



OFFICE BUILDOUT AND RENOVATION

Seffner, Florida

PROJECT MANUAL

VOLUME 1

08-25-2021



FLEISCHMANGARCIA
ARCHITECTURE | PLANNING | INTERIOR DESIGN

AA C000123

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FGA Project No. 21003
CONSTRUCTION DOCUMENTS
08-25-2021

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 **AIA**[®] Document A101[™] – 2017

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

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

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

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

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

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

The Owner and Contractor agree as follows.

ADDITIONS AND DELETIONS:

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

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

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

TABLE OF ARTICLES

- 1 THE CONTRACT DOCUMENTS
- 2 THE WORK OF THIS CONTRACT
- 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION
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ARTICLE 1 THE CONTRACT DOCUMENTS

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

ARTICLE 2 THE WORK OF THIS CONTRACT

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

ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

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

(Paragraphs deleted)

§ 3.1.1 The Contractor shall not proceed with the Work until the Owner receives a Certificate of Insurance with coverage as agreed upon in the Contract Documents.

(Paragraph deleted)

§ 3.1.2 If prior to commencement of the Work, the Owner requires time to file mortgages and other security interests, the Owner's time requirement shall be as follows:

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

§ 3.3 Substantial Completion

§ 3.3.1 The Contractor shall achieve Substantial Completion of the entire

(Paragraphs deleted)

Work not later than () calendar days from the date of commencement of the Work, subject to adjustments of this Contract Time as provided in the Contract Documents.

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

(Table deleted)

(Paragraph deleted)

Int.

ARTICLE 4 CONTRACT SUM

§ 4.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor’s performance of the Contract. The Contract Sum shall be (\$), subject to additions and deductions as provided in the Contract Documents. There shall be no additions to the Contract Sum as a result of any price increase in Contractor’s cost of labor, services or materials that occur after the Contract is signed by Contractor.

§ 4.2 Alternates and Clarifications

§ 4.2.1 Alternates and Clarifications, if any, which are described in the Contract Documents are hereby accepted and included in the Contract Sum by the Owner:

(Table deleted)

§ 4.2.2 Subject to the conditions noted below, the following alternates may be accepted by the Owner following execution of this Agreement. Upon acceptance, the Owner shall issue a Modification to this Agreement.

(Paragraph deleted)

Item	Price	Conditions for Acceptance
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§ 4.3 Allowances, if any, included in the Contract Sum: None.

Item	Price
------	-------

§ 4.4 Unit prices, if any:

(Paragraph deleted)

Item	Units and Limitations	Price per Unit (\$0.00)
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§ 4.5 Liquidated damages, if any:

(Paragraphs deleted)

See AIA Document A201-2007, Section 9.8 Substantial Completion.

§ 4.6 Other:

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

ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments

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

§ 5.1.2 The period covered by each Application for Payment shall be one calendar month ending on the last day of the month, or as follows: Twenty-Fifth (25th) day of the month. § 5.1.3 Provided that a fully completed Application for Payment, together with required supporting documents, is received by the Owner not later than the twenty-fifth (25th) day of a month, the Owner shall make payment of the certified amount to the Contractor not later than the tenth (10th) day of the following month. If an Application for Payment is received by the Owner after the application date fixed above, payment shall be made by the Owner not later than twenty (20) days after the Owner receives the fully completed Application for Payment, together with required supporting documents. *(Federal, state or local laws may require payment within a certain period of time.)*

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

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

Init.

§ 5.1.6 Subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

- .1 Take that portion of the Contract Sum properly allocable to completed Work as determined by multiplying the percentage completion of each portion of the Work by the share of the Contract Sum allocated to that portion of the Work in the schedule of values, less retainage of ten percent (10%). Pending final determination of cost to the Owner of changes in the Work, amounts not in dispute shall be included as provided Section 7.3.9 of AIA Document A201 -2007, General Conditions of the Contract for Construction;
- .2 Add that portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction, (or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing) less retainage of ten percent (10%);
- .3 Subtract the aggregate of previous payments made by the Owner;
- .4 Subtract amounts, if any, for which the Owner has withheld or nullified a Certificate for Payment as provided in Section 9.5 of AIA Document A201-2007;
- .5 Add, upon Substantial Completion of Work, a sum sufficient to increase the total payments to the ninety-five percent (95%) of the Contract Sum, less such amounts as the Owner shall determine for incomplete Work, retainage applicable to such work and unsettled claims; and
- .6 Add, if final completion of the Work is thereafter materially delayed through no fault of the Contractor, any additional amounts payable in accordance with Article 9 of AIA Document A201-2007.

(Paragraphs deleted)

§ 5.1.7 Retainage § 5.1.7.1 Reduction or limitation of retainage, if any, shall be as follows: None.

(Paragraphs deleted)

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

(Paragraph deleted)

§ 5.2 Final Payment

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

- .1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Article 12 of AIA Document A201-2007, and to satisfy other requirements, if any, which extend beyond final payment; and
- .2 a final Certificate for Payment has been issued by the Owner.

§ 5.2.2 The Owner's final payment to the Contractor will be made within 30 days of Substantial Completion and receipt of the following:

- .1 fully executed lien documents from Contractor, Subcontractors and Suppliers;
- .2 two sets, one electronic of as-built drawings, warranty and maintenance manuals;
- .3 final unconditional Certificate of Occupancy;
- .4 all punch list work has been completed and accepted;
- .5 fully executed final change order(s); and
- .6 all warranty work through date of acceptance of items 1-5 has been completed and accepted from Contractor, Subcontractors and Suppliers.

§ 5.3 Interest

Payments due and unpaid under the Contract shall bear interest from the date payment is due at

(Paragraphs deleted)

Chase Manhattan Prime Rate plus two percent (2%).

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Initial Decision Maker

(Paragraphs deleted)

There shall not be an Initial Decision Maker, and all references in the Contract Documents to an Initial Decision Maker are hereby void.

§ 6.2 Binding Dispute Resolution

For any Claim subject to, but not resolved by, mediation pursuant to Article 15 of AIA Document A201–2007, the method of binding dispute resolution shall

(Paragraphs deleted)

be litigation in a court of competent jurisdiction. OWNER AND CONTRACTOR WAIVE ANY RIGHT TO TRIAL BY JURY AND, INSTEAD, CHOOSE TO HAVE ANY SUCH DISPUTE RESOLVED BY A JUDGE.

ARTICLE 7 TERMINATION OR SUSPENSION

§ 7.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A201–2007.

(Paragraphs deleted)

§ 7.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A201–2007.

ARTICLE 8 MISCELLANEOUS PROVISIONS

§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A201–2007 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

§ 8.2 The Owner’s representative:

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

§ 8.3 The Contractor’s representative:

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

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

§ 8.5 Insurance and Bonds

§ 8.5.1 The Contractor shall purchase and maintain insurance as set forth in Article 11 of AIA Document A201–2007, General Conditions of the Contract for Construction, as modified, including without limitation identified limits of liability.

Type of insurance or bond	Limit of liability or bond amount (\$0.00)
Workman’s Compensation	Coverage complying with all the requirements of the State the project is located and shall include Employer’s Liability Insurance at a limit of not less than \$1,000,000.
Comprehensive General Liability	\$3,000,000
Bodily Injury & Personal Injury	\$2,000,000
Motor Vehicle Liability	\$1,000,000
Property Damage	\$1,000,000

(Paragraph deleted)

Init.

§ 8.6 Other provisions:

8.6.1 The Owner will contract directly with an independent testing agency for testing and inspections. The Contractor is responsible for coordinating tests and inspections as required in the specifications and for correcting any work identified as non-compliant with the Contract Documents. The Contractor shall be responsible for the additional costs of re-testing failures, re-scheduling inspections, tests and/or inspections beyond the required Scope of Work and/or the omission of any required test or inspection.

8.6.2 The Owner will contract directly for items as noted in the pre-bid conference notes,

8.6.3 Photographs of the following items shall be submitted with the Application for Payment for same; rigid perimeter insulation; stored insulation materials on job site and materials in-place; electrical ground rods and ground connections for building service and site lighting; stored copper rods and/or cable materials on job site and materials in-place; paint primer for exterior metal (e.g. canopy roofing, roof cap), and tube steel entrance truss framing; stored paint materials on job site and materials in-place; structural steel stiffeners for curtainwall framing mullions. The Contractor shall, at the Contractor's expense, uncover in-place Work as necessary to confirm materials used. The Contractor is responsible for any costs associated with outside inspection and/or testing required to confirm concealed work. Payment to the Contractor will be withheld until these conditions are met.

8.6.4 The Contractor is responsible for restoration of off-site areas disturbed in performance of the Work.

(Paragraphs deleted)

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents, except for Modifications issued after execution of this Agreement, are enumerated in the section below:

- .1 AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor (as modified).

(Paragraph deleted)

- .2 AIA Document A201™–2007, General Conditions of the Contract for Construction (as modified).

- .3 Drawings: See Exhibit B.

(Paragraph deleted)

- .4 Specifications: See Exhibit C.

(Table deleted)

(Paragraphs deleted) 5 Addenda, if any:

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

(Paragraphs deleted)

- .6 Other documents forming part of the Contract Documents

Document	Title	Date	Pages
Exhibit A	Schedule of Values		
Exhibit B	List of Drawings		
Exhibit C	General Index for the Specification Manual		
Exhibit D	Affidavits and Lien Waiver Forms		

(Paragraphs deleted)

- .7 Other documents, if any, listed below:

Bidding documents issued by the Architect or Owner including without limitations the Invitation to Bid, the Instruction to Bidders and Addenda or portions thereof relating to any Bid Document. This Agreement entered into as of the day and year first written above. The undersigned company represents that the undersigned individual is duly authorized by the company to execute and deliver this instrument on behalf of the company and to bind the company in all matters addressed herein.

OWNER *(Signature)*

(Printed name and title)

CONTRACTOR *(Signature)*

(Printed name and title)

Contractor's License Number

Init.

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 **AIA[®] Document A201[™] – 2007**

General Conditions of the Contract for Construction

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

THE OWNER:
(Name, legal status and address)

THE ARCHITECT:
(Name, legal status and address)

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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, Bidding Documents including without limitation the Advertisement or Invitation to Bid, the instructions to Bidders and Addenda or portions thereof relating to any Bidding Documents, Addenda issued prior to execution of the Contract, other documents listed in the Agreement and Modifications issued after execution of the Contract. A Bid Proposal or any portion therein shall not be a Contract document. 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 Owner. A Change Order Request shall not be a Modification to the Contract.

§ 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, Subcontractor, material supplier or other entity to fulfill the Contractor's obligations whether on or off the site of the Project. 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 INTENTIONALLY OMITTED

§ 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. Computed dimensions shall take precedence over scale dimensions and large scale drawings shall take precedence over small scale drawings.

§ 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.

§ 1.2.4 If there is an inconsistency in the Drawings, Specifications, or between the Drawings and the Specifications, or between existing site conditions and the Drawings and Specifications, unless otherwise ordered in writing by the Architect or the Owner, the Contractor shall provide the better quality of, or the greater quantity of, more stringent, or higher standard of Work or materials. The Contractor shall promptly, and no later than 48 hours after discovery, notify the Owner and Architect of any inconsistency found in the Drawings, Specifications, or between the Drawings and the Specifications and any existing site condition.

§ 1.2.5 Where a typical or representative detail is shown on the Drawings, such detail shall constitute the standard of workmanship and materials throughout corresponding portions of the Work. Where necessary, the Contractor shall adopt such detail for use in said corresponding portions of the Work in a manner that is satisfactory to the Architect.

§ 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 Drawings, Specifications and other documents prepared by the Architect and the Architect's consultants are instruments of the Architect's service through which the Work to be executed by the Contractor is described. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with this Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors and material or equipment suppliers are authorized to use and reproduce the Instruments of Service provided to them solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment suppliers may not use the Instruments of Service on other projects or for additions to this Project outside the scope of the Work without the specific written consent of the Owner. All copies of the Instruments of Services, except the Contractor's record set, shall be returned or suitably accounted for to the Owner, on request, upon completion of the Work.

§ 1.5.3 Drawings issued by the Architect concerning clarifications, proposed changes (in form of "bulletins") or changes will be in the form of a reproducible print of each such Drawing. The Contractor, at his expenses, shall do all printing or duplication and distribution of such reproducible prints as necessary for the proper performance of the Work.

§ 1.6 TRANSMISSION OF DATA IN DIGITAL FORM

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

ARTICLE 2 OWNER

§ 2.1 GENERAL

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express

authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

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

§ 2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER

§ 2.2.1 Prior to commencement of the Work, the Contractor may request in writing that the Owner provide a written statement acknowledging that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract.

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

§ 2.2.3 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work, provided, however, Contractor shall review any such surveys, soil tests, or legal descriptions submitted by the Owner and notify the Owner within twenty (20) days of receipt of any inaccuracies.

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

§ 2.2.5 The Owner shall furnish to the Contractor one electronic copy of the Drawings and one electronic copy of the Specifications for purposes of making reproductions pursuant to Section 1.5.2. The Contractor shall furnish all other copies of the Drawings and Specifications necessary to perform the Work.

§ 2.3 OWNER'S RIGHT TO STOP THE WORK

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3. This right shall be in addition to and not in restriction or derogation of the Owner's rights under Article 14 hereof and shall not relieve the Contractor of any of his responsibilities and obligations under the Contract Documents.

§ 2.4 OWNER'S RIGHT TO CARRY OUT THE WORK

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents, including the Contract Time, and fails within a five-day period after receipt of written notice from the Owner by letter, email, or progress meeting minutes 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, immediately correct such deficiencies, including supplementing the Contractor's forces to achieve Substantial Completion within the Contract Time. In such case an appropriate Change Order shall be issued deducting from payments then or thereafter due the Contractor the reasonable cost of correcting such deficiencies and/or supplementing Contractor's forces, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect or failure. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, at the Owner's option, the excess shall be deducted from any payment thereafter due or shall be paid by the Contractor immediately upon the demand of the Owner.

§ 2.5 ADDITIONAL RIGHTS

The rights stated in Article 2 shall be in addition to and not in limitation of any other rights of the Owner granted in the Contract Documents or at law or in equity.

ARTICLE 3 CONTRACTOR

§ 3.1 GENERAL

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

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

§ 3.1.3 The Contractor shall not be relieved of obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Owner or Architect in their 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 and on site 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 commencing the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.2.3, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor. The Contractor shall promptly report to the Owner any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect or Owner 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 shall also ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of any governmental body or public or quasi-public authority. The Contractor shall promptly report to the Owner any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect or Owner may require.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Owner or Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall make Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities unless the Contractor should have recognized such error, inconsistency, omission, difference or nonconformity and failed to report it to the Owner. If the Contractor performs any construction activity when Contractor should have known it involves a recognized error, inconsistency, omission, difference or nonconformity in the Contract Documents or with existing site conditions without such notice to the Owner, the Contractor shall assume appropriate responsibility for such performance and shall bear an appropriate amount of the attributable costs for correction.

§ 3.3 SUPERVISION AND CONSTRUCTION PROCEDURES

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract, unless the Contract Documents give

other specific instructions concerning these matters. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences or procedures, the Contractor shall evaluate the jobsite safety thereof and, except as stated below, shall be fully and solely responsible for the jobsite safety of such means, methods, techniques, sequences or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely written notice to the Owner and Architect and shall not proceed with that portion of the Work without further written instructions from the Owner or Architect. If the Contractor is then instructed to proceed with the required means, methods, techniques, sequences or procedures without acceptance of changes proposed by the Contractor, the Owner shall be solely responsible for any loss or damage arising solely from those Owner-required means, methods, techniques, sequences or procedures.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors or claiming by, through or under the Contractor and for any damages, losses, costs and expenses resulting from such acts or omissions.

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

§ 3.4 LABOR AND MATERIALS

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

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

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

§ 3.4.4 All manufactured articles, and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned as directed by the respective manufacturers, unless otherwise specified.

§ 3.4.5 Contractor shall provide all manpower and deliver all materials at such times and in such quantities as will insure the speedy and uninterrupted progress of the Work and achieve Substantial Completion within the Contract Time. All materials shall be delivered to the Site in proper order and quantity. Contractor shall handle and protect all materials used in performance of the Work furnished by Contractor as the same are delivered to the Site, or to any applicable off-site storage location, and shall be solely responsible for the security and condition of the same. After final completion and acceptance of the Work, or sooner if requested by the Owner, Contractor shall remove all surplus materials, equipment, temporary structures and scaffolding furnished by it which have not been incorporated into the Work.

§ 3.4.6 Title to all materials shall immediately vest to the Owner upon payment in respect of such materials, whether or not then incorporated or installed into the Project, subject to the right of the Owner, or Architect to reject same for failure to conform to the standards of any of the Contract Documents. Title to all Work and materials shall be in owner, free and clear of all liens, claims, security interests or encumbrances.

§ 3.4.7 All materials furnished shall be new unless stated otherwise. When materials are specified to conform to any standard, the materials delivered to the Site shall bear manufacturers' labels stating that the materials meet such standards. The above requirements shall not restrict or affect Owner's right to test materials as provided in the Contract Documents.

§ 3.5 WARRANTY

The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants

that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Owner or Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment. The warranty given in this Paragraph shall survive and exceed any warranty limitation period set forth elsewhere in the Contract Documents.

§ 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 Owner 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 and will keep the Owner informed of any changes in applicable laws, ordinances, codes or permits affecting the Project. A photocopy of the building permit shall be delivered to the Architect and Owner as soon as it is obtained. Upon final completion, the Contractor shall deliver all original permits, licenses and certificates to the Owner and shall deliver photocopies to the Architect.

§ 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 2 days after first observance of the conditions. The Owner will promptly investigate such conditions and, if the Owner 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 make an equitable adjustment in the Contract Sum or Contract Time, or both. If the Owner 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 Owner shall promptly notify the Contractor in writing, stating the reasons. If the Contractor disputes the Owner's determination or recommendation, the Contractor may proceed as provided in Article 15. The Contractor shall not receive an adjustment in the Contract Sum or the Contract Time if such unknown or concealed condition is: (i) of a usual nature or does not differ materially from those ordinarily encountered and generally recognized as inherent in construction activities of the character provided for in the Contract Documents; (ii) located below the surface of the ground and does not differ materially from those generally encountered in the general area in which the site of the Project is located or does not differ materially from conditions encountered in any sub-surface investigation completed prior to the date of the Agreement; (iii) not materially different from those conditions disclosed or which reasonably should have been discerned by the Contractor's prior observations, field measurements, work, inspection, tests and reviews; and (iv) of a nature which the Contractor or any Subcontractor should reasonably know or anticipate based on any of the foregoing.

§ 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

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continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.8 ALLOWANCES

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

§ 3.8.2 Unless otherwise provided in the Contract Documents,

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

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

§ 3.9 SUPERINTENDENT

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

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

§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed. The Contractor shall provide the Owner with seventy-two (72) hours' notice of its intent to replace the superintendent.

§ 3.9.4 The Contractor shall require each Subcontractor for principal portions of the Work to provide a competent superintendent authorized to represent and speak on behalf of the Subcontractor at the Project site during the progress of the Work.

§ 3.10 CONTRACTOR'S CONSTRUCTION SCHEDULES

§ 3.10.1 The Contractor, promptly and no later than twenty one days after being awarded the Contract, shall prepare and submit for the Owner's information a Contractor's construction schedule for the Work. The schedule shall not exceed the Contract Time set forth in the Contract Documents plus or minus any adjustments made to the Contract Time by an executed Change Order, shall be revised at appropriate intervals as required by the conditions of the Work and Project, shall be related to the entire Project to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the Work.

§ 3.10.2 The Contractor shall prepare a submittal schedule, promptly and no later than twenty one days after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, and shall submit the schedule(s) for the Owner's and Architect's approval. The Owner's and Architect's approval shall not unreasonably be delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Owner and Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule or fails to submit according to the 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.

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

§ 3.10.4 The Contractor also acknowledges and represents that it is aware that it will be required to accommodate the Owner's fixturing personnel up to four (4) weeks prior to Substantial Completion, which acknowledgment shall be reflected in the approved schedule. The Contractor shall coordinate the work of the Owner's fixturing personnel with the Work.

§ 3.11 DOCUMENTS AND SAMPLES AT THE SITE

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

§ 3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

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

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

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

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

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

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

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

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

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. The Contractor shall not be required to provide professional services in violation of applicable law. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall cause such services or certifications to be provided by a properly licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect and Owner. The Owner and the Architect shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor all performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review, approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Contractor shall not be responsible for the adequacy of the performance and design criteria specified in the Contract Documents.

§ 3.13 USE OF SITE

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

§ 3.14 CUTTING AND PATCHING

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

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

§ 3.15 CLEANING UP

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials or rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery and surplus materials from and about the Project. The Contractor shall thoroughly wash and clean all glass and mirror surfaces, and shall leave the Work neat and broom clean. The Contractor shall, not less than two times each week, clean up by removing rubbish, including old and surplus materials. The Contractor shall use its best efforts to prevent dust. The Contractor shall be responsible for the overall cleanliness and neatness of Work.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and Owner shall be entitled to reimbursement from the Contractor and, at the option of the Owner, shall be deducted from the next payment to the Contractor or be paid by the Contractor to the Owner.

§ 3.15.3 Refer to the specification section pertaining to Final Cleaning for additional requirements and information.

§ 3.16 ACCESS TO WORK

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

§ 3.17 ROYALTIES, PATENTS AND COPYRIGHTS

The Contractor shall pay all royalties and license fees. The Contractor shall defend all suits or claims for infringement of copyrights and patent rights and shall save the Owner and Architect harmless from loss (including but not limited to, attorneys' fees and any litigation expenses) unless particular design, process or product of a particular manufacturer or manufacturers is specified in the Contract Documents; provided, however, if the Contractor has reason to believe that the required design, process or product specified is an infringement of a copyright or a patent, the Contractor shall be responsible for such loss unless the Contractor promptly gives such information to the Architect and Owner.

§ 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, but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity which would otherwise exist as to a party or person described in this Section 3.18.

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

§ 3.19 MEETINGS

The Contractor shall send his qualified representative to meetings held at the Project site every two weeks or at such time as the Architect or Owner shall designate.

§ 3.20 REPRESENTATIONS AND WARRANTIES

The Contractor represents and warrants the following to the Owner (in addition to the other representations and warranties contained in the Contract Documents), as an inducement to the Owner to execute the Agreement, which representations and warranties shall survive the execution and delivery of the Agreement and the final completion of the Work:

.1 that the Contractor is financially solvent, able to pay his debts as they mature and possessed of sufficient working capital to complete the Work and perform his obligations under the Contract Documents;

2 that the Contractor is able to furnish the plant, tools, materials, supplies, equipment and labor required to complete the Work and perform his obligations hereunder and has sufficient experience and competence to do so;

3 that the Contractor is authorized to do business in the State where the Project is located and properly licensed by all necessary governmental and public and quasi- public authorities having jurisdiction over the Contractor and over the Work and the site of the Project;

.4 that the execution of the Agreement and performance thereof is within the Contractor's duly authorized powers; and

.5 that the Contractor's duly authorized representative has visited the site of the Work, familiarized himself with the existing conditions under which the Work is to be performed and correlated his observations with the requirements of the Contract Documents and that Contractor is competent to perform the Work within the Contract Time and Contract Sum.

§ 3.21 SURETIES

The Contractor shall keep its surety and any surety for any Subcontractor informed of all information and occurrences as required by any surety bond on the Project.

ARTICLE 4 ARCHITECT

§ 4.1 GENERAL

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

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

§ 4.1.3 If the employment of the Architect is terminated, the Owner shall employ a successor architect whose status under the Contract Documents shall be that of the Architect.

§ 4.2 ADMINISTRATION OF THE CONTRACT

§ 4.2.1 The Owner and Architect will provide administration of the Contract as described in the Contract Documents during construction until the date the final payment is issued. 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 Owner and 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 Owner or Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. Neither the Owner nor the Architect will have control over, charge of, or responsibility for, the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents, except as provided in Section 3.3.1.

§ 4.2.3 The Owner will exercise care and diligence in discovering and promptly reporting any defects or deficiencies in the Work of the Contractor or any of his subcontractors or their agents or employees, or any other person performing any of the Work in the construction of the Project to the Contractor. The Owner and Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Owner and Architect will not have control over or charge of and will not be responsible for acts or omissions of the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 COMMUNICATIONS FACILITATING CONTRACT ADMINISTRATION

Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and material suppliers shall be through the Contractor. Communications by and with separate contractors shall be through the Owner.

§ 4.2.5 Based on the Owner's evaluations of the Contractor's Applications for Payment, the Owner will review and approve the amounts due the Contractor.

§ 4.2.6 The Owner and Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Owner or Architect consider it necessary or advisable, the Owner or Architect will have authority to require inspection or testing of the Work in accordance with Sections 13.5.2 and 13.5.3, whether or not such Work is fabricated, installed or completed. However, neither this authority of the Owner or 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 Owner or Architect to the Contractor, Subcontractors, material and equipment suppliers, their agents or employees, or other persons or entities performing portions of the Work.

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§ 4.2.7 The Owner or 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 Owner's or 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 Owner's or Architect's judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Owner's or 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 Owner's or Architect's review shall not constitute approval of safety precautions or, unless otherwise specifically stated by the Owner or Architect, of any construction means, methods, techniques, sequences or procedures. The Owner's or 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 Owner will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.9 The Owner will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion and will receive written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10

§ 4.2.10 Intentionally Omitted.

§ 4.2.11 The Owner or Architect as applicable will initially interpret and initially decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Owner's or 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 or Owner 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 Owner or Architect as applicable 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 and without negligence.

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

ARTICLE 5 SUBCONTRACTORS

§ 5.1 DEFINITIONS

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

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

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

§ 5.2.1 Unless otherwise stated in the Contract Documents or the bidding requirements, the Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner through the Architect the names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed

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for each principal portion of the Work. The Owner or Architect may reply within 14 days to the Contractor in writing stating (1) whether the Owner or the Architect has reasonable objection to any such proposed person or entity or (2) that the Owner or Architect requires additional time for review. Failure of the Owner or Architect to reply within the 14 day period shall constitute notice of no reasonable objection.

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

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

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

§ 5.3 SUBCONTRACTUAL RELATIONS

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

§ 5.3.2 Contractor shall furnish to Owner a copy of the master Subcontract form to be used within ten (10) days after the signing of this agreement.

§ 5.3.3 Any part of the Work performed for the Contractor by a Subcontractor shall be pursuant to a written Subcontract between the Contractor and such Subcontractor, which shall be prepared on a master form of Subcontract which contains provisions that:

- .1 require that such portion of the Work be performed in accordance with the requirements of the Contract Documents;
- .2 require timely submission of Subcontractor applications for payment with lien waivers/releases in order to enable the Contractor to apply for payment in accordance with the provisions of Article 9;
- .3 waive all rights the subcontracting parties may have against one another or that the Subcontractor may have against the Owner for damages caused by fire or other perils covered by the property insurance described in Paragraph 11.3, except for such rights as they may have to the proceeds of such insurance held by the Owner under Subparagraph 11.3.9;
- .4 recognize the rights of the Owner pursuant to the Contingent Assignment of Subcontracts under Subparagraph 5.4.1 and require the Subcontractor (upon notice by the Owner that the Owner has terminated the

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Agreement with the Contractor pursuant to the terms of Article 14, and that the Owner has elected, pursuant to Subparagraph 5.4.1, to retain the Subcontractor pursuant to the terms of its Subcontract with the Contractor) to complete the unperformed obligations under such Subcontract and, if requested by the Owner, to enter into an appropriate agreement evidencing the fact that the Subcontractor is bound to the Owner under his Subcontract in the manner in which he had been bound to the Contractor;

.5 require the Subcontractor to carry and maintain insurance in accordance with the requirements of the Contract Documents; and

.6 contain no provisions inconsistent with any of the foregoing Subparagraphs .1 through .6 of this Subparagraph 5.3.3.

§ 5.3.4 Contractor's use of Subcontractors and Materialmen shall not diminish Contractor's obligation to complete the Work in accordance with the Contract Documents. Contractor shall control and coordinate the Work of its Subcontractors and Materialmen and shall provide and supervise sufficient and competent manpower and materials to perform the Work in accordance with the Contract Documents. Nothing contained in this Agreement shall create any contractual relationship between Subcontractors or Materialmen and Owner. Nothing in this Article shall obligate Owner to pay or to see to the payment of any sums to any Subcontractor or Materialmen.

§ 5.4 CONTINGENT ASSIGNMENT OF SUBCONTRACTS

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

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

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

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

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

§ 5.5 PAYMENTS TO SUBCONTRACTORS BY THE CONTRACTOR

The Contractor shall pay each Subcontractor, no later than promptly upon receipt of payment from the Owner, an amount equal to the percentage of completion allowed to the Contractor on account of such Subcontractor's Work, less the percentage retained from payments to the Contractor. The Contractor shall also require each Subcontractor to make similar payments to its Sub-subcontractors.

§ 5.6 PAYMENTS TO SUBCONTRACTORS BY THE OWNER

§ 5.6.1 If the Owner fails to approve an Application for Payment for cause which the Owner determines is the fault of the Contractor and not the fault of a particular Subcontractor, or if the Contractor fails to make a payment which is properly due to a particular Subcontractor, the Owner may pay such Subcontractor directly, less the amount to be retained under his Subcontract. Any amount so paid by the Owner shall be repaid to the Owner by the Contractor in the manner set forth in Paragraph 2.4.

§ 5.6.2 The Owner shall have no obligation to pay, or to see to the payment of, any monies to any Subcontractor. Nothing contained in Paragraph 5.6 shall be deemed to create any contractual relationship between the Owner and any Subcontractor or to create any rights in any Subcontractor against the Owner.

§ 5.6.3 The Contractor shall promptly advise the Owner of any claim or demand by a Subcontractor claiming that any amount is due to such Subcontractor or claiming any default by the Contractor in any of its obligations to such Subcontractor.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

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

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

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

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

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

§ 6.2 MUTUAL RESPONSIBILITY

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

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

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

§ 6.2.4 The Contractor shall promptly remedy damage the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or separate contractors as provided in Section 10.2.5 and shall indemnify, defend and hold harmless the Owner from any such damages or claims.

§ 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 Owner or 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 and Contractor; a Construction Change Directive is issued by the Owner and may or may not be agreed to by the Contractor; an order for a minor change in the Work may be issued by the Architect alone.

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

§ 7.2 CHANGE ORDERS

§ 7.2.1 A Change Order is a written instrument prepared by the Contractor and signed by the Owner and Contractor after execution of the Agreement 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.

§ 7.2.2 The compensation specified in a Change Order shall constitute an accord and satisfaction and full payment for the Work covered thereby and a complete release of and for all delay, impact and disruption costs or expenses occasioned by reason of said change in the Work.

§ 7.2.3 No time extension shall be granted Contractor by reason of the issuance of any Change Order unless expressly stated therein.

§ 7.2.4 Notwithstanding the generality of the foregoing, under no circumstances will the Contract Sum be adjusted on account or as a result of any occurrence or transaction arising out of or from the negligence or willful act or failure to act on the part of the Contractor.

§ 7.3 CONSTRUCTION CHANGE DIRECTIVES

§ 7.3.1 A Construction Change Directive is a written order prepared by the Owner or Architect and signed by the Owner or 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 or Architect 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. Contractor shall immediately proceed with the change even if Contractor disagrees with the proposed adjustment, if any, to the Contract Sum or Contract Time so as to not delay completion of the Work. Any disagreement shall be resolved as set forth in 7.3.7 – 7.3.10 below.

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

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

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

§ 7.3.4 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed in a proposed Change Order or Construction Change Directive so that

application of such unit prices to quantities of Work proposed will cause substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 7.3.5 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with and complete the change in the Work involved. While proceeding with the change, Contractor shall also, within ten (10) days of receipt of the Construction Change Directive, advise the Owner 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 and/or Contract Time. If Contractor does not promptly proceed with the change in the Work, Contractor shall have waived and released any claim for any adjustment in the Contract Sum and/or Contract Time on account of the change and shall be liable to Owner for all direct and consequential damages incurred by Owner as a result of Contractor's delayed performance.

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

§ 7.3.7 If the Contractor does not respond within ten (10) days or disagrees with the method for adjustment in the Contract Sum, the Owner or Architect shall determine the method and the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Owner may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.7 shall be limited to the following:

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

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Owner or 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 Owner will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Owner determines to be reasonably justified. The Owner'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 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 Contractor 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 and Owner have authority to order minor changes in the Work not involving adjustment in the Contract Sum or extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes will be effected by written order signed by the Architect and Owner and shall be binding on the Contractor.

ARTICLE 8 TIME

§ 8.1 DEFINITIONS

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including adjustments authorized in writing by the Owner, 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 of the final unconditional Certificate of Occupancy 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 and that the Contractor is capable of properly completing the Work within the Contract Time.

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

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

§ 8.3 DELAYS AND EXTENSIONS OF TIME

§ 8.3.1 If the critical path of the Project is delayed at any time in the commencement or progress of the Work by an act of the Owner or Architect, or of an employee of either, or of a separate contractor employed by the Owner; or by changes ordered in the Work; or by labor disputes, fire outside of the Contractor's control, unusual delay in deliveries due solely to the acts of the carrier providing delivery, unavoidable casualties or other causes beyond the Contractor's control; or by delay authorized by the Owner pending mediation or by other causes that the Architect determines may justify delay, then the Contract Time shall be extended by Change Order for such reasonable time as the Architect or Owner may determine. Any change shall be an extension of the Contract Time only and the Contractor shall not seek or recover any damage for delay provided for in this Paragraph 8.3.1. The Contractor shall use best efforts to mitigate the effects of any such delay.

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

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

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 CONTRACT SUM

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

§ 9.2 SCHEDULE OF VALUES AND INITIAL SWORN STATEMENT

§ 9.2.1 The Contractor shall submit to the Owner, before the first Application for Payment, a schedule of values allocating the entire Contract Sum to the various portions of the Work and prepared in such form and supported by such data to substantiate its accuracy as the Owner may require. This schedule, unless objected to by the Owner, shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 9.2.2 Within thirty (30) days following commencement of the Work, the Contractor shall deliver to the Owner a Contractor's sworn statement, duly executed and acknowledge and in form satisfactory to the Owner, listing all Subcontracts.

§ 9.3 APPLICATIONS FOR PAYMENT

§ 9.3.1 No later than the date established for each progress payment, the Contractor shall submit to the Owner three copies of AIA Document G702, Application and Certificate for Payment and AIA Document G703, Continuation Sheet, itemized in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. Such application shall be notarized and supported by such data substantiating the Contractor's right to payment as the Owner may require, such as copies of requisitions from Subcontractors and material suppliers, and shall reflect retainage if provided for in the Contract Documents.

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

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

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

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which payments have been received from the Owner shall, to the best of the Contractor's knowledge, information and belief, be free and clear of liens, claims, security interests or encumbrances in favor of the Contractor, Subcontractors, material suppliers, or other persons or entities making a claim by reason of having provided labor, materials and equipment relating to the Work. The Contractor shall satisfy or discharge and shall indemnify, defend and hold Owner harmless from any liens, claims, security interest or encumbrances filed by the Contractor, subcontractors, or anyone claiming by, through or under any of them, and will pay on demand any costs or attorneys' fees incurred by Owner if Contractor fails to satisfy, discharge or defend such liens, claims, security interest or encumbrance.

§ 9.3.4 Each Application for Payment shall be accompanied by the following, all in the form satisfactory to the Owner:

.1 duly executed waivers of construction mechanics' and materialmen's liens establishing payment or satisfaction of all such obligations to Subcontractors, required lower tier Subcontractors and Materialmen for the preceding pay period; and

.2 Contractor's affidavit of payment and waiver of lien for Work done and materials furnished through the date covered by the last preceding partial payment and shall furnish its affidavit certifying that all Subcontractors and Materialmen have been paid for Work performed and materials furnished through such date except for any permitted retainage. Contractor shall attach to each Application or Requisition affidavits of payment and waivers of lien from all Subcontractors, providing labor and/or materials and/or equipment in connection with the Work, and Sub-subcontractors and materialmen who have given notice to Owner for such Work performed and materials furnished. Contractor shall execute a waiver of lien at the time payment is made for a Requisition for all Work performed through the date of Requisition in respect of which payment is being made, as a condition of such payment.

§ 9.4 CERTIFICATES FOR PAYMENT

§ 9.4.1 The Owner will, within twenty days after receipt of a fully complete Contractor's Application for Payment and the documents required in Section 9.3.4 above, either pay such amount as the Owner determines is properly due, or notify the Contractor in writing of the reasons for withholding payment in whole or in part as provided in Section 9.5.1.

§ 9.4.2 Intentionally Omitted.

§ 9.5 DECISIONS TO WITHHOLD PAYMENT

§ 9.5.1 The Owner may withhold payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Owner's opinion the Work has not progressed to the point indicated in the Application for Payment or because of

- .1 defective Work not remedied;
- .2 third party claims filed or reasonable evidence indicating probable filing of such claims unless security acceptable to the Owner is provided by the Contractor;
- .3 failure of the Contractor to make payments properly to Subcontractors or for labor, materials or equipment, and/or to provide the duly executed waivers of construction mechanics' and materialmen's liens from Contractor, Subcontractors, required lower tier Subcontractors and Materialmen;
- .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 failure to carry out the Work in accordance with the Contract Documents.

§ 9.5.2 When the above reasons for withholding payment are removed, payment will be made for amounts previously withheld. The Owner shall not be deemed in default by reason of withholding payment while any of the above grounds remain uncured.

§ 9.5.3 If the Owner withholds 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.

§ 9.6 PROGRESS PAYMENTS

§ 9.6.1 The Owner shall make payment in the manner and within the time provided in the Contract Documents.

§ 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 Owner may, on request by any Subcontractor and at the Owner's discretion, 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.

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

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

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

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

§ 9.7 FAILURE OF PAYMENT

If the Owner does not pay the Contractor within seven days after the date established in the Contract Documents the amount determined by the Owner, then the Contractor may, upon seven additional days' written notice to the Owner stop the Work until payment of the amount owing has been received.

§ 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. The date of Substantial Completion for this Project is and shall be the date of receipt of the final Unconditional Certificate of Occupancy. Owner and Contractor acknowledge that time is of the essence in completing the Project on time so that Owner can schedule the training and start date of its employees, schedule advertisements, deliver furniture and fixtures and so Owner's retail business can operate. They also acknowledge that Owner's damages from any failure to achieve Substantial Completion within the Contract Time will cause substantial damage to Owner and that the amount of that damage cannot be determined at this time. Owner and Contractor therefore agree to liquidate that damage as \$5,000 for each day beyond the Contract Time that the Project is not completed and Contractor agrees to pay Owner that amount for each such day.

§ 9.8.2 When the Owner considers that the Work, or a portion thereof which the Owner agrees to accept separately, is sufficiently complete to perform Punchlist Work, the Owner shall prepare and submit to the Contractor a comprehensive list of items to be completed or corrected (the "Punchlist"). 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. The Contractor shall complete all Punchlist work no later than fourteen (14) days after receipt of the Punchlist from the Owner. Contractor acknowledges that the Owner will suffer substantial harm after the Owner occupies the building and puts it to its intended use if the Punchlist work is not promptly performed. As such, the Contractor agrees to pay as liquidated damages, and not as a penalty, to the Owner \$250 per day for each day after the 14th day from receipt of that Punchlist that the Punchlistwork is not complete. When the Punchlist work is completed, Contractor's Project Manager and Superintendent shall initial each item on the Punchlist indicating that each item has been performed.

§ 9.8.3 Upon receipt of the initialed Punchlist, the Owner will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Owner's inspection discloses any item, whether or not included on the Punchlist, which is not sufficiently complete in accordance with the Contract Documents the Contractor shall complete or correct such item upon notification by the Owner. In such case, the Contractor shall then submit a request for another inspection by the Owner to determine completion. The Contractor shall pay the Owner a reinspection fee ("Reinspection Fee") in the amount of \$400 for each reinspection required before the Work is complete and shall pay the travel costs for the Owner's representative to travel from their home office to the Project site for any reinspections.

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

§ 9.8.5 Upon Substantial Completion of the Work or designated portion thereof and upon application by the Contractor the Owner shall make payment of retainage applying to such Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

§ 9.9 PARTIAL OCCUPANCY OR USE

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer as required under Section 11.3.1.5 and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Owner 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 and Contractor shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

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

§ 9.10 FINAL COMPLETION AND FINAL PAYMENT

§ 9.10.1 Upon receipt of the Contractor's written notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Owner will promptly make such inspection and, when the Owner finds the Work acceptable under the Contract Documents and the Contract is fully performed, the Owner will within thirty (30) days issue final payment.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Owner in form and substance satisfactory to the Owner (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect and will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner, (3) a written statement that the Contractor knows of no substantial reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment; (5) final As-built drawings marked by the Contractor with record information as set forth in the Contract Documents; (6) warranty, maintenance and equipment operation documents; (7) a final Contractor's sworn statement from the Contractor duly executed and acknowledged showing all Subcontractors to be fully paid, and similar final sworn statements from Subcontractors and, where appropriate, from sub-subcontractors; and (8) other data establishing payment or satisfaction of obligations, such as receipts, releases and waivers of liens, claims, security interests or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor or sub-subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien. If such lien remains unsatisfied after payments are made and is not bonded over as provided in the previous sentence, the Contractor shall promptly pay to the Owner all money that the Owner may be compelled to pay in discharging such lien, including all costs and reasonable attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, and if the Contractor has provided all documents and materials required in the Contract Documents but final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, the Owner shall, upon application by the Contractor, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted provided, however, that the retainage held following such payment shall be in an amount equal to two hundred percent (200%) of the cost of finally completing the Work, including without limitation the items included on the Punchlist. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Owner prior to such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of claims.

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

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

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

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 SAFETY PRECAUTIONS AND PROGRAMS

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

§ 10.2 SAFETY OF PERSONS AND PROPERTY

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

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

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

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

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

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

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

§ 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. The Contractor shall review the structural capability of the structure prior to allowing installation of temporary lifting devices or staging equipment or the temporary off-loading and storage of materials, and shall not exceed design loads without making modifications to building structure to support such loads. All modifications to building structure to support temporary loading shall be submitted to the Architect for review. Costs associated with the Architect's review or redesign of structure to accept temporary construction loading shall be borne by the Contractor.

(Paragraphs deleted)

§ 10.2.8 The Contractor shall replace and make good any loss or injury to the Owner's property or the Owner's tenants' property, the site or adjacent property resulting from the Contractor's negligent acts or omissions.

§ 10.2.9 INJURY OR DAMAGE TO PERSON OR PROPERTY

If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, written notice of such injury or damage, whether or not insured,

shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.3 HAZARDOUS MATERIALS

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

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

§ 10.3.3 The Contractor shall take all necessary precautions for the safety of the Owner, its representatives and all persons in use or occupancy of the building as well as their licensees.

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

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

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

§ 10.3.7 The Contractor shall take all precautionary measures as required by all government authorities having jurisdiction over the Work as well as the Owner to prevent and correct fire causing conditions, and shall conduct all operations with due regard for the avoidance of fire hazards. The Contractor shall comply strictly with and enforce among all workmen on the job all fire and safety regulations of the Owner, including smoking regulations, as the same, from time to time, may be promulgated. Violation of any such regulations shall be cause for dismissal of the offender(s) from the Work. Nothing contained herein shall be construed to make the Owner responsible for the conduct of the Work by the Contractor.

§ 10.4 EMERGENCIES

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

ARTICLE 11 INSURANCE AND BONDS
§ 11.1 CONTRACTOR'S LIABILITY INSURANCE

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

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

§ 11.1.2 The insurance required by Subparagraph 11.1.1 shall include Personal Injury Liability, Broad Form Property Damage Liability endorsement, Explosion, Collapse and Underground Damage Liability endorsement, and contractual Liability (applicable to the Contractor's obligations under Paragraph 3.18) insurance, and shall be written on an occurrence basis for not less than the following limits of liability, or any limits required by law, whichever is greater:

.1 Workmen's compensation insurance shall be written for not less than the statutory limits and shall include Employer's Liability Insurance at a limit of not less than One Million Dollars (\$1,000,000);

.2 Comprehensive General Liability insurance indemnifying and holding harmless the Owner, and the Architect as additional insured, including contractual liability coverage, shall be written for not less than Three Million Dollars (\$3,000,000); Bodily injury and personal injury shall be insured at a limit of not less than Two Million Dollars (\$2,000,000) for each occurrence and Two Million Dollars (\$2,000,000) total aggregate liability; Motor Vehicle Liability Coverage, with coverage limits not less than One Million Dollars (\$1,000,000);

.3 Property damage shall be insured at a limit of not less than One Million Dollars (\$1,000,000) total aggregate liability; and

§ 11.1.3 Prior to the commencement of the Work, Contractor shall file with the Owner valid certificates of Insurance and amendatory riders or endorsements to Contractor's insurance policies, all in form and substance satisfactory to the Owner, naming Owner and any subsidiary, parent or affiliate corporations of Owner and their directors, officers, agents and employees or other persons or entities with an insurable interest designated by Owner as additional insured thereunder. Said endorsements or amendatory riders shall indicate that as respects said additional insured, there shall be severability of interests under said insurance policies for all coverage's provided under said insurance policies. The certificates and amendatory riders or endorsements shall clearly indicate the specific coverage (including the contractual liability for the Contractor's obligations under Paragraph 3.18) and shall contain a provision requiring the giving of written notice to Owner until at least thirty (30) days prior to the cancellation, non-renewal or material modification of any such policies, as evidenced by return receipt of United States Certified or Registered Mail.

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

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insured for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's completed operations.

§ 11.1.5 If requested by the Owner after the date of the Agreement, the Contractor shall promptly procure, at the Owner's expense, liability insurance in such amounts as the Owner may request insuring against perils not listed in Subparagraph 11.1.1.

§ 11.1.6 If the Contractor fails to purchase or maintain or require to be purchased and maintained the liability insurance specified in Subparagraph 11.1.1, the Owner may (but shall not be obligated to) purchase such insurance on the Contractor's behalf and shall be entitled to be repaid for any premiums paid therefor by the Contractor in the manner set forth in Paragraph 2.4.

§ 11.1.7 When such insurance, due to the attainment of a normal expiration date or renewal date, shall expire, the Contractor shall, not less than thirty (30) days prior to such expiration or renewal date, supply the Owner with updated replacement certificates of insurance and amendatory riders or endorsements that clearly evidence the continuation of all coverage in the same manner, limits of protection, and scope of coverage, as was provided by the certificates and amendatory riders or endorsements originally supplied.

§ 11.2 OWNER'S LIABILITY INSURANCE

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

§ 11.3 CONTRACTOR-SUPPLIED PROPERTY INSURANCE

§ 11.3.1 **Builder's Risk Insurance.** If required by the Contract, the Contractor shall purchase and maintain Builder's Risk insurance, in a form and with coverages acceptable to the Owner. Coverage shall be on an all-risk or equivalent policy form and shall include, without limitation, insurance against the perils of fire (with extended coverage) and physical loss or damage including theft, vandalism, malicious mischief, collapse, testing and startup, temporary buildings, and debris removal including demolition occasioned by the enforcement of law. Coverage shall be or 100% of the estimated completed replacement cost value of the Project (including all leasehold improvements, materials, and work to be incorporated into the Project). Such policy shall be written on a completed value form (100% non-reporting) without any coinsurance. In addition, the Builder's Risk policy shall:

a. Include coverage, in addition to the 100% completed replacement cost coverage, for at least 25% of the Project soft costs. Such soft costs coverage shall include without limitation advertising, design fees, professional fees, financing, lease administration, realty taxes, general administration, lease expenses, permit fees, insurance premiums, and including architects services and expenses as required as a result of a loss (including but not limited to interest expense; fees; and plans, specifications, blueprints and models, in connection with any restoration following an insured loss).

b. Include 100% coverage for flood unless the Project is located in a Flood Zone "A", as defined by the National Insurance Flood Plan. If the Project is located in a Flood Zone "A", Borrower shall maintain flood limits providing for the first 20% of the completed replacement cost, with a deductible not greater than 3% of completed replacement costs.

c. Include windstorm coverage with a deductible no greater than 5% of the estimated completed replacement cost value of the Project.

d. Include earthquake coverage with a sub-limit of no less than the first 25% of the completed replacement cost of the Project, unless the Project is located in Earthquake Mercalli Zone VII or greater. If the Project is located in an Earthquake Mercalli Zone VII or greater, Contractor shall maintain earthquake limits providing for the first 75% of the completed replacement cost, with a deductible not greater than 5% of completed replacement costs.

e. Include business income delay in completion coverage for a period of at least 6 months on an actual loss sustained basis, for benefit of Owner.

f. Include coverage for off-site storage of portions of the Work, portions of the Work in transit, and testing coverage for at least 90 days. Such coverage shall be for 100% of the replacement value of the completed property.

g. Not include in its limits, unless by separate limits, any tools, apparatus, machinery, scaffolding, hoists, forms, staging, shoring and other similar items commonly referred to as construction equipment which may be on the Project site and the capital value of which is not included in the Work. Contractor shall make its own arrangements for any insurance it may require on any construction equipment, and all such policies shall include a waiver of subrogation provision in favor of Owner.

h. Not include an exclusion for sidewalks, retaining walls, or underground property, nor an exclusion for interior water damage of any type.

i. Not contain a "permission to occupy" limitation.

j. Other than as specified above, have a deductible no greater than 1% of the estimated completed replacement cost value of the Project.

k. If limits are to be met via a policy that covers other projects (for example, a blanket limits policy), then that policy shall be endorsed to provide segregated limits for each of the limits and coverages required herein.

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

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

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

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

§ 11.3.1.5

§ 11.3.2 EQUIPMENT BREAKDOWN/BOILER AND MACHINERY INSURANCE

If required by the Contract, the Contractor shall also maintain boiler and machinery insurance, which shall specifically cover loss or damage to any equipment to be installed or that is installed in the Project that is not otherwise covered by the Builders' Risk policy until final acceptance by the Owner. Such coverage shall specifically include hot and cold testing and start up coverage. This insurance shall include interests of the Owner, Contractor, Subcontractors and Sub-subcontractors in the Work, and the Owner and Contractor shall be named insureds.

§ 11.3.3 All of the policies set forth in this section 11.3 shall be obtained from companies authorized to do business in the jurisdiction in which the Project is located, and shall be procured from companies with at least an "A-" financial strength rating and "VIII" financial size category from A.M. Best.

§ 11.3.4 If the Owner requests in writing that insurance for special hazards that are not encompassed by this Section 11.3, the Contractor shall, if possible, include such insurance, and the cost thereof shall be charged to the Owner by appropriate Change Order.

§ 11.3.5 All policies required by this Section 11.3 shall contain waivers of subrogation by endorsement or otherwise in favor of the Owner.

§ 11.3.6 Prior to commencing the Work, Contractor shall 1) provide Owner with copies of each policy required by this Section 11.3; 2) cause an Accord 27 Evidence of Property Insurance form to be issued by each insurer and provided to Owner, naming Owner as Loss Payee and Additional Interest on the policies required by this section, and requiring that Owner receive 30 days prior written notice of cancellation of non-renewal of any such policy; and 3) shall cause each policy to be endorsed with Owner as both an additional insured and as loss payee (as Owner's interests appear). All insurance shall insure interests of Owner, Contractor, and Subcontractors of all tiers in the Work.

§ 11.3.7 WAIVERS OF SUBROGATION

The Owner and Contractor waive all rights against (1) each other, any of their wholly owned subsidiaries and agents, their members, principals, officers and employees, and any subcontractors of any tier, agents and employees, each of the other and their wholly owned subsidiaries and agents, and (2) the Architect, Architect's consultants, separate contractors described in the Agreement, if any, and any of their subcontractors of any tier, agents and employees, (3) Landlord and its agents, members, officers and employees, and (4) Lender and its subsidiaries, agents, participants, officers and employees for any loss or damages to the extent of actual recovery of any insurance obtained pursuant to this Section 11.3 or other applicable insurance, except such rights as they may have to proceeds of such insurance held by the Owner or Contractor. The Contractor shall require similar written waivers in favor of the Owner and Contractor from all Subcontractors of any tiers and their agents and employees, the Architect, Architect's consultants, and separate contractors, if any. The foregoing waivers 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, even though that person or entity 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.

(Paragraph deleted)

§ 11.3.8. The Contractor shall promptly investigate and make a full written report to the Owner and any insurance carriers as to all alleged accidents and/or claims for damages relating to construction of the Project or relating to any other property of the Owner, including any damage or destruction to the Project or such other property and the estimated cost of repair and shall perform all necessary recordkeeping related to same. The Contractor shall do nothing to jeopardize the rights of the Owner and/or any other party insured under said policies. The Contractor shall notify Owner and any insurance carriers of any loss, and shall cooperate fully with any insurance carrier in connection with any such claim. A loss under any policy in this section 11.3 shall be diligently adjusted by the Contractor, at the Contractor's sole expense, in good faith on behalf of both Owner and Contractor, with loss made payable to either or both the Owner and Contractor as their interest may appear, subject, however, to requirements of any applicable mortgagee clause as may be required. The Contractor shall not settle any losses or portions of losses, complete loss reports, or endorse loss drafts without the prior written consent of the Owner. The Owner may at any time assume from the Contractor any or all rights and duties of adjustment and settlement, to the extent desired by the Owner at Owner's sole discretion, upon written notice to the Contractor.

§ 11.3.9 The Owner may, in its sole discretion, elect to receive all or any portion of any insurance payments, and will deposit in a separate account proceeds to received, which the Owner shall distribute in a good faith manner. In the event the Owner makes such election, the Contractor and Subcontractors of all tiers will, as necessary, instruct any insurer to make all payment directly to the Owner. If after such any loss no other special agreement is made, regarding loss payment that would cause sums to be paid to the Contractor (including Subcontractors of all tiers), then to that extent replacement of damaged property shall be covered by appropriate Change Order. Should any parties in interest (a term which does not include any insurer) object in writing, within 10 days of notice, to the manner of adjustment and/or settlement of any loss, resolution shall proceed as provided in Paragraph 15.3. The parties in interest shall, in that case, adjust and make settlement with insurers in accordance with the direction of tribunal. The Contractor shall pay Subcontractors their just share of insurance proceeds received by the Contractor, and by appropriate agreements, written where legally required for validity, shall require Subcontractors to make payments to their sub-subcontractors in similar manner.

§ 11.3.10 Coverage under the policies required by this Section 11.3 shall be maintained for the full term of the Project until the acceptance of the completed Project by the Owner.

§ 11.4 PERFORMANCE BOND AND PAYMENT BOND

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

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

§ 11.5 FAILURE TO PURCHASE OR MAINTAIN INSURANCE

If the Owner or the Contractor is damaged by failure of the other to purchase or maintain insurance required under Article 11 and so notifies the damaged party, then the party who failed to purchase or maintain the insurance shall bear all reasonable costs properly attributable thereto.

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

§ 12.2 CORRECTION OF WORK

§ 12.2.1 BEFORE OR AFTER SUBSTANTIAL COMPLETION

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

§ 12.2.2 AFTER SUBSTANTIAL COMPLETION

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

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

§ 12.2.2.3 The one-year period for correction of Work shall be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

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

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

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

§ 12.2.6 Eleven (11) months after the date of Substantial Completion of the Work or designated portion thereof, or after the date for commencement of warranties established under Subparagraph 9.9.1, or by terms of an applicable special warranty required by the Contract Documents, or after any extended period as set forth in Subparagraph 12.2.2, and before any warranty or correction period can expire, Contractor shall notify Owner that the warranty is about to expire and Contractor and Owner shall attend an on-site meeting and perform a thorough walk-through of the Project. The purpose of the walk-through is to identify any Work that is not in accordance with the requirements of the Contract Documents or any issues relating to any warranty, regardless of whether any such Work was identified on any prior punch list or Notification of Warranty Work/Request for Correction of the Work. Contractor shall promptly correct all such Work identified by the Owner. Contractor's correction or warranty period and obligations shall be extended for any additional time period until this walk-through is performed and until Contractor completely performs those corrections.

§ 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. The Work shall comply with all applicable laws, statutes, ordinances, codes, rules, regulations or orders during its performance and at its completion.

§ 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. The Contractor shall not assign the Contract as a whole or in part without written consent of the Owner. If the Contractor attempts to make such an assignment without such consent, the Contractor shall nevertheless remain legally responsible for all obligations under the Contract.

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

§ 13.3 WRITTEN NOTICE

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

§ 13.4 RIGHTS AND REMEDIES

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

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

§ 13.4.3 No provision contained in the Contract Documents shall create or give to third parties any claim or right of action against the Owner or the Contractor except as specifically provided herein.

§ 13.5 TESTS AND INSPECTIONS

§ 13.5.1 If the Contract Documents, or any laws, statutes, ordinances, building codes, rules, regulations or orders of any governmental body or public or quasi-public authority having jurisdiction over the Work or the site of the Project require any portion of the Work to be inspected, tested or approved, the Contractor shall give the Architect and Owner timely notice thereof so the Architect and Owner may observe such inspection, testing or approval. The Owner shall bear all costs of such inspections, tests or approvals except where the Contract Documents provide otherwise. Contractor shall secure any required certificates of inspection, testing or approval and promptly deliver them to the Architect and the Owner as provided in Article 8.7 of the Agreement.

§ 13.5.2 If the Architect, Owner or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection or approval not included under Section 13.5.1, the Owner will perform or 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 Owner and Architect of when and where tests and inspections are to be made so that the Owner and Architect may be present for such procedures. Such costs, except as provided in Section 13.5.3, shall be at the Owner's expense.

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

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

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

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

§ 13.5.7 No inspection or examination shall relieve the Contractor of the obligation to perform the Work in accordance with the Agreement. No payment, either partial or full, by the Owner to Contractor shall relieve Contractor of responsibility for complying with the Agreement. The Contractor shall remedy all defects and pay the cost of any damage to other work resulting therefrom.

§ 13.6 INTEREST

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

§ 13.7 TIME LIMITS ON CLAIMS

No action or proceeding shall lie or shall be maintained by the Contractor against the Owner or Architect unless such action or proceeding shall be commenced within six (6) months after the date payment is mailed or otherwise made in respect of the Final Application for Payment or, if this Contract is terminated by the Owner, unless such action or proceeding is commenced within six (6) months of the date of such termination.

§ 13.8 CLOSEOUT OF PROJECT

The Contractor shall provide all warranty documents, operation and maintenance manuals and as-built drawings to Owner within thirty (30) days after Substantial Completion. The Owner and Contractor acknowledge that damages will be suffered by the Owner in its operation of the completed building without the benefit of this documentation is difficult to quantify and therefore agree that the Contractor will be assessed liquidated damages, not as a penalty, in the amount of \$250 per day for each day following the date of Substantial Completion that the Owner has not been provided with all warranty documents, maintenance and operation manuals and as-built drawings.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 TERMINATION BY THE CONTRACTOR

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

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

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

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' written notice to the Owner, terminate the Contract and recover from the Owner payment for Work executed.

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

§ 14.2 TERMINATION BY THE OWNER FOR CAUSE

§ 14.2.1

(Paragraphs deleted)

If the Contractor shall institute proceedings or consent to proceedings requesting relief or arrangement under the Federal Bankruptcy Act or any similar or applicable federal or state law, or if a petition under any federal or state bankruptcy or insolvency law is filed against the Contractor and such petition is not dismissed within sixty (60) days from the date of said filing, or if the Contractor admits in writing his inability to pay his debts generally as they become due, or if he makes a general assignment for the benefit of his creditors, or if a receiver, liquidator, trustee or assignee is appointed on account of his bankruptcy or insolvency; or if a receiver of all or any substantial portion of the Contractor's properties is appointed; or if the Contractor abandons the Work; or if he fails, except in cases for which extension of time is provided, to prosecute promptly and diligently the Work or to supply enough properly skilled workmen or proper materials for the Work; or if he submits an Application for Payment, sworn statement, waiver of lien, affidavit or document of any nature whatsoever which is intentionally falsified; or if he fails to make prompt payment to Subcontractors or Suppliers for materials or labor or otherwise breaches his obligations under any subcontract with a Subcontractor; or if a mechanic's or materialman's lien or notice of lien is filed against any part of the Work or the site of the Project and not promptly bonded or insured over by the Contractor in a manner satisfactory to the Owner; or if the Contractor disregards any laws, statutes, ordinances, rules, regulations or orders of any

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governmental body or public or quasi-public authority having jurisdiction of the Work or the site of the Project; or if he otherwise violates any provision of the Contract Documents; then the Owner, without prejudice to any right or remedy available to the Owner under the Contract Documents or at law or in equity, may, after giving the Contractor and the surety under the Performance Bond and under the Labor and Material Payment Bond described in Paragraph 11.4, seven (7) days' written notice, terminate the employment of the Contractor. If requested by the Owner, the Contractor shall remove any part or all of his equipment, machinery and supplies from the site of the Project within seven (7) days from the date of such request, and in the event of the Contractor's failure to do so, the Owner shall have the right to remove or store such equipment, machinery and supplies at the Contractor's expense. In case of such termination, the Contractor shall not be entitled to receive any further payment for Work performed by the Contractor through the date of termination. The Owner's right to terminate the Agreement pursuant to this Subparagraph 14.2.1 shall be in addition to and not in limitation of any rights or remedies existing hereunder or pursuant hereto or at law or in equity.

§ 14.2.2 When any of the above reasons exist, 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' written notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

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

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

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds all costs to the Owner of completing the Work, then the Contractor shall be paid for all Work performed by the Contractor to the date of termination. If such costs to the Owner of completing the Work exceed such unpaid balance, the Contractor shall pay the difference to the Owner immediately upon the Owner's demand. The costs to the Owner of completing the Work shall include (but not be limited to) the cost of any additional architectural, managerial and administrative services required thereby, any costs incurred in retaining another contractor or other subcontractors, any additional interest or fees which the Owner must pay by reason of a delay in completion of the Work, attorney's fees and expenses, and any other damages, costs and expenses the Owner may incur by reason of completing the Work or any delay thereof. The amount, if any, to be paid to the Contractor shall survive the termination of the Contract.

§ 14.3 SUSPENSION BY THE OWNER FOR CONVENIENCE

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

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

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

§ 14.4 TERMINATION BY THE OWNER FOR CONVENIENCE

§ 14.4.1 The Owner may, at any time, upon seven (7) days' written notice to the Contractor, terminate the Contract for the Owner's convenience and without cause.

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

- .1 cease operations as directed by the Owner in the notice;
 - .2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work;
- and

- .3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Contractor shall be entitled to receive payment for Work executed to the date of termination. The Owner shall, upon the Contractor executing such confirmatory assignments as the Owner shall request, accept and assume all of the Contractor's obligations under all Subcontracts executed in accordance with the terms of the Contract Documents that may accrue after the date of such termination and which the Contractor has incurred in good faith in connection with the Work. Adjustments made in the cost of performance may have a mutually agreed fixed or percentage fee.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 CLAIMS

§ 15.1.1 DEFINITION

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

§ 15.1.2 NOTICE OF CLAIMS

Claims by either the Owner or Contractor must be initiated by written notice to the other party with a copy sent to the Architect. Claims by either party must be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.3 CONTINUING CONTRACT PERFORMANCE

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

§ 15.1.4 CLAIMS FOR ADDITIONAL COST

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

§ 15.1.5 CLAIMS FOR ADDITIONAL TIME

§ 15.1.5.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, written notice as provided herein shall be given within seven (7) days after the Contractor becomes aware of the condition causing or threatening to cause delay. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

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

§ 15.1.5.3 Should the Contractor be or anticipate being delayed or disrupted in performing the Work hereunder for any reason including, without limitations, its financial condition or Contractor's general nonpayment of its debts as such debts become due, it shall promptly, and in no event more than seven days after Contractor becomes aware of the commencement of any condition which is causing or is threatening to cause such delay or disruption, notify the Owner in writing of the condition and of the effect of such condition upon the progress schedule, stating why and in what respect the condition is causing or is threatening to cause delay, provided, however, that notwithstanding the above, if such delay or disruption, or anticipated change in the Contractor's financial condition, the Contractor shall notify the Owner forthwith of such cause or anticipated cause. Failure to comply strictly with this notice requirement shall be sufficient cause to deny the Contractor a change in schedule and to require it to conform to the progress schedule then in effect.

§ 15.1.6

(Paragraphs deleted)

INTENTIONALLY OMITTED.

§ 15.2 INTENTIONALLY OMITTED

(Paragraphs deleted)

§ 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 and 9.10.5 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 litigation but, in such event, mediation shall proceed in advance of litigation, 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.

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

§ 15.4 MECHANICS LIEN AND CLAIMS

If any mechanic's lien or other claim shall be filed for or on account of the Work or if any Restraining Notices related to Contractor's performance of Work or Judgments shall be filed against such Contractor, then Contractor shall within fourteen (14) days after notification thereof, discharge or bond off such lien or claim or otherwise make provision satisfactory to Owner for its satisfaction. Any failure to comply with the terms of this provision shall constitute a material breach of this Agreement. If Owner discharges or bonds off any mechanic's lien after Contractor's failure to do so, all costs, including reasonable attorneys' fees related to said discharge, shall be chargeable to Contractor.

(Paragraphs deleted)

ARTICLE 16 ADDITIONAL PROVISIONS

§ 16.1 PAYMENT OF EMPLOYEES

The Contractor and each Subcontractor and Sub-subcontractor shall pay all employees engaged in the Work in full, less legally required deductions, in accordance with the applicable labor laws and all other applicable governmental regulations.

16.2 WAIVER OF REMEDIES

16.2.1 The Contractor acknowledges that he can be compensated adequately by money damages for any breach of the Contract which may be committed by the Owner. The Contractor agrees that no default, act or omission of the Owner shall constitute a material breach of the Contract entitling the Contractor to cancel or rescind the same or to suspend or abandon performance thereof, or entitle Contractor to an injunction or restraining order, except as otherwise provided in the Contract Documents; and the Contractor hereby waives any and all rights and remedies to which the Contractor might otherwise be or become entitled because of any wrongful act or omission of the Owner or Architect saving only the Contractor's right to money damages or statutory lien rights.

16.3 PROVISIONS REQUIRED BY LAW DEEMED INSERTED

Each and every provision of law and government regulation required by law to be inserted in the Contract Documents shall be deemed to be inserted therein and this Contract shall read and shall be enforced as though so included therein and if through mistake or otherwise any such provision is not inserted, or is not correctly inserted, then upon the application of either party this Contract shall be deemed to be amended to make such insertion or correction.

16.4 JURISDICTION AND VENUE

The Contract Documents and all disputes between the parties shall be governed by the laws of the place where the Project is located per Section 13.3 and the jurisdiction and venue for any action between the parties shall lie solely and exclusively is Federal or State Court in the county in which the Project is located.

16.5 SEVERABILITY

The invalidity or unenforceability of any particular provision in the Contract Documents shall not affect the other provisions in the Contract Documents and the Contract Documents shall be construed in all respects as if such invalid or unenforceable provision was omitted.

16.6 FLORIDA STATUTES, CHAPTER 558 NOTICE OF CLAIM

Owner and Contractor agree to opt out of the requirements of Chapter 558 in favor of the Notice and Cure provision agreed to and set forth in this Agreement.

DIVISION 0 - BIDDING REQUIREMENTS1. REFERENCES AND DEFINITIONS

- (A) Throughout the plans, specifications, addenda, and other Contract Documents, the term "Contractor(s)" shall be taken to mean the General Contractor or his Subcontractors.
- (B) In the plans, specifications, addenda, and other Contract Documents, the abbreviation GC is used. GC shall be taken to mean the General Contractor.
- (C) The term "Owner" or "Owner's Representative" shall be taken to mean the person or persons authorized by the Owner, Rooms To Go, to act in his behalf.
- (D) The words "plans" and "drawings" shall be taken to have the same meaning, unless in context specifically referencing plan view or views.
- (E) Where the word "provide" or "furnish" is used, this shall be taken to mean "supply and install", unless otherwise noted or specified.
- (F) The drawings and specifications are complementary each to the other and what is called for by one shall be as binding as if called for by both. However, the drawings and specifications shall be considered inseparable documents and each Contractor shall consider both instruments in order to perform the work in accordance with their combined intent.
- (G) References to the "Project Manager", "Architect", "A/E" in the specifications or on the drawings shall be taken to mean an authorized professional representative of the Owner.
- (H) In case of discrepancies in the Contract Documents, Contractor shall first consult with the Project Manager and the Owner for clarifications, revisions, or further action as may be required. Any discrepancy which results in any claim for additional time or money must be addressed to the Owner in writing.

2. DRAWINGS AND SPECIFICATIONS

- (A) Each Bidder will be authorized access to the Design Professional Plans Website to download one (1) complete set of Bid Documents including pdfs formats of Drawings and Specifications.
 - (1) It shall be the responsibility of each Bidder to obtain and pay for all further copies of drawings and specifications which he might require to prepare his bid, and in the case of the successful Bidder, to perform the work including Change Bulletins and change orders.
 - (2) The bid set shall be retained for use as construction documents. Revised sheets shall be issued at time of change issuance to the Contractor.

3. EXAMINATION OF CONTRACT DOCUMENTS

- (A) Before submitting proposal, each Bidder should carefully examine all drawings, specifications, addenda (if any), and all other Contract Documents.
- (B) All inquiries regarding the meaning of drawings, specifications, and/or other Contract Documents shall be addressed to:

Professional of Record: As indicated on the drawings.

BIDDERS NOTE:

- (1) INQUIRIES SHALL BE LIMITED TO CALLS FROM PRE-QUALIFIED GENERAL CONTRACTORS BIDDING THIS PROJECT. SUBCONTRACTORS SHALL MAKE CONTACTS ONLY THROUGH ONE OF THESE GENERAL CONTRACTORS.
- (2) BIDDERS SHALL NOT RELY ON VERBAL REPLIES. SHOULD CLARIFICATIONS OR REVISIONS BE REQUIRED, THE BIDDING DOCUMENTS WILL BE MODIFIED BY WRITTEN ADDENDUM DISTRIBUTED TO ALL BIDDING GENERAL CONTRACTORS
- (3) NO PRE-APPROVALS WILL BE GIVEN FOR SUBSTITUTE MATERIALS, EQUIPMENT, OR METHODS. REFER TO SEPARATE PARAGRAPH THIS SECTION FOR SUBSTITUTION PROCEDURE.
- (4) BIDDERS ARE HEREBY INSTRUCTED TO QUALIFY THEIR RESPECTIVE BIDS IN WRITING FOR ALL CONDITIONS NOT CLARIFIED BY THE BIDDING DOCUMENTS TO THEIR SATISFACTION. ANY SUCH QUALIFICATIONS MUST BE SUBMITTED IN WRITING WITH THE BID PROPOSAL.

4. SITE INSPECTION

- (A) Each bidder shall visit the project site prior to the preparation of his bid to investigate and determine all conditions on and near the site which could affect the execution of the work. Any Contractor's failure to fully acquaint himself with existing conditions under which the work is to be performed will not be justification for additional compensation.
- (B) The location of the underground utilities, such as sewers, electrical power, water piping, conduits, etc., indicated on the drawings is as exact as can be determined from available information but its accuracy or completeness cannot be guaranteed. Exact location of these utilities shall be verified by the Contractor prior to starting work. Contractor shall exercise special care when excavating at or near the general location of underground utilities for the safety of workers, as well as for protection of the utility services.
- (C) Any connections to or relocation of any existing utility line requiring temporary discontinuation of utilities which are in active use shall be scheduled and coordinated with the utility companies and/or the representatives of the Owner. All premium time required for the installation of any such connections and/or relocations shall be included in Contractor's bid. In no case shall the utilities be left disconnected at the end of a working day or weekend unless authorized by representatives of the utilities and the Owner. Any existing utilities damaged due to the operation of any Contractor shall be repaired to the satisfaction of the Owner and utility company or agency, by the Contractor causing the damage, at no increase in the contract cost.

5. INSURANCE

- (A) The Contractor shall provide and maintain during the life of the contract, insurance with insurers satisfactory to the Project Manager and the Owners. Coverages noted below should be provided. Any Contractor not having these limits should so state in his proposal, otherwise it will be assumed the noted coverages are to be provided.
 - (1) Workmen's Compensation and Employer's Liability - Workmen's Compensation as required by statute and, if such exposures exist, Contractor's liability under the Federal Longshoremen and Harbor Workers Act. Employer's liability shall be for a minimum limit of \$1,000,000. In case any work is sublet, each Contractor shall require any and all of his subcontractors similarly to provide such coverages for all the latter's employees employed in connection with the work, unless such employees are covered by the protection of the Contractor. Provide similar coverage for any class of employees engaged in work at the site

- who are not protected under the applicable workers' compensation statute.
- (2) Comprehensive General Liability Insurance indemnifying and holding harmless the Property Owner, Rooms To Go and CASCO, the Project Manager as additional insured, including contractual liability coverage, in an amount not less than \$2,000,000 for personal and bodily injury to all persons in any one occurrence and for damage to property; and
 - (3) Motor Vehicle Liability Coverage, with coverage limits not less than \$1,000,000.
 - (4) Certificates of insurance, satisfactory to Owner and naming Owner as a certificate holder and as an additional insured, shall be delivered to Owner prior to the commencement of work, and said certificates shall contain a provision that coverages afforded under the policies will not be canceled without thirty (30) days prior written notice to Owner. All insurance required to be carried by Contractor pursuant hereto shall be taken out with insurance companies approved by Owner in advance.
 - (5) Builder's Risk Insurance – Unless noted otherwise, the Owner shall maintain a policy for the duration of the project upon all structures and upon all materials in or adjacent thereto which are to be made a part of the insured structure to the insurable value thereof less a deductible amount of \$10,000 (Contractor paid) for each occurrence. This coverage will not include Contractor's and subcontractor's equipment and may not necessarily be all inclusive as to Contractor's desired protection.
 - (6) Equipment Breakdown Insurance. Contractor shall provide Equipment Breakdown/Boiler and Machinery insurance that covers loss or damage to any equipment to be installed or that is installed in the Project that is not otherwise covered by the Builders' Risk policy.

6. SPECIFIED MANUFACTURERS, SUBSTITUTIONS, AND ALTERNATES

- (A) The following provisions shall govern the bidding of the work. The provisions specified below shall not relieve the Contractor from meeting other requirements set forth elsewhere in the Bidding or Contract Documents.
- (B) When a brand name is not specified:
 - (1) Product used shall meet the specified standard, such as ASTM, etc., if specified, and shall be of the appropriate design, configuration, type, and finish as required to meet the requirements of the intended service.
- (C) When two (2) or more brand names are specified without further qualifying stipulations:
 - (1) In all cases, the first-named brand or manufacturer's equipment has been used for the basic design and to determine the space requirements.
 - (2) Any one of the specified brands or manufacturer's products equivalent to the first-named may be used for the base bid price.
 - (3) Should other than the first-named brand be used in preparation of the bid, the Contractor shall be responsible to determine and assure that the product or equipment being bid will fit and function in the space allocated.
 - (4) In all cases, the product used shall meet the requirements of the intended service, including specified optional accessories, performance, and basic features. Should one of the named manufacturers offer a range of quality for a particular item, the Contractor shall provide the selection of equal or greater quality compared with the first-named brand in the specifications. All equality determinations rest with the Engineer, and his decisions shall be final.
- (D) When one (1) brand name only is specified without further qualifying stipulations:

- (1) Contractor's base bid price shall be based on the product specified.
 - (2) The Contractors are invited and encouraged to propose, as Substitutions, the products or equipment of other manufacturers potentially suitable for the intended services and/or applications. See paragraph below regarding Substitutions for further requirements.
- (E) Substitutions
- (1) Any material, product, or equipment (other than specified materials, brands, or manufacturers) proposed by the Contractor shall be considered a Substitution.
 - (2) Except as otherwise specified herein below, in order to qualify for review by the Project Manager for a decision on approval, a Substitution shall be submitted at the time of bidding a minimum of one week prior to receipt of bids. The proposed Substitution shall be clearly identified and shall include the respective add or deduct to the contract base bid amount as defined above. The Contractor shall submit complete data (including samples, if requested) regarding the Substitution to the Project Manager for review and decision.
 - (3) Substitutions requested or written approval during the bidding period and accepted by Addendum prior to award of the contract are to be included in the Contract Documents.
- (F) Alternates
- (1) When requested in the specifications or on the drawings, Contractor shall include the total appropriate add or deduct, including associated charges to the contract amount for the Alternate as specified.
 - (2) Requested Alternates shall be numbered and shall be clearly identified in the Contractor's bid.
 - (3) Omission of requested alternate pricing may invalidate the proposal.
 - (4) Each bidder is encouraged to submit any voluntary alternates or unit prices he feels appropriate.
- (G) Unit Prices
- (1) When requested in the specifications or by the Owner, the proposal shall include unit prices for certain classes of work, to be used as the basis of payment to the contractor.
 - (2) Unit prices shall cover all labor, material and related fees to perform the required work items. No additional adjustment will be allowed for general conditions, overhead, profit, insurance or other direct or indirect expense of the contractor or subcontractor.
- (H) Associated Costs and Delays
- (1) All additional costs associated with the use of any product, material, or equipment (other than the first-named brand, a specified material, or a requested Alternate) shall be the responsibility of the Contractor making the substitution or electing to use other than the first-named brand.
 - (2) For example, if a Contractor elects to use the third-named brand in the specifications covering a particular item of equipment, and the choice of that brand necessitates an increase in electrical feeder size, additional structural support, access panels, or any other changes whatsoever in this work and/or the work of others, the Contractor shall include in his bid the cost of all such changes.

- (3) The approval of a Substitution and/or the discovery of associated costs during construction shall not relieve the Contractor from paying for changes in his work and/or the work of others.
- (4) To avoid the associated costs as described above due to an untimely discovery of necessary changes, the Contractor may be permitted to revert to the use of the specified product, material, or equipment provided a delay in the project does not result. The Owner shall first be consulted and his decision regarding the interpretation of "delay" shall be final.
- (5) It shall be further understood that the use of any approved Substitution or other than the first-named brand in the specifications shall involve no extension of the project completion date and/or shall not cause delays in the work of other Contractors unless otherwise stipulated in writing with the respective Contractor's bid and/or proposal for Substitution.

7. PROPOSALS

- (A) Proposals shall be received by the Owner to the Attention of Mr. Harmon Jones no later than the time and date as designated in the "Invitation to Bid".
- (B) Proposals shall be submitted in duplicate on the enclosed "Proposal Form" sealed in an opaque envelope marked "Proposal". Proposals will not be accepted over the telephone. No exceptions to procedure will be allowed and any bid received after the specified time will be subject to rejection. To be considered a valid bid, proposals must be filled in completely including category breakdowns and qualification data.
- (C) All proposals shall be in accordance with all requirements of all contract documents and subject to all conditions provided in same.
- (D) All proposals shall be in a lump sum and shall cover and include all materials, accessories, tools, equipment, expendable equipment, insurance, taxes, overhead, profit and performance of all services and labor required to completely execute the work in accordance with the contract documents.
- (E) Each bidder shall break his proposal into the categories per page 4 of the enclosed Proposal Form. This categorization is requested only to further clarify bids as well as assure understanding of the scope of work. These categories will not be considered as fixing the basis for any contract adjustment. The completed bid proposal form shall be received by the Owner within two (2) hours following specified bid due time.

-END OF SECTION-

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DIVISION 0 - BIDDING REQUIREMENTS

PROPOSAL FORM

Date:

Rooms To Go
111 7th Avenue South, Suite 100,
Franklin, TN 37064.

Attn: Mr. Harmon Jones

Re: _____

Gentlemen:

The undersigned being familiar with the local conditions affecting the cost of the work with the drawings and specifications for the proposed above referenced project as prepared by CASCO, St. Louis, Missouri, hereby proposes and agrees if this proposal is accepted to enter into contract to supply labor, materials, services and equipment necessary for the complete execution of all general construction work in strict accordance with the plans and specifications for a lump sum of:

_____ DOLLARS (\$ _____)
Write Out in Words Write in Figures

_____ Consecutive Calendar Days

This bid is based upon proprietary brands as shown on plans and/or specified.

The undersigned further proposes and agrees hereby to commence work with an adequate force and equipment immediately after being notified in writing to do so, and to complete all work as required by the plans and specifications within the number of consecutive calendar days as itemized above.

In submitting this bid, it is understood that the right is reserved by the Owner or his representative to reject any or all bids, and it is agreed that this bid may not be withdrawn for a period of thirty (30) days from bid due date.

It is further acknowledged that, after thorough examination of the site, drawings and specifications, the above quoted prices do not include any changes or substitutions to specified materials or methods. Any proposed changes or substitutions are itemized by attachment herewith for consideration noting the appropriate Add or Deduct amount. (Reference documents for specifically requested alternates.)

Alternate prices and unit prices as requested in the Specifications, if applicable to this proposal, are herewith included.

We propose to subcontract the following items of work to other firms as follows:

<u>Item of Work</u>	<u>Subcontractor Name and Address</u>
Sitework	
Concrete	
Masonry	
Steel	
Roofing	
Millwork	
EIFS	
Doors/Frames/Hardware	
Glass/Curtainwall	
Drywall	
Acoustical Ceilings	
Flooring	
Painting	
Canopies	
Plumbing	
Fire Sprinkler	
HVAC	
Electrical	
Fire/Security Alarm	

At the time of submission of this proposal, the undersigned has received the following addenda (if any):

<u>Addendum No.</u>	<u>Date</u>
---------------------	-------------

Name of Firm _____

By (Typed) _____

By (Signature) _____

Title _____

Official Address _____

Telephone No. _____

Attest:

Secretary

SEAL

List of Alternates

The following alternate prices, as requested in specification section 01030 and the Pre-Bid Conference are herewith included for consideration and made part of this proposal. Omission of requested alternate pricing will invalidate this proposal.

<u>No.</u>	<u>Description</u>	<u>Cost Adjustment/Time Note ADD or DEDUCT</u>
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List of Unit Prices

The following unit prices, as requested in the Pre-Bid Conference, are submitted as part of this Bid Proposal Form and shall hold for the duration of the project. Omission of requested unit prices will invalidate this proposal.

Should additional work be required, or should quantities of certain classes of work be increased or decreased from the base contract, by approval of the Owner, the Contractor agrees that the following unit prices may be used as a basis of payment to Contractor or credit to the Owner for such addition, increase or decrease in the work as determined by the Owner.

<u>No.</u>	<u>Description</u>	<u>Add</u>	<u>Deduct</u>
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Recommended Substitutions

The following substitutions and/or changes are herewith offered for consideration.

<u>Description</u>	<u>Cost Adjustment (Note ADD or DEDUCT)</u>
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Attach additional pages if necessary

PROPOSAL BREAKDOWN

ROOM TO GO

<u>DESCRIPTION</u>	<u>AMOUNT</u>
<u>DIVISION 1 - GENERAL CONDITIONS</u>	
Contractor General Conditions	\$ _____
Contractor Fee	\$ _____
TOTAL GENERAL CONDITIONS	\$ _____
<u>DIVISION 2 - SITEWORK</u>	
Demolition	\$ _____
Soil Treatment	\$ _____
TOTAL SITEWORK	\$ _____
<u>DIVISION 3 - CONCRETE</u>	
Concrete	\$ _____
-Foundations/Footings	
-Floor Slab	
<u>DIVISION 4 - MASONRY</u>	
Masonry	\$ _____
-Concrete Block/Brick	
-Glass Block	
<u>DIVISION 5 - METALS</u>	
Structural Metals	\$ _____
-Miscellaneous Metals	
<u>DIVISION 6 - CARPENTRY</u>	
Carpentry	\$ _____
-Wood Blocking/Nailers	
-Millwork	
-Toilet Room Vanities	
-Solid Polymer Fabrications	
-Miscellaneous Carpentry	
<u>DIVISION 7 - THERMAL & MOISTURE PROTECTION</u>	
EIFS	\$ _____
Roofing & Accessories	\$ _____
-Roofing	
-Flashing & Sheet Metal	
<u>DIVISION 8 - DOORS & WINDOWS</u>	
Doors/Frames/Hardware	\$ _____
Glass/Glazing/Storefront	\$ _____
<u>DIVISION 9 - FINISHES</u>	
Drywall	\$ _____
-Steel Studs, Furring	
-Rigid Insulation	
-Wall Board	
Ceramic/Tile	\$ _____
Acoustic Ceilings	\$ _____
ROOMS TO GO	

Resilient Flooring and Base		\$ _____
Carpet		\$ _____
Painting	\$ _____	

DIVISION 10 - SPECIALTIES

Toilet Partitions		\$ _____
Toilet Accessories		\$ _____
-Soap Dispensers		
-Grab Rails		
-Toilet Paper Dispensers		
-Waste Receptacles		
Canopies	\$ _____	
Fire Extinguishers and Accessories		\$ _____

DIVISION 15 - MECHANICAL

Plumbing		\$ _____
-Basic Materials		
-Domestic Water Piping		
-Sanitary Waste Piping		
-Vent Piping		
-Water Heater		
-Water Cooler		
-Lavatories		
-Urinal		
-Water Closet		
-Pipe Insulation		
-Floor Drains		
Fire Sprinklers		\$ _____
HVAC		\$ _____
-Basic Materials		
-Roof Top Units		
-Exhaust Fan		
-Air Distribution		
-Insulation		
-Controls		

DIVISION 16 - ELECTRICAL

Electrical/Lighting		\$ _____
-Basic Materials		
-Power Distribution Systems		
-Interior Lighting		
-Building Mounted Exterior Lighting		
-Exit Signage		
-Emergency Lighting		
-Grounding		
-Telephone Service		
Fire/Security Alarm		\$ _____

TOTAL BUILDING (DIVISIONS 3 - 16) \$ _____

TOTAL BASE BID \$ _____

- END OF SECTION -

DIVISION 1 - GENERAL REQUIREMENTS1. SCHEDULE

- (A) This is a "Time is of the Essence" project. Bidders shall submit a time schedule with their bid proposals.
- (B) Due to the nature of the Owner's retail market this project must be completed in accordance with the agreed construction schedule. Sitework must be so scheduled as to have the pavement base course installed as early as possible in the job schedule.
- (C) General Contractor shall carefully schedule and coordinate work so as to provide the maximum cooperation and the minimum of interference with the work of others. Scheduling shall be approved by the Owner's Representative.
- (D) General Contractor shall submit prior to the start of the work a schedule showing the various phases and indicating the starting and completion dates of all phases of the contract work.
- (E) After the work is commenced, the General Contractor shall conduct weekly jobsite meetings with all major Contractors and shall advise the Owner as to the then current status of the schedule, and indicating whether or not the General Contractor contemplates, as of that time, any future deviation from the schedule. Such reports and meetings minutes shall include a statement indicating that the report is based on the then current information furnished by all Contractors and material suppliers and shall be issued promptly after the weekly meeting.
- (F) No extension of time beyond date stipulated in proposal will be allowed on account of inclement weather, material delivery delays, or other causes which could have been avoided by exercise of reasonable foresight on General Contractor's part.
- (G) Any problems that occur during the course of the job that would affect the schedule shall be brought to the Owner's Representative attention immediately.

2. WORK OF THE GENERAL CONTRACTOR

- (A) General Contractor shall furnish all labor and material required to perform and complete all work as shown and described in the Contract Documents. Include all work indicated or specified in addenda, change bulletins, clarifications accepted alternates or amendments.
- (B) The scope of work shall include all work noted in the plans or these specifications with the following clarifications:
 - (1) Verification of the site conditions is the responsibility of the General Contractor and no extra (time or money) shall be approved due to this General Contractor's failure to review conditions under which the work will be performed unless identified specifically by written exception as a part of his proposal.
 - (2) The Contract Documents are intended to describe a total and completed

facility. The specifications describe the various items of work, character of materials and quality of workmanship. Any appurtenances, parts, finish work, etc., essential to the entire completion of the work, though not specifically shown or specified shall be covered by the contract sum.

- (3) The General Contractor will be required to furnish and install all temporary water, electric power and lighting, etc., that is necessary to perform his work and shall remove same upon completion of the work. Point of connection, route and method of extension must meet the approval of the Owner's Representative, the utility and local governing authorities.
- (C) The General Contractor shall not assign any monies due or to become due to him under the Contract Documents without prior consent of the Owner, nor shall either party to the contract assign the contract or sublet it as a whole without the written consent of the other.
- (D) The base bid shall be a complete and total package but to avoid price duplications shall exclude those items for which alternates are requested. Each alternate price shall be a total including all charges associated with adding the said item to the scope of work. Reference Section 00011, Paragraph 6(F).

3. PAYMENTS

- (A) The General Contractor shall furnish a cost on the most current version of A.I.A. Forms G702 and G703 with the complete breakdown of the contract price so arranged and itemized as to meet the approval of the Owner's Representative.
- (B) All applications for payment will be submitted on A.I.A. Form G702 or a reasonable facsimile thereto and shall be accompanied by Certificate A.I.A. Form G703.
 - (1) Column B, Description of Work, on Form G703 shall be listed by Sub-contract and specification division and shall include material supplier items.
 - (2) Column C, Schedule Value, on Form G703 shall be the actual sub-contract value and not the estimated value for the corresponding line item of work.
- (C) Submit three (3) embossed, notarized copies of applications with original signatures on each, accompanied by current jobsite photographs and a current critical path project schedule.
- (D) General Contractor shall submit all appropriate lien releases, including with the application for payment
- (E) Payment applications shall be accompanied by Contractor and material supplier partial lien waivers for the preceding month's application. These partial lien waivers shall equal the total dollar amount for each line item listed under "Description of Work, Column B, Form G703", for which the General Contractor received payment for the preceding month's application.

- (F) **Payment applications will not be processed until all such partial and/or final lien waivers have been submitted to the Owner's Office. Partial and final lien waivers shall be accompanied by an itemized index of waivers, which covers the previous month's draw.**
- (G) The Owner shall pay the General Contractor between the first and fifteenth of each month for work performed the preceding month, in accordance with Plans and Specifications, plus any approved Change Orders, if pay requests and lien waivers are in compliance with contract and submitted as stipulated.
- (H) Payments to be made as follows:
- (1) The General Contractor shall prepare a statement each month of all work performed the preceding month including all acceptable materials suitably stored on the site at that time.
 - (2) When the statement is approved by the Owner, the Owner will pay ninety percent (90%) of the amount due.
 - (3) Release of retained funds shall be contingent upon completion of all punchlist work, the receipt of the General Contractor's execution of Exhibit "A" and all warranties, As-Built Drawings, and service/operating manuals. Release of retained funds will also not be approved until all contractor and requested material supplier final lien waivers have been submitted.
 - (4) Miscellaneous Provisions: General Contractors and material suppliers shall not be entitled to service charges or interest on any monies due and not paid and on any monies due as a result of any claim, dispute or other matter in question.
 - (5) All Change Order cost breakdowns shall be notarized and shall be included on the Application for Payment Form G702 and G703.

4. SUBSTITUTIONS

- (A) All material, equipment and processes to be substituted for those specified or shown in Contract Documents shall be approved by Design Professional and the Owner's Representative in writing prior to item or work being installed or performed. Substitutions shown on shop drawings approved by the Design Professional do not constitute approval of substituted item.
- (B) Request for Substitution shall be in accordance with "SUBSTITUTION PROCEDURES" below.

5. SUBSTITUTION PROCEDURES

- (A) Instructions to Bidders specify time restrictions for submitting request for substitutions during the bidding period. Comply with requirements specified in this section.
- (1) Request for substitutions must be clearly identified.
 - (2) If the submittal is approved by the Design Professional, a Bid Addendum will be issued to all prospective bidders at least one week prior to bid

date.

- (3) Unless request for changes are received and approvals are published by Bid Addendum in accordance with the above procedure, the successful bidder shall be held responsible for furnishing items and materials of the trade names or manufacturer's names called for in the specifications.
- (B) Substitutions may be considered when a product becomes unavailable through no fault of the General Contractor. Changes in products, materials, equipment, and methods of construction required by the Contract Documents proposed by the General Contractor after award of the Contract are considered to be requests for substitutions. The following are not considered requests for substitutions:
- (1) Substitutions requested during the bidding period and accepted by Bid Addendum prior to award of the Contract, are included in the Contract Documents and are not subject to requirements specified in this Section for substitutions.
 - (2) Revisions to Contract Documents requested by the Owner's Representative or the Design Professional.
 - (3) Specified options of products and construction methods included in the Contract Documents.
 - (4) The General Contractor's determination of the compliance with governing regulations and orders issued by the governing authorities.
- (C) A request for substitutions constitutes a representation that the contractor:
- (1) Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
 - (2) Will provide the same warranty for the substitution as the specified products.
 - (3) Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to the Owner.
 - (4) Waives claims for additional costs or time extension which may subsequently become apparent.
 - (5) Will credit the Owner cost savings (full amount).
- (D) Request for substitutions shall include the following data:
- (1) Date of request.
 - (2) Project name.
 - (3) Specification reference.
 - (4) Specified item.

- (5) Proposed substitution.
 - (6) Manufacturer.
 - (7) Cost impact.
 - (8) Deviations from the specified item with Cost Breakdown
 - (9) Schedule impact.
 - (10) Manufacturer's recommendations for use and installation. Submit drawings if required for clarity.
 - (11) A complete schedule of changes in the drawings and specifications, if any, which must be made in other work in order to permit the use and installation of the proposed substitute in accordance with the recommendations of the manufacturer of the product.
 - (12) Technical data to support request for approval. List reference standards met, submit testing laboratory reports and experience records.
 - (13) Other supporting data such as brochures, samples and drawings.
 - (14) Samples or product literature of specified product for comparison, if required by the Design Professional or the Owner's Representative.
- (E) Determination as to acceptability of proposed substitution shall be based only on data submitted. If necessary, the Design Professional will request additional information or documentation for evaluation within one week or upon receipt of a request for substitution.
- (1) The Design Professional will notify the General Contractor of acceptance or rejection of the proposed substitution within two weeks of receipt of request, or one week of receipt of additional information or documentation, whichever is later.
 - (2) Approval will be in the form of a signed change order by the Owner.
 - (3) Use the product specified if the Design Professional or Owner cannot make a decision on the use of the proposed substitute within in the time allocated.
- (F) All accepted substitutions require written change order approval by the Owner's Representative.**

6. SUBSTITUTIONS AFTER CONTRACT AWARD

- (A) In the event the General Contractor proposes substitutions to the Design Professional or to the Owner after the Contract has been awarded, the Design Professional will record all time used by him, his employees, and/or his consultants in the evaluation of each such proposed substitution.

- (B) Regardless of whether or not the Design Professional approves a proposed substitution, the Design Professional shall be reimbursed at the rate of two and one-half (2.5) times the direct cost for all time spent by the Design Professional and/or their consultants in evaluating each proposed substitution. A Change Order will be issued to reduce the Construction Contract by an amount equal to the fees charged by the Design Professional for reviewing one or more proposed substitutions. the Design Professional will be reimbursed by the Owner in accordance with the Change Order amounts.

7. SUBMITTAL PROCEDURES

- (A) Summary: The following includes administrative and procedural requirements for submittals required for performance of the Work:

- Definitions.
- Procedures (coordinating/processing/submittal preparation).
- Contractor's construction schedule.
- Submittal schedule.
- Daily construction reports.
- Shop Drawings and submittal data.
- Product Data.
- Samples.
- Quality assurance submittals.
- Required actions.

- (B) Definitions:

- (1) 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.
- (2) Field Samples are full-size physical examples erected on-site to illustrate finishes, coatings or finish materials. Field samples are used to establish the standard by which the Work will be judged.
- (3) Mock-ups are full-size assemblies for review of construction, coordination, testing or operation. Mock-ups are used to establish the standard by which the work will be judged.

- (C) Procedures:

- (1) Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related activities to avoid delay.
 - (a) Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that required sequential activity.
 - (b) Coordinate transmittal of different types of submittals for related elements of the work so processing will not be delayed by the need to review concurrently for coordination.

- (i) The Design Professional and Owner reserve the right to withhold action on a submittal requiring coordination with other submittals until all related submittals are received.
- (c) Processing: To avoid the need to delay installation as a result of the time required to process submittals, allow sufficient time for submittal review, including time for resubmittals.
 - 1. Allow 2 weeks for initial review. Allow additional time if the Design Professional must delay processing to permit coordination with subsequent submittals.
 - 2. If an intermediate submittal is necessary, process the same as the initial submittals.
 - 3. Allow 2 weeks for reprocessing each submittal.
 - 4. No extension of Contract Time will be authorized because of failure to transmit submittals sufficiently in advance of the Work to permit processing.
- (2) Submittal Preparation: Place a permanent title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block.
 - (a) Provide a space approximately 4 by 5 inches on the title block on Shop Drawings to record the Contractor's review and approval markings on the action taken.
 - (b) Include the following information on the title block for processing and recording action taken.
 - 1. Project name.
 - 2. Date.
 - 3. Name and address of Architect.
 - 4. Name and address of Contractor.
 - 5. Name and address of subcontractor.
 - 6. Name and address of supplier.
 - 7. Name of manufacturer.
 - 8. Number and title of appropriate Specification Section.
 - 9. Drawing number and detail references, as appropriate.
- (3) Submittal Transmittal: Package each submittal appropriately for transmittal and handling. Transmit each submittal from the General

Contractor to the Design Professional using the transmittal form. The Design Professional will not accept submittals received from sources other than the General Contractor.

- (a) On the transmittal, record relevant information and requests for data. On the form, or separate sheet, record deviations from Contract Document requirements, including variations and limitations. Include Contractor's certification that information complies with Contract Document requirements.
 - (b) Transmittal Form: use AIA Document G810.
- (4) Submittal Review: The Design Professional review and approval.
- (a) The Design Professional shall review and approve submittals with reasonable promptness so as to cause not delay in Work. Allow two weeks for initial review.
 - (b) The Design Professional's approval is only for conformance with design concept of project with information in Contract Documents. The Design Professional's approval of a separate item shall not indicate approval of an assembly in which item functions.
 - (c) The Design Professional's approval of submittals shall not relieve General Contractor of responsibility for any deviation from requirements of Contract Documents unless General Contractor has informed the Design Professional in writing of such deviation at time of submission and the Design Professional and Owner have given written approval to the specific deviation. The Design Professional's approval shall not relieve the General Contractor for responsibility for errors or omissions in submittals.
 - (d) The Design Professional shall return reviewed shop drawings for printing and distribution by General Contractor.
- (5) Resubmission: Make corrections and changes indicated for unapproved submission and resubmit in same manner as specified above, until the Design Professional's and/or Owner's approval is obtained.
- (6) Distribution:
- (a) General Contractor shall be responsible for obtaining and distributing copies of submittals to his sub-contractors and material suppliers after as well as before final approval. Prints of revised shop drawings shall carry the Design Professional's appropriate stamp.
 - (b) General Contractor shall maintain a file of approved submittals and record all deviations from submittal for the duration of the project.
 - (c) The Owner will retain two copies of all submittals.

- (d) When the following are specified in individual sections of the Specification Manual or as requested by the Owner, submit appropriate documentation at project closeout:
 - 1. Operation and maintenance data.
 - 2. Warranties.
- (7) Any approved submittal that does not conform to the Contract Documents requires written change order approval by the Owner. The General Contractor is responsible for obtaining written Change Order approval.
- (D) General Contractor's Construction Schedule:
 - (1) Bar-Chart Schedule: Prepare fully developed, horizontal bar-chart type, contractor's construction schedule. Submit to the Owner's Representative within 30 days after the date established for "Commencement of Work".
 - (a) Provide a separate time bar for each significant construction activity. Provide a continuous vertical line to identify the first working day of each week. Use the breakdown of units of Work as indicated in the "Schedule of Values".
 - (b) Within each time bar indicate estimated completion percentage in 10 percent increments. As Work progresses, place a contrasting mark in each bar to indicate Actual Completion.
 - (c) Prepare the schedule on a sheet or sheets, of stable transparency, or other reproducible media, of sufficient width to show data for entire construction period.
 - (d) Secure time commitments for performing critical elements of Work from parties involved. Coordinate each element on the schedule with other construction activities; include minor elements involved in the sequence of the Work. Show each activity in proper sequence. Indicate graphically the sequences necessary for complete of related portions of the Work.
 - (e) Coordinate the General Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittal Schedule, progress reports, payment requests, and other schedules.
 - (f) Indicate completion in advance of the date established for Substantial Completion. Indicate Substantial Completion on the Schedule.
 - (2) Phasing: On the schedule, show how requirements for phased completion to permit Work by separate Contractors and partial occupancy by the Owner affect the sequence of Work.
 - (3) Work Stages: Indicate important stages of construction for each major portion of the Work, including submittal review, testing, and installation.

- (4) Area Separations: Provide a separate time bar to identify each major construction area for each major portion of the Work. Indicate where each element in an area must be sequenced or integrated with other activities.
 - (5) Cost Correlation: At the head of the schedule, provide a cost correlation line, indicating planned and actual cost. On the line show dollar volume of Work performed as of the dates used for preparation of payment request.
 - (6) Distribution: Following response to the initial submittal, print and distribute copies to the Design Professional, Owner, subcontractors, and other parties required to comply with the scheduled dates. Post copies in the Project meeting room and on-site temporary field office.
 - (a) 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.
 - (b) Schedule Updating: Revise the schedule after each meeting, event, or activity where revisions have been recognized or made. Issue the updated schedule concurrently with the report of each meeting.
- (E) Submittal Schedule:
- (1) After development and acceptance of the Contractor's Construction Schedule, prepare a complete schedule of submittals. Submit the schedule within 30 days after the date established for "commencement of work".
 - (a) Coordinate Submittal Schedule with the list of subcontracts, Schedule of Values, and the list of products as well as the Contractor's Construction Schedule.
 - (b) Prepare the schedule in chronological order. Provide the following information:
 1. Scheduled data for the first submittal.
 2. Related Section number.
 3. Submittal category (Shop Drawings, Product Data, or Samples).
 4. Name of the subcontractor.
 5. Description of the part of the Work covered.
 6. Scheduled date for resubmittal.
 7. Scheduled date the Design Professional's or the Owner

representative's final release or approval.

- (2) Distribution: Following response to the initial submittal, print and distribute copies to the Design Professional, Owner, subcontractors, and other parties required to comply with the submittal dates indicated. Post copies in the Project meeting room and on-site field office.
 - (a) 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.
 - (3) 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.
- (F) Daily Construction Reports:
- (1) Prepare a daily construction report recording the following information concerning events at the site, and submit duplicate copies to the Owner upon request:
 - (a) List of Contractors at the site.
 - (b) Approximate count of personnel at the site.
 - (c) High and low temperatures, general weather conditions.
 - (d) Accidents and unusual events.
 - (e) Meetings and significant decisions.
 - (f) Stoppages, delays, shortages and losses.
 - (g) Emergency procedures.
 - (h) Change Orders received, implemented.
 - (i) Services connected, disconnected.
 - (j) Equipment or system tests and start-ups.
 - (k) Partial Completions, occupancies.
 - (l) Substantial Completions authorized.

8. SHOP DRAWINGS AND SUBMITTAL DATA

- (A) Shop Drawings and Submittal Preparation:
- (1) Submit newly prepared information drawing accurately to scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as

the basis the Shop Drawings. Standard information prepared without specific reference to the Project is not a Shop Drawings.

- (2) Shop Drawings include fabrication and installation Drawings, setting diagrams, schedules, patterns, templates and similar Drawings. Include the following information:
 - (a) Dimensions.
 - (b) Identification of products and materials included by sheet and detail number.
 - (c) Compliance with specified standards.
 - (d) Notation of coordination requirements.
 - (e) Notation of dimensions established by field measurement.
- (3) Sheet Size: Except for templates, patterns and similar full-size Drawings, submit Shop Drawings on sheets at least 8-1/2 x 11 inches but no larger than 36 by 48 inches.
- (4) The instructions below will guide you on how to submit a shop drawing through the Shop Drawing Dropbox. Utilizing the Shop Drawing Dropbox ensures that the shop drawing submittal gets processed and distributed correctly. Please let us know if you have any questions. **All Shop Drawings get logged into an internal system before being reviewed.** Shop drawings sent directly to the reviewer will still be forwarded to be logged into the internal system. Utilizing the Shop Drawings Dropbox eliminates that extra step making the sure the turnaround is as short as possible. When submitting Shop Drawing Submittals electronically, the General Contractor is required to follow the procedures set forth below:
 - a. General Contractor shall submit shop drawings thru Dropbox: TBD
 - b. Do not submit directly to Project Leader, or Project Administrative Coordinator.
 - c. General Contractor's shall complete the Shop Drawing Submittal Form in its entirety. Under the section: "Notify Others by Email" include the email address TBD.
 - d. Submittals shall be provided in complete and not emailed in "piecemeal" fashion. Partial submittals shall be rejected.
 - e. For shop drawings that are required to be signed and sealed, scanned copies of the signature and seal will be acceptable provided that wet signed and sealed prints are sent to FleischmanGarcia for record purposes.
 - f. All submitted documents shall be in .pdf format. Any submittal not in pdf format shall be immediately rejected.

- g. All shop drawings shall have the review stamp of the General Contractor indicating that he has reviewed the submittal prior to receipt by FleischmanGarcia. Shop Drawings that do not have the General Contractor's review stamp shall be immediately rejected.

Note: Submittals that cannot be reviewed via email including Samples that need color or texture approval must be provided hard copy. Submittal received by FleischmanGarcia after 12 noon Central Time will begin to be processed for review the next business day. FleischmanGarcia shall return electronic submittals via email in .pdf format. Hard copies will not be returned.

- (5) Do not use Shop Drawings without an appropriate final stamp indicating action taken.
- (B) After award of the Contract, the General Contractor shall promptly prepare and submit to the Design Professional all product data, shop drawings and certifications as required by the specifications within the designated timeframe provided in Section 01021.B.I.1 and 01021.B.I.2. All Product Data, Shop Drawings and Certifications required by the specifications shall be submitted to the design professional no later than 120 days after award of the contract.
- (C) Except for those shop drawings and/or submittals specifically requested by the Design Professional and the Owner, the Design Professional will not review shop drawings, submittals, or product data.
- (1) Request for clarifications and/or interpretations of the Contract Documents shall be made in writing on an individual and specific basis. All such requests shall first be reviewed by the General Contractor.
- (2) In the event specific approvals are required by the manufacturer of a product, material, or fabrication, the General Contractor and his Contractors shall provide said "approval" of the shop drawings or submittals as required to release for fabrication and/or shipment on a timely basis. The General Contractor and his Contractors shall advise suppliers, vendors, distributors, and manufacturers of the terms stated in this paragraph regarding release or "approval" for manufacturing, fabrication, and/or shipment to insure timely delivery of respective products, materials, equipment, and fabrications.
- (3) Submittals received by the Design Professional outside the scope of the above guidelines will be returned to the General Contractor without review or comment.
- (D) The above stated procedures and policies regarding shop drawings and submittals are intended to simplify and expedite the construction process and emphasize the General Contractor's role and responsibility for coordinating the work of all trades in a proper and timely manner consistent with the Contract Documents. In keeping with this intent and concept, review comments received by the General Contractor and his Contractors from the Design Professional on selected and requested shop drawings and/or submittals shall not be interpreted

or construed as relieving the Contractor or his Contractors from complying with the requirements set forth in the Contract Documents.

- (E) For all shop drawings, or product data, including those requested by the Design Professional and the Owner, the General Contractor shall review same thoroughly and carefully, clearly marking and/or noting all discrepancies and deviations from the Contract Documents, and affixing an appropriate review stamp, signed and dated. General Contractor's review (and submittal if requested) shall constitute a representation by the General Contractor that he has verified compliance with the Contract Documents; and that he has determined and/or verified field measurements, coordination, materials, and requirements relating to the work and information contained therein are consistent with the project criteria and Contract Documents. The General Contractor shall be responsible to distribute all shop drawings and product data to the appropriate Contractor, as applicable, on a timely basis after his review.
- (F) At the completion of the project and prior to or in conjunction with the General Contractor's request for final payment, two (2) copies of requested shop drawings and similar data shall be furnished to the Owner as part of the "As-Built" project records, including applicable revisions and notations to truly reflect as-built conditions.
- (G) Requested shop drawings and submittal data shall be mailed with a transmittal letter or form prepared by the General Contractor which shall include the number of copies and identification of each item submitted. The transmittal shall not be used as the only source for identifying deviations, if any, from the Contract Documents.
- (1) Shop drawings and submittal data which the General Contractor requests to be returned by overnight carrier will be sent via General Contractor's overnight carrier's account.
- (H) Requested shop drawings for inter-related equipment must be submitted at one time, since the performance of one piece of equipment must be matched in performance by all other equipment of the overall system.
- (I) Submittals required of the specifications:
- (1) Submit direct to the Design Professional within noted timeframe after award of the contract:
- Concrete (Reinforcing Steel Shop Drawings, Concrete Mix Designs, Concrete Mix Strength Data); 60 days.
 - Unit Masonry Work (Concrete Block Strength Certification, Accessory Product Data, Grout Mix Design, Product Samples to Owner); 60 days.
 - Structural Steel (Shop Drawings, Connection Design Certification, Connection Design Calculations); 30 days.
 - Section 054000, Cold Rolled Structural Metals (Shop Drawings,

- Manufacturer's Data and Certification); 30 days.
- Section 055213, Pipe and Tube Railings (Shop Drawings); 60 days.
 - Section 061000, Rough Carpentry (Product Data, Shop Drawings); 120 days.
 - Section 064116, Plastic Laminate Faced Cabinets (Shop Drawings); 120 days.
 - Section 072100, Building Insulation (Product Data); 60 days.
 - Section 079200, Joint Sealants (Color Samples to Owner, Product Data); 90 days.
 - Section 081113, Hollow Metal Doors and Frames (Shop Drawings, Product Data) 90 days
 - Section 081416, Flush Wood Doors (Shop Drawings, Product Data) 90 days
 - Section 083113, Access Doors and Frames (Shop Drawings, Product Data) 90 days
 - Section 084113, Aluminum Framed Entrances & Storefronts (Shop Drawings, Product Data, Design Certification); 60 days.
 - Section 087100, Door Hardware (Hardware Schedule, Product Data); 120 days.
 - Section 088000, Glazing (Product Data, Product Sample to Owner); 60 days.
 - Section 09261, Gypsum Board Assemblies (Product Data, Texture Samples to Owner); 90 days.
 - Section 095113, Acoustical Panel Ceilings (Product Data, Texture Samples to Owner); 90 days.
 - Section 099100, Painting (Color Samples to Owner, Product Data, Paint Schedule); 120 days.
 - Section 102113, Plastic Laminate Toilet Compartments (Shop Drawings, Product Data); 120 days.
 - Section 102800, Toilet Room Accessories (Product Data); 120 days.
 - Section 104415, Fire Extinguishers and Accessories (Product Data); 120 days.
 - Wall Hung Canopies (Product Data, Shop Drawings, Design Certification); 120 days.

- Section 15301, Fire Protection Systems (Shop Drawings, Product Data, Test Certifications); 60 days.
- Section 220000, Plumbing Systems (Product Data); 60 days.
- Section 230000, HVAC Systems and Equipment (Product Data); 60 days.
- Section 233000, Air Distribution Systems and Accessories (Product Data); 60 days.
- Section 260100, Basic Materials, Methods and Requirements (Product Data, Ground System Test Report); 60 days.
- Section 260519, Low Voltage Electric Work (Fire Alarm Shop Drawings, Product Data); 90 days
- Section 265119, Interior Lighting Systems (Product Data); 60 days.
- Section 265600, Exterior Lighting Systems (Product Data); 60 days.
- Section 283111, Fire Alarm System (Product Data); 60 days.
- Section 313116, Termite Control (Product Data, Guarantee); 60 days.

9. PRODUCT DATA

- (A) Collect Product Data into a single submittal for each element of construction or system. Product Data includes printed information, such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams, and performance curves.
- (1) Mark each copy to show applicable choices and options. Where printed Product Data includes information on several products that are not required, mark copies to indicate the applicable information. Include the following information:
- (a) Manufacturer's printed recommendations.
 - (b) Compliance with trade association standards.
 - (c) Compliance with recognized testing agency standards.
 - (d) Application of testing agency labels and seals.
 - (e) Notation of dimension verified by field measurement.
 - (f) Notation of coordination requirements.

- (2) Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.
- (3) Preliminary Submittal: Submit a preliminary single copy of Product Data where selection of options is required.
- (4) Submittals: Submit 4 copies of each required submittal; submit 6 copies where required for maintenance manuals. the Design Professional will retain one and will return the other marked with action taken and corrections or modifications required. The Owner will retain 2 copies of all submittals.
 - (a) Unless noncompliance with Contract Document provisions is observed, the submittal may serve as the final submittal.
- (5) 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.

10. SAMPLES

- (A) Submit full-size full fabricated Samples cured and finished as specified and physically identical with the material or product proposed. Samples include partial sections of manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches showing color, texture, and pattern.
 - (1) Mount, display, or package Samples in the manner to facilitate review of qualities indicated. Include the following:
 - (a) Specification Section number and reference.
 - (b) Generic description of the Sample.
 - (c) Sample Source.
 - (d) Product name or name of the manufacturer.
 - (e) Compliance with recognized standards.
 - (f) Availability and delivery time.
 - (2) 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.
 - (c) Refer to other Sections for Samples to be returned to the Contractor for incorporation in the Work. Such Samples must be undamaged at time of use. On the transmittal, indicate special request regarding disposition of Sample submittals.
- (3) Preliminary Submittals: Submit a full set of choices where Samples are submitted for selection of color, pattern, texture, or similar characteristics form a range of standard choices.
- (a) The Design Professional or Owner will review and return preliminary submittals with the Design Professional's or Owner's notation, indicating selection and other action.
- (4) Submittals: Except for Samples illustrating assembly details, workmanship, fabrication techniques, connections, operation and similar characteristic, submit 4 sets. The Design Professional or Owner will return one set marked with the action taken. The Owner shall retain two copies of all submittals.
- (5) Maintain sets of Samples, as returned, at the Project Site, for quality comparisons throughout the course of construction.
- (a) Unless noncompliance with Contract Documents 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.
- (B) Distribution of Samples: Prepare and distribute additional sets of subcontractors, manufacturers, fabricators, suppliers, installers, and others as required for performance of the Work. Show distribution on transmittal forms.
- (1) Field samples are full-size examples erected on-site to illustrate finishes, coatings, or finish materials and to establish the Project standard.
- (a) Comply with submittal requirements to the fullest extent possible. Process transmittal forms to provide a record of activity.

11. QUALITY ASSURANCE SUBMITTAL

- (A) Submit quality control submittals, including design data, certifications, manufacturer's instruction, 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 Section 01400 "Quality Assurance Testing and Inspection".

12. REQUIRED ACTION

- (A) Except for submittals for the record or information, where action and return is required, the Design Professional will review each submittal, mark to indicate action taken, and return promptly.
 - (1) Compliance with specified characteristics is the Contractor's responsibility.
- (B) Action Stamp: The Design Professional will stamp each submittal with a uniform action stamp. The Design Professional will mark the stamp appropriately to indicate action taken, as follows:
 - (1) Final Unrestricted Release: When the Design Professional marks a submittal "Approved", the Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents.
 - (2) Final-But-Restricted Release: When the Design Professional marks a submittal "Approved as Noted", 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 Design Professional marks a submittal "Not Approved, Revise and Resubmit", do not proceed with Work covered by the submittal, include 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 "Not Approved, Revise and Resubmit" at the Project Site or elsewhere where Work is in progress.
 - (4) Other Action: Where submittal is for information or record purposes or special processing or other activity, the Design Professional will return the submittal marked "Action Not Required".
- (C) Other Action:

- (1) Any approved submittal that does not conform to the Contract Documents requires written change order approval by the Owner's representative.

13. EXPEDITING PRODUCT DELIVERIES

- (A) General Contractor shall be responsible for ordering and purchasing products equipment, and materials on a prompt and timely basis to avoid delays in construction due to deliveries.

14. AS-BUILT DRAWINGS

- (A) Each contractor shall maintain current and accurate marked-up prints indicating the as-built conditions associated with his contracted work. Upon completion of his work, he shall submit the required marked prints to the General Contractor for review and approval.
- (B) The as-built conditions shown on these prints shall be transferred to a "master as-built set" maintained by the General Contractor.
- (C) Each contractor shall sign this "master as-built set" certifying its accuracy.
- (D) Upon completion of the "Punchlist" the General Contractor shall forward the "master as-built set" to the Owner as a permanent record of the project.
- (E) As part of the close out documents, the General Contractor shall deliver to the Owner, two (2) complete hardcopy record sets and electronically scanned files of all submittals including deviations to the approved submittals.
- (F) The final retainage will not be released until receipt of this "master as-built set".
- (G) The General Contractor shall provide as-built survey drawings and/or information as required by the local permitting authority.

15. OWNER FURNISHED MATERIALS

- (A) Owner will furnish and install items as noted on the plans and in the Pre-Bid Conference Notes.
- (B) Each Contractor will receive, unload, store, insure and protect all Owner provided materials.
- (C) Refer to plans and Pre-Bid Conference Notes for other Owner furnished items.

16. SAFETY AND PROTECTION

- (A) Each Contractor shall be fully responsible for complete and absolute compliance with all provisions of the Occupational Safety and Health Act of 1970, including all amendments, pertaining to the work.
- (B) Each Contractor shall furnish and maintain for his portion of all the work all danger signals, signs, lights, guard barricades, etc., required by good practice and by law during the entire period of his contract. Each Contractor shall confine

his equipment, storage of materials and the operations of his workmen to limits indicated by law. No Contractor shall load or permit the loading of any part of the structure with a weight that will endanger its safety.

- (C) Each Contractor shall be solely responsible for the proper protection of all materials and equipment delivered to the site from the time of such delivery until final approval and acceptance by the Owner. This protection and security provision shall include all Owner supplied items.
- (D) Each Contractor shall, at all times, protect the excavations, trenches and/or the portions of the building pertaining to his work from damage from rainwater, spring water, ground water, backing up of drains or sewers, and all other water. He shall provide all pumps and equipment and enclosures to provide this protection. He shall construct and maintain all necessary temporary drainage and do all pumping necessary to keep excavations free of water.
- (E) Each Contractor shall provide all shoring, bracing and sheathing as required for safety and for the proper execution of the work, and having it removed when the work is completed. Special attention shall be given to foundations for buildings and basements. Where cuts for utilities exceed 4', they shall be sloped or shored as required by a registered Engineer, in accord with both OSHA and local regulations.
- (F) Any work damaged by failure to provide protection as required above shall be removed and replaced with new work at the Contractor's expense. Special attention is drawn to this provision as it relates to Owner supplied items.

17. PERMITS, REGULATIONS, CODES AND STANDARDS

- (A) Each Contractor shall secure required permits necessary for the execution of his work. Specified permit fees to be paid by the Owner.
- (B) The Owner is responsible for filing the plans for the Building Permit. The General Contractor shall cooperate with the Owner in expediting acquisition of this Permit. The main Building Permit fee shall be paid by the Owner.
- (C) Each Contractor shall give all notices and comply with all laws, ordinances, rules and regulations bearing on the conduct of the work as drawn or specified.
- (D) All work installed by each Contractor shall be in compliance with governing Federal, State and Local Codes. All electrical work shall comply with the National Electrical Code (NEC - latest), except where more stringent local or other Codes must govern. Installations made without regard to Code requirements must be corrected by each Contractor without an increase in the contract amount.
- (E) The plans and specifications may exceed Code and Product Manufacturer requirements.
- (F) Any "Standard" (ASTM, ASA, etc.) referenced in these specifications shall be based on the edition and/or amendments of the Standard as specified herein. In cases where the edition or date of the "Standard" is not specified, the edition and/or amendments of the Standard which are current on the date the bids are

submitted shall govern. Should a more current edition of a Standard become effective during construction, the General Contractor may, with the approval of the Design Professional apply the latest edition of the specified Standard.

18. SUPERVISION, COORDINATION AND LAYOUT

- (A) All work included in the respective contracts shall be under the constant supervision of qualified superintendents or foremen.
- (B) Considering the Time of Essence Contract the General Contractor shall conduct weekly job meetings with all major Contractors in attendance for the purpose of coordination and expediting.
- (C) In order to maintain proper coordination and continuation of all branches of work, job superintendents or foremen shall not be changed without prior notice to and approval of the Owner's Representative.
- (D) Each Contractor shall carefully examine all drawings and specifications for the total project and coordinate his work with others to avoid delay and shall be responsible to ascertain that the work he installs does not interfere with work of other Contractors. If work is installed which does interfere, it shall be corrected at the Contractor's expense. Pre-occupation of space by any Contractor does not give him the right of priority to the space.
- (E) When piping, conduits, ducts or other items are to run in the same general direction, elevation or location, the Contractors involved shall request the General Contractor to arrange a conference to determine the proper allocation of the space or position.
- (F) When work is to be installed above ceilings, adequate clearance must be maintained to allow for access, repairs, and removal of all devices. Each Contractor shall be responsible for protecting his installation from being blocked off by others. Should this condition occur, he shall bring the matter to the attention of the other Contractor for correction.
- (G) Each Contractor shall be responsible for any layout associated with the performance of his work. Should a Contractor's work be subsequent to and contingent upon layout by another, he shall check said layout prior to proceeding with his work, reporting any discrepancies to the General Contractor. Proceeding with the layout shall be considered as acceptance of the layout.

19. TESTS AND INSPECTIONS

- (A) If the provisions of the contract, specifications, or any law, building ordinance or Code, rule, utility requirement, order or regulation prescribed by any legally constituted public authority having jurisdiction, require that any of the work performed by any Contractor, or any material thereof, whether complete or incomplete, be tested or inspected, then the General Contractor shall have said tests or inspections made by the Owner's testing laboratory in connection therewith. Additional testing or inspection shall be performed if the Contractor deems necessary.
- (B) The testing laboratory shall be selected by the Owner's Representative,

scheduled and coordinated by the General Contractor and paid for by the Owner.

- (C) All tests shall be made by a well-established independent testing laboratory, having the facilities to make the tests required.
- (D) The testing laboratory shall report the results of all tests in writing to the General Contractor, the Design Professional, and the Owner's Representative.
- (E) The General Contractor shall be responsible for directly selecting, retaining, paying for, contracting with an Independent Testing Consultant (ITC) to provide total HVAC system testing and balancing services for this project. The General Contractor shall NOT subcontract this work to or under the HVAC Contractor's work to ensure that all TAB work is done independently of the mechanical installer/contractor. The General Contractor shall pay for complete HVAC Test System Test and Balance and re-test of noted deficiencies corrected by the contractor. The General Contractor shall be responsible to coordinate scheduling with the ITC. The ITC shall complete the "Systems Start-Up Checklist" (see Section 15051, Exhibit B) and the General Contractor shall fax copies to the ITC and Owner before confirming the arrival date of the ITC on-site.
- (F) All costs for retesting or reinspection of materials, trip charges, excess standby time and overtime premiums incurred because of failure or inability of testing laboratory to execute the testing or reinspection initially shall be paid for by the General Contractor.

20. SURVEILLANCE BY A LOCAL PROFESSIONAL

- (A) Where required by Local or State code or authority, the Owner shall retain an Architect or Civil Engineer licensed in the State to provide construction surveillance and sign-off of the project.

21. CUTTING, PATCHING, AND CLEANING

- (A) No Contractor shall endanger and/or damage any work by cutting, drilling, digging or other actions. No Contractor shall cut or alter the work of other Contractor without prior approval by the General Contractor.
- (B) Any cost caused by defective and/or ill-timed work shall be borne by the Contractor responsible, therefore.
- (C) In no case shall any Contractor cut into any structural element, beam, or column without prior written approval from the Design Professional.
- (D) Each Contractor shall be responsible to follow the progress of the project to assure that his portion of the work is installed at the appropriate time to avoid unnecessary cutting, patching, or modifications to his work and/or the work of other Contractors.
- (E) In case any Contractor is required to cut existing work in order to install the work required under his portion of the contract, the Contractor requiring the cutting shall bear the expense of the cutting and all subsequent repairing, patching, and/or replacement. All cutting, patching, repairing, and/or replacing shall meet with the approval of the Owner's Representative and the Design Professional.

- (F) Progress Cleaning: Each Contractor shall be responsible for cleaning up packing materials, trash, and any debris related to his portion of the work and/or generated by his workmen. In addition, each Contractor shall be responsible for cleaning walls, floors and other finished surfaces soiled as a result of his portion of the work or due to his workmen. All work by each Contractor shall be clean at the completion of the respective portion of the contract.
- (G) General Contractor is to maintain a clean access entry drive. Keep mud and debris onsite.
- (H) The Contractor or material supplier shall promptly correct all work rejected by the Design Professional or the Owner as defective or as failing to conform to the Contract Documents whether observed before or after substantial completion and whether or not fabricated, installed or completed. The Contractor or material supplier shall bear all costs of correcting such rejected work or materials, including the cost of the Design Professional's additional services thereby made necessary.
- (I) If the Owner prefers to accept defective or non-conforming work or materials, he may do so instead of requiring its removal and correction, in which case a Change Order will be issued to reflect an appropriate reduction in the contract sum, or, if the amount is determined after final payment, it shall be paid by the Contractor or material supplier.

22. OWNER OCCUPANCY

- (A) The Owner reserves the right to take occupancy at the earliest possible date, particularly with regard to delivery and installation of fixtures, and merchandise. Depending on the progress of the General Contractor's work, this may or may not create some inconvenience. The General Contractor should anticipate this possibility. Claims for time delays and/or extra costs due to such inconveniences will not be allowed.
- (B) When the Owner takes beneficial occupancy and begins receipt of merchandise, the site shall no longer be considered as a construction site. Subsequent to beneficial occupancy the General Contractor and each Contractor will be subject to the rules of the store management regarding access, hours of work, security, smoking, food, noise, dust, etc.

23. FINAL CLEANING

- (A) General: Provide final cleaning. Conduct cleaning and waste removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- (B) Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
- (C) Comply with safety standards for cleaning. Do not pour volatile, harmful, or dangerous materials into drainage systems.

- (D) Complete the following cleaning operations prior to noon the Thursday preceding the Owner's fixture date. Incomplete work may be performed by the Owner.
- (1) General
 - (a) Remove all debris and surface dust, soil and stains.
 - (b) Remove all non-permanent labels (e.g. stickers, etc.).
 - (c) Sweep and damp mop all hard surface flooring (e.g. exposed concrete, tile, VCT, wood, etc.).
 - (d) Vacuum all carpet. Spot clean all soil and stains.
 - (e) Clean and sanitize all plumbing fixtures.
 - (f) Clean parking lot and site of rubbish, waste materials, litter and other debris.
 - (2) Office and all Interior Areas
 - (a) Wipe down and clean all surfaces including all walls, mirrors, doors, track lighting, overhead ductwork, glass block, wood trim, translucent panels, decorative metal and decorative items.
 - (b) Wipe down and clean the storefront framing, windows and laminate sills.
 - (c) Vacuum carpet removing debris and excess nap. Spot clean all soil and stains.
 - (d) Vacuum dust and debris from all enclosed areas and top of partition walls.
 - (e) Sweep and wet mop all floor tile.
 - (3) Toilet Rooms
 - (a) Wipe down and clean all surfaces including walls, mirrors, entry doors and countertops and partitions.
 - (b) Wipe down and clean light fixture lenses.
 - (c) Sweep and wet mop floors.
 - (d) Clean and sanitize all plumbing fixtures.
 - (4) Utility/Electrical Room
 - (a) Wipe down and clean all surfaces including walls, electrical and mechanical equipment, conduits, lighting fixtures, ductwork and piping.

- (b) Sweep and wet mop the concrete floor.
- (5) Janitors Closet
 - (a) Wipe down and clean all surfaces including walls, piping, light fixtures, shelving and entry door.
 - (b) Clean and sanitize the mop sink.
 - (c) Sweep and wet mop the concrete floor.
- (6) Breakroom
 - (a) Wipe down and clean all surfaces including walls, light fixtures(s) and entry door.
 - (b) Sweep and wet mop hard surface flooring. Vacuum carpet (if applicable).
- (7) Building Exterior
 - (a) Wipe down and clean all window glass, storefront framing/trim and doors.
 - (b) Remove all soil, stains and discoloration from masonry walls and sills.
 - (c) Remove all dust and dirt from underside of the canopy(s).
 - (d) Remove all debris from the roof.
- (8) Site
 - (a) Remove all rubbish, waste materials, litter and other debris from the parking lot and site area.
 - (b) Sweep all paved areas. Wash paved areas to remove remaining soil. Clean spills, stains and other foreign deposits from paved areas.
 - (c) Remove all tools, construction equipment, machinery and surplus materials from the site. Tools, equipment, machinery and materials in use shall be stored in a single area designated by the Owner's Representative.
 - (d) Remove all soil, stains, and foreign debris from sidewalks and curbs. Pressure wash if needed.
- (E) In the sole opinion of the Owner, the Owner will supplement the General Contractor's cleaning forces as needed to comply with these standards and the project schedule. The incurred cost will be the responsibility of the General Contractor and be deducted from the contract fee.

24. FINAL INSPECTION

- (A) As the work nears completion, the General Contractor shall review the requirements of the Contract Documents, inspect the work, and inform all parties involved of work to be corrected or completed before the project can be deemed substantially complete.
- (B) Upon Substantial Completion, the Owner's Representative will perform an inspection.
- (C) The Owner's Representative reserves the right to cancel and reschedule the inspection in the event considerably more work remains to be completed or corrected than indicated on the written request for inspection.
- (D) A representative of the General Contractor shall be present at the time of inspection.
- (E) Separate/individual punchlists will be performed by the following parties.
 - (1) The Owner's Construction Manager.
 - (2) The Architect and/or the MEP engineering consultants
 - (3) The independent testing and inspection company (ITC)
 - (4) The Owner's Facility Manager
 - (5) The independent HVAC test and balance company
 - (6) The Civil Engineer
 - (7) An independent fire protection inspection company
 - (8) Other specialty professionals as deemed necessary

The punchlist will be issued to the General Contractor upon performance of the specific inspection. Punchlist are partial or preliminary until all work has been completed. A final punch cannot be performed on portions of work that are incomplete. A consolidated final punchlist will be issued by the Owner to the General Contractor within 15 days following completion of all work.

25. GUARANTEE

- (A) General Guarantee - See Sample in Section 01700, WARRANTY MANUALS
 - (1) The General Contractor and his Contractors shall guarantee their work in writing, including labor and materials, for a period of one (1) year or longer, if so specified elsewhere, from the date of final completion of the contract by the General Contractor or from full occupancy of the building by the Owner, whichever date is earlier.
 - (2) However, if at the time of full occupancy of the building by Owner, a

portion of the work has not been completed or is found to be defective, the starting date of guarantee for the defective or incomplete portion shall be effective only after same has been completed or corrected by the General Contractor.

- (3) If a portion of the building and/or the work is turned over to the Owner for occupancy and/or operation prior to the completion of the work under contract, the beginning of the guarantee period for the portion occupied will begin from the date of occupancy. In order to receive an adjustment in the guarantee period, the Contractors involved shall each submit a written certificate describing the portion of the work involved.
 - (4) Defective work and all damages resulting from same occurring within one year from the date of completion of work under contract shall be corrected by the General Contractor or responsible Contractor at his own expense.
 - (5) The General Contractor must perform a walkthrough with the Store Manager. The Contractor must obtain the Store Manager's signoff on the Owner's turnover checklist and include a copy in the Warranty Manual.
- (B) Specific Warranty
- (1) Manufacturer's equipment warranty shall be for at least a period of one (1) year as defined in the General Guarantee paragraph. When manufacturer's standard warranty is for a longer period, or if a longer period is called for in the specific equipment specifications, then the longer warranty period shall govern. In any case, the overall effective guarantee period shall not be shorter than the one (1) year period dating from the final completion date of the contract.
 - (2) General Contractor shall be required to turn over manufacturer's written guarantee to Owner's Representative prior to receiving final payment.

-END OF SECTION-

DIVISION 1 - GENERAL REQUIREMENTS

PART 1: GENERAL

1. SUMMARY

(A) This Section includes administrative and procedural requirements governing Alternates.

2. DEFINITIONS

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

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

3. PROCEDURES

(A) Coordination: Modify or adjust affected adjacent Work as necessary to completely and fully integrate that Work into the Project.

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

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

(C) Execute accepted alternates under the same conditions as other Work of this Contract.

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

PART 2: PRODUCTS (NOT APPLICABLE)

PART 3: EXECUTION

4. SCHEDULE OF ALTERNATES

(A) Other items as requested in the Pre-Bid Meeting.

END OF SECTION

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DIVISION 1 - GENERAL REQUIREMENTS1. GENERAL

- (A) All work under Divisions 15 and 16 of these specifications will be subject to and governed by the following:
- (1) GENERAL PROVISIONS AND BIDDING INFORMATION - Section 00011
- (B) The term "Mechanical" Contractors shall mean the Heating and Air Conditioning Contractor, Plumbing Contractor, and Fire Protection Contractor. The term "Electrical" Contractor shall mean the building Electrical Contractor. Electrical work performed by the automatic temperature control Contractor shall be included in the Heating and Air Conditioning Contractor's work. For ease of reference, the following abbreviations may be used in the specifications and drawings:
- GC General Contractor who shall be the prime Contractor for this project and who shall be responsible to the Owner.
- HAC Heating and Air Conditioning Contractor, a subcontractor to the GC.
- PBC Plumbing Contractor, a subcontractor to the GC.
- ELC Electrical Contractor, a subcontractor to the GC.
- FPC Fire Protection Contractor, a subcontractor to the GC.

2. MATERIALS, EQUIPMENT AND WORKMANSHIP

- (A) Unless otherwise specified, all materials and equipment incorporated in the work under the contract shall be new. All work shall be performed by persons qualified in the respective trades.
- (B) All material shall conform to the governing Codes or regulations.
- (C) All material and equipment shall bear the label of the Underwriters' Laboratories, Inc. (U.L.), if U.L. has an established certification for the particular type of material, device, or equipment.
- (D) Contractors shall not scale the drawings. Refer to architectural and structural drawings for the building construction and dimensions and refer to "Room Finish Schedule" on architectural drawings for material, finish, and construction method of walls, floors and ceilings so that proper roughing-in Contractor's work can be provided.
- (E) Where the word "provide" is used, this shall be taken to mean "furnish and install", unless otherwise noted or specified.
- (F) It is the intent of the drawings and specifications that all labor, materials, and equipment be provided as required to complete the installation of all mechanical and electrical systems and work described, shown, or indicated in the Contract Documents for proper functioning and finished appearance. The respective Contractors shall provide all necessary components, hardware, accessories, and devices as required to comply with the intent of the Contract Documents, whether or not such items are shown on the drawings or referenced in the specifications.
- (G) Unless otherwise noted on the drawings or specified, each Contractor shall provide structural members, brackets, bracing, hardware, and related accessories as required to securely install all equipment, devices, and materials under his portion of the work. This shall include flashing, gaskets, sealants, and caulking as required to prevent entrance of or damage from rain or wind.
- (H) In all cases, route utilities to cause the least interference with the fixture plan (e.g. mount sprinkler mains as high as possible). At the equipment access platform, route sprinkler drop along perimeter wall to avoid interference with platform use, etc.).

3. OWNER-FURNISHED EQUIPMENT AND/OR MATERIALS

- (A) Each Contractor shall receive, unload, secure, uncrate, erect, install, and place into proper operation all Owner-furnished equipment and accessories in accordance with the drawings and specifications and in accordance with the equipment manufacturer's detailed working drawings and installation recommendations. Contractor shall provide all materials, accessories, devices, and equipment as required to properly install and place into operation all Owner-furnished equipment, including assistance with and coordinating start-up services when provided by the equipment manufacturer.
 - (1) Stored materials are the General Contractor's responsibility upon receipt.
- (B) The equipment furnished by the Owner will carry the manufacturer's standard warranty. The Contractor shall notify the Owner's Representative should any defective components or features be discovered during receiving, uncrating, installation, or testing. The Owner will notify the manufacturer for replacement or repairs.
- (C) Any repairs and/or replacements required due to Contractor's negligence shall be the responsibility of the Contractor.
- (D) The Contractor shall provide all labor and work for repairs and/or replacements related to Owner-furnished equipment during the term of the manufacturer's warranty, including warranty extensions (if any), purchased with the equipment. All work, materials, and labor related to repairs and/or replacements excluded from the manufacturer's warranty shall be provided by the Contractor for all defects, malfunctions, or deficiencies occurring within the full warranty period.
- (E) The maintenance service requirements specified on the drawings and/or in the respective sections of the specifications shall apply to all Owner-furnished equipment, unless noted or specified otherwise.
- (F) Data relating to Owner-furnished equipment shall be included in the Operating and Maintenance Manuals provided by the Contractor in accordance with this section of the specifications unless noted or specified otherwise.
- (G) Each item of Owner-furnished Equipment and/or material is shown or identified on the drawings and/or in the appropriate Section of the specifications.
- (H) The Contractor shall make notifications and coordinate with the Owner's Representative and the manufacturer to assure a timely, properly functioning installation of Owner-furnished equipment.
- (I) Contractor is responsible for complete installation of equipment. If additional information is required, this must be made known at bidding time as an extra for this work will not be considered by the Owner.

4. CONCRETE WORK

- (A) Concrete Encasement and Cradles
 - (1) Concrete encasement, cradles, or trenches for underground pipes, conduits and ducts shall be provided by the respective Contractor, unless otherwise noted or specified.
 - (2) Composition and quality of concrete work shall comply with Division 3 of the specifications.

5. SLEEVES THROUGH MASONRY AND CONCRETE WALLS AND FLOORS

- (A) Exterior and Foundation Walls
 - (1) All piping or conduit through exterior walls and foundation walls shall pass through schedule 40 steel sleeves which shall be large enough to allow for caulking material. No sleeves are permitted through concrete structural members unless indicated on the structural drawings.
 - (2) Space between pipe or conduit and sleeve shall first be packed with jute, hemp, or oakum and then be finally caulked flush with finished surfaces.

(B) Interior Walls and Partitions

- (1) All piping or conduit through masonry interior walls and partitions shall pass through either schedule 40 black steel, plastic or galvanized steel sheet metal sleeves. Schedule 40 sleeves must be used with concrete or masonry construction. Sleeves will not be required for temperature control tubing.
- (2) Space between pipe or conduit and sleeve, or between insulation and sleeve shall be caulked when passing through mechanical room walls or fire-rated walls.
- (3) Ducts: Space between duct and opening shall be grouted with non-shrinking cement or plaster for fire rating and noise isolation. Openings in stud walls shall be sleeved with galvanized sheet metal collar and grouted as above. Fire dampers shall be provided in all ducts penetrating fire-rated walls.

(C) Floors

- (1) All piping or conduit through concrete floors shall be provided with schedule 40 pipe sleeves, extending 1" above floor, except in finished areas. Sleeves in finished areas shall terminate flush with floor, and shall be schedule 40 pipe, plastic, or sheet metal.
 - (a) When opening is on the lowest floor - grout space between pipe or conduit and sleeve with non-shrinking cement.
 - (b) When opening is above lowest floor - space between pipe or conduit or insulation and sleeve shall be grouted with non-shrinking cement or shall be caulked from above and below to provide watertight construction and to maintain fire-rating of floor structure.
- (2) All ducts through floors shall be provided with galvanized or painted steel angle frame for support of duct and closure of opening. Provide grouting in the same manner as for ducts through walls. Fire dampers are required in all ducts penetrating fire-rated floors.

6. LINTELS

- (A) All lintels required for supporting building construction above pipes, boxes, panels, ducts, etc., shall be furnished and installed by the GC.
- (B) Contractor requiring the opening or recess shall be responsible for the size, location, and configuration of the opening.

7. ROOF OPENINGS AND CURBS

(A) Roof Openings

- (1) All roof openings for piping, vents, flues, stacks, ducts, conduits, etc., shall be sleeved by the respective Contractor.
- (2) All framed openings on roof shall be provided by GC in accordance with details, dimensions, and locations shown on the structural and architectural drawings.

(B) Roof Curbs

- (1) Unless prefabricated type curbs are specified, curbs shall be constructed by the GC in accordance with details and dimensions shown on the structural and architectural plans. Respective Contractor shall provide correct dimensions to the GC prior to fabrication of curbs.
- (2) Flashing for piping, vents, flues, stacks, ducts, conduits, etc., shall be made watertight by means of sleeves, flashing, and draw collars. Materials and methods shall be in accordance with Section 7E of these specifications. Sleeves, flashing, and flashing draw collars shall be furnished and installed by the Contractor requiring the opening. If piping is insulated, the insulation shall be sealed off by insulation cement or weatherproof mastic in a manner and with

materials as required to prevent rain leakage. Contractors requiring openings shall coordinate all flashing, counter flashing, and related details with the roofing Contractor.

- (3) Plumbing vent terminals shall be installed as shown on the drawings.
- (4) Special flashing and counter flashing requirements, if required, shall be as shown on the drawings and/or as specified elsewhere in Division 15.
- (5) Prefabricated roof curbs, if required, shall be of the type as specified in the appropriate Section of Division 15 of these specifications and/or noted on the drawings.

(C) Flashing and Counter Flashing

- (1) Flashing around roof curbs shall be provided by the roofing Contractor under GC. Counter flashing shall be by the Contractor requiring such curbed openings, except where counter flashing is a component part of the equipment. All counter flashing materials and methods shall be in accordance with Section 07600 of these specifications.

8. CUTTING AND PATCHING

(A) For New Construction

- (1) Roof Openings - Field-cut openings in roof deck shall be cut by other Contractor under GC. The size and location of such openings are the responsibility of the Contractor requiring the opening.
- (2) Floors, Walls, and Partitions - Openings in stud walls shall be cut and/or framed by other Contractors under GC. Openings in concrete and masonry work shall be sleeved prior to or as the concrete and masonry work is being placed. The size and location of openings are the responsibility of the Contractor requiring the opening.
- (3) Openings, lintels, frames, etc., as required for flush mounted panels and recessed equipment shall be provided by other Contractors under GC, unless otherwise noted on the drawings or specified herein.
- (4) Each Contractor shall be responsible to follow the progress of the project to assure that all sleeves, openings, rough-in boxes, frames, etc., are placed at the proper time. Any and all subsequent cutting and patching and/or unnecessary modifications to the work of other Contractors shall be done at the expense of the Contractor requiring the opening. Under no circumstances shall any structural members, load bearing walls, footings, or foundations be cut without first obtaining written permission from CASCO.

(B) Cutting shall be limited to the size necessary for working conditions. When cutting surfaces are difficult or costly to replace, such as marble, ceramic tile, wood paneling, etc., each Contractor shall consult with the General Contractor in advance and they shall jointly develop a method of cutting.

(C) All patching shall be done with materials and by methods consistent with the construction and materials being patched. In general, cement grout shall be used with masonry, and filler compound shall be used with dry-wall or plastered surfaces. Quality and final appearance of all patching work shall be subject to the approval of the Owner's Representative and/or CASCO.

9. OPERATING AND SERVICE MANUALS

(A) General- Near the completion of the project, and (in order to allow Owner time in which to become familiar with its contents) at least one (1) month prior to Contractor's request for final inspection, each Contractor shall be required to provide two (2) volumes of Operating and Service Manuals containing the following:

- (1) Start-up and Shut-down Procedures - Provide a step-by-step write-up of all major equipment. When manufacturer's printed start-up, trouble shooting and

shut-down procedures are available, they may be incorporated into the operating manual for reference.

- (2) Operating Instructions - Written operating instructions shall be included for the efficient and safe operation of all equipment.
- (3) Equipment List - List of all major equipment as installed shall include model number, capacities, flow rates, and nameplate data. (The list shall include all equipment furnished by Owner.)
- (4) Contractor will, before the store opens, familiarize store personnel with operating instructions on each piece of equipment (e.g. set temperature controls, timers for lights, etc.). Refer to Owner's turnover checklist.
- (5) Service Instructions - Each Contractor shall be required to provide the following information for all pieces of equipment:
 - (a) Recommended spare parts including catalogue number, name of local suppliers, or factory representative.
 - (b) Lubrication and maintenance instructions for all equipment including all electric motors.
 - (c) Belt sizes, types and lengths (mechanical only).
- (6) Manufacturer's Certificate of Warranty - Manufacturer's certificate of warranty shall be obtained for all major equipment furnished by each Contractor. Warranty shall be obtained for at least one (1) year as defined in the GUARANTEE paragraph. Where longer period is called for in the specific equipment specifications, the longer period shall govern.
- (7) The Contractor shall include in the manuals parts catalogues for each item of equipment furnished by him on the project with the components identified by number for replacement ordering.

(B) Submission

- (1) Manuals shall be in duplicate, and all materials shall be bound into volumes of standard 8-1/2" x 11" hard binders. Large drawings too bulky to be folded into 8-1/2" x 11" size shall be separately bound or folded into brown envelopes, cross referenced and indexed with the manuals.
- (2) The manuals shall include the name of General Contractors, and other major Contractors.

10. ACCESS TO EQUIPMENT

(A) Accessibility

- (1) All control devices, specialties, valves, and removable panels on equipment shall be so located as to provide easy access for inspection and maintenance including ease of removal of any interior components.
- (2) Should any Contractor's work, such as piping, ducts, conduits, etc. be installed without due regard to the accessibility of devices installed by other Contractors, the installation shall be relocated, offset, or re-routed without cost to the Owner.

(B) Access Panels

- (1) Where devices are to be concealed in walls or above non-removable ceilings, each Contractor shall be required to furnish the required access panels to the GC for installation.
- (2) Size of panels shall be larger than the devices for accessibility and shall be not less than 6 inches square for wall panels and not less than 12 inches square for ceiling panels. Where the opening must allow adequate room for a person to pass through, a 24" x 24" panel shall be provided.

- (3) Construction of panel shall comply with the following:
 - (a) For masonry, tile, wood or gypsum board surfaces - extruded aluminum frames, 3/4" border, aluminum piano hinges, screwdriver-operated cam lock, brushed satin aluminum finish. Final painting to match decor by GC.
 - (b) For acoustical tile ceiling - flangeless construction of even tile module, recessed door panel for receiving acoustic tile by GC, piano hinges, flush screwdriver-operated cam latch, white prime coat finish. Access panels will not be required in accessible type ceilings.

11. OPERATION OF DEFECTIVE EQUIPMENT

- (A) If after installation, operation of the equipment proves to be unsatisfactory to Owner by reasons of defects, errors or omissions, Owner reserves the right to operate the equipment until it can be removed from service for correction by Contractor. Contractor shall be liable for any damage to equipment resulting from such continued operation.

12. ELECTRICAL WORK FOR MECHANICAL EQUIPMENT

- (A) Electrical Contractor - Shall wire all mechanical equipment furnished by various Contractors and the Owner, in accordance with the following general provisions:
 - (1) Power wiring from panel to motor controllers, relays, etc., and controllers to motor terminals per equipment manufacturer's wiring diagram.
 - (2) Furnish, install and wire local disconnect switches, manual push buttons and other control wiring specifically called for or noted in electrical specifications.
 - (3) Initial field oiling of all motors prior to the test running of same.
 - (4) Receive, unload, set and align all separately shipped motors. Adjust and align drive and adjust belt tension.
 - (5) Furnish and install motor starters specifically called for on plans.
 - (6) Install and wire all field-mounted devices, such as selector switches, push button stations, etc. specifically called for to be furnished by other Contractors when not a factory pre-wired component.
- (B) Mechanical and/or Plumbing Contractors - Shall include the following:
 - (1) All motor starters or control devices specifically called for to be factory pre-wired.
 - (2) Furnish individual motor starters or control devices specifically called for in accordance with the specifications, or as noted on the drawings.
 - (3) Automatic control and interlock wiring as called for under Division 15.
 - (4) Furnish complete and accurate wiring diagrams to ELC for all equipment requiring electrical power wiring and/or control wiring.
 - (5) All separately shipped motors shall be delivered to ELC for installation. Adjustment motor base and all bolts and nuts required for installation of base and motor shall be furnished by respective Contractor.
 - (6) Furnish motor terminal connection diagram as prepared by motor manufacturers.
- (C) Motor Starters - Motor starters for mechanical equipment shall be furnished by the respective Contractors as called for on the drawings. In general, the following principles shall be followed:
 - (1) All magnetic motor starters to be built-in in motor control panelboards will be furnished and installed by ELC.

- (2) All magnetic motor starters to be factory pre-wired shall be furnished and installed at the factory and shall be included in the respective Mechanical Contract.
- (3) All individual motor starters shall be furnished and installed by the ELC, unless noted to be furnished by others on plans. The ELC will install and wire all individual motor starters, including those furnished by others.
- (4) Magnetic motor starters furnished by ELC will be provided with auxiliary contacts required for operation of starting device only. Additional auxiliary contacts required for electrical interlock and automatic controls shall be furnished and installed by the Contractor responsible for the interlock wiring.
- (5) In order to be properly sized, all heater elements for overload relays on magnetic motor starters (except the starters factory prewired with equipment) shall be furnished and installed by the ELC in the field. Each Contractor furnishing the motorized equipment shall be required to furnish a list of motor characteristics to the ELC so that properly sized heater elements may be provided. The list shall include equipment identification by name and by number, full load current, locked rotor current, voltage rating, and suggested service factor to compensate for operating duty cycle and ambient temperature.

13. PAINTING

(A) General

- (1) In general, all required field painting of piping, ductwork and other mechanical and electrical systems and components shall be done by Contractor under the GC. However, all painting or finishing, which is required for special results and/or wherever painting or finishing is specifically referenced within the context of Divisions 15 and 16, all such painting or finishing shall be provided by the respective Contractor, except as otherwise noted. Other painting to be provided under the mechanical and electrical work is described below.
- (2) Contractors are referred to Section 09900 for further clarification and scope of painting work for this project.

(B) Work Included - By Each Contractor

- (1) Equipment with factory standard finishes: Each Contractor shall touch-up paint all scratches or damages to finishes to match the factory finish. This shall include all Owner-furnished equipment.
- (2) All miscellaneous structural members, brackets, braces, hardware, and accessories provided by each Contractor shall be painted with light grey rust inhibiting metal primer, except as otherwise specified herein or noted on the drawings. Items in this category which are galvanized, cadmium or copper plated, stainless steel, or finished with a factory finish shall not be painted.
- (3) Nameplates and equipment identifications shall be masked-off or suitably protected from paint during touch-up or adjacent painting required by the respective mechanical or electrical Contractor. Protection of nameplates and similar identifications as may be required during paint operations performed by the painting Contractor under the GC shall be provided by that painting Contractor.

(C) Painting Specifications

- (1) All painting work shall be performed in a neat and workmanlike manner. All painting materials shall be of the best quality and suitable for the service intended. All finish paints shall present a glossy finish and/or shall match the color and texture of the adjacent areas and surfaces.
- (2) Surfaces to be painted by the respective mechanical or electrical Contractor shall be free of rust, scale, peeling, blistering, grease, oil, or deteriorating film prior to application of primer.
- (3) Applicable parts of Section 09900 of these specifications shall govern work under

this Section.

END OF SECTION

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DIVISION 1 - GENERAL REQUIREMENTSREQUIREMENTS FOR QUALITY ASSURANCE TESTING AND INSPECTIONS1. GENERAL

- (A) The Owner will employ and pay for the services of an independent testing agency to provide quality assurance testing and inspections. The testing agency shall be licensed in the state where the structure is located and shall meet the requirements of "Recommended Practices for Inspection and Testing Agencies for Concrete, Steel, Soil, Masonry and Bituminous Materials as Used in Construction" (ASTM E329). All testing and inspections shall be performed under the supervision of an engineer registered in the state where the structure is located.
- (B) Materials and operations shall be tested and inspected as the work progresses. Failure to detect any defective work or material shall not in any way prevent later rejection when such defect is discovered, nor shall it obligate the Owner's Representative for final acceptance.
- (C) The testing agency shall report all test and inspection results to Fleischman Garcia Architects, Owner and Contractor immediately after they are performed. All test and inspection reports shall be signed and sealed by an engineer registered in the state where the structure is located and shall include the exact location in the work represented by the test.
- (D) At the completion of all work the testing agency shall submit a quality assurance certification (control inspection report for site work, concrete, masonry, structural steel roofing) signed and sealed by an engineer registered in the state where the structure is located, stating that all work subject to quality assurance testing and inspections has been constructed in accordance with the contract documents and all other applicable code requirements and that all noted deficiencies have been corrected or accepted.. Submit a quality assurance certification for each specifications section requiring quality assurance testing and inspections.
- (E) The testing agency and its representatives are not authorized to revoke, alter, relax, enlarge or release any requirement of the contract documents, approve or accept any portion of the work, perform any duties of the Contractor, or be a party to scheduling of work.
- (F) The Contractor shall notify the testing agency a minimum of 24 hours in advance of all required testing and all reasonable facilities shall be made available for technicians.
- (G) Records of inspection shall be kept available to the building official during progress of work for two years after completion of the project. Records shall be preserved by the independent testing agency.
- (H) Testing agency personnel shall have their time sheets signed by an authorized representative of the general contractor. Copies of signed time sheets must be submitted with all invoices for payment.
- (I) Professional Liability, General Liability and Worker's Compensation Insurance are required. Minimum coverage for Professional Liability Insurance is \$2,000,000; General Liability \$2,000,000; and Worker's Compensation \$1,000,000.

2. SCOPE OF WORK

- (A) The specific requirements for quality assurance testing are shown in each section of the specifications and included, but is not necessarily limited to the following:
 - (1) Structural Steel.
 - (2) Metal Roof Deck.
- (B) Furnish all labor, materials, tools and supplies, and perform operations in connection with quality assurance testing and inspections.

- END OF SECTION -

ROOMS TO GO

111 7th Avenue South, Suite 100, Franklin, TN 37064
PO Box 1247, Franklin, TN 37065
Telephone: 615-595-5881 Fax: 615/595-9995

Date

Salutation

Company

Address

City, State, Zip

Re: Warranty Manual
Rooms To Go Showroom, *City, State, Zip*

Dear *Project Manager*:

Enclosed please find a warranty manual Table of Contents. This table contains all items that should be included in the warranty manuals. Please forward two (2) copies of the manual and (2) sets of required as-built drawings to this office within 30 days of project turnover.

If you have any questions regarding any of these items, please call Chyrl Miller or myself.

Sincerely,

Project Manager

RTG Sr. Construction Manager

Initials/xx

Enclosures

**ROOMS TO GO SHOWROOM
WARRANTY MANUAL TABLE OF CONTENTS**

Cover letter (by Owner)

I. Permits/Certificates/Administrative Forms Obtained by General Contractor

- Certificate of Occupancy
- Building Permit
- Other Pertinent Permits
- Notice of Commencement
- Signed Turn-Over/Acceptance Form by Store Manager

II. General Contractor, Subcontractor, and Material Supplier Directory (include project/showroom location, owner(s), company name (General Contractor, Subcontractor, Material Supplier), address, phone number(s), contact person and scope of work performed)

III. Warranty/Guarantee of Labor, Materials and Work Performed by all applicable Subcontractors and Material Suppliers (Form attached for your use): * See IV for specific requirements.

- General Contractor
- Division 2 - Site Work Contractor(s)/Subcontractor(s) and/or Material Supplier(s) who provided:
 - ⇒ 02011 Testing
 - ⇒ 02050 Demolition (utilities, demolition & removal, asbestos removal work, if applicable)
 - ⇒ 02211 Site Grading (erosion control, clearing & removal of debris, tree protection (as applicable), topsoil removal & stockpiling, grading, proof-rolling, compaction, cleanup)
 - ⇒ 02221 Excavation and Backfill
 - ⇒ 02241 Limestone Stabilized Sub-grade
 - ⇒ 02252 Cement Stabilized Sand
 - ⇒ 02280 Soil Treatment *
 - ⇒ 02511 Asphalt Paving
 - ⇒ 02521 Concrete Pavement
 - ⇒ 02523 Concrete Joints
 - ⇒ 02525 Concrete Curbs
 - ⇒ 02526 Pre-cast Concrete Wheel Stops
 - ⇒ 02530 Concrete Sidewalks
 - ⇒ 02532 Curb, Curb & Gutters and Headers
 - ⇒ 02668 Water Piping
 - ⇒ 02711 Site Drainage
 - ⇒ 02730 Sanitary Sewers
 - ⇒ 02770 Asphalt Seal Coat
 - ⇒ 02811 Underground Sprinkler/Irrigation System *
 - ⇒ 02871 Fencing & Gates
 - ⇒ 02900 Landscape
- Division 3 - Concrete Contractor(s)/Subcontractor(s) and/or Material Supplier(s) who provided:
 - ⇒ 03301 Concrete
 - ⇒ 03450 Polymer Modified Glass Fiber Reinforced Cement (Exterior Column Covers) *
 - ⇒ 03456 Glass Fiber Reinforced Gypsum (KIDS Interior Column Covers) *

- Division 4 - Masonry Contractor(s)/Subcontractor(s) and/or Material Supplier(s) who provided:
 - ⇒ 04201 Unit Masonry Work, Glass Block Units *
 - ⇒ 04730 Simulated Stone Veneer *

- Division 5 - Structural Metal/Steel Contractor(s)/Subcontractor(s) and/or Material Suppliers(s) who provided:
 - ⇒ 05120 Structural Steel
 - ⇒ 05210 Steel Joists
 - ⇒ 05211 Steel Joist Girders
 - ⇒ 05311 Metal Roof Deck
 - ⇒ 05400 Cold Rolled Structural Metals
 - ⇒ 05500 Miscellaneous Metals

- Division 6 - Carpentry Contractor(s)/Subcontractor(s) and/or Material Suppliers(s) who provided:
 - ⇒ 06100 Carpentry, Access Panels
 - ⇒ 06650 Solid Polymer Fabrications *

- Division 7 - Thermal & Moisture Protection Contractor(s)/Subcontractor(s) and/or Material Suppliers(s) who provided:
 - ⇒ 07210 Building Insulation
 - ⇒ 07241 Exterior Insulation & Finish System (EIFS) *
 - ⇒ 07273 Roofing Underlayment
 - ⇒ 07401 Metal Roofing (Zeelock/Ceelock) *
 - ⇒ 07402 Metal Siding
 - ⇒ 07420 Aluminum Composite Panel System (KIDS) *
 - ⇒ 07465 Aluminum Soffit Panels *
 - ⇒ 07540 Single Ply TPO Membrane Roofing *
 - ⇒ 07600 Flashing & Sheet Metal *
 - ⇒ 07701 Roof Accessories
 - ⇒ 07800 Insulated Translucent Skylight
 - ⇒ 07901 Joint Sealants *

- Division 8 - Doors & Windows Contractor(s)/Subcontractor(s) and/or Material Suppliers(s) who provided:
 - ⇒ 08101 Hollow Metal Work
 - ⇒ 08421 Storefront System *
 - ⇒ 08422 Impact Resistant Storefront System *
 - ⇒ 08711 Finish Hardware *
 - ⇒ 08811 Glass and Glazing *
 - ⇒ 08812 Impact Resistant Glass and Glazing *

- Division 9 - Finishes Contractor(s)/Subcontractor(s) and/or Material Suppliers(s) who provided:
 - ⇒ 09261 Gypsum Drywall
 - ⇒ 09331 Tile Work
 - ⇒ 09511 Suspended Acoustical Ceiling System
 - ⇒ 09640 Wood Flooring *
 - ⇒ 09650 Resilient Flooring *
 - ⇒ 09680 Carpeting *
 - ⇒ 09900 Painting *

- Division 10 - Specialties Contractor(s)/Subcontractor(s) and/or Material Suppliers(s) who provided:

- ⇒ 10165 Plastic Laminate Toilet Compartment
- ⇒ 10522 Fire Extinguishers and Accessories *
- ⇒ 10538 Wall Hung Canopies *
- ⇒ 10811 Toilet Room Accessories
- ⇒ 10900 Interior Space Frame (*KIDS*)
- ⇒ 10999 Decorative Metals
- Division 12 - Furnishings
 - ⇒ 12484 Floor Mats and Frames *
- Division 14 – Hydraulic Passenger Elevator Contractor(s)/Subcontractor(s) and/or Material Suppliers(s) who provided:
 - ⇒ 14240 Hydraulic Passenger Elevator *
- Division 15 - Mechanical Contractor(s)/Subcontractor(s) and/or Material Suppliers(s) who provided:
 - ⇒ 15301 Fire Protection System *
 - ⇒ 15401 Plumbing System and Equipment *
 - ⇒ 15501 HVAC Systems and Equipment *
- Division 16 - Electrical Contractor(s)/Subcontractor(s) and/or Material Suppliers(s) who provided:
 - ⇒ 16052 Low Voltage Electrical Work (Security and Fire Alarm System) *
 - ⇒ 16401 Power Distribution Systems *
 - ⇒ 16501 Lighting Systems *

IV. Manufacturer's Product Warranty and Guarantee to include Operation, Service and Maintenance Manuals

- 02280 Soil Treatment 1) Special written guarantee that materials & application was made at the concentration, rate and methods specified; 2) a five (5) year warranty against termites from date of acceptance of project.
- 02811 Underground Irrigation Sprinkler System Include disk in closeout containing a PDF of the final approved Certified Lawn Irrigation shop drawings. 1) Sign off and acceptance by Owner and/or its Representative confirming proper training on operation and maintenance of system; 2) pipe warranty installation data form shall be completed and forwarded to company, the warranty presented to Owner after completion and prior to payment; 3) two (2) sets of as-built drawings which details and locates all underground sprinkler features (i.e. sleeves,, piping, valves, heads, etc.).
- 03450 Polymer Modified GFRC (Exterior Column Covers) – 1) Manufacturer shall warrant all materials against defect for two (2) years after acceptance of final installation; 2) Contractor shall provide two (2) year installation warranty and guarantee.
- 03456 Glass Fiber Reinforced Gypsum GFRG (*KIDS* Interior Column Covers) - 1) Manufacturer's two (2) year warranty after acceptance against defective materials; 2) Contractor shall warrant installation and installation materials for two (2) years after acceptance.
- 04201 Unit Masonry – 1) Contractor shall, upon completion of work contained herein, issue a written warranty to the Owner covering workmanship and material. Said warranty shall become effective upon completion and acceptance of work under this Section by Owner's representative and shall cover workmanship for one year and include material manufacturer's warranty for a period of one year against failure due to product which did not conform to formula or meet manufacturer's quality control standards at time of its production.
- 04730 Simulated Stone Veneer - 1) Special Warranty: Prepare and submit in accordance with section 01700. 2) Provide 40-year warranty against Manufacturer, the most current version of ACI 530.1, "Building Code Requirements for Concrete Masonry Structures".
- 05210, 05211 Structural Steel – Include disk in closeout containing a PDF of the final approved Certified Structural Steel and Joist shop drawings sealed by the Manufacturer's Engineer with the Registered Engineer's Seal for the State where showroom is located.

- 06650 Solid Polymer Fabrications – 1) Manufacturer’s ten (10) warranty against defects in materials. Warranty shall provide material and labor to repair or replace defective materials. Damage caused by physical or chemical abuse or damage from excessive heat will not be warranted. 2) Contractor to provide a commercial care and maintenance video, review maintenance procedures and warranty details with Director of Maintenance and/or his Representative upon completion of project.
- 07241 Exterior Insulation and Finish System (EIFS) – 1) Manufacturer’s standard five (5) year limited warranty for materials. 2) Inspection of the EIFS installation shall be performed by a representative of the Manufacturer. A report of the field visit shall be developed describing the materials and workmanship to be in compliance with Manufacturer’s recommendations, or to describe any deficiencies, with associated corrections identified during the site visit. Report shall be on EIFS manufacturer’s company letterhead. A copy of report shall be sent to Owner, Contractor and Architect of record.
- 07401 Metal Roofing (Zee-Lock/Cee-Lock) – 1) Paint finish shall have a twenty (20) year guarantee against cracking, peeling and fade (not to exceed 5 NBS units); 2) Galvalume material shall have a twenty (20) year guarantee against failure due to corrosion, rupture or perforation; and 3) Applicator shall furnish guarantee covering water-tightness of the roofing system for a period of two (2) years from date of substantial completion.
- 07420 Aluminum Composite Panel System – 1) Manufacturer’s three (3) year warranty system free from defects in materials and workmanship; 2) Sheet Rock Manufacturer to provide standard product warranty; 3) Finish warranty five (5) year against chalk, peel, crack or check; three to five (3-5) year against fade (will vary by color selection and jobsite environment)
- 07465 Aluminum Soffit Panels – A warranty and guarantee against contact with dissimilar materials (i.e. copper, zinc, steel, concrete, stucco, etc) which may affect product.
- 07540 Single Ply TPO Membrane Roofing – 1) Maintenance data for roofing system. 2) Manufacturer’s Representative shall provide written certification that the workmanship and installation have been properly and correctly performed and that the Manufacturer’s warranty is valid. If Manufacturer’s inspection and certification is not provided, then General Contractor is to be responsible for obtaining roof test cuts and analysis provided by a Certified Independent Testing Laboratory. Copies of results provided to Owner’s Representative. 3) Special Warranty: Manufacturer’s standard form, without monetary limitation in which Manufacturer agrees to repair or replace all components of membrane roofing system that fail in materials, application or workmanship within specified warranty period. Failure includes roof leaks. Special warranty includes roofing membrane, base flashing, roofing membrane accessories, roof insulation, fasteners and other components of membrane roofing system; 4) Warranty Period: Fifteen (15) years minimum from date of Certificate of Occupancy.
- 07600 Flashing and Sheet Metal – 1) A two (2) year guarantee.
- 07800 Insulated Translucent Skylight – 1) Manufacturer’s (25) twenty-five year warranty that exterior face shall have permanent glass erosion barrier to provide maximum long-term resistance to reinforcing fiber exposure. 2) Manufacturer’s guarantee that exterior face shall not change color more than 3.0 Hunter or CIE Units or five (5) years outdoor South Florida weathering at 7 degrees facing South.
- 07901 Joint Sealants – 1) A two (2) year guarantee.
- 08421 Storefront System and 08422 Impact Resistant Storefront System – Include disk in closeout containing a PDF of the final approved Certified Storefront System shop drawings.
- 08711 Finish Hardware – 1) Manufacturer’s written guarantee for all hardware items as stated in their catalogs, vendor shall assume all responsibility; Guarantees shall in writing by the Manufacturer and shall be delivered to the Owner, guarantee shall begin from date of acceptance of the building; Defective hardware within the guaranteed period must be replaced at Contractor’s expense, including labor for removal and reinstallation. 2) Copy of final Hardware Schedule.
- 08811 Glass and Glazing and 08812 Impact Resistant Glass and Glazing – 1) Warranty: High-Performance coated glass standard limited warranty of (10) ten years; 2) All clear plexi-glass material to have a ten (10) year non-yellowing warranty and all frosted Plexiglas to have a one (1) one-year warranty.
- 09640 Wood Flooring – 1) Manufacturer’s written product guarantee; 2) Manufacturer’s suggested maintenance and care instructions.
- 09650 Resilient Flooring – 1) Manufacturer’s written product guarantee; 2) Manufacturer’s suggested maintenance and care instructions.

- 09680 Carpeting – 1) Manufacturer’s written product guarantee; 2) Manufacturer’s suggested maintenance and care instructions.
- 09900 Painting – 1) Water repellent “Prime-a-Pell 200” shall cover workmanship for (5) five years and include material manufacturer’s warranty for a period of (5) five years against failure due to product which did not conform to formula or meet manufacturer’s quality control standards at time of its production. 2) Final paint schedule with color mix codes.
- 10522 Fire Extinguishers and Accessories - 1) Operational and Maintenance Data: In compliance with Section 01700 to include testing, refill or recharge schedules, procedures and recertification requirements. 2) Copy of Final Schedule Floor Plan depicting fire extinguisher size, type and locations.
- 10538 Wall Hung Canopies – 1) A two (2) year guarantee. 2) Finish Warranty for all finishes against blistering, peeling or any other separation of coating from substrate and against color loss of more than five NBS units. 3) Maintenance Data: include instructions for general maintenance and repair of surfaces and finishes.
- 12484 Floor Mats and Frames - 1) Maintenance data.
- 14240 Hydraulic Passenger Elevator – 1) Maintenance agreement to include regular maintenance for one year after completion of work, periodic examinations and perform work including adjustments and preventative maintenance (i.e. greasing, oiling and replacement of parts, this does not include accidents, vandalism, misuse or negligence other than manufacturer).
- 15301 Fire Protection System – Include disk in closeout containing a PDF of the final approved Certified Fire Protection shop drawings. 1) Equipment use and operating manuals with recommended and/or required maintenance instructions to include manufacturer’s guarantees and certificates (i.e. sprinklers, risers, alarms, fire pump, backflow prevention devices, etc.). 2) Copy of all inspection and test reports. 3) As-built drawings.
- 15401 Plumbing System - 1) Equipment use and operating manuals with recommended and/or required maintenance instructions to include the manufacturer’s guarantees and certificates (i.e. water closet, urinal, lavatory, sinks, faucets, water cooler, water heater, wall hydrant, etc.). 2) Copy of all inspection and test reports. 3) As-built drawings.
- 15501 HVAC Systems and Equipment - 1) Equipment use and operating manuals including required and recommended maintenance instructions; 2) Manufacturer’s Special Warranty, standard form to replace components of RTU that fail materials or workmanship within specified warranty periods A. Compressors: Manufacturer’s standard but no less than (5) five years from date of Substantial Completion; B. Heat Exchanger: Manufacturer’s standard but not less than (10) ten years from date of Substantial Completion and C. Solid-State Ignition Modules: Manufacturer’s standard but not less than (3) three years from date of Substantial Completion. 3) Copy of all inspection and test reports. 4) As-built drawings. 4) HVAC Test & Balance Report.
- 16052 Low Voltage Electrical Work – 1) Fire Alarm System Supplier one (1) year guarantee equipment; 2) Equipment catalogs with operation and maintenance instructions.
- 16401 Power Distribution Systems – 1) Product and equipment manuals with operation and maintenance instructions; 2) Electrical Contractor shall provide copy of ground test report for Owner’s records.
- 16501 Lighting Systems – 1) Product and equipment manuals with operation and maintenance instructions

III. Miscellaneous Items

- As-Built Drawings all changes red-lined (two paper copies and two electronic copies in PDF format).
 - ⇒ Lawn Irrigation (detailing locations & descriptions of sleeves, piping, valves, heads, etc)
 - ⇒ Fire Protection
 - ⇒ Plumbing
 - ⇒ HVAC (detailing layout of thermostats and remote sensors)
 - ⇒ Fire & Security Alarm Installation
 - ⇒ Electrical including Site Lighting
- A Disk containing PDF file of the following Certified shop drawings –
 - ⇒ Structural Steel – *(Signed & sealed by Fabricator’s Engineer with the registered Engineer’s seal for the State where structure is located. Engineer’s seal may be qualified “For Design of Connections Only”).*

- ⇒ Storefront/Curtainwall System Design – *(Written Certification, signed & sealed by an Engineer registered in State where structure is located, stating curtainwall system and its anchorage to the structure has been designed to support the required design wind load as specified in the appropriate building code without exceeding the allowable stresses of the material and without exceeding the deflection of 1/175 of the span or 3/4", whichever is less.)*
- ⇒ Fire Protection – *(Provide seal and signature of licensed Professional Engineer on shop drawings, calculations, and any other related documents as required to obtain State & local approvals and/or Certificate of Occupancy.)*

SAMPLE

Note this Guarantee must be typed as shown below, under General Contractor’s letterhead.

GENERAL CONTRACTOR GUARANTEE

PROJECT:

OWNER:

We, _____, General Contractor for the above referenced project, do hereby warrant that all labor, materials and equipment furnished and work performed in conjunction with the above referenced project are in accord with the Contract Documents and authorized modifications thereto, and will be free from defects or arrangement the same, including adjacent work displaced for a period of one year from Date of Substantial Completion (date of Certificate of Occupancy).

Should any defect develop during warranty period due to improper or defective materials, equipment, workmanship or arrangement thereof, including adjacent work displaced the Contractor agrees corrective work shall be made good at no expense to Owner.

This warranty commences on ___ / ___ / ___ and expires on ___ / ___ / ___.

The Owner will give General Contractor written notice of any defective work which develops during warranty period. Should General Contractor fail to correct work within **5** days after receiving written notice, Owner may at his option correct the work and General Contractor agrees to pay such charges upon demand.

Nothing in the above shall be deemed to apply to work which has been abused or neglected by the Owner.

Date: ___ / ___ / ___

For: _____
(General Contractor/Company Name)

By: _____
(It’s Authorized Officer/Representative’s Signature)

Printed Name: _____

Title: _____

Witness

***Note this Guarantee must be typed as shown below, under Subcontractor’s Letterhead.**

SUBCONTRACTOR GUARANTEE

PROJECT:

OWNER:

GENERAL CONTRACTOR:

Scope of Work: _____

We, _____, Subcontractor for the above referenced project, do hereby warrant that all labor, materials and equipment furnished and work performed in conjunction with the above referenced project are in accord with the Contract Documents and authorized modifications thereto, and will be free from defects or arrangement the same, including adjacent work displaced for a period of ____ year(s) from Date of Substantial Completion (date of Certificate of Occupancy).

Should any defect develop during warranty period due to improper or defective materials, equipment, workmanship or arrangement thereof, including adjacent work displaced the Subcontractor agrees that corrective work shall be made good at no expense to Owner.

This warranty commences on ___/___/___ and expires on ___/___/___.

The Owner will give General Contractor and Subcontractor written notice of any defective work which develops during warranty period. Should Subcontractor fail to correct work within **5** days after receiving written notice, Owner may at his option correct the work and Subcontractor agrees to pay such charges upon demand.

Nothing in the above shall be deemed to apply to work which has been abused or neglected by the Owner.

Date: ___/___/___ For: _____
(Subcontractor/Company Name)

By: _____
(It’s Authorized Officer/Representative’s Signature)

Printed Name: _____

Title: _____

Witness

General Contractor’s Authorized Officer’s Signature: _____

(Revision 02/29/2012)

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SECTION 024119 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract, including General and Supplementary Conditions and other Division 1 Specifications Sections, apply to work of this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Demolition and removal of selected portions of a building.
 - 2. Demolition and removal of selected site elements.
 - 3. Patching and repairs.

1.3 DEFINITIONS

- A. Remove: Remove and legally dispose of items except those indicated to be reinstalled, salvaged, or to remain the Owner's property.
- B. Demolish: Remove and legally dispose of items except those indicated to be reinstalled, salvaged, or to remain the Owner's property.
- C. Existing to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by the Architect, items may be removed to a suitable, protected storage location during selective demolition and then cleaned and reinstalled in their original locations.

1.4 MATERIALS OWNERSHIP

- A. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain the Owner's property, demolished materials shall become the Contractor's property and shall be removed from the site with further disposition at the Contractor's option.

1.5 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections, for information only, unless otherwise indicated.
- B. Photographs or videotape, sufficiently detailed, of existing conditions of interior and exterior construction and site improvements that might be misconstrued as damage caused by selective demolition operations.

- C. Record drawings at Project.
 - 1. Identify and accurately locate capped utilities and other subsurface structural, electrical, or mechanical conditions.
- D. Proposed protection measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and, for noise control. Indicate proposed locations and construction of barriers.
- E. Schedule of selective demolition activities indicating the following:
 - 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity.
 - 2. Interruption of utility service.
 - 3. Coordination of shut-off, capping, and continuation of utility services.

1.5 QUALITY ASSURANCE

- A. Demolition Firm Qualifications: Engage an experienced firm that has successfully completed selective demolition Work similar to that indicated for this Project.
- B. Regulatory Requirements: Comply with governing EPA notification regulations before starting selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.
- D. Predemolition Conference: Conduct conference at project site.
 - 1. Inspect and discuss condition of construction to be selectively demolished.
 - 2. Review structural load limitations of existing structure.
 - 3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 - 4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
 - 5. Review areas where existing construction is to remain and requires protection.

1.6 FIELD CONDITIONS

- A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
- B. Owner assumes no responsibility for actual condition of buildings to be selectively demolished.

1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- D. Storage or sale of removed items of materials on site will not be permitted.
- E. 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.

PART 2 - PRODUCTS

2.1 REPAIR MATERIALS

- A. Use repair materials identical to existing materials unless noted otherwise.
1. Where identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
 2. Use materials whose installed performance equals or surpasses that of existing materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped.
- B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.
- D. When unanticipated mechanical, electrical, or structural elements that conflict with the intended function or design are encountered, investigate and measure the nature and extent of the conflict. Promptly submit a written report to the Architect.
- E. Verify that hazardous materials have been remediated before proceeding with building demolition operations.

- F. Conduct periodic surveys as the work progresses to detect hazards from selective demolition activities.

3.2 UTILITY SERVICES

- A. Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
- B. Utility Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services serving building to be selectively demolished.
 - 1. Arrange to shut off indicated utilities with utility companies.
 - 2. Where utility services are required to be removed, relocated, or abandoned, provide bypass connections to maintain continuity of service to other parts of the site before proceeding with selective demolition.
 - 3. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal the remaining portion of pipe or conduit after bypassing.
- C. Utility Requirements: Refer to Division 22, 23, and 26 Sections for shutting off, disconnecting, removing, and sealing or capping utility services. Do not start selective demolition work until utility disconnecting and sealing have been completed and verified in writing.
- D. Refrigerant: Remove refrigerant from mechanical equipment to be selectively demolished according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.3 PREPARATION

- A. Conduct demolition operations and remove debris to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.
- B. Conduct demolition operations to prevent injury to people and damage to adjacent buildings and facilities to remain. Ensure safe passage of people around selective demolition area.
 - 1. Erect temporary protection, such as walks, fences, and railings, where required by authorities having jurisdiction.
 - 2. Protect existing site improvements, appurtenances, and landscaping to remain.
 - 3. Provide temporary weather protection, during interval between demolition and removal of existing construction, on exterior surfaces and new construction to ensure that no water leakage or damage occurs to structure or interior areas.
 - 4. Protect walls, ceilings, floors, and other existing finish work that are to remain and are exposed during selective demolition operations.

5. Cover and protect furniture, furnishings, and equipment that have not been removed.
- C. Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent movement, settlement, or collapse of building to be selectively demolished.
1. Strengthen or add new support when required during progress of selective demolition.

3.4 POLLUTION CONTROLS

- A. Use water mist, temporary enclosures, and other suitable methods to limit the spread of dust and dirt. Comply with governing environmental protection regulations.
1. Do not use water when it may damage existing construction.
- B. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
1. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level.
- C. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before start of selective demolition.

3.5 SELECTIVE DEMOLITION

- A. Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete 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. To minimize disturbance of adjacent surfaces, use hand or small power tools designed for sawing or grinding, not hammering and chopping. 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. Maintain adequate ventilation when using cutting torches.
 5. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.

6. Locate selective demolition equipment throughout the structure and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 7. Dispose of demolished items and materials promptly. On-site storage or sale of removed items is prohibited.
 8. Return elements of construction and surfaces to remain to condition existing before start of selective demolition operations.
- B. Demolish concrete and masonry in small sections. Cut concrete and masonry at junctures with construction to remain, using power-driven masonry saw or hand tools; do not use power-driven impact tools except for floor slab and sidewalk demolition..
- C. Remove air-conditioning equipment without releasing refrigerants.

3.6 PATCHING AND REPAIRS

- A. Promptly patch and repair holes and damaged surfaces caused to adjacent construction by selective demolition operations.
- B. Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials.
1. Completely fill holes and depressions in existing walls and partitions to remain with an approved patching material, applied according to manufacturer's printed recommendations.
- C. Restore exposed finishes of patched areas and extend finish restoration into adjoining construction to remain in a manner that eliminates evidence of patching and refinishing.
- D. Patch and repair floor and wall surfaces in the new space where demolished walls or partitions extend from one finished area into another. Provide a flush and even surface of uniform color and appearance.
1. Closely match texture and finish of existing adjacent surface.
 2. Patch with durable seams that are as invisible as possible. Comply with specified tolerances.
 3. Where patching smooth painted surfaces, extend final paint coat over entire unbroken surface containing the patch after the surface has received primer and second coat.
- E. Patch, repair, or rehang existing ceilings to remain as necessary to provide an even-plane surface of uniform appearance.
- F. Roofing: Remove no more existing roofing than what can be covered in one day by new roofing and so that building interior remains watertight and weathertight.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.
- B. Burning: Do not burn demolished materials.
- C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.
- D. Provide for dumpsters to temporarily store demolished materials. Location of dumpsters shall be coordinated with the Owner.

3.8 CLEANING

- A. Sweep the building broom clean on completion of selective demolition operation.
- B. The site/location of selective demolition work shall be kept clean of any and all debris which could present a hazard to persons on site.

END OF SECTION 024119

SECTION 054000 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Miscellaneous steel studs and tracks.
 - 2. Hat-shaped steel channels.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 9 Section "Gypsum Board Assemblies" for gypsum board and nonload-bearing metal-stud framing and ceiling-suspension assemblies.

1.3 SUBMITTALS

- A. Product data for each type of cold-formed metal framing, accessory, and product specified.
- B. Mill certificates signed by manufacturers of cold-formed metal framing certifying that their products comply with requirements, including uncoated steel thickness, yield strength, tensile strength, total elongation, and galvanized-coating thickness.
- C. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.
- D. 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.
- E. Product test reports from a qualified independent testing agency evidencing compliance with requirements of the following based on comprehensive testing:
 - 1. Expansion anchors.
 - 2. Mechanical fasteners.
- F. Research reports or evaluation reports of the model code organization acceptable to authorities having jurisdiction that evidence cold-formed metal framing's compliance with building code in effect for Project.

- G. Submit complete detail shop drawings for metal stud exterior framing systems and special component installation not fully dimensioned or detailed in manufacturer's product data, with drawings signed and sealed by a professional engineer licensed in the State of Florida.
- H. Submitted shop drawings must be checked and signed by the General Contractor.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who has completed cold-formed metal framing similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- B. Mill certificates signed by steel sheet producer (or test reports from a qualified independent testing agency) indicating steel sheet complies with requirements, including uncoated steel thickness, yield strength, tensile strength, total elongation, chemical requirements, ductility and galvanized-coating thickness.
- C. ASTM A 1003/A 1003M-08: Specification for Steel Sheet, Carbon and Metallic- and Nonmetallic-Coated for Cold Rolled Sheet.
- D. AISC "Specification for the Design, Fabrication and Erection of Structural Steel for Buildings," latest edition.
- E. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code--Steel" and AWS D1.3 "Structural Welding Code--Sheet Steel."
 - 1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification. Recertification will be the responsibility of the General Contractor.
 - 2. Welding members lighter than 18 gauge will not be permitted.
- F. Fire-Test-Response Characteristics: Where fire-resistance-rated assemblies are indicated, provide cold-formed metal framing identical to that tested as part of an assembly for fire resistance per ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Fire-Resistance Ratings: As indicated by design designations listed in UL "Fire Resistance Directory," or by Warnock Hersey or another testing and inspecting agency acceptable to authorities having jurisdiction.
- G. AISI Specifications: Comply with AISI's S100-2007 "Specification for the Design of Cold-Formed Steel Structural Members" for calculating structural characteristics of cold-formed metal framing.
 - 1. CCFSS Technical Bulletin: "AISI Specification Provisions for Screw Connections."

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Store cold-formed metal framing in location directed and, protect with a waterproof covering, and ventilate to avoid condensation.

1.6 COMPONENT DESIGN

- A. In accordance with AISI latest edition, no composite action will be considered between collateral wall material.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide cold-formed metal framing by one of the following:
 - 1. Allied American Studco, Inc.
 - 2. Angeles Metal Systems.
 - 3. California Metal Systems, Inc.
 - 4. Clark Steel Framing Industries
 - 5. Consolidated Fabricators Corp.
 - 6. Consolidated Systems, Inc.
 - 7. Dale Industries, Inc.
 - 8. Design Shapes in Steel.
 - 9. Dietrich Industries, Inc.
 - 10. Knorr Steel Framing Systems.
 - 11. MarinoWare; Div. of Ware Industries, Inc.
 - 12. Super Stud Building Products, Inc.
 - 13. Unimast, Inc.
 - 14. United Metal Products, Inc.
 - 15. Western Metal Lath Co.

2.2 MATERIALS

- A. Galvanized-Steel Sheet: ASTM A 653/A 653M; zinc coated according to ASTM A 924/A 924M, and as follows:
 - 1. Coating Designation: G 60.
 - 2. Grade: Grade 33, 33,000 psi minimum yield strength, 20 percent elongation.

2.3 WALL AND CEILING FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs of web depths indicated on drawings, punched, with stiffened flanges, complying with ASTM C955, and as follows:
 - 1. Uncoated Steel Thickness: .0474 inch (18 gage) minimum, unless otherwise indicated on drawings. Nominal 1-5/8 inch flange and minimum 1/2 inch flange return lip.
- B. Steel Track: Manufacturer's standard U-shaped track, unpunched, of web depths indicated on drawings, with straight flanges, complying with ASTM C955, and as follows:
 - 1. Uncoated Steel Thickness: Match steel studs.
- C. Hat Channels: Hat-shaped sections, 7/8" high by 2-3/4" wide.
 - 1. Uncoated steel thickness: .0474 inch (18 gage) minimum, unless otherwise indicated on drawings.
 - 2. Hat Channel Fasteners: Provide minimum of two rust-resistant, self-tapping screw-type fasteners per connection of hat channels to metal framing members.

2.4 FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories of the same material and finish used for framing members, with a minimum yield strength of 33,000 psi.
- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
 - 1. Supplementary framing.
 - 2. Bracing, bridging, and solid blocking.
 - 3. Web stiffeners.
 - 4. Gusset plates.
 - 5. Deflection track and vertical slide clips.
 - 6. Stud kickers and girts.
 - 7. Reinforcement plates.

2.5 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A 36, zinc coated by the hot-dip process according to ASTM A 123.
- B. Cast-in-Place Anchor Bolts and Studs: ASTM A 307, Grade A; carbon-steel hex-head bolts and studs; carbon-steel nuts; and flat, unhardened-steel washers. Zinc coated by the hot-dip process according to ASTM A 153.
- C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times the design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

- D. Mechanical Fasteners: Corrosion-resistant coated, self-drilling, self-threading steel drill screws.
 - 1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.
- E. Welding Electrodes: Comply with AWS standards.

2.6 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035, with dry film containing a minimum of 94 percent zinc dust by weight.

2.7 FABRICATION

- A. Fabricate cold-formed metal framing and accessories plumb, square, true to line, and with connections securely fastened.
 - 1. Cut framing members by sawing or shearing; do not torch cut.
 - 2. Fasten cold-formed metal framing members by welding or screw fastening, as indicated on drawings. Wire tying of framing members is not permitted.
 - a. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to cold-framed metal framing manufacturer's instructions with screw penetrating joined members by not less than 3 exposed screw threads.
 - c. Splicing of components will not be permitted.
 - 3. Fasten other materials to cold-formed metal framing by welding, bolting, or screw fastening, according to manufacturer's recommendations.
- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or distortion.
- C. Fabrication Tolerances: Fabricate assemblies to a maximum allowable tolerance variation from plumb, level, and true to line of 1/8 inch in 10 feet determined by a 16'-0" straight edge, with total tolerance of 3/8" in any run, and as follows:
 - 1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
 - 2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting substrates and abutting structural framing for compliance with requirements, including installation tolerances and other conditions affecting performance of cold-formed metal framing. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled. Employ authorized installers approved by the manufacturer to do all installation work.
- B. Install cold-formed metal framing and accessories plumb, square, true to line, and with connections securely fastened, according to manufacturer's recommendations and the requirements of this Section.
 - 1. Cut framing members by sawing or shearing; do not torch cut.
 - 2. Fasten cold-formed metal framing members by welding or screw fastening, as standard with fabricator. Wire tying of framing members is not permitted. No bolts, rivets, powder-driven shots, or similar devices shall be used for permanent fastening.
 - a. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to cold-framed metal framing manufacturer's instructions with screw penetrating joined members by not less than 3 exposed screw threads.
 - 3. Spacing: as indicated on drawings.
- C. Install framing members in one-piece lengths, unless splice connections are indicated for track or tension members.
- D. Provide temporary bracing and leave in place until framing is permanently stabilized.
- E. Resistance to bending and rotation about the minor axis shall be provided by mechanical lateral bracing where required.
- F. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.
- G. Fasten reinforcement plate over web penetrations that exceed size of manufacturer's standard punched openings.
- H. Erection Tolerances: Install cold-formed metal framing to a maximum allowable tolerance variation from plumb, level, and true to line of 1/8 inch in 10 feet and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.3 FIELD QUALITY CONTROL

- A. Field and shop welds will be subject to inspection and testing.
- B. Remove and replace Work that does not comply with specified requirements.
- C. Testing may be required by the Architect to determine compliance of Work with specified requirements. If testing reveals non-conforming work, cost of testing shall be paid by the Contractor.

3.4 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanizing repair paint according to ASTM A 780 and the manufacturer's instructions.

END OF SECTION 054000

SECTION 055213 - PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel tube railings.

1.2 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- C. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

1.3 ACTION SUBMITTALS

- A. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- B. Delegated-Design Submittal: For railings, including analysis data signed and sealed by the qualified professional engineer registered in the State of Florida and responsible for their preparation.

1.4 FIELD 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 MANUFACTURERS

- A. Source Limitations: Obtain each type of railing from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer registered in the State of Florida to design railings, including attachment to building construction.
- B. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Handrails and Top Rails of Guards:
 - a. Uniform load of 50 lbf/ ft. (0.73 kN/m) applied in any direction.
 - b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 - 2. Infill of Guards:
 - a. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
 - b. Infill load and other loads need not be assumed to act concurrently.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

2.3 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.
 - 1. Provide type of bracket that provides 1-1/2-inch clearance from inside face of handrail to finished wall surface.

2.4 STEEL AND IRON

- A. Tubing: ASTM A 500 (cold formed) or ASTM A 513.
- B. Plates, Shapes, and Bars: ASTM A 36/A 36M.

2.5 FASTENERS

- A. General: Provide the following:
 - 1. Hot-Dip Galvanized Railings: Type 304 stainless-steel or hot-dip zinc-coated steel fasteners complying with ASTM A 153/A 153M or ASTM F 2329 for zinc coating.
- B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.
- C. Fasteners for Interconnecting Railing Components:
 - 1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.

2.6 MISCELLANEOUS MATERIALS

- A. Etching Cleaner for Galvanized Metal: Complying with MPI#25.
- B. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- C. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.
- D. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.7 FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
- B. Fabricate security barriers of construction same as railings and to comply with configurations as shown on the project drawings. Provide bracing at top of security barriers which connect to adjacent walls to stabilize barriers.
- C. Shop assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- 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 work true to line and level with accurate angles and surfaces.

- F. Fabricate connections that are exposed to weather in a manner that excludes water. Provide weep holes where water may accumulate.
- G. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- H. Connections: Fabricate railings with welded connections unless otherwise indicated.
- I. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove flux immediately.
 - 4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
- J. Form Changes in Direction as Follows:
 - 1. Guardrails - By flush bends or by inserting prefabricated flush-elbow fittings.
 - 2. Handrails - By radius bends or by inserting prefabricated elbow fittings.
- K. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- L. Close exposed ends of railing members with prefabricated end fittings.
- M. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch (6 mm) or less.
- N. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.
 - 1. crush-resistant fillers or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.
- O. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.
- P. Toe Boards: Where indicated, provide toe boards at railings around openings and at edge of open-sided floors and platforms. Fabricate to dimensions and details indicated.

2.8 STEEL AND IRON FINISHES

A. Galvanized Railings:

1. Hot-dip galvanize steel railings, including hardware, after fabrication.
2. Comply with ASTM A 123/A 123M for hot-dip galvanized railings.
3. Comply with ASTM A 153/A 153M for hot-dip galvanized hardware.
4. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
5. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

B. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.

C. Preparing Galvanized Railings for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner.

D. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Shop, Field, and Maintenance Painting of Steel," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Fit exposed connections together to form tight, hairline joints.

B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

1. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
2. Set posts plumb within a tolerance of 1/16 inch in 3 feet (2 mm in 1 m).
3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet (6 mm in 3.5 m).

C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

D. Adjust railings before anchoring to ensure matching alignment at abutting joints.

E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.2 RAILING CONNECTIONS

- A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.
- B. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches (50 mm) beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches (150 mm) of post.

3.3 ANCHORING POSTS

- A. Anchor post as designed and shown on the project drawings. Anchor the railings at the locations indicated and comply with the structural loading requirements.
- B. Leave anchorage joint exposed with anchoring material flush with adjacent surface.

3.4 ADJUSTING AND CLEANING

- A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas, and repair galvanizing to comply with ASTM A 780/A 780M.

3.5 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

END OF SECTION 055213

SECTION 061000 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Wood furring, grounds, nailers, and blocking.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Keep materials under cover and dry. Protect from weather and contact with damp or wet surfaces. Stack lumber, plywood, and other panels. Provide for air circulation within and around stacks and under temporary coverings.

PART 2 - PRODUCTS

2.1 LUMBER, GENERAL

- A. Lumber Standards: Comply with DOC PS 20, "American Softwood Lumber Standard," and with applicable grading rules of inspection agencies certified by ALSC's Board of Review.
- B. Grade Stamps: Provide lumber with each piece factory marked with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.
- C. 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.
 - 1. Provide dressed lumber, S4S, unless otherwise indicated.
 - 2. Provide dry lumber with 19 percent maximum moisture content at time of dressing for 2-inch nominal thickness or less, unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.
 - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
- D. Application: Treat all rough carpentry unless otherwise indicated.
 - 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 - 2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
 - 3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
 - 4. Wood framing members that are less than 18 inches (460 mm) above the ground in crawlspaces or unexcavated areas.
 - 5. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 DIMENSION LUMBER

- A. General: Provide dimension lumber of grades indicated according to the ALSC National Grading Rule (NGR) provisions of the inspection agency indicated.
- B. Lumber for Miscellaneous Uses: Unless otherwise indicated, provide Standard grade lumber for support of other work, including cant strips, bucks, nailers, blocking, furring, grounds, stripping and similar members.

2.4 MISCELLANEOUS LUMBER

- A. General: Provide lumber for support or attachment of other construction, including rooftop equipment curbs and support bases, cant strips, bucks, nailers, blocking, furring, grounds, stripping, and similar members.
- B. Fabricate miscellaneous lumber from dimension lumber of sizes indicated and into shapes shown.

- C. Moisture Content: 19 percent maximum for lumber items not specified to receive wood preservative treatment.
- D. Grade: For dimension lumber sizes, provide No. 3 or Standard grade lumber per ALSC's NGRs of any species. For board-size lumber, provide No. 3 Common grade per NELMA, NLGA, or WWPA; No. 2 grade per SPIB; or Standard grade per NLGA, WCLIB or WWPA of any species.

2.5 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacturer.
 - 1. For all rough carpentry related to roofing and roof accessories, provide fasteners with a hot-dip zinc coating per ASTM A 153 or of Type 304 stainless steel.
- B. Nails: ASTM F 1667.
- C. Power-Driven Fasteners: ICC-ES AC70.
- D. Wood Screws: ASME B18.6.1.
- E. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers; hot dip galvanized.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Discard units of material with defects that impair quality of rough carpentry and that are too small to use with minimum number of joints or optimum joint arrangement.
- B. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted.
- C. Fit rough carpentry to other construction; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds, and similar supports to allow attachment of other construction.
- D. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. NES NER-272 for power-driven staples, P-nails, and allied fasteners.
 - 2. Published requirements of metal framing anchor manufacturer.
 - 3. "Table 2304.9.1--Fastening Schedule," of the Florida Building Code.

- E. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; predrill as required.
- F. Use hot-dip galvanized or stainless-steel nails where rough carpentry is related to roofing or roof accessories, in ground contact, or in area of high relative humidity.

3.2 WOOD GROUNDS, NAILERS, BLOCKING, AND SLEEPERS

- A. Install wood grounds, nailers, blocking, and sleepers where shown and where required for screeding or attaching other work. Form to shapes shown and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated. Build into masonry during installation of masonry work. Where possible, anchor to formwork before concrete placement.
- C. Provide pressure treated wood grounds in gypsum drywall and plaster partitions for support of plumbing fixtures, toilet accessories, fire extinguisher cabinets and brackets, wall-mounted fixtures and furnishings, and hardware.
 - 1. Provide solid wood grounds, minimum 2 x 4 lumber, in all partitions scheduled to receive wall-mounted door bumpers. Position directly behind and centered on bumpers. Screw attach securely to metal studs.

3.3 WOOD NAILERS, EDGING, AND BLOCKING FOR ROOF ACCESSORIES:

- A. Provide wherever shown and where required for attachment of other work. Form to shapes, as shown, and cut as required for true line and level on work to be attached. Coordinate location with other work involved.
- B. Where wood members are doubled, ends shall be lapped and thoroughly spiked to each other and to bearing members, maintaining structural integrity, using ring-shank nails.
- C. Where wood members abut concrete, securely fasten to same by bolts or lag screws on staggered centers. Heads of all bolts or lag screws shall be provided with large-head washers.
- D. Round corners of wood plates where flashing occurs.
- E. Make tight connections between members. Install fasteners without splitting of wood; pre-drill as required.
- F. Holes drilled oversized or wallowed out shall be redrilled.
- G. For fastening wood to:

1. Metal. Countersunk flat head No. 10 self tapping, self drilling, metal screws, at 4" o.c., staggered; utilizing appropriate size bolt and nut where possible.
2. Wood. Ring-Shank nails, 3/8" round heads at 12" o.c., staggered; 1-1/4" minimum substrate penetration.
3. Plywood. Annular thread nails, 3/8" round heads at 8" o.c. staggered with full penetration.
4. New Masonry or Concrete. 3/4" diameter by 12" long with 3" hook anchor bolts and Hughes WSH 1093 washers, spaced 2'-8" apart, staggered if nailer or blocking is wider than 6 inches.
5. Existing Structural Concrete and Precast Concrete. Countersunk, flat head, threaded, self-tapping masonry screws ("Tapcons"), at 8" o.c., staggered; 1/1/2" minimum substrate penetration

END OF SECTION 061000

SECTION 064116 - PLASTIC LAMINATE CASEWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Extent of plastic laminate casework is indicated on Drawings. Work includes:
 - 1. Plastic laminate finished casework.
 - 2. Plastic laminate countertops.
 - 3. Quartz agglomerate material countertops.
 - 4. Cabinet hardware. Match / equal or better as Customer Service

1.3 SUBMITTALS

- A. Quality Certification: Submit manufacturer's (Fabricator's) certification, stating that the fabricated work complies with quality grades and other requirements indicated.
- B. Shop Drawings: Submit shop drawings showing location of each item, dimensioned plans and elevations, large scale casework sections and details, attachment devices, and other components.
- C. Cabinet hardware: one unit of each type and finish.
- D. Plastic laminate: manufacturer's sample chain.
- E. Quartz materials: Samples 2 inches square.

1.4 QUALITY ASSURANCE

- A. AWI Quality Standard: Comply with applicable requirements of "Architectural Woodwork Standards, 1st Edition, 2009, Sections 10 and 11", published by the Architectural Woodwork Institute (AWI), except as otherwise indicated.
- B. Fabricator Qualifications: Casework fabricator shall have at least five years of documented experience in the fabrication and installation of commercial casework.
 - 1. Provide five (5) references which show that the casework fabricator has previous successful experience with commercial, plastic laminate casework. Include the name, address, and telephone numbers for the project Owner and General Contractor.

- C. Mockups: Build mockups, which may be at reduced size, of typical plastic laminate cabinets as shown on drawings, including at least one door and drawer with all operating hardware.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Protect casework during transit, delivery, storage and handling to prevent damage, soiling and deterioration.
- B. Do not deliver casework until painting, wetwork, grinding and similar operations which could damage, soil or deteriorate woodwork have been completed in installation areas. If, due to unforeseen circumstances, casework must be stored in other than installation areas, store only in areas meeting requirements specified for installation areas.

1.6 PROJECT CONDITIONS

- A. Conditioning: Installer shall advise Contractor of temperature and humidity requirements for casework installation areas. Do not install casework until required temperature and relative humidity have been stabilized and will be maintained in installation areas.
- B. Maintain temperature and humidity in installation area as required to maintain moisture content of installed casework within a 1.0 percent tolerance of optimum moisture content, from date of installation through remainder of construction period. The fabricator of casework shall determine optimum moisture content and required temperature and humidity conditions.
- C. Field measurements: Where casework is indicated to be fitted to other construction, check actual dimensions of other construction by accurate field measurements before manufacturing casework; show recorded measurements on approved shop drawings. Coordinate manufacturing schedule with construction progress to avoid delay of work.

1.7 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of work specified in other Sections to insure that cabinets can be supported and installed as indicated.
- B. Coordinate sizes and locations of electrical power and lighting components to insure correct locations on or within casework.

PART 2 - PRODUCTS

2.1 BASIC MATERIALS AND FABRICATION METHODS

- A. Plastic Laminate: Comply with NEMA LD-3 for type, thickness, color, pattern, and finish indicated for each application. Provide plastic laminate by one of the following; color selection by Architect.

1. Refer to Finish Schedule for manufacturer, product, and color selection.
- B. Solid Surfacing Material: Homogenous solid sheets of quartz-based fabricated stone.
1. Refer to Finish Schedule for manufacturer, product, and color selection.
- C. Acrylic Latex Sealant with Silicone: Colored acrylic latex caulk with silicone for sealing joints between casework and building and between countertops and backsplashes. Color shall be selected by Architect to match color of laminated plastic surfaces. All products used in this section shall comply with the limits for VOC content as described in Section 01352 paragraph 2.5. Verify the VOC content of the following products:
1. "Form Fill Adhesive Caulk".
 2. "ColorRITE Caulking Spectrum".
 3. "Color Flex"; Kampel.
- D. Lumber and Panel Materials: Comply with AWI Section 10 requirements for lumber and panel product requirements, unless specific core material is identified herein.
1. Panel materials for cabinet bodies, doors, drawer fronts, and countertops shall be softwood veneer core plywood, medium density particle board, or medium density fiberboard (MDF) used as a substrate for laminated plastic, per AWI requirements.
 - a. Plywood shall be made:
 - (1)95% void-free.
 - (2)3/4" thick / Seven (7) Ply.
 - (3)3/8" thick / Three (3) Ply.
 - (4)Exposure I: Exterior waterproof glue.
 - (5)Classification: APA Group I, (Fir, Odorless Virola)
 - (6)Appearance Grades: (Installation Applications)
 - A-A Exposed & Semi-Exposed Surface Laminate Base: Two (2) Sides
 - A-C Exposed & Semi-Exposed Surface Laminate Base/Concealed Surface Laminate Base
- E. Design and Construction Features: Comply with details shown for profile and construction of casework; and, where not otherwise shown, comply with applicable quality standards.
- F. Shop-Cut Openings: Fabricate casework with shop-cut openings, where possible, to receive hardware, appliances, plumbing fixtures, electrical work and similar item openings accurately and use templates or roughing-in diagrams for proper size and shape. Smooth edges of cutouts and, where located in countertops and similar exposures, seal edges with a water-resistant coating.

2.2 PLASTIC LAMINATE FINISHED CASEWORK

- A. Grade: AWI Custom Grade.
- B. Cabinet Construction: Flush overlay, conforming to AWI Section 400-G-7. Conform to the following requirements:
 - 1. Cabinet Body Sides, Dividers, Tops, Bottoms, Fixed Shelves and Stretchers: Not less than 3/4" thick. Provide stretchers at top of base cabinet.
 - 2. All adjustable shelves shall be constructed using minimum 3/4" thick 9-ply Luan veneer plywood. Shelves shall have GP-50 type laminated plastic on both faces, and it shall be applied in the same machine direction on both faces. Shelves shall be edge banded with GP-50 type laminated plastic on all 4 sides.
 - 3. Backs: Not less than 1/4" thick.
 - 4. Drawer Fronts: Not less than 3/4" thick.
 - 5. Drawers: Sides, subfronts and backs: Not less than 1/2" thick; bottoms: not less than 1/4" thick. Provide box type construction with front, bottom and back lock shouldered in sides and secured with glue and mechanical fasteners.
 - 6. Doors: Not less than 3/4" thick.
 - 7. Door and Drawer Front Edge Banding: PVC edge banding, 3mm. thick, matching laminate in color, pattern, and finish.
 - 8. Joinery: Rabbet backs flush into end panels and secure with concealed mechanical fasteners. Connect wall cabinet tops and bottoms and base cabinet bottoms and stretchers to ends and dividers by means of mechanical fasteners. Rabbet tops, bottoms and backs into end panels.
 - 9. Subbase: Not less than 1-1/2" thick, 4-1/2" high, recessed 2-1/2" from cabinet fronts and exposed ends. Cover with base as scheduled on drawings.
 - 10. All base and wall cabinets wider than 36 inches shall have a full height center divider. Omit divider in base cabinets containing sinks.
- C. Exposed Surfaces: Provide high pressure laminate in grades indicated for the following types of surfaces:
 - 1. Horizontal surfaces: Grade HGS (0.048" nominal thickness).
 - 2. Vertical Surfaces: Grade VGS (0.028" nominal thickness). Doors must have same laminate on both faces.
- D. Semi-Exposed Surfaces: Finish semi-exposed surfaces as follows, unless otherwise indicated.
 - 1. Plastic laminate, Grade CLS (0.020" nominal thickness); white in color.
- E. Concealed Surfaces: Finish concealed surfaces without plastic laminate with two coats of shellac or clear sanding sealer.
- F. Fabricate all exposed edges of casework, including edges of doors and drawers when open, with matching plastic laminate.

2.3 PLASTIC LAMINATE COUNTERTOPS

- A. General: Except as otherwise indicated, provide separate plastic laminate countertops (installed on other casework or other support system as indicated) to comply with requirements for casework for plastic laminate finish.
- B. Grade: AWI custom grade.
- C. Grade BLK (0.020" nominal thickness) back-up sheet required wherever unsupported area exceeds 6 sq. ft. and core is 3/4" thick; 8 sq. ft. and core is 1" thick; 10 sq. ft. and core is 1-1/8" or thicker.
- D. Wire Management Grommets: Provide where indicated on drawings.
 - 1. Grommet sets shall include a plastic grommet to fit a 2" diameter hole, with a retractable, self-storing slot cover. Color: black.
 - 2. Manufacturer: Outwater Plastics Industries, Inc., part #31 BK, or Doug Mockett & Company, Inc., part no. TG.

2.4 QUARTZ AGGLOMERATE ("QUARTZ") SOLID SURFACE MATERIAL COUNTERTOPS

- A. Grade: Custom
- B. Countertop and Backsplash Material Thickness: 3/4 inch.
- C. Fabricate tops in one piece, unless otherwise indicated. Comply with solid-surfacing-material manufacturer's written recommendations for adhesives, sealers, fabrication, and finishing.
 - 1. Fabricate tops with shop-applied edges of materials and configuration indicated.
 - 2. Fabricate tops with loose backsplashes for field application where indicated on drawings.
- D. Drill holes in countertops for plumbing fittings in shop.

2.5 CABINET HARDWARE

- A. General: Provide cabinet hardware and accessory materials associated with architectural woodwork, except for units which are specified as "door hardware" in other sections of these specifications.
- B. Hardware Standards: Except as otherwise indicated, comply with ANSI A156.9 "American National Standard for Cabinet Hardware".
 - 1. Quality Level: Type 2 (institutional), unless otherwise indicated.
 - 2. Quality Certification: Where available, provide cabinet hardware bearing the BHMA certification label, affixed either to hardware or its packaging, showing compliance with BHMA Cabinet Hardware Standard 201.

- C. Cabinet Hardware Schedule: Refer to schedule included as last pages of this section for specific hardware and accessory items required for casework.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Condition casework to average prevailing humidity conditions in installation areas prior to installing.
- B. Deliver concrete inserts and similar anchoring devices to be built into substrates well in advance of time substrates are to be built.
- C. Prior to installation of casework, examine shop fabricated work for completion, and complete work as required, including removal of packing.

3.2 INSTALLATION

- A. Installer: The installation of all work of this section shall be by the fabricator of the plastic laminate casework.
- B. Install the work plumb, level, true and straight with no distortions. Shim as required using concealed shims. Install to a tolerance of 1/8" in 8'-0" for plumb and level (including countertops).
- C. Scribe and cut work to fit adjoining work, and refinish cut surfaces or repair damaged finish at cuts.
- D. Anchor casework to anchors or blocking built-in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for a complete installation.
- E. Install without distortion so that doors and drawers will fit openings properly and be accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete the installation of hardware and accessory items as indicated.
- F. Countertops: Anchor securely to base units and other support systems as indicated.
 - 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 countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.

- G. Sealant: Caulk exposed joints between casework and building and between laminated plastic countertops and backsplashes with colored acrylic latex caulk with silicone. Color shall be selected by Architect to match color of laminated plastic surfaces.

3.3 ADJUSTMENT, CLEANING, FINISHING AND PROTECTION

- A. Repair damaged and defective casework wherever possible to eliminate defects functionally and visually; where not possible to repair properly, replace casework. Adjust joinery for uniform appearance.
- B. Clean hardware, lubricate and make final adjustments for proper operation.
- C. Clean casework on exposed and semi-exposed surfaces.
- D. Protection: Installer of casework shall advise Contractor of procedures required to protect casework during remainder of construction period to ensure that work will be without damage or deterioration at time of acceptance.

3.4 CABINET HARDWARE SCHEDULE

- A. Finish: Of all hardware shall be US26 polished chrome unless noted otherwise.
- B. Manufacturers: Provide products by the following manufacturers or approved equal.
1. Adjustable shelving supports - K & V (Knappe & Vogt), #345, for 5 mm hole; nickel-plated steel.
 2. Hinges – Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 110 degrees of opening, self-closing.
 3. Catches - Stanley #SP41, magnetic type (US28).
 4. Pulls – Doug Mockett & Company DP281A - Round stainless steel rod handle, satin stainless steel.
 5. Drawer Slides - Knappe & Vogt No. 8400 (100 lbs.) telescoping full extension with ball bearings; anachrome finish cold rolled steel.
 6. Locks - Key operated, pin tumbler, dead bolt type. Provide National Locks or Corbin Cabinet Lock, US 26 finish.
 7. Drawers:

1 set	Slides	8400
1	Pull	SWP-640/S
1	Lock	(where indicated on drawings: National C8179)
 8. Cabinet Doors (single):
(Doors 48" high and over shall carry 3 or more hinges per door)

1 set	Hinge	375
1	Catch	41
1	Pull	SWP-640/S
1	Lock	(where indicated on drawings: National C8173 x strike)

9. Cabinet Doors (pairs):
(Doors 48" high and over shall carry 3 or more hinges per door.)

2 pair	Hinges	375
2	Catch	41
2	Pulls	SWP-640/S
1	Lock	(where indicated on drawings: National C8173 x strike)

END OF SECTION 064116

SECTION 072100 - BUILDING INSULATION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Concealed thermal building insulation.
 - 3. Concealed acoustical building insulation.
- B. Related Sections include the following:
 - 1. Division 4 Section “Unit Masonry Assemblies” for foamed-in-place masonry wall insulation and cavity wall insulation.

1.3 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data for each type of insulation product specified.

1.4 QUALITY ASSURANCE

- A. Single-Source Responsibility for Insulation Products: Obtain each type of building insulation from a single source with resources to provide products complying with requirements indicated without delaying the Work.
- B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated on Drawings or specified elsewhere in this Section as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
 - 1. Surface-Burning Characteristics: ASTM E 84.
 - 2. Fire-Resistance Ratings: ASTM E 119.
 - 3. Combustion Characteristics: ASTM E 136.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.
- B. Protect plastic insulation as follows:
 - 1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
 - 2. Protect against ignition at all times. Do not deliver plastic insulating materials to Project site before installation time.
 - 3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide insulation products by one of the following:
 - 1. Polyisocyanurate Board Insulation:
 - a. Celotex Corporation (The)
 - b. Atlas Roofing Corporation
 - c. Dow Chemical Company
 - 2. Glass-Fiber Blanket Insulation
 - a. CertainTeed Corporation
 - b. Guardian Building Products, Inc.
 - c. Johns Manville Corporation
 - d. Knauf Fiber Glass
 - e. Owens Corning
 - 3. Slag-Wool / Rock-Wool Fiber Sound Attenuation Insulation:
 - a. Fibrex Insulations, Inc.
 - b. Owens Corning
 - c. Roxul Inc.
 - d. Thermafiber

2.2 INSULATING MATERIALS

- A. General: Provide insulating materials that comply with requirements and with referenced standards.
- B. Polyisocyanurate Board Insulation: Rigid, cellular polyisocyanurate thermal insulation with core faced on both sides with aluminum foil to comply with referenced standard and with other requirements indicated below:
 - 1. ASTM Standard: ASTM C 1289, Type 1, Class 1 or 2.
 - 2. Surface-Burning Characteristics: Maximum flame-spread and smoke-developed indices of 75 and 450, respectively, based on tests performed on unfaced core on thicknesses up to 4 inches.
 - 3. Conditioned R-value: 5.0 minimum, per ASTM C 1289 and ASTM C 518.
 - 4. Thickness: 1 - inch unless otherwise indicated on drawings.
- C. Faced, Glass-Fiber Blanket (Batt) Insulation: ASTM C 665, Type II (Blankets with kraft paper vapor retarder membrane facing on one face), Class C. Provide blankets with R-19 rating, approximately 6.25" thick.
- D. Unfaced Mineral-Fiber Blanket Insulation: Sound attenuation insulation combining mineral fibers of type described below with thermosetting resins to comply with ASTM C 665, Type I (blankets without membrane facing).
 - 1. Mineral-Fiber Type: Fibers manufactured from slag wool or rock wool.
 - 2. Surface-Burning Characteristics: Maximum flame-spread and smoke-developed indices of 25 and 50, respectively.
 - 3. Thickness: 3", unless otherwise indicated on drawings.

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 to determine if other conditions affecting performance of insulation are satisfactory. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of substances harmful to insulations or vapor retarders, including removing projections capable of puncturing vapor retarders or that interfere with insulation attachment.

3.3 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.
- B. Install insulation that is undamaged, dry, and unsoiled.
- C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Apply insulation to produce thickness indicated.

3.4 INSTALLATION OF GENERAL BUILDING INSULATION

- 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. Polyisocyanurate Board Insulation: Install as follows:
 - 1. Attach boards to masonry and concrete wall substrates by adhesive attachment. Seal joints between boards with aluminum foil tape.
- C. Glass - Fiber Blanket Insulation: Install as follows:
 - 1. Place blankets in cavities formed by framing members to produce a friction fit between edge of insulation and framing members.
- D. Slag-Wool / Rock-Wool Fiber Sound Attenuation Insulation
 - 1. Install in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.

3.5 PROTECTION

- A. General: Protect installed insulation and radiant barriers 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 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes joint sealants for the following locations:
 - 1. Exterior joints in vertical surfaces and nontraffic horizontal surfaces as indicated below:
 - a. Control and expansion joints in unit masonry.
 - b. Control and expansion joints in Portland cement plaster.
 - c. Perimeter joints between materials listed above and frames of doors and windows.
 - d. Control and expansion joints in ceiling and overhead surfaces.
 - e. Provide joint between all dis-similar surfaces.
 - f. Other joints as indicated.
 - 2. Exterior joints in horizontal traffic surfaces as indicated below:
 - a. Control, expansion, and isolation joints in cast-in-place concrete slabs.
 - b. Provide joint between all dis-similar surfaces.
 - c. Other joints as indicated.
 - 3. Interior joints in vertical surfaces and horizontal nontraffic surfaces as indicated below:
 - a. Control and expansion joints on exposed interior surfaces of exterior walls.
 - b. Perimeter joints of exterior openings where indicated.
 - c. Vertical control joints on exposed surfaces of interior unit masonry and concrete walls and partitions.
 - d. Perimeter joints between interior wall surfaces and frames of interior doors and windows.
 - e. Sealing exposed perimeter joints and countertop-to-backsplash joints in plastic laminate casework.
 - f. Provide joint between all dis-similar surfaces.
 - g. Other joints as indicated.
 - 4. Interior joints in horizontal traffic surfaces as indicated below:
 - a. Control and expansion joints in cast-in-place concrete slabs.

- b. Provide joint between all dis-similar surfaces.
- c. Other joints as indicated.

B. Related Sections: The following Sections contain requirements that relate to this Section:

- 1. Division 8 Section "Glass and Glazing" for sealants used in glazing.

1.3 SYSTEM PERFORMANCE REQUIREMENTS

- A. Provide elastomeric joint sealants that have been produced and installed to establish and to maintain watertight and airtight continuous seals without causing staining or deterioration of joint substrates.

1.4 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract.
- B. Product data from manufacturers for each joint sealant product required.
- C. Samples for initial selection purposes in form of manufacturer's standard bead samples, consisting of strips of actual products showing full range of colors available, for each product exposed to view.
- D. Certificates from manufacturers of joint sealants attesting that their products comply with specification requirements and are suitable for the use indicated.
- E. Provide and maintain a file of manufacturer's instructions for each of the products used.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who has completed joint sealant applications similar in material, design, and extent to that indicated for Project that have resulted in construction with a record of successful in-service performance.
- B. Single Source Responsibility for Joint Sealant Materials: Obtain joint sealant materials from a single manufacturer for each different product required.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multicomponent materials.

- B. Store and handle materials in compliance with manufacturer's recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.7 PROJECT CONDITIONS

- A. Environmental Conditions: Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside the limits permitted by joint sealant manufacturer.
 - 2. When joint substrates are wet.
- B. Joint Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than allowed by joint sealant manufacturer for application indicated.
- C. Joint Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with their adhesion are removed from joint substrates.

1.8 SEQUENCING AND SCHEDULING

- A. Sequence installation of joint sealants in existing interior concrete pavement to occur prior to application of clear concrete sealing compound where indicated or scheduled on drawings.

PART 2 – PRODUCTS

2.1 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, joint fillers, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
- B. Colors: Provide color of exposed joint sealants to comply with the following:
 - 1. Provide selections made by Architect from manufacturer's full range of standard colors for products of type indicated.

2.2 ELASTOMERIC JOINT SEALANTS

- A. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing elastomeric sealants that comply with ASTM C 920, including those requirements referencing ASTM C 920 classifications for Type, Grade, Class, and Uses.
- B. Products: Subject to compliance with requirements, provide one of the products specified.
- C. Single Part Pourable Urethane Sealant for use in horizontal joints in floor slabs, sidewalks, and concrete pavement. Provide one of the following:
 - 1. "Vulkem 45"; Mameco International, Inc.
 - 2. "NR-201 Urexpan"; Pecora Corp.
 - 2. "Sonolastic SL1"; Sonneborn Building Products.
- D. Single Part, Nonsag, Silyl-Terminated Polyether (STPE) Joint Sealant for use in sealing hollow metal door frames to adjoining wall surfaces, roof flashing and edge metal installations, masonry control and expansion joints, and general purpose exterior sealing except where silicone is specified:
 - 1. Products: Provide one of the following:
 - a. BASF "Masterseal NP 150" low modulus, non-sag, elastomeric, hybrid sealant.
 - b. ChemLink "DuraLink 50" 100% solids polyether sealant.
 - c. Sika "SikaHyflex – 150 LM" one component, low modulus, hybrid construction sealant.
- E. Medium-Modulus Neutral-Curing Silicone Sealant for perimeter sealing of aluminum windows and storefronts.
 - 1. 791; Dow Corning (accommodates joint movement of ± 50 percent).
 - a. Apply to masonry and concrete with Dow Corning 1200 Primer.

2.3 LATEX JOINT SEALANTS

- A. Acrylic-Emulsion Sealant: Manufacturer's standard, one part, nonsag, mildew-resistant, acrylic-emulsion sealant complying with ASTM C 834, formulated to be paintable and recommended for exposed applications on interior locations involving joint movement of not more than plus or minus 5 percent. Provide at intersections of interior door and window frames and adjoining wall surfaces.
 - 1. "AC-20"; Pecora Corp.
 - 2. "Sonolac"; Sonneborn Building Products.
- B. Acrylic Latex Sealant with Silicone: Colored acrylic latex caulk with silicone for sealing joints between casework and building and between countertops and backsplashes. Color shall be selected by Architect to match color of laminated plastic surfaces.

1. "Form Fill Adhesive Caulk".
2. "ColorRITE Caulking Spectrum".
3. "ColorFlex"; Kampel.

2.4 ACOUSTICAL JOINT SEALANT

- A. Acoustical sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 and the following:
1. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
 2. Install at perimeter joints around all electrical boxes in acoustically-rated walls and all drywall ceilings throughout Music Building 1 and Building 1 Addition, and elsewhere as indicated on drawings.
- B. Manufacturer – Provide one of the following:
1. AC-20FTR Acoustical and Insulation Sealant; Pecora Corporation
 2. Sheetrock Acoustical Sealant; USG Corp.

2.5 MILDEW – RESISTANT SILICONE SEALANT

- A. One-part mildew-resistant interior sealant designed to seal nonporous interior building surfaces including tubs, sinks, lavatories, and urinals at perimeter intersection with finished walls.
- B. Manufacturer – Provide one of the following:
1. Dow Corning 786 Mildew-Resistant Silicone Sealant.
 2. Sanitary SCS1700 Sealant; G.E. Silicones

2.6 JOINT SEALANT BACKING

- A. General: Provide sealant backings of material and type 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 either material indicated below and of size, shape, and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
1. Closed-cell polyethylene foam, nonabsorbent to liquid water and gas, nonoutgassing in unruptured state.

2. Proprietary, reticulated, closed-cell polymeric foam, nonoutgassing, with a density of 2.5 pcf and tensile strength of 35 psi per ASTM D 1623, and with water absorption less than 0.02 g/cc per ASTM C 1083.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.6 JOINT FILLERS FOR CONCRETE PAVING

- A. General: Provide joint fillers of thickness and widths indicated.
- B. Bituminous Fiber joint Filler: Preformed strips of asphalt saturated fiberboard. Provide one of the following:
 1. "Fiber Expansion Joint"; The Burke Company.
 2. "Tex-Lite Fiber"; J & P Petroleum Products, Inc.
 3. "Fibre Expansion Joint Filler"; W.R. Meadows, Inc.

2.7 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming in any way joint substrates and adjacent nonporous surfaces, and formulated to promote optimum adhesion of sealants with 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. Do not proceed with installation of joint sealants until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with recommendations of joint sealant manufacturer 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 concrete, masonry, unglazed surfaces of ceramic tile, and similar porous joint substrate surfaces by brushing, grinding, blast cleaning, 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 from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.
 3. Remove laitance and form release agents from concrete.
 4. Clean metal, glass, porcelain enamel, glazed surfaces of ceramic tile, and other nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
- B. Joint Priming: Prime joint substrates where indicated or where recommended by joint sealant manufacturer based on preconstruction joint sealant-substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's recommendations. Confine primers to areas of joint sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint sealant manufacturer's printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:

1. Install joint fillers of type indicated to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - a. Do not leave gaps between ends of joint fillers.
 - b. Do not stretch, twist, puncture, or tear joint fillers.
 - c. Remove absorbent joint fillers that have become wet prior to sealant application and replace with dry material.
 2. Install bond breaker tape between sealants where backer rods are not used between sealants and joint fillers or back of joints.
- D. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability. Install sealants at the same time sealant backings are installed.
- E. Tooling of Nonsag Sealants: Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated, to eliminate air pockets, and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.
1. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.
- 3.4 CLEANING
- A. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved 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 or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so that and 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 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Standard hollow-metal steel doors.
 - 2. Standard hollow-metal steel frames.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 4 Section "Unit Masonry" for building anchors into and grouting frames in masonry construction.
 - 2. Division 8 Section "Flush Wood Doors" for solid-core wood doors installed in steel frames.
 - 3. Division 8 Section "Door Hardware" for door hardware and weatherstripping.
 - 4. Division 8 Section "Glazing" for glass in steel doors and sidelights.
 - 5. Division 9 Section "Painting" for field painting primed doors and frames.

1.3 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings.

1.4 SUBMITTALS

- A. Approval Numbers: Provide State of Florida Product Approval Numbers.
- B. Product Data: Include construction details, material descriptions, core descriptions, label compliance, fire-resistance rating, and finishes for each type of steel door and frame specified.
- C. Shop Drawings:
 - 1. In addition to requirements below, provide a schedule of hollow metal doors and frames using same reference numbers for details and openings as those on Drawings:
 - a. Elevations of each door design.
 - b. Details of doors, including vertical and horizontal edge details.

- c. Frame details for each frame type, including dimensioned profiles.
 - d. Details and locations of reinforcement and preparations for hardware.
 - e. Details of each different wall opening condition.
 - f. Details of anchorages, accessories, joints, and connections.
2. State of Florida Product Approval must be applicable to actual door and frame sizes indicated on drawings.
 3. Shop drawings shall indicate hardware locations for doors and frames based upon Steelcraft standards. No other locations are acceptable.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Source Limitations: Obtain hollow metal doors and frames through one source from a single manufacturer.
- C. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated.
 1. Test Pressure: Test at atmospheric (neutral) pressure according to NFPA 252 or UL 10B.
- D. Smoke-Control Door Assemblies: Comply with NFPA 105 or UL 1784.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver doors and frames palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store doors and frames under cover at Project site. Place units in a vertical position with heads up, spaced by blocking, on minimum 4-inch- high wood blocking. Avoid using nonvented plastic or canvas shelters that could create a humidity chamber.
 1. If wrappers on doors become wet, remove cartons immediately. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify openings by field measurements before fabrication and indicate measurements on Shop Drawings.

1.8 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, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Ceco Door Products.
 - 2. CURRIES Company; an ASSA ABLOY Group Company.
 - 3. Republic Builders Products Company.
 - 4. Steelcraft; an Ingersoll-Rand Company.
 - 5. Amweld International, LLC

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 A60 (ZF180) zinc-iron-alloy (galvannealed) coating designation.
- D. Supports and Anchors: After fabricating, galvanize units to be built into exterior walls according to ASTM A 153/A 153M, Class B.
- E. Inserts, Bolts, and Fasteners: Provide items to be built into exterior walls, hot-dip galvanized according to ASTM A 153/A 153M.

2.3 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 A250.8.
 - 1. Design: As indicated on Drawings.
 - 2. Core Construction: Manufacturer's standard polystyrene, polyurethane, or mineral-board core that produces doors complying with ANSI A250.8.

- a. Fire Door Core: As required to provide fire-protection ratings indicated.
 3. Vertical Edges for Single-Acting Doors: Beveled edge
 - a. Beveled Edge: 1/8 inch in 2 inches.
 4. Top and Bottom Edges: Closed with flush (at top), inverted (at bottom), 0.042-inch-thick end closures or channels of same material as face sheets.
 5. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Hollow Metal Doors and Frames."
- B. Exterior and Interior Doors: Face sheets fabricated from A-60 galvanized steel sheet. Provide doors complying with requirements indicated below by referencing ANSI A250.8 for level and model and ANSI A250.4 for physical-endurance level:
1. Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 2 (Seamless), 16 gage (.053 inch).
 2. Exterior doors shall be hurricane-resistant and tested to the following windstorm or severe weather performance standards:
 - a. ANSI A250.13
 - b. ASTM E330
 - c. TAS201, TAS202, TAS203
 3. Exterior doors shall be rated to resist the following minimum ultimate pressures:
 - a. Single Doors: +43 psf; -47 psf
 - b. Door Pairs: +41 psf; -45 psf
- C. Hardware Reinforcement: Fabricate reinforcement plates from same material as door face sheets to comply with the following minimum sizes:
1. Hinges: Minimum 0.123 inch thick by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than 6 spot welds.
 2. Pivots: Minimum 0.167 inch thick by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than 6 spot welds.
 3. Lock Face, Flush Bolts, Closers, and Concealed Holders: Minimum 0.067 inch thick.
 4. All Other Surface-Mounted Hardware: Minimum 0.067 inch thick.
- D. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.
- 2.4 HOLLOW METAL FRAMES
- A. General: Comply with ANSI A250.8 and with details indicated for type and profile.
- B. Exterior and Interior Frames: Fabricated from A-60 galvanized steel sheet.
1. Fabricate frames with mitered and continuously welded face corners.
 2. Frames for Level A Steel Doors: 16 gage (.053 inch) thick steel sheet.

- C. Hardware Reinforcement: Fabricate reinforcement plates from same material as frames to comply with the following minimum sizes:
 - 1. Hinges: Minimum 0.123 inch thick by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than 6 spot welds.
 - 2. Pivots: Minimum 0.167 inch thick by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than 6 spot welds.
 - 3. Lock Face, Flush Bolts, Closers, and Concealed Holders: Minimum 0.067 inch thick.
 - 4. All Other Surface-Mounted Hardware: Minimum 0.067 inch thick.
- D. Supports and Anchors: Fabricated from electrolytic zinc-coated or metallic-coated steel sheet.
- E. Jamb Anchors:
 - 1. Masonry Type: Adjustable strap-and-stirrup 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.
 - 2. Postinstalled Expansion Type for In-Place Concrete Masonry: minimum 3/8-inch-diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.
- F. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.
- G. Plaster Guards: Formed from same material as frames, not less than 0.016-inch thick.

2.5 FABRICATION

- A. General: Fabricate hollow metal doors and frames to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Hollow Metal Doors:
 - 1. 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. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. Provide three anchors per jamb.
 - b. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.
 5. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Provide plastic plugs to keep holes clear during construction.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
- D. Hardware Preparation: Factory prepare hollow metal doors and frames to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping.
1. All locations shall be based upon Steelcraft standards.
 2. Reinforce doors and frames to receive nontemplated mortised and surface-mounted door hardware.
 3. Comply with applicable requirements in ANSI A250.6 and ANSI/DHI A115 Series specifications for door and frame preparation for hardware. Locate hardware according to ANSI A250.8.

2.6 STEEL FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
1. Finish hollow metal doors and frames after assembly.
- B. Galvanized 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. Factory Priming for Field-Painted Finish: Apply shop primer specified below immediately after surface preparation and pretreatment. Apply a smooth coat of even consistency to provide a uniform dry film thickness of not less than 0.7 mils.
1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied finish paint

system indicated; and providing a sound foundation for field-applied topcoats despite prolonged exposure.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of hollow metal doors and frames.
 - 1. Examine roughing-in for embedded and built-in anchors to verify actual locations of hollow metal frame connections before frame installation.
 - 2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory.
- B. Prior to installation and with installation spreaders in place, adjust and securely brace hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - 1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - 2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 - 3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - 4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.
- C. Drill and tap doors and frames to receive nontemplated mortised and surface-mounted door hardware.

3.3 INSTALLATION

- A. General: Provide doors and frames of sizes, thicknesses, and designs indicated. Install hollow metal doors and frames 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 for doors of size and profile indicated. Comply with SDI 105.
 - 1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.

- a. At fire-protection-rated openings, install frames according to NFPA 80.
 - b. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - c. Check plumb, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
2. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
 3. 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, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.
- C. Hollow Metal Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.
1. Non-Fire-Rated Hollow Metal Doors:
 - a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
 - b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
 - c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
 - d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.
 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
 3. Smoke-Control Doors: Install doors according to NFPA 105.

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 doors or frames that are warped, bowed, or otherwise unacceptable.
- B. Clean grout and other bonding material off hollow metal doors and frames immediately after installation.
- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying primer.
- D. Galvannealed Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION 08111

SECTION 081416 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Solid core doors with MDO, Hardboard or MDF faces.
 - 2. Factory fitting flush wood doors to frames and factory machining for hardware.
- B. Related Sections:
 - 1. Division 9 Section "Painting" for field painting of metal doors, metal louvers and metal frames for light openings.
 - 2. Division 8 Section "Glazing" for glass in view panels in flush wood doors.

1.3 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract.
- B. Product data for each type of door, including details of core and edge construction, trim for openings and louvers, and factory-finishing specifications.
- C. Shop drawings indicating location and size of each door, elevation of each kind of door, details of construction, location and extent of hardware blocking, fire ratings, and other pertinent data.
 - 1. For factory-machined doors, indicate dimensions and locations of cutouts for locksets and other cutouts adjacent to light and louver openings.
- D. Samples for Initial Selection: Color charts consisting of actual materials in small sections for the following:
 - 1. Faces of Factory-Finished Doors: Show the full range of colors available for stained finishes.
- E. Samples for Verification:
 - 1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish. For each wood species and transparent

finish, provide set of three samples showing typical range of color and grain to be expected in the finished work.

1.4 QUALITY ASSURANCE

- A. Quality Standard: Comply with the following standard:
 - 1. AWI Quality Standard: Architectural Woodwork Quality Standards of the Architectural Woodwork Institute for grade of door, core, construction, finish, and other requirements.
 - 2. WDMA I.S.1-A, "Architectural Wood Flush Doors."
- B. Fire-Rated Wood Doors: Provide wood doors that comply with NFPA 80; are identical in materials and construction to units tested in door and frame assemblies per ASTM E 152; and are labeled and listed by UL, Warnock Hersey, or another testing and inspection agency acceptable to authorities having jurisdiction.
- C. Single-Source Responsibility: Obtain doors from one source and by a single manufacturer.

1.5 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 instructions.
- B. Identify each door with individual opening numbers as designated on shop drawings, using temporary, removable, or concealed markings.

1.6 PROJECT CONDITIONS

- A. Conditioning: Do not deliver or install doors until conditions for temperature and relative humidity have been stabilized and will be maintained in storage and installation areas during the remainder of the construction period to comply with the following requirements applicable to Project's geographical location:
 - 1. AWI quality standard Section 100-S-11 "Relative Humidity and Moisture Content."

1.7 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, agreeing to repair or

replace defective doors that have warped (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section or that show telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span, or do not conform to tolerance limitations of referenced quality standards.

1. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors where defect was not apparent prior to hanging.
2. Warranty shall be in effect during the following period of time after date of Substantial Completion.
 - a. Solid Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturer: Subject to compliance with requirements, provide doors by one of the following:
 1. Solid Core Doors:
 - a. Algoma Hardwoods, Inc.
 - b. Eggers Industries
 - c. Graham Wood Doors
 - d. Marshfield Door Systems
 - e. Mohawk Flush Doors, Inc.
 - f. VT Industries, Inc.

2.2 INTERIOR FLUSH WOOD DOORS

- A. Solid Core Doors for Opaque Finish: Comply with the following requirements:
 1. Faces: MDO, Hardboard or MDF.
 2. A.W.I. Grade: Premium.
 3. Construction: PC 5 (Particleboard core, 5 ply, with core bonded to faces).
 4. Core: Particleboard core, ANSI A208.1, Grade LD-2.
 5. Bonding: Stiles and rails bonded to core, then entire unit abrasive planed before veneering.
- B. Fire-Rated Solid Core Doors: Comply with the following requirements:
 1. Faces and Grade: Provide faces and grade to match non-fire-rated doors in same area of building, unless otherwise indicated.
 2. Construction: Manufacturer's standard core construction as required to provide fire-resistance rating indicated.

3. Blocking: Provide composite blocking designed to maintain fire resistance of door but with improved screw-holding capability of same thickness as core and with minimum dimensions as follows:
 - a. 5-inch top rail blocking.
 - b. 5-inch bottom rail blocking.
 - c. 5-by-18-inch lock blocks.
 - d. 5-inch midrail blocking.

2.3 INTEGRAL BLINDS AND LIGHT FRAMES

- A. Integral Blind and Glass Assembly: Basis of design is Between the Glass Blinds by Privacy Glass Solutions. Provide units composed of two lites of glass with manually operated blinds between the lites of glass that tilt and lift. Assemble glass units in a manner similar to insulating glass units with 11/16" spacer. Horizontal Venetian blinds with aluminum slats.
- B. Metal Frames for Light Openings: Manufacturer's standard frame formed of 0.048-inch thick, cold-rolled steel sheet; factory primed and approved for use in doors including fire rated doors where indicated.

2.4 FABRICATION

- A. Fabricate flush wood doors to comply with following requirements:
 1. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances and bevels:
 - a. Comply with clearance requirements of referenced quality standard for fitting.
 - b. Comply with requirements of NFPA 80 for fire-resistance-rated doors.
 2. 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.
 - a. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before proceeding with factory machining.
- B. Openings: Factory cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of door(s) required.
 1. Light Openings: Trim openings with moldings of material and profile indicated.
 2. Glazing: Factory install glazing in doors. Comply with applicable requirements in Section 088000 "Glazing."
 3. Louvers: Field install louvers in factory prepared openings.

2.5 FACTORY FINISHING

- A. General: Comply with AWI's "Architectural Woodwork Quality Standards Illustrated" for factory finishing.
- B. Finish doors at factory.
- C. Transparent Finish:
 - 1. Grade: Premium
 - 2. Finish: WDMA System TR-8 UV cured catalyzed polyurethane.
 - 3. Staining: As selected by Architect from manufacturer's full range.
 - 4. Sheen: Satin

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine installed door frames prior to hanging door:
 - 1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with plumb jambs and level heads.
 - 2. Reject doors with defects.
- B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Hardware: For installation see Division 8 Section "Door Hardware."
- B. Manufacturer's Instructions: Install wood doors to comply with manufacturer's instructions and referenced quality standard and as indicated.
 - 1. Install fire-rated doors in corresponding fire-rated frames according to requirements of NFPA 80.
 - 2. Fitting Clearances for Non-Fire-Rated Doors: Provide 1/8 inch at jambs and heads, 1/16 inch per leaf at meeting stiles for pairs of doors, and 1/8 inch from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide 1/4-inch clearance from bottom of door to top of threshold.
 - 3. Fitting Clearances for Fire-Rated Doors: Comply with NFPA 80.
- C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

3.3 ADJUSTING AND PROTECTION

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Refinish or replace doors damaged during installation.
- 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 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section includes access doors and frames for walls and ceilings.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Samples: For each type of access door and frame and for each finish specified, complete assembly minimum 6 by 6 inches (150 by 150 mm) in size.
- C. Product Schedule: For access doors and frames.

PART 2 - PRODUCTS**2.1 ACCESS DOORS AND FRAMES**

- A. Flush Access Doors with Exposed Flanges: AP-1
 - 1. Acceptable Manufacturers
 - a. Acudor Products
 - b. Babcock-Davis
 - c. JL Industries Inc.
 - d. Larsens Manufacturing
 - e. Milcor
 - 2. Description: Face of door flush with frame, with exposed flange and concealed hinge.
 - 3. Locations: Typical for wall locations unless noted otherwise on the project drawings.
 - 4. Door Size: As indicated on the project drawings.
 - 5. Metallic-coated Steel Sheet for Door: Nominal 0.064 inch (1.63 mm), 16 gage, factory finished.

6. Frame Material: Same material, thickness, and finish as door.
7. Latch and Lock:
 - a. Typical - Cam latch, hex-head wrench operated.
 - b. Where keyed or locking is indicated on the project drawings - Cam latch, key operated.

B. Flush Access Doors with Concealed Flanges : AP-2

1. Acceptable Manufacturers
 - a. Acudor Products
 - b. Babcock-Davis
 - c. JL Industries Inc.
 - d. Larsens Manufacturing
 - e. Milcor
2. Description: Face of door flush with frame; with concealed flange for gypsum board installation and concealed hinge.
3. Locations:
 - a. Typical for ceiling locations
 - b. Wall locations only where noted on project drawings
4. Door Size: As indicated on the project drawings.
5. Metallic-coated Steel Sheet for Door: Nominal 0.064 inch (1.63 mm), 16 gage, factory primed.
6. Frame Material: Same material and thickness as door.
7. Latch and Lock:
 - a. Typical - Cam latch, hex-head wrench operated.
 - b. Where keyed or locking is indicated on the project drawings - Cam latch, key operated.

2.2 MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.
- C. Frame Anchors: Same material as door face.
- D. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

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 mounting holes, attachment devices and fasteners of type required to secure access doors to types of supports indicated.
 - 1. For concealed flanges with drywall bead, provide edge trim for gypsum panels securely attached to perimeter of frames.
- D. Latch and Lock Hardware:
 - 1. Quantity: Furnish number of latches and locks required to hold doors tightly closed.
 - 2. Keys: Furnish two keys per lock and key all locks alike.

2.4 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. 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.
- D. Painted Finishes: Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
 - 1. Factory Primed: Apply manufacturer's standard, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.
 - 2. Factory Finished: Apply manufacturer's standard baked-enamel or powder-coat finish immediately after cleaning and pretreating, with minimum dry-film thickness of 1 mil (0.025 mm) for topcoat.
 - a. Color: As selected by Architect from full range of industry colors.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates 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. 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.

END OF SECTION

SECTION 084113 – ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Exterior entrance and storefront systems
 - 2. Interior storefront systems
- B. Related sections include the following:
 - 1. Division 7 Section "Joint Sealants" for sealing between framing and masonry.
 - 2. Division 8 Section "Door Hardware" for lock cylinders.
 - 3. Division 8 Section "Glazing" for impact insulated glass.

1.3 SYSTEM DESCRIPTION

- A. General: Provide aluminum storefront and entrance systems capable of withstanding loads and thermal and structural movement requirements indicated without failure, based on testing manufacturer's standard units in assemblies similar to those indicated for this Project. Failure includes the following:
 - 1. Air infiltration and water penetration exceeding specified limits.
 - 2. Framing members transferring stresses, including those caused by thermal and structural movement, to glazing units.
- B. Glazing: Physically and thermally isolate glazing from framing members.
- C. Wind Loads: Provide storefront and entrance systems, including anchorage, capable of withstanding wind-load design pressures calculated according to the requirements of the Florida Building Code and ASCE 7-2010.
 - 1. Storefronts and entrance doors shall be rated to resist the following minimum pressures which have been adjusted by a .6 load factor applied to the ultimate pressures:
 - a. 3'-0" x 8'-0" Entrance Doors in Zone 4: (+) 43 psf; (-) 47 psf.
 - b. Fixed glass storefront windows of 20 sq. ft. or less in Zone 5: (+) 43 psf; (-) 57 psf.
 - c. Refer to structural drawings for other Ultimate Wind Pressures on Exterior

Doors, Windows, Walls and apply a .6 load factor.

2. Deflection of framing members in a direction normal to wall plane is limited to 1/175 of clear span or 3/4 inch, whichever is smaller, unless otherwise indicated.
 3. Static-Pressure Test Performance: Provide storefront entrance systems that do not evidence material failures, structural distress, failure of operating components to function normally, or permanent deformation of main framing members exceeding 0.2 percent of clear span when tested according to ASTM E 330.
 - a. Test Pressure: 150 percent of inward and outward wind-load design pressures.
 - b. Duration: As required by design wind velocity; fastest 1 mile of wind for relevant exposure category.
- D. Hurricane-Resistance Test Performance: Provide storefront entrance systems that pass large and small missile-impact tests, as required by systems' location above grade, and cyclic-pressure tests according to The Florida Building Code, Sections 1609 and 1626.
1. Comply with Missile Level D Enhanced Protection requirements for Essential Facilities in accordance with ASTM E 1996.
- E. Dead Loads: Provide storefront entrance system members that do not deflect an amount which will reduce glazing bite below 75 percent of design dimension when carrying full dead load.
1. Provide a minimum 1/8-inch clearance between members and top of glazing or other fixed part immediately below.
 2. Provide a minimum 1/16-inch clearance between members and operable windows and doors.
- F. Live Loads: Provide storefront entrance systems, including anchorage, that accommodate the supporting structures' deflection from uniformly distributed and concentrated live loads indicated without failure of materials or permanent deformation.
- G. Engineering Responsibility: Storefront subcontractor shall engage a Florida registered structural engineer to design connections, member reinforcements, and fastening to building structure, and prepare design calculations and engineering data.
- H. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:
1. Fixed Framing and Glass Area:
 - a. Maximum air leakage of 0.06 cfm/sq.ft. at a static-air-pressure differential of 1.57 lbf/sq.ft. (75 Pa).
 2. Entrance Doors:

- a. Pairs of Doors: Maximum air leakage of 1.0 cfm/sq.ft. at a static-air-pressure differential of 1.57 lbf/sq.ft. (75 Pa).
 - b. Single Doors: Maximum air leakage of 0.5 cfm/sq.ft. at a static-air-pressure differential of 1.57 lbf/sq.ft. (75 Pa).
- I. Water Penetration: Provide entrance and storefront systems that do not evidence water leakage through fixed glazing and frame areas when tested according to ASTM E 331 at minimum differential pressure of 20 percent of inward-acting wind-load design pressure as defined by ASCE 7, "Minimum Design Loads for Buildings and Other Structures," but not less than 6.24 lbf/sq. ft. Water leakage is defined as follows:
 1. Uncontrolled water infiltrating systems or appearing on systems' normally exposed interior surfaces from sources other than condensation. Water controlled by flashing and gutters that is drained back to the exterior and cannot damage adjacent materials or finishes is not water leakage.
 - J. Thermal Movements: Provide storefront entrance systems, including anchorage, that accommodate thermal movements of systems and supporting elements resulting from the following maximum change (range) in ambient and surface temperatures without buckling, damaging stresses on glazing, failure of joint sealants, damaging loads on fasteners, failure of doors or other operating units to function properly, and other detrimental effects.
 1. Temperature Change (Range): 100 deg F ambient; 150 deg F material surfaces.
 - K. Structural-Support Movement: Provide storefront entrance systems that accommodate structural movements including, but not limited to, sway and deflection.
 - L. Dimensional Tolerances: Provide storefront entrance systems that accommodate dimensional tolerances of building frame and other adjacent construction.
- 1.4 SUBMITTALS
- A. Product Data: For each product specified. Include details of construction relative to materials, dimensions of individual components, profiles, and finishes.
 - B. Shop Drawings: For storefront entrance systems. Show details of fabrication and installation, including plans, elevations, sections, details of components, provisions for expansion and contraction, and attachments to other work. Show elevations at 2 A scale and details at 3" scale.
 1. Shop drawings shall include large-scale anchorage details indicating attachment to slabs, walls, and overhead structure.
 2. Submit calculations, structural properties, connection information and product information to verify that the system performance and anchorage can successfully resist wind loads. All calculations shall be signed and sealed by a Florida registered professional structural engineer.
 3. For entrance systems, include hardware schedule and indicate operating

hardware types, quantities, and locations.

4. Shop drawings shall include State of Florida Product Approval applicable to actual sizes of doors indicated.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer to assume engineering responsibility and perform work of this Section who has specialized in installing storefront entrance systems similar to those required for this Project and who is acceptable to manufacturer.
 1. Engineering Responsibility: Prepare data for storefront entrance systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
- B. Source Limitations: Obtain each type of storefront entrance system through one source from a single manufacturer.
- C. Product Options: Drawings indicate size, profiles, and dimensional requirements of entrance and storefront systems and are based on the specific systems indicated.
 1. Do not modify intended aesthetic effect, as judged solely by Architect, except with Architect's approval and only to the extent needed to comply with performance requirements. Where modifications are proposed, submit comprehensive explanatory data to Architect for review.
- D. All exterior storefronts and storefront entrance doors shall bear the label of the National Fenestration Rating Council (NFRC) and shall comply with Chapters 3 and 4 of the Florida Building Code, Fifth Edition (2014), Energy Conservation. This project is located in International Climate Zone 2A. In Chapter 4, Section C407 – Total Building Performance is applicable.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Kawneer Company, Inc.
2. Vistawall Architectural Products.
3. YKK AP America

2.2 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated, complying with the requirements of standards indicated below.
1. Sheet and Plate: ASTM B 209.
 2. Extruded Bars, Rods, Shapes, and Tubes: ASTM B 221.
 3. Extruded Structural Pipe and Tubes: ASTM B 429.
 4. Bars, Rods, and Wire: ASTM B 211.
- B. Steel Reinforcement: Complying with ASTM A 36 for structural shapes, plates, and bars; ASTM A 611 for cold-rolled sheet and strip; or ASTM A 570 for hot-rolled sheet and strip. Coat with corrosion-resistant primer.
- C. Glazing shall be provided by aluminum entrance manufacturer as follows:
1. Glass must be laminated glass product of the type included in the entrance assembly that was tested for hurricane resistance per the NOA.
 2. Refer to Section 088000 – Glazing, for impact-resistant, laminated glass specification.
- D. Glazing Gaskets: Manufacturer's standard pressure-glazing system of black, resilient glazing gaskets, setting blocks, and shims or spacers, fabricated from an elastomer of type and in hardness recommended by system and gasket manufacturer to comply with system performance requirements. Provide gasket assemblies that have corners sealed with sealant recommended by gasket manufacturer.
1. Provide silicone sealant in lieu of glazing gasket if required by entrance manufacturer for hurricane-resistant construction.
- E. Framing system gaskets, sealants, and joint fillers as recommended by manufacturer for joint type.

2.3 COMPONENTS

- A. Doors: Provide manufacturer's standard 1-3/4-inch-thick glazed doors with minimum 0.125-inch-thick, extruded tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deep penetration and fillet welded or that incorporate concealed tie-rods.
1. Glazing Stops and Gaskets: Provide manufacturer's standard snap-on extruded-aluminum glazing stops and preformed gaskets.
 2. Stile Design: Medium stile; 4-inch nominal width.

- B. Brackets and Reinforcements: Provide manufacturer's standard brackets and reinforcements that are compatible with adjacent materials. Provide nonstaining, nonferrous shims for aligning system components.
- C. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
 - 1. Reinforce members as required to retain fastener threads.
 - 2. Do not use exposed fasteners, except for hardware application. For hardware application, use countersunk Phillips flat-head machine screws finished to match framing members or hardware being fastened, unless otherwise indicated.
- D. Weather Stripping: Manufacturer's standard replaceable weather stripping as follows:
 - 1. Compression Weather Stripping: Molded neoprene complying with ASTM D 2000 requirements or molded PVC complying with ASTM D 2287 requirements.
 - 2. Sliding Weather Stripping: Wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing complying with AAMA 701 requirements.

2.4 HARDWARE

- A. General: Provide heavy-duty hardware units indicated in sizes, number, and type recommended by manufacturer for entrances indicated. See Door Hardware section.
- B. Continuous gear hinges.

2.5 FABRICATION

- A. General: Fabricate components that, when assembled, will have accurately fitted joints with ends coped or mitered to produce hairline joints free of burrs and distortion. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.
 - 2. Fabricate components for screw-spline frame construction.
- B. Forming: Form shapes with sharp profiles, straight and free of defects or deformations, before finishing.
- C. Prepare components to receive concealed fasteners and anchor and connection devices.
- D. Fabricate components to drain water passing joints and condensation and moisture occurring or migrating within the system to the exterior.
- E. Glazing Channels: Provide minimum clearances for thickness and type of glass indicated according to FGMA's "Glazing Manual."

- F. Metal Protection: Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- G. Storefront: Fabricate framing in profiles indicated for flush glazing (without projecting stops). Provide subframes and reinforcing of types indicated or, if not indicated, as required for a complete, hurricane-resistant system. Factory assemble components to great extent possible. Disassemble components only as necessary for shipment and installation.
 - 1. Frame dimensions to be 2 1/2" x 5".
- H. Entrances: Fabricate door framing in profiles indicated. Reinforce as required to support imposed loads. Factory assemble door and frame units and factory install hardware to greatest extent possible. Reinforce door and frame units as required for installing hardware indicated. Cut, drill, and tap for factory-installed hardware before finishing components.
 - 2. Provide compression weatherstripping at fixed stops.

2.6 ALUMINUM FINISHES

- A. High-Performance Organic Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 1. Fluoropolymer Two-Coat System: Manufacturer's standard two-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2605.
 - a. Color and Gloss: To match existing.

2.7 STEEL PRIMING FOR STEEL REINFORCEMENT

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying primer.
- B. Surface Preparation: Perform manufacturer's standard cleaning operations to remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel.
- C. Priming: Apply manufacturer's standard corrosion-resistant primer immediately after surface preparation and pretreatment.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of entrance and storefront systems. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Comply with manufacturer's written instructions for protecting, handling, and installing storefront entrance systems. Do not install damaged components. Fit frame joints to produce hairline joints free of burrs and distortion. Rigidly secure nonmovement joints. Seal joints watertight.
- B. Metal Protection: Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose. 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 and condensation and moisture occurring or migrating within the system to the exterior.
- D. Set continuous sill members and flashing in a full sealant bed to provide weathertight construction, unless otherwise indicated.
- E. Install framing components plumb and true in alignment with established lines and grades without warp or rack of framing members.
- F. Install entrances plumb and true in alignment with established lines and grades without warp or rack. Lubricate operating hardware and other moving parts according to hardware manufacturers' written instructions.
 - 1. Install doors to produce weathertight enclosure and tight fit at weatherstripping.
 - 2. Install hardware according to manufacturer's written instructions using concealed fasteners to greatest extent possible.
- G. Install glazing to comply with requirements of Division 8 Section "Glazing," unless otherwise indicated.
- H. Install perimeter sealant, using compatible backer rod where indicated on drawings to produce weathertight installation.
- I. Erection Tolerances: Install entrance and storefront systems to comply with the following maximum tolerances:

2. Variation from Plane: Limit variation from plane or location shown to 1/8 inch in 12 feet; 1/4 inch over total length.
3. Alignment: Where surfaces abut in line, limit offset from true alignment to 1/16 inch. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch.
4. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch.

3.3 ADJUSTING AND CLEANING

- A. Adjust doors and hardware to provide tight fit at contact points and weather stripping, smooth operation, and weathertight closure.
- B. Remove excess sealant and glazing compounds, and dirt from surfaces.

3.4 PROTECTION

- A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure storefront entrance systems are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 084113

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes commercial door hardware for the following:
 - 1. Swinging doors.
 - 2. Sliding doors.
 - 3. Other doors to the extent indicated.
- B. Door hardware includes, but is not necessarily limited to, the following:
 - 1. Mechanical door hardware.
 - 2. Electromechanical door hardware.
 - 3. Cylinders specified for doors in other sections.
- C. Related Sections:
 - 1. Division 06 Section "Rough Carpentry".
 - 2. Division 06 Section "Finish Carpentry".
 - 3. Division 08 Section "Operations and Maintenance".
 - 4. Division 08 Section "Door Schedule".
 - 5. Division 08 Section "Hollow Metal Doors and Frames".
 - 6. Division 08 Section "Flush Wood Doors".
 - 7. Division 08 Section "Aluminum-Framed Entrances and Storefronts".
 - 8. Division 28 Section "Access Control Hardware Devices".
- D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
 - 1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
 - 2. ANSI/SDI A250.13 - Testing and Rating of Severe Windstorm Resistant Components for Swing Door Assemblies.
 - 3. ASTM E1886 - Test Method for Performance of Exterior Windows, Curtain Walls, Doors and Shutters Impacted by Missiles and Exposed to Cyclic Pressure Differentials.

4. ASTM E330 - Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure difference.
 5. ASTM E1996 - Standard specification for performance of exterior windows, curtain walls, doors and storm shutters impacted by Windborne Debris in Hurricanes.
 6. ICC/IBC - International Building Code.
 7. NFPA 70 - National Electrical Code.
 8. NFPA 80 - Fire Doors and Windows.
 9. NFPA 101 - Life Safety Code.
 10. NFPA 105 - Installation of Smoke Door Assemblies.
 11. TAS-201-94 - Impact Test Procedures.
 12. TAS-202-94 - Criteria for Testing Impact and Non-Impact Resistant Building Envelope Components using Uniform Static Air Pressure.
 13. State Building Codes, Local Amendments.
- E. Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:
1. ANSI/BHMA Certified Product Standards - A156 Series.
 2. UL10C - Positive Pressure Fire Tests of Door Assemblies.
 3. ANSI/UL 294 - Access Control System Units.
 4. UL 305 - Panic Hardware.
 5. ANSI/UL 437- Key Locks.

1.3 SUBMITTALS

- A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.
- B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
 2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
 3. Content: Include the following information:

- a. Type, style, function, size, label, hand, and finish of each door hardware item.
 - b. Manufacturer of each item.
 - c. Fastenings and other pertinent information.
 - d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
 - e. Explanation of abbreviations, symbols, and codes contained in schedule.
 - f. Mounting locations for door hardware.
 - g. Door and frame sizes and materials.
 - h. Warranty information for each product.
4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
- C. Shop Drawings: Details of electrified access control hardware indicating the following:
1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:
 - a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
 - b. Complete (risers, point-to-point) access control system block wiring diagrams.
 - c. Wiring instructions for each electronic component scheduled herein.
 2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.
- D. Proof of Qualification: Provide copy of manufacturer(s) Factory Trained Installer documentation indicating proof of status as a qualified installer of Windstorm assemblies.
- E. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.
- F. Informational Submittals:
1. Hurricane Resistant Openings (State of Florida): Within the State of Florida, provide copy of current State of Florida Product Approval or Metro-Dade County

Notice of Acceptance (NOA) as proof of compliance that doors, frames and hardware for exterior opening assemblies have been tested and approved for use at the wind load and design pressure level requirements specified for the Project.

- a. Hurricane Resistant Components (State of Florida): Within the State of Florida, provide copy of independent, third party certified listing to ANSI A250.13.
 2. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.
- G. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.

1.4 QUALITY ASSURANCE

- A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.
- B. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).
- C. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- D. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.
- E. Windstorm Assembly Installer Qualifications: Installers are to be factory trained for shop and field installation prior to project bid, and are responsible for commissioning, servicing, and warranting the installed equipment specified for the project. A pre-installation site inspection of the frame and floor conditions shall be conducted by the

factory trained installer prior to any Windstorm assembly hardware applied to the opening.

- F. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.
1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
 2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.
- G. Hurricane Resistant Exterior Openings (State of Florida including the High Velocity Hurricane Zone (HVHZ)): Provide exterior door hardware as complete and tested assemblies, or component assemblies, including approved doors and frames specified under Section 081113 "Hollow Metal Doors and Frames", to meet the wind loads, design pressures, debris impact resistance, and glass and glazing requirements as detailed in the current State of Florida building code sections applicable to the Project.
1. Each unit to bear third party permanent label in accordance with the Florida Building Code requirements.
- H. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.
- I. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:
1. Function of building, purpose of each area and degree of security required.
 2. Plans for existing and future key system expansion.
 3. Requirements for key control storage and software.
 4. Installation of permanent keys, cylinder cores and software.
 5. Address and requirements for delivery of keys.
- J. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.
1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
 2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.

3. Review sequence of operation narratives for each unique access controlled opening.
 4. Review and finalize construction schedule and verify availability of materials.
 5. Review the required inspecting, testing, commissioning, and demonstration procedures
- K. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedule.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.
- B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.
- C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.6 COORDINATION

- A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.
- B. Door Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.
- C. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.7 WARRANTY

- A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under

other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

- B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:
 - 1. Structural failures including excessive deflection, cracking, or breakage.
 - 2. Faulty operation of the hardware.
 - 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 4. Electrical component defects and failures within the systems operation.
- C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.
- D. Special Warranty Periods:
 - 1. Five years for standard duty cylindrical (bored) locks and latches.
 - 2. Five years for exit hardware.
 - 3. Five years for manual overhead door closer bodies.
 - 4. Twenty five years for manual overhead door closer bodies.
 - 5. Five years for motorized electric latch retraction exit devices.
 - 6. Two years for electromechanical door hardware.

1.8 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.
- B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:
 - 1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing

requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.

- C. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 HANGING DEVICES

- A. Hinges: ANSI/BHMA A156.1 certified butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.
1. Quantity: Provide the following hinge quantity:
 - a. Two Hinges: For doors with heights up to 60 inches.
 - b. Three Hinges: For doors with heights 61 to 90 inches.
 - c. Four Hinges: For doors with heights 91 to 120 inches.
 - d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.
 2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:
 - a. Widths up to 3'0": 4-1/2" standard or heavy weight as specified.
 - b. Sizes from 3'1" to 4'0": 5" standard or heavy weight as specified.
 3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:
 - a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
 - b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.
 4. Hinge Options: Comply with the following:
 - a. Non-removable Pins: With the exception of electric through wire hinges, provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.
 5. Manufacturers:
 - a. Hager Companies (HA).
 - b. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK).
 - c. Stanley Hardware (ST).

- B. Concealed Hinges: Hinges mortised into door and frame so that they are concealed when the door is closed. Hinges shall be adjustable three ways; vertically, horizontally and compression (in/out) capable of a 180 degree swing. Hinges are to be non-handed and available for hollow metal and steel covered composite fire doors rated up to 3 hours and for 20 minute wood core fire doors. Provide fastener type, size, and quantity as recommended by hinge manufacturer for properly installing concealed hinges in the door and frame type application. Provide steel receiver for metal door and frame cutouts for receiving concealed hinges.
1. Manufacturers:
 - a. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK).
- C. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 certified continuous geared hinge. with minimum 0.120-inch thick extruded 6060 T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs.
1. Manufacturers:
 - a. Hager Companies (HA).
 - b. Pemko Products; ASSA ABLOY Architectural Door Accessories (PE).
- D. Sliding and Folding Door Hardware: Hardware is to be of type and design as specified and should comply with ANSI/BHMA A156.14.
1. Bi-folding Door Hardware: Rated for door panels weighing up to 125 lb.
 2. Pocket Sliding Door Hardware: Rated for doors weighing up to 200 lb.
 3. Manufacturers:
 - a. Hager Companies (HA).
 - b. Pemko Products; ASSA ABLOY Architectural Door Accessories (PE).

2.3 POWER TRANSFER DEVICES

- A. Electrified Quick Connect Transfer Hinges: Provide electrified transfer hinges with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.
1. Manufacturers:
 - a. Hager Companies (HA) - ETW-QC (# wires) Option.

- b. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) - QC (# wires) Option.
 - c. Stanley Hardware (ST) - C Option.
 - B. Electrified Quick Connect Continuous Geared Transfer Hinges: Provide electrified transfer continuous geared hinges with a removable service panel cutout accessible without de-mounting door from the frame. Furnish with Molex™ standardized plug connectors with sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.
 1. Manufacturers:
 - a. Pemko Products; ASSA ABLOY Architectural Door Accessories (PE) - SER-QC (# wires) Option.
 - C. Electric Door Wire Harnesses: Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.
 1. Provide one each of the following tools as part of the base bid contract:
 - a. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) - Electrical Connecting Kit: QC-R001.
 - b. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) - Connector Hand Tool: QC-R003.
 2. Manufacturers:
 - a. Hager Companies (HA) - Quick Connect.
 - b. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) - QC-C Series.
 - c. Stanley Hardware (ST) - WH Series.

2.4 DOOR OPERATING TRIM

- A. Door Push Plates and Pulls: ANSI/BHMA A156.6 certified door pushes and pulls of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.

1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
4. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.
5. Manufacturers:
 - a. Hiawatha, Inc. (HI).
 - b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
 - c. Trimco (TC).

2.5 CYLINDERS AND KEYING

- A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.
- B. Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:
 1. Threaded mortise cylinders with rings and cams to suit hardware application.
 2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
 3. Bored or cylindrical lock cylinders with tailpieces as required to suit locks.
 4. Tubular deadlocks and other auxiliary locks.
 5. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
- C. Patented Cylinders: ANSI/BHMA A156.5, Grade 1 Certified Products Directory (CPD) listed cylinders employing a utility patented and restricted keyway requiring the use of a patented key. Cylinders are to be protected from unauthorized manufacture and distribution by manufacturer's United States patents.
 1. Patented key systems shall not be established with products that have an expired patent. Expired systems shall only be specified and supplied to support existing systems.
 2. Manufacturers:
 - a. Medeco (MC) - X4.
- D. Keying System: Each type of lock and cylinders to be factory keyed.

1. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.
2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
3. Existing System: Field verify and key cylinders to match Owner's existing system.

E. Key Quantity: Provide the following minimum number of keys:

1. Change Keys per Cylinder: Two (2)
2. Master Keys (per Master Key Level/Group): Five (5).
3. Construction Keys (where required): Ten (10).

F. Construction Keying: Provide construction master keyed cylinders.

G. Key Registration List (Bitting List):

1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
2. Provide transcript list in writing or electronic file as directed by the Owner.

2.6 KEY CONTROL

P. Electronic Key Management System: Provide an electronic key control system with Stand-alone Plug and Play features including advanced RFID technology. Touchscreen interface with PIN access for keys individually locked in place. Minimum 1,000 system users and 21 iFobs for locking receptors. System shall have a minimum 250,000 audit events screen displayed or ability to be exported via USB port.

1. Manufacturers:
 - a. Medeco (MC).
 - b. Traka (TA).

2.7 MECHANICAL LOCKS AND LATCHING DEVICES

A. Mortise Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed. Locksets are to be manufactured with a corrosion resistant steel case and be field-reversible for handing without disassembly of the lock body.

1. Where specified, provide status indicators with highly reflective color and wording for "locked/unlocked" or "vacant/occupied" with custom wording options if required. Indicator to be located above the cylinder with the inside thumb-turn not blocking the visibility of the indicator status. Indicator window size to be a minimum of 2.1" x 0.6" with a curved design allowing a 180 degree viewing angle with protective covering to prevent tampering.

2. Manufacturers:

- a. Corbin Russwin Hardware (RU) - ML2000 Series.
- b. Sargent Manufacturing (SA) - 8200 Series.
- c. Schlage (SC) - L9000 Series.

B. Cylindrical Locksets, Grade 2 (Standard Duty): ANSI/BHMA A156.2, Series 4000, Grade 2 Certified Products Directory (CPD) listed.

1. Locks are to be non-handed and fully field reversible.

2. Manufacturers:

- a. Corbin Russwin Hardware (RU) - CL3800 Series.
- b. Sargent Manufacturing (SA) - 7 Line.
- c. Schlage (SC) - ALX Series.

2.8 ELECTROMECHANICAL LOCKING DEVICES

2.9 AUXILIARY LOCKS

A. Mortise Deadlocks, Small Case: ANSI/BHMA A156.36, Grade 1, small case mortise type deadlocks constructed of heavy gauge wrought corrosion resistant steel. Steel or stainless steel bolts with a 1" throw and hardened steel roller pins. Deadlocks to be products of the same source manufacturer and keyway as other specified locksets.

1. Manufacturers:

- a. Corbin Russwin Hardware (RU) - DL4000 Series.
- b. Sargent Manufacturing (SA) - 4870 Series.
- c. Schlage (SC) - L460 Series.

2.10 LOCK AND LATCH STRIKES

A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.

B. Standards: Comply with the following:

1. Strikes for Mortise Locks and Latches: BHMA A156.13.
2. Strikes for Bored Locks and Latches: BHMA A156.2.
3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
4. Dustproof Strikes: BHMA A156.16.

2.11 CONVENTIONAL EXIT DEVICES

A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:

1. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
2. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer's catalog and template book for specific requirements.
3. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.
4. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.
5. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.
 - a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
 - b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.
6. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.
7. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2" wide stiles.
8. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.

9. Rail Sizing: Provide exit device rails factory sized for proper door width application.
 10. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.
 11. Hurricane and Tornado Resistance Compliance: Conventional exit devices are to be U.L. listed for windstorm assemblies where applicable. Provide the appropriate hurricane or tornado resistant products that have been independent third party tested, certified, and labeled to meet state and local windstorm building codes applicable to project.
- B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Exit device latch to be stainless steel, pullman type, with deadlock feature.
1. Manufacturers:
 - a. Corbin Russwin Hardware (RU) - ED4000 / ED5000 Series.
 - b. Sargent Manufacturing (SA) - 80 Series.
 - c. Von Duprin (VD) - 35A/98 XP Series.

2.12 ELECTROMECHANICAL EXIT DEVICES

- A. Electromechanical Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed panic and fire exit hardware devices subject to same compliance standards and requirements as mechanical exit devices. Electrified exit devices to be of type and design as specified below and in the hardware sets.
1. Energy Efficient Design: Provide devices which have a holding current draw of 15mA maximum, and can operate on either 12 or 24 volts. Locks are to be field configurable for fail safe or fail secure operation.
 2. Where conventional power supplies are not sufficient, include any specific controllers required to provide the proper inrush current.
 3. Motorized Electric Latch Retraction: Devices with an electric latch retraction feature must use motors which have a maximum current draw of 600mA. Solenoid driven latch retraction is not acceptable.
 4. Manufacturers:
 - a. Corbin Russwin Hardware (RU) - ED5000 Series.
 - b. Sargent Manufacturing (SA) - 80 Series.
 - c. Von Duprin (VD) - 35A/98 XP Series.

2.13 DOOR CLOSERS

- A. All door closers specified herein shall meet or exceed the following criteria:
1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers.
 2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
 3. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.
 4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
 5. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
 6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.
- B. Door Closers, Surface Mounted (Large Body Cast Iron): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control.
1. Manufacturers:
 - a. Corbin Russwin Hardware (RU) - DC8000 Series.
 - b. LCN Closers (LC) - 4040XP Series.
 - c. Norton Door Controls (NO) - 9500 Series.
 - d. Sargent Manufacturing (SA) - 281 Series.
- C. Door Closers, Overhead Concealed (Narrow Profile): ANSI/BHMA 156.4 Grade 1 Certified Products Directory (CPD) listed door closers designed for narrow profile frames and doors. Closers to have fully concealed body in the frame head for offset hung applications, with separate and independent valves for closing speed and backcheck adjustments and a decorative cover plate.
1. Manufacturers:

- a. LCN Closers (LC) - 2030 Series.
- b. Rixson Door Controls (RF) - 91DCP Series.

2.14 ARCHITECTURAL TRIM

A. Door Protective Trim

1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.
2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1" LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.
3. Where plates are applied to fire rated doors with the top of the plate more than 16" above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer's catalog and template book for specific requirements for size and applications.
4. Protection Plates: ANSI/BHMA A156.6 certified protection plates (kick, armor, or mop), fabricated from the following:
 - a. Stainless Steel: 300 grade, 050-inch thick.
5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.
6. Manufacturers:
 - a. Hiawatha, Inc. (HI).
 - b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
 - c. Trimco (TC).

2.15 DOOR STOPS AND HOLDERS

- A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.
- B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 certified door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.
 1. Manufacturers:

- a. Hiawatha, Inc. (HI).
- b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
- c. Trimco (TC).

2.16 ARCHITECTURAL SEALS

- A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.
- B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.
 1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.
- C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.
 1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NPFA 252, Standard Methods of Fire Tests of Door Assemblies.
- D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.
- E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.
- F. Manufacturers:
 1. National Guard Products (NG).
 2. Pemko Products; ASSA ABLOY Architectural Door Accessories (PE).
 3. Reese Enterprises, Inc. (RE).

2.17 FABRICATION

- A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.18 FINISHES

- A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.
- B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware
- C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

- A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.
- B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

- A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.
 - 1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.
- B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
 2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
 3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
 4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.
- C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
- D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."
- E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

- A. Field Inspection (Punch Report): Reference Division 01 Sections "Closeout Procedures". Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.
1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.
 2. Submit documentation of incomplete items in the following formats:
 - a. PDF electronic file.
 - b. Electronic formatted file integrated with the Openings Studio™ door opening management software platform.

3.5 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

- A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.
- B. Clean adjacent surfaces soiled by door hardware installation.
- C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

- A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SETS

- A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.
 - 1. Quantities listed are for each pair of doors, or for each single door.
 - 2. The supplier is responsible for handling and sizing all products.
 - 3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.
 - 4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.
- B. Manufacturer's Abbreviations:
 - 1. MK - McKinney
 - 2. PE - Pemko
 - 3. RO - Rockwood
 - 4. SA - SARGENT
 - 5. ET - Emtek
 - 6. MC - Medeco

Revised
Hardware Sets

Set: 1.0

Doors: A100C

Description: LOBBY PR - EAC

1 Continuous Hinge	CFMXXHD1		PE	
1 Continuous Hinge (Elec)	CFMXXHD1 SER		PE	⚡
1 Concealed Vert Rod Exit, Exit Only	43 AD8410 EO	US32D	SA	
1 Concealed Vert Rod Exit, Nightlatch	43 55 56 AD8410 106 x 862	US32D	SA	⚡
1 Medeco Cylinder	100200 H - M4 Key system	26	MC	
2 Concealed Closer	91N / PH91 - 90N [special template]	626	RF	
2 Door Stop	409 / 446 as required	US26D	RO	
1 Gasketing	by door / frame mfg			
1 ElectroLynx Harness	QC-C1500 [PS to hinge]		MK	⚡
1 ElectroLynx Harness	QC-CXXP [Lock / exit to hinge]		MK	⚡
1 Card Reader	SE RP40 / SE RP15 as req			⚡
1 Wiring Diagram	WD-SYSPK		SA	
2 Position Switch	DPS-M/W-WH (as required)		SU	⚡
1 Power Supply	AQLX-E1 - Size as required		SU	⚡

Set: 2.0

Doors: X106

Description: EXT ELEC - ALUM - EAC

1 Continuous Hinge	CFMXXHD1		PE	
1 Continuous Hinge (Elec)	CFMXXHD1 SER		PE	⚡
1 Concealed Vert Rod Exit, Exit Only	43 AD8410 EO	US32D	SA	
1 Concealed Vert Rod Exit, Nightlatch	8815 ETP	US32D	SA	⚡
1 Medeco Cylinder	100200 H - M4 Key system	26	MC	
2 Door Pull	BF168	US32D	RO	
2 Door Closer	281 CPS	EN	SA	
1 Threshold	2005AT MSES25SS		PE	
1 Gasketing	by door / frame mfg			
1 Rain Guard	346C x LAR		PE	

2 Sweep	3452AV	PE
1 ElectroLynx Harness	QC-C1500 [PS to hinge]	MK ⚡
1 ElectroLynx Harness	QC-CXXP [Lock / exit to hinge]	MK ⚡
1 Card Reader	SE RP40 / SE RP15 as req	⚡
1 Position Switch	DPS-M/W-WH (as required)	SU ⚡
1 Power Supply	AQLX-E1 - Size as required	SU ⚡

Notes: Hardware listed for design criteria, confirm with specific door manufacturer the hardware requirements to meet specified windstorm rating - Provide 3rd party test results for confirmation.

Set: 2.1

Doors: X107

Description: EXT EGRESS - HM - EAC

1 Continuous Hinge (Elec)	CFMXXHD1 SER	PE ⚡
1 Rim Exit Device, Storeroom	43 55 56 WS 8804 ETL	US32D SA ⚡
1 Medeco Cylinder	100200 H - M4 Key system	26 MC
1 Door Closer	281 CPS	EN SA
1 Kick Plate	K1050 10" X 2" LDW	US32D RO
1 Threshold	2005AT MSES25SS	PE
1 Gasketing	303AS	PE
1 Rain Guard	346C x LAR	PE
1 Sweep	3452AV	PE
1 ElectroLynx Harness	QC-C1500 [PS to hinge]	MK ⚡
1 ElectroLynx Harness	QC-CXXP [Lock / exit to hinge]	MK ⚡
1 Card Reader	SE RP40 / SE RP15 as req	⚡
1 Position Switch	DPS-M/W-WH (as required)	SU ⚡
1 Power Supply	AQLX-E1 - Size as required	SU ⚡

Notes: Hardware listed for design criteria, confirm with specific door manufacturer the hardware requirements to meet specified windstorm rating - Provide 3rd party test results for confirmation.

Door normally closed and secured.

Authorized credential retracts the latchbolt to allow free entry, door relocks upon closing. REX (request to exit) switch in device rail allow for free exit at all times. Entry by key override at all times. Door is fail secure

Set: 3.0

Doors: D109

Description: STOR - RATED - EAC

3 Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D MK
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1 Access Control Cyl Lock	IN120-10G77 BIPS MB LL - By security vendor	US26D	SA	⚡
1 Medeco Cylinder	100200 H - M4 Key system	26	MC	
1 Door Closer	281 Reg / PA	EN	SA	
1 Kick Plate	K1050 10" X 2" LDW	US32D	RO	
1 Door Stop	409 / 446 as required	US26D	RO	
1 Gasketing	S88D		PE	

Set: 4.0

Doors: B154

Description: STOR - RATED

3 Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK	
1 Storeroom Lock	LC 65G04 KL	US26D	SA	
1 Medeco Cylinder	100200 H - M4 Key system	26	MC	
1 Door Closer	281 Reg / PA	EN	SA	
1 Kick Plate	K1050 10" X 2" LDW	US32D	RO	
1 Door Stop	409 / 446 as required	US26D	RO	
1 Gasketing	S88D		PE	

Set: 5.0

Doors: A112, A115A, A132A, A192, B102, B122, B134, B134A, B138, D125, E108A

Description: CORR - EAC

3 Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK	
1 Access Control Rim Exit	43 IN120-8877 BIPS MB ETL - By security vendor	US32D	SA	⚡
1 Medeco Cylinder	100200 H - M4 Key system	26	MC	
1 Door Closer	281 Reg / PA	EN	SA	
1 Kick Plate	K1050 10" X 2" LDW	US32D	RO	
1 Door Stop	409 / 446 as required	US26D	RO	
3 Silencer	608		RO	

Set: 6.0

Doors: A113A, A197, B105, B127, B127A, B160, B160A, C137, D105A, D115, D116, D120, D126, D144, D148, E101, E101B, E114, E114A, E139, E139A

Description: OPEN OFFICE - EAC

3 Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK	
1 Access Control Cyl Lock	IN120-10G77 BIPS MB LL - By security vendor	US26D	SA	⚡
1 Medeco Cylinder	100200 H - M4 Key system	26	MC	
1 Door Closer	281 Reg / PA	EN	SA	
1 Kick Plate	K1050 10" X 2" LDW	US32D	RO	

1 Door Stop	409 / 446 as required	US26D	RO
3 Silencer	608		RO

Set: 7.0Doors: [E155](#)

Description: ELEC / IDF - EAC

3 Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Access Control Rim Exit	43 IN120-8877 BIPS MB ETL - By security vendor	US32D	SA ⚡
1 Medeco Cylinder	100200 H - M4 Key system	26	MC
1 Door Closer	281 Reg / PA	EN	SA
1 Door Stop	409 / 446 as required	US26D	RO
1 Gasketing	S88D		PE

Set: 8.0Doors: [D155A](#)

Description: IDF - EAC [OHS]

3 Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Access Control Rim Exit	43 IN120-8877 BIPS MB ETL - By security vendor	US32D	SA ⚡
1 Medeco Cylinder	100200 H - M4 Key system	26	MC
1 Door Closer	281 PS	EN	SA
1 Gasketing	S88D		PE

Set: 9.0Doors: [B122A](#), [B130](#), [B166](#)

Description: CORR

3 Hinge (heavy weight)	T4A3786 4-1/2" x 4-1/2"	US26D	MK
1 Rim Exit Device, Passage	43 8815 ETP	US32D	SA
1 Door Closer	281 Reg / PA	EN	SA
1 Kick Plate	K1050 10" X 2" LDW	US32D	RO
1 Door Stop	409 / 446 as required	US26D	RO
3 Silencer	608		RO

Set: 10.0Doors: [D133](#)

Description: MAIL - EAC

3 Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Access Control Cyl Lock	IN120-10G77 BIPS MB LL - By security vendor	US26D	SA ⚡

1 Medeco Cylinder	100200 H - M4 Key system	26	MC
1 Door Closer	281 Reg / PA	EN	SA
1 Kick Plate	K1050 10" X 2" LDW	US32D	RO
1 Door Stop	409 / 446 as required	US26D	RO
3 Silencer	608		RO

Set: 11.0Doors: [B153](#), [E145A](#)

Description: OPEN OFFICE

3 Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Office Lock	LC 65G05 KL	US26D	SA
1 Medeco Cylinder	100200 H - M4 Key system	26	MC
1 Door Closer	281 Reg / PA	EN	SA
1 Kick Plate	K1050 10" X 2" LDW	US32D	RO
1 Door Stop	409 / 446 as required	US26D	RO
3 Silencer	608		RO

Set: 12.0Doors: [D103](#)

Description: NOT USED

1 Cased open	No hardware required		
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Set: 13.0Doors: [B161C](#), [D101](#), [D101A](#)

Description: BREAK

3 Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Passage Latch	65U15 KL	US26D	SA
1 Door Closer	281 Reg / PA	EN	SA
1 Kick Plate	K1050 10" X 2" LDW	US32D	RO
1 Door Stop	409 / 446 as required	US26D	RO
3 Silencer	608		RO

Set: 14.0Doors: [C128](#)

Description: PRINT

3 Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Passage Latch	65U15 KL	US26D	SA
1 Door Closer	281 PS	EN	SA
1 Kick Plate	K1050 10" X 2" LDW	US32D	RO
3 Silencer	608		RO

Set: 15.0

Doors: C140

Description: FITNESS

3 Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Pull Plate	BF 110 x 70C	US32D	RO
1 Push Plate	70C	US32D	RO
1 Door Closer	281 Reg / PA	EN	SA
1 Kick Plate	K1050 10" X 2" LDW	US32D	RO
1 Door Stop	409 / 446 as required	US26D	RO
3 Silencer	608		RO

Set: 16.0

Doors: D122, D159, E136, E142

Description: OFFICE - EAC

3 Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Access Control Cyl Lock	IN120-10G77 BIPS MB LL - By security vendor	US26D	SA ⚡
1 Medeco Cylinder	100200 H - M4 Key system	26	MC
1 Door Closer	281 Reg / PA	EN	SA
1 Kick Plate	K1050 10" X 2" LDW	US32D	RO
1 Door Stop	409 / 446 as required	US26D	RO
1 Gasketing	S88D		PE
1 Sweep	29326CNB		PE

Set: 17.0

Doors: A221, B173, C142, E108

Description: SGL - EAC

3 Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Access Control Cyl Lock	IN120-10G77 BIPS MB LL - By security vendor	US26D	SA ⚡
1 Medeco Cylinder	100200 H - M4 Key system	26	MC
1 Door Closer	281 Reg / PA	EN	SA
1 Kick Plate	K1050 10" X 2" LDW	US32D	RO
1 Door Stop	409 / 446 as required	US26D	RO
3 Silencer	608		RO

Set: 18.0

Doors: A172, B141, E106, E170

Description: STOR

3 Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Storeroom Lock	LC 65G04 KL	US26D	SA
1 Door Stop	409 / 446 as required	US26D	RO
3 Silencer	608		RO

Set: 19.0

Doors: C144, E171

Description: JAN

3 Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Storeroom Lock	LC 65G04 KL	US26D	SA
1 Mop Plate	K1050 4" X 1" LDW	US32D	RO
1 Door Stop	409 / 446 as required	US26D	RO
1 Gasketing	S88D		PE

Set: 20.0

Doors: A107, A122, A127, A128, A129, A142, A145, A146, A153, A154, A155, A184, A185, A196, A207, A219, B111, B112, B114, B115, B116, B117, B118, B119, B120, B123, B123A, B139, B140, B143, B144, B145, B146, B147, B148, B151, B165, B170, C106, C113, C117, C118, C123, C124, C125, C135, C151, D107, D113, D114, D117, D118, D119, D121, D123, D124, D131, D134, D137, D139, D145, D146, D153, D154, D160, E107, E109, E110, E113, E115, E116, E117, E118, E119, E120, E121, E124, E125, E129, E130, E131, E137, E138, E140, E141, E143, E144, E148, E149, E150, E151, E152, E153

Description: OFFICE

3 Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Office Lock	LC 65G05 KL	US26D	SA
1 Door Stop	409 / 446 as required	US26D	RO
3 Silencer	608		RO

Set: 21.0

Doors: A100A

Description: WORK

3 Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Classroom Lock	LC 65G37 KL	US26D	SA
1 Door Stop	409 / 446 as required	US26D	RO
3 Silencer	608		RO

Set: 22.0

Doors: A173, A174, A176, A177, B164, B168, B171, C120, C121, C122, C141A, C141B, C141C, C143, C145, C156, C157, C158, D141, D142, D143, D156, D157, E103, E104, E122, E123, E126, E128, E133, E134

Description: TOILET

3 Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Privacy Lock	V21 8265 LNL	US26D	SA
1 Mop Plate	K1050 4" X 1" LDW	US32D	RO
1 Door Stop	409 / 446 as required	US26D	RO
1 Gasketing	S88D		PE
1 Sweep	29326CNB		PE

Set: 22.1

Doors: B155, B155A

Description: LACTATION

3 Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Dormitory/Exit Lock	V21 8225 LNL	US26D	SA
1 Mop Plate	K1050 4" X 1" LDW	US32D	RO
1 Door Stop	409 / 446 as required	US26D	RO
1 Gasketing	S88D		PE
1 Sweep	29326CNB		PE

Notes: Coordinate hardware requirements with existing door / frame. Verify lock functions and hardware compatibility prior to ordering any hardware

Set: 23.0

Doors: A119, A203, B128, B129, B131, B142, B166A, B166B, B172, B172A, C109, D108, D138, D147, D149, D150, D151, D152, D155, D155B, E100, E106A, E112, E146, E147

Description: CONF / INTERVIEW

3 Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK
1 Passage Latch	65U15 KL	US26D	SA
1 Door Stop	409 / 446 as required	US26D	RO
3 Silencer	608		RO

Set: 24.0

Doors: A100B

Description: WORK [BLIND DOOR]

3 Hinge, Concealed	MK80A	Satin	MK
		Chrome	
1 Edge Pull	RM754 4"	US32D	RO
1 Mortise Deadlock	4875	US26D	SA
3 Silencer	608		RO

Set: 25.0

Doors: B173A, C106A

Description: POCKET DOOR

1 Pocket Door Hdwe	PF28200A		PE
1 Pocket door lock (Keyed)	2113	US15	ET
1 Passage	XGT - 205 - PD9610 - A	630	XX

Notes: advise if locking is require - does latch need to meet ADA

Set: 26.0

Doors: C109A

Description: CLOSET - BI-FOLD

1 Bi-fold Door set	HF4/100A/XX		PE
1 Pull	RM1200-6	US32D	RO

Set: 27.0

Doors: B167

Description: CASSED OPEN

1 Cased open	No hardware required		
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Set: 28.0

Doors: A113

Description: EXISTING - EAC

1 Access Control Cyl Lock	IN120-10G77 BIPS MB LL - By security vendor	US26D	SA ⚡
1 Medeco Cylinder	100200 H - M4 Key system	26	MC
1 Existing - Balance	Balance of Existing Hardware to Remain		

Notes: Coordinate hardware requirements with existing door / frame. Clean and repair as necessary - advise architect if hardware needs to be replaced

Set: 29.0

Doors: A101, A102, A103, A104, A105, A106, A108, A109, A110, A111, A114, A116, A116A, A117, A120, A121, A124, A125, A130, A131, A135, A136, A137, A141, A143, A144, A147, A148, A150A, A151, A152, A156, A157, A158, A159, A160, A161, A162, A163, A164, A165, A166, A167, A168, A169, A170, A175, A178, A179, A180, A180A, A181, A182, A189, A190, A190A, A193, A194, A195, A198, A199, A201, A202A, A205, A206, A208, A211, A212, A213, A214, A214A, A215, A216, A217, A218, A220, A220A, B100, B106, B108, B109, B135, B136, B137, B149, B150, B161, B161A, B161B, B162, B163, B169, C100, C101, C102, C103, C104, C105, C108, C110, C111, C114A, C115, C129, C130, C131, C132, C133, C134, C138, C141, C146, C147, C148, C150, C152, C154, C155, C159, D102, D104, D111, D112, D113A, D127,

D128, D129, D130, D132, D133A, D135, D136, E145, E145B, X101, X102, X103, X104, X105, X108, X109

Description: EXISTING

1 ETR

All Existing Hardware to Remain

Notes: Coordinate hardware requirements with existing door / frame. Clean and repair as necessary - advise architect if hardware needs to be replaced

Set: 30.0

Doors: MISC

Description: MISC

1 Key Management System

T21

TA

SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes glazing for the following products, including those specified in other Sections where glazing requirements are specified by reference to this Section:
 - 1. Window units.
 - 2. Vision lites.
 - 3. Storefronts, storefront entrances, and other doors.
 - 4. Fixed glass interior windows.

1.3 DEFINITIONS

- A. Manufacturer is used in this Section to refer to a firm that produces primary glass or fabricated glass as defined in the referenced glazing standard.

1.4 SUBMITTALS

- A. General: Submit the following according to Conditions of Contract and Division 1 Specification Sections.
- B. Product data for each glass product and glazing material indicated.
- C. Samples for verification purposes of 12-inch square samples of each type of glass indicated except for clear monolithic glass products, and 12-inch long samples of each color required (except black) for each type of sealant or gasket exposed to view. Install sealant or gasket sample between two strips of material representative in color of the adjoining framing system.
- D. Product certificates signed by glazing materials manufacturers certifying that their products comply with specified requirements.
 - 1. Separate certifications are not required for glazing materials bearing manufacturer's permanent labels designating type and thickness of glass, provided labels represent a quality control program of a recognized certification agency or independent testing agency acceptable to authorities having jurisdiction.

1.5 QUALITY ASSURANCE

- A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, except where more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
 - 1. FGMA Publications: "FGMA Glazing Manual."
- B. Safety Glass: Products complying with ANSI Z97.1 and testing requirements of 16 CFR Part 1201 for Category II materials.
 - 1. Subject to compliance with requirements, provide safety glass permanently marked with certification label of Safety Glazing Certification Council (SGCC) or other certification agency acceptable to authorities having jurisdiction.
- C. Fire-Resistive Glazing Products for Door Assemblies: Products identical to those tested per ASTM E 152, labeled and listed by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
- D. Fire-Resistive Glazing Products for Window Assemblies: Products identical to those tested per ASTM E 163, labeled and listed by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
- E. Glazier Qualifications: Engage an experienced glazier who has completed glazing similar in material, design, and extent to that indicated for Project with a record of successful in-service performance.
- F. Single-Source Responsibility for Glass: Obtain glass from one source for each product indicated below:
 - 1. Primary glass of each (ASTM C 1036) type and class indicated.
 - 2. Heat-treated glass of each (ASTM C 1048) condition indicated.
- G. Single-Source Responsibility for Glazing Accessories: Obtain glazing accessories from one source for each product and installation method indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials to comply with manufacturer's directions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.7 PROJECT CONDITIONS

- A. Environmental Conditions: Do not proceed with glazing when ambient and substrate temperature conditions are outside the limits permitted by glazing materials manufacturer or when glazing channel substrates are wet from rain, frost, condensation, or other causes.

PART 2 - PRODUCTS

2.1 PRIMARY FLOAT GLASS PRODUCTS

- A. Float Glass: ASTM C 1036, Type I (transparent glass, flat), and Quality q3 (glazing select).

2.2 HEAT-TREATED FLOAT GLASS

- A. Uncoated, Clear, Heat-Treated Float Glass: ASTM C 1048, Condition A (uncoated surfaces), Type I (transparent glass, flat), Class 1 (clear), Quality q3 (glazing select), kind as indicated below, 1/4" thick:

1. Kind FT (fully tempered) in the following locations:
 - a. Interior door vision panels in doors in non fire-rated openings.
 - b. Interior windows in non fire-rated openings.
 - c. Glass is noted as glazing Type A (gasketed frames) on drawings.
2. Manufacturers: Subject to compliance with requirements, provide heat-treated glass by one of the following companies.
 - a. AFG Industries, Inc.
 - b. Ford Glass Division
 - c. Guardian Industries Corp.
 - d. HGP & Affiliates, Inc.
 - e. Pilkington LOF
 - f. PPG Industries, Inc.
 - g. Saint-Gobain
 - h. Viracon, Inc.

2.3 INSULATING GLASS

- A. Impact Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190.

1. Exterior storefronts, entrances, and window products:
 - a. Basis of Design is 1" Gray Impact Insulated W/ Solarban 70XL #2 Surface;
 - 3/16" Gray Tempered W/ Solarban 70XL #2 Surface
 - 7/16" air space – argonfilled
 - 3/16" Clear H.S.
 - .090 PVB
 - 3/16" Clear H.S.

2. Glass is noted as glazing Type B on drawings.

2.4 ELASTOMERIC GLAZING SEALANTS

- A. General: Provide products of type indicated, complying with the following requirements:
 1. Compatibility: Select glazing sealants and tapes of proven compatibility with other materials they will contact, including glass products, seals of insulating glass units, and glazing channel substrates, under conditions of installation and service, as demonstrated by testing and field experience.
 2. Suitability: Comply with sealant and glass manufacturer's recommendations for selecting glazing sealants and tapes that are suitable for applications indicated and conditions existing at time of installation.
 3. Colors: Provide color of exposed joint sealants to comply with the following:
 - a. Provide selections made by Architect from manufacturer's full range of standard colors for products of type indicated.
- B. Elastomeric Glazing Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealants that comply with ASTM C 920 requirements.

2.6 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tape: Preformed, butyl-based elastomeric tape with a solids content of 100 percent, nonstaining and nonmigrating in contact with nonporous surfaces, with or without spacer rod as recommended by tape and glass manufacturers for application indicated, packaged on rolls with a release paper backing, and complying with AAMA 800.
- B. Expanded Cellular Glazing Tape: Closed-cell, polyvinyl chloride foam tape, factory coated with adhesive on both surfaces, packaged on rolls with release liner protecting adhesive, and complying with AAMA 800 for product 810.5.

2.7 GLAZING GASKETS

- A. Lock-Strip Gaskets: Neoprene extrusions in size and shape indicated, fabricated into frames with molded corner units and zipper lock strips, complying with ASTM C 542, black.
- B. Dense Compression Gaskets: Molded or extruded gaskets of material indicated below, complying with standards referenced with name of elastomer indicated below, and of profile and hardness required to maintain watertight seal:
 1. Neoprene, ASTM C 864.
 2. EPDM, ASTM C 864.
 3. Silicone, ASTM C 1115.
 4. Thermoplastic polyolefin rubber, ASTM C 1115.

5. Any material indicated above.
- C. Soft Compression Gaskets: Extruded or molded closed-cell, integral-skinned gaskets of material indicated below, complying with ASTM C 509, Type II, black, and of profile and hardness required to maintain watertight seal:
1. Neoprene.
 2. EPDM.
 3. Silicone.
 4. Thermoplastic polyolefin rubber.
 5. Any material indicated above.

2.8 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials involved for glazing application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers and Sealers: Type recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore A durometer hardness of 85 plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions with a Shore 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).

2.9 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS

- A. Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with recommendations of product manufacturer and referenced glazing standard as required to comply with system performance requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine glass framing, with glazier present, for compliance with the following:
 1. Manufacturing and installation tolerances, including those for size, squareness, offsets at corners.
 2. Presence and functioning of weep system where required.
 3. Minimum required face or edge clearances.

4. Effective sealing between joints of glass-framing members.

B. Do not proceed with glazing until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings that are not firmly bonded to substrates.

3.3 GLAZING, GENERAL

A. Comply with combined recommendations of manufacturers of glass, sealants, gaskets, and other glazing materials, except where 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 from edge damage during handling and installation as follows:

1. Use a rolling block in rotating glass units to prevent damage to glass corners. Do not impact glass with metal framing. Use suction cups to shift glass units within openings; do not raise or drift glass with a pry bar. Rotate glass lites with flares or bevels on bottom horizontal edges so edges are located at top of opening, unless otherwise indicated by manufacturer's label.

2. Remove damaged glass from Project site and legally dispose of off site. Damaged glass is glass with edge damage or other imperfections that, when installed, weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.

E. Install elastomeric setting blocks in sill rabbets, sized and located to comply with referenced glazing standard, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide spacers for glass sizes larger than 50 unites inches (length plus height) as follows:

1. Locate spacers inside, outside, and directly opposite each other. Install correct size and spacing to preserve required face clearances, except where gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and comply with system performance requirements.

2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

- H. Provide edge blocking to comply with requirements of referenced glazing publications, unless otherwise required by glass manufacturer.
- I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- J. Square cut wedge-shaped gaskets at corners and install gaskets in manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 TAPE GLAZING

- A. Position tapes on fixed stops so that when compressed by glass their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously but not in one continuous length. Do not stretch tapes to make them fit opening.
- C. Where framing joints are vertical, cover these joints by applying tapes to heads and sills first and then to jambs. Where framing joints are horizontal, cover these joints by applying tapes to jambs and then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until just before each lite is installed.
- F. Center glass lites in openings on setting blocks and press firmly against tape 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.

3.5 GASKET GLAZING (DRY)

- A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with stretch allowance during installation.
- B. Secure compression gaskets in place with joints located at corners to compress gaskets producing a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- C. Install gaskets so they protrude past face of glazing stops.

3.6 SEALANT GLAZING (WET)

- A. Install continuous spacers between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel weep systems until

sealants cure. Secure spacers in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass. Install pressurized gaskets to protrude slightly out of channel to eliminate dirt and moisture pockets.

3.7 PROTECTION AND CLEANING

- A. Protect exterior glass from breakage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.
- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for build-up of dirt, scum, alkali deposits, or stains, and remove as recommended by glass manufacturer.
- D. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents and vandalism, during construction period.
- E. Wash glass on both faces in each area of Project not more than 4 days prior to date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.

END OF SECTION 088000

SECTION 092900 - GYPSUM BOARD ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Nonload-bearing steel framing members for gypsum board assemblies.
 - 2. Gypsum board assemblies attached to steel framing.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 7 Section "Building Insulation" for sound attenuation insulation.

1.3 DEFINITIONS

- A. Gypsum Board Construction Terminology: Refer to ASTM C 11 and GA-505 for definitions of terms for gypsum board assemblies not defined in this Section or in other referenced standards.

1.4 ASSEMBLY PERFORMANCE REQUIREMENTS

- A. Sound Transmission Characteristics: For gypsum board assemblies with STC ratings, provide materials and construction identical to those of assemblies whose STC ratings were determined according to ASTM E 90 and classified according to ASTM E 413 by a qualified independent testing agency.
- B. Fire Resistance: Provide gypsum board assemblies with fire-resistance ratings indicated.

1.5 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data for each type of product specified.

1.6 QUALITY ASSURANCE

- A. Single-Source Responsibility for Steel Framing: Obtain steel framing members for gypsum board assemblies from a single manufacturer, unless otherwise indicated.
- B. Single-Source Responsibility for Panel Products: Obtain each type of gypsum board and other panel products from a single manufacturer.
- C. 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.
- D. Fire-Test-Response Characteristics: Where fire-resistance-rated gypsum board assemblies are indicated, provide gypsum board assemblies that comply with the following requirements:
 - 1. Fire-Resistance Ratings: As indicated by GA File Numbers in GA-600 "Fire Resistance Design Manual" or design designations in UL "Fire resistance Directory" or in the listing of another testing and inspecting agency acceptable to authorities having jurisdiction.
 - 2. Gypsum board assemblies indicated are identical to assemblies tested for fire resistance according to ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.
- B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Neatly stack gypsum panels flat to prevent sagging.

1.8 PROJECT CONDITIONS

- A. Environmental Conditions, General: Establish and maintain environmental conditions for applying and finishing gypsum board to comply with ASTM C 840 requirements or gypsum board manufacturer's recommendations, whichever are more stringent.
- B. Room Temperatures: For nonadhesive attachment of gypsum board to framing, maintain not less than 40 deg F. For adhesive attachment and finishing of gypsum board, maintain not less than 50 deg F for 48 hours before application and continuously after until dry. Do not exceed 95 deg F when using temporary heat sources.
- C. Ventilation: Ventilate building spaces as required to dry joint treatment materials. Avoid drafts during hot, dry weather to prevent finishing materials from drying too rapidly.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Steel Framing and Furring:
 - a. Clark Steel Framing, Inc.
 - b. Consolidated Systems, Inc.
 - c. Dale Industries, Inc.
 - d. Dietrich Industries, Inc.
 - e. Marino/Ware (formerly Marino Industries Corp.).
 - f. National Gypsum Co.; Gold Bond Building Products Division.
 - g. Unimast, Inc.
 2. Grid Suspension Assemblies:
 - a. Armstrong World Industries, Inc.
 - b. Chicago Metallic Corp.
 - c. USG Interiors, Inc.
 3. Gypsum Board and Related Products:
 - a. American Gypsum Co.
 - b. Georgia-Pacific Corp.
 - c. National Gypsum Co.; Gold Bond Building Products Division.
 - d. United States Gypsum Co.

2.2 STEEL FRAMING COMPONENTS FOR SUSPENDED AND FURRED CEILINGS

- A. General: Provide components complying with ASTM C 754 for conditions indicated.
- B. Grid Suspension System for Interior Ceilings: ASTM C 645, manufacturer's standard direct-hung grid suspension system composed of main beams and cross-furring members that interlock to form a modular supporting network.

2.3 STEEL FRAMING FOR WALLS AND PARTITIONS

- A. General: Provide steel framing members complying with the following requirements:
1. Protective Coating: ASTM A 653, G 40 hot-dip galvanized coating.
- B. Steel Studs and Runners: ASTM C 645, with flange edges of studs bent back 90 degrees and doubled over to form 3/16-inch-wide minimum lip (return), and complying with the following requirements for minimum thickness of base (uncoated) metal and for depth:
1. Thickness: 0.0179 inch (25 gage) unless otherwise indicated.
 2. Thickness: 0.0329 inch, (20 gauge) as follows:

- a. For head runner, sill runner, jamb, and cripple studs at door and other openings.
 - b. At partitions all around shower stalls.
3. Depth: 3 5/8" unless otherwise indicated on drawings.
- C. Deflection Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of structure while maintaining continuity of fire-resistance-rated and/or sound-rated assembly indicated on drawings in thickness not less than indicated for studs and in width to accommodate depth of studs.
1. Provide wherever full height partition framing extends to roof structure above.
- D. Fasteners for Metal Framing: Provide fasteners of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel framing and furring members securely to substrates involved; complying with the recommendations of gypsum board manufacturers for applications indicated.

2.4 GYPSUM BOARD PRODUCTS

- A. General: Provide gypsum board of types indicated in maximum lengths available that will minimize end-to-end butt joints in each area indicated to receive gypsum board application.
1. Widths: Provide gypsum board in widths of 48 inches.
- B. Gypsum Wallboard: ASTM C 1396 and as follows:
1. Type: Type X where required for fire-resistance-rated assemblies.
 2. Edges: Tapered.
 3. Thickness: 5/8 inch unless otherwise indicated on drawings.
 4. Type: Sag-resistant for ceiling surfaces ("ceiling board") 1/2 " thick
- C. Glass-Mat, Water-Resistant Gypsum Backing Board: ASTM C 1178, of type and thickness indicated below for installation at shower stalls:
1. Type and Thickness: Regular, 5/8 inch thick, unless otherwise indicated.
 2. Products: Subject to compliance with requirements, provide "Dens-ShieldTile Backer" manufactured by G-P Gypsum Corp.
- D. Paperless Drywall Panels: ASTM C 1396 and ASTM C 1177/C, for installation in Toilet Rooms only, except behind tile at shower stalls:
1. Type and thickness: Regular, 5/8" thick with moisture and mold resistant core and surfaces.
 2. Facing: Coated, glass mat.
 3. Product: Subject to compliance with requirements, provide "DensArmor Plus Paperless Interior Panel" panels manufactured by G-P Gypsum Corp.

2.5 TRIM ACCESSORIES

- A. Accessories for Interior Installation: Cornerbead, edge trim, and control joints complying with ASTM C 1047 and requirements indicated below:
1. Material: Formed metal complying with the following requirement:
 - a. Steel sheet zinc coated by hot-dip process or rolled zinc.
 2. Shapes indicated below by reference to Fig. 1 designations in ASTM C 1047:
 - a. Cornerbead on outside corners, unless otherwise indicated.
 - b. J-bead with both face and back flanges; face flange formed to receive joint compound. Use J-beads for edge trim, unless otherwise indicated.
 - c. One-piece control joint formed with V-shaped slot and removable strip covering slot opening.
- B. Accessory for Curved Edges: Cornerbead formed of metal with either notched or flexible flanges that are bendable to curvature radius.

2.6 JOINT TREATMENT MATERIALS

- A. General: Provide joint treatment materials complying with ASTM C 475 and the recommendations of both the manufacturers of sheet products and of joint treatment materials for each application indicated.
- B. Joint Tape for Gypsum Board: Paper reinforcing tape, unless otherwise indicated.
- C. Joint Tape for Glass Mat, Water-Resistant Gypsum Backer Units and Paperless Drywall: 2" 10 x 10 glass mesh tape embedded in setting compound recommended by panel manufacturer.
- D. Drying-Type Joint Compounds for Gypsum Board: Factory-packaged vinyl-based products complying with the following requirements for formulation and intended use.
1. Ready-Mixed Formulation: Factory-mixed product.
 - a. All-purpose compound formulated for both taping and topping compounds.

2.7 ACOUSTICAL SEALANT

- A. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 and the following requirements:
1. Product is effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

- B. Acoustical Sealant for Exposed and Concealed Joints:
 - a. PL Acoustical Sealant; ChemRex, Inc.; Contech Brands.
 - b. AC-20 FTR Acoustical and Insulation Sealant; Pecora Corp.
 - c. SHEETROCK Acoustical Sealant; United States Gypsum Co.

2.8 MISCELLANEOUS MATERIALS

- A. General: Provide auxiliary materials for gypsum board construction that comply with referenced standards and recommendations of gypsum board manufacturer.
- B. Spot Grout: ASTM C 475, setting-type joint compound recommended for spot-grouting hollow metal door frames.
- C. Steel drill screws complying with ASTM C 954 for fastening gypsum board to steel members from 0.033 to 0.112 inch thick.
- D. Ready-Mixed Texture Compound: Type required for spray application of orange peel texture to all gypsum board walls.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates to which gypsum board assemblies attach or abut, installed hollow metal frames, cast-in-anchors, and structural framing, with installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of assemblies specified in this Section. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Ceiling Anchorages: Coordinate installation of ceiling suspension systems with installation of overhead structural assemblies to ensure that inserts and other provisions for anchorages to building structure have been installed to receive ceiling hangers that will develop their full strength and at spacing required to support ceilings.

3.3 INSTALLING STEEL FRAMING, GENERAL

- A. Steel Framing Installation Standard: Install steel framing to comply with ASTM C 754 and with ASTM C 840 requirements that apply to framing installation.
- B. Install supplementary framing, blocking, and bracing at terminations in gypsum board assemblies to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, door bumpers, furnishings, or similar construction. Comply with details

indicated and with recommendations of gypsum board manufacturer or, if none available, with United States Gypsum Co.'s "Gypsum Construction Handbook."

3.4 INSTALLING STEEL FRAMING FOR SUSPENDED AND FURRED CEILINGS

A. Suspend ceiling hangers from building 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 structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with the location of hangers required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
3. Secure wire hangers by looping and wire-typing, either directly to structures or to inserts, eyescrews, or other devices and fasteners that are secure and appropriate for structure as well as for type of hanger involved, and in a manner that will not cause them to deteriorate or otherwise fail.
4. Secure flat, angle, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eyescrews, or other devices and fasteners that are secure and appropriate for structure as well as for type of hanger involved, and in a manner that will not cause them to deteriorate or otherwise fail.
5. Do not support ceilings directly from permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
6. Do not attach hangers to steel deck tabs.
7. Do not attach hangers to steel roof deck. Attach hangers to structural members.
8. Do not connect or suspend steel framing from ducts, pipes, or conduit.

B. Install suspended steel framing components in sizes and at spacings indicated, but not less than that required by the referenced steel framing installation standard.

1. Wire Hangers: 48 inches o.c.
2. Main Tees: 48 inches o.c.
3. Cross Channels 24 inches o.c.
4. Cross Tees: As required for installation of recessed fluorescent light fixtures.

C. Installation Tolerances: Install steel framing components for suspended ceilings so that grid suspension members are level to within 1/8 inch in 12 feet as measured both lengthwise on each member and transversely between parallel members.

D. Grid Suspension System: Attach perimeter wall track or angle where grid suspension system meets vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

3.5 INSTALLING STEEL FRAMING FOR WALLS AND PARTITIONS

- A. Install runners (tracks) at floors, ceilings, and structural walls and columns where gypsum board stud assemblies abut other construction.
 - 1. Where studs are installed directly against exterior walls, install asphalt felt strips or foam gaskets between studs and wall.
- B. Installation Tolerances: Install each steel framing and furring member so that fastening surfaces do not vary more than 1/8 inch from the plane formed by the faces of adjacent framing.
- C. Extend partition framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.
 - 1. For STC-rated and fire-resistance-rated partitions that extend to the underside of floor/roof slabs and decks or other continuous solid structural surfaces to obtain ratings, install framing around structural and other members extending below floor/roof slabs and decks, as needed, to support gypsum board closures needed to make partitions continuous from floor to underside of solid structure.
- D. Terminate partition framing at suspended ceilings where indicated.
- E. Install steel studs and furring in sizes and at spacings indicated.
 - 1. Single-Layer Construction: Space studs 16 inches o.c., unless otherwise indicated.

3.6 APPLYING AND FINISHING GYPSUM BOARD, GENERAL

- A. Gypsum Board Application and Finishing Standards: Install and finish gypsum panels to comply with ASTM C 840 and GA-216.
- 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 board panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in the central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- D. Install gypsum panels with face side out. Do not install imperfect, damaged, or damp panels. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
- E. Locate both edge or end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Avoid joints other than control joints at corners of framed openings where possible.

- F. Attach gypsum panels to steel studs so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- G. Attach gypsum panels to framing provided at openings and cutouts.
- H. Form control and expansion joints at locations indicated and as detailed, with space between edges of adjoining gypsum panels, as well as supporting framing behind gypsum panels.
- I. Cover both faces of steel stud partition framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases that are braced internally.
 - 1. Except where concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
 - 2. Fit gypsum panels around ducts, pipes, and conduits.
 - 3. Where partitions intersect open concrete coffers, concrete joists, and other structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by coffers, joists, and other structural members; allow 1/4 - to 3/8-inch wide joints to install sealant.
- J. Isolate perimeter of nonload-bearing gypsum board partitions at structural abutments, except floors, as detailed. Provide 1/4- to 1/2-inch wide spaces at these locations and trim edges with U-bead edge trim where edges of gypsum panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- K. Where STC-rated gypsum board assemblies are indicated, seal construction at perimeters, behind control and expansion joints, openings, and penetrations with a continuous bead of acoustical sealant including a bead at both faces of the partitions. Comply with ASTM C 919 and manufacturer's recommendations for location of edge trim and closing off sound-flanking paths around or through gypsum board assemblies, including sealing partitions above acoustical ceilings.
 - 1. Sealing of penetrations in sound walls which are identified as also being fire-rated or smoke-resistant is the work of Section 07840. Fire and smoke requirements take precedence.
- L. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's recommendations.
 - 1. Space screws a maximum of 12 inches o.c. for vertical applications.
- M. Space fasteners in panels that are tile substrates a maximum of 8 inches o.c.
- N. Sealing of perimeters of and penetrations through fire-rated or smoke-resistant assemblies is the work of Section 07840.
- O. Identify rated walls above ceilings with the note "fire and smoke barrier-protect all openings", complying with requirements of local jurisdictions.

3.7 GYPSUM BOARD APPLICATION METHODS

- A. Single-Layer Application: Install gypsum wallboard panels as follows:
1. On ceilings, apply gypsum panels prior to wall/partition board application to the greatest extent possible and at right angles of framing, unless otherwise indicated.
 2. On partitions/walls, apply gypsum panels vertically (parallel to framing), unless otherwise indicated, and provide panel lengths that will minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of board.
- B. Wall Tile Substrates: For substrates indicated to receive ceramic tile, comply with the following:
1. Install glass-mat, water resistant gypsum backing board panels to comply with manufacturer's installation instructions at showers. Install with ¼ -inch open space where panels abut other construction or penetrations. Fill gap with elastomeric sealant.
- C. Single-Layer Fastening Methods: Apply gypsum panels to supports as follows:
1. Fasten with screws.

3.8 INSTALLING TRIM ACCESSORIES

- A. General: For trim accessories with back flanges, fasten to framing with the same fasteners used to fasten gypsum board. Otherwise, fasten trim accessories according to accessory manufacturer's directions for type, length, and spacing of fasteners.
- B. Install cornerbead at external corners.
- C. Install edge trim where edge of gypsum panels would otherwise be exposed. Provide edge trim type with face flange formed to receive joint compound, except where other types are indicated.
1. Install LC-bead where gypsum panels are tightly abutted to other construction and back flange can be attached to framing or supporting substrate.
 2. Install aluminum trim and other accessories where indicated.
- D. Install control joints according to ASTM C 840 and manufacturer's recommendations and in specific locations approved by architect for visual effect.

3.9 FINISHING GYPSUM BOARD ASSEMBLIES

- A. General: Treat gypsum board joints, interior angles, flanges of cornerbead, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration.
- B. Prefill open joints, rounded or beveled edges, and damaged areas using setting-type joint compound.
- C. Apply joint tape over gypsum board joints and to flanges of trim accessories as recommended by trim accessory manufacturer.
- D. Levels of Gypsum Board Finish: Provide the following levels of gypsum board finish per GA-214.
 - 1. Level 1 for ceiling plenum areas, concealed areas, and where indicated, unless a higher level of finish is required for fire-resistance-rated assemblies and sound-rated assemblies.
 - 2. Level 2 where panels form substrates for tile and where indicated.
 - 3. Level 4 for gypsum board surfaces, unless otherwise indicated.
- E. Use one of the following joint compound combinations as applicable to the finish levels specified:
 - 1. Embedding and First Coat: Ready-mixed drying-type, all purpose or taping compound. Fill (second) Coat: Ready-mixed, drying-type, all-purpose or topping compound. Finish (third) Coat: Ready-mixed, drying-type, all-purpose or topping compound.
- F. For Level 4 gypsum board finish, embed tape in joint compound and apply first, fill (second), and finish (third) 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.
- G. Where Level 2 gypsum board finish is indicated, embed tape in joint compound and apply first coat of joint compound.
- H. Where Level 1 gypsum board finish is indicated, embed tape in joint compound.

3.10 APPLYING TEXTURE FINISHES TO WALLS

- A. Surface Preparation and Primer: Prepare and apply primer to gypsum panels and other surfaces receiving texture finishes. Apply primer to surfaces that are clean, dry, and smooth.
- B. Texture Finish Application: Mix and apply finish using powered spray equipment, to produce a uniform texture free of starved spots or other evidence of thin application or of application patterns.
- C. Prevent texture finishes from coming into contact with surfaces not indicated to receive texture finish by covering them with masking agents, polyethylene film, or other means. If, despite these precautions, texture finishes contact these surfaces, immediately remove

droppings and overspray to prevent damage according to texture finish manufacturer's written recommendations.

3.11 FIELD QUALITY CONTROL

- A. Above-Ceiling Observation: Architect will conduct an above-ceiling observation prior to installation of gypsum board ceilings and soffits and report any deficiencies in the work observed. Do not proceed with installation of gypsum board to ceiling or soffit support framing until deficiencies have been corrected.
1. Notify architect one week in advance of the date and the time when the project, or part of the project, will be ready for an above-ceiling observation.
 2. Prior to notifying architect, complete the following in areas to receive gypsum board ceilings:
 - a. Installation of 80 percent of lighting fixtures, powered for operation.
 - b. Installation, insulation, and leak and pressure testing of water piping systems.
 - c. Installation of air duct systems.
 - d. Installation of air devices.
 - e. Installation of mechanical system control air tubing.
 - f. Installation of ceiling support framing.

3.12 CLEANING AND PROTECTION

- A. Promptly remove any residual joint compound from adjacent surfaces.
- B. Provide final protection and maintain conditions, in a manner acceptable to Installer, that ensure gypsum board assemblies are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 092900

SECTION 093013 – CERAMIC TILING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Porcelain paver tile.
 - 2. Glazed wall tile.
 - 3. Marble thresholds and window sills.
 - 4. Crack suppression membrane.
 - 5. Urethane Grout.

1.3 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product data for each type of product specified.
- C. Samples for initial selection purposes in form of manufacturer's color charts consisting of actual tiles or sections of tile showing full range of colors, textures, and patterns available for each type and composition of tile indicated. Include samples of grout and accessories involving color selection.
- D. Samples for verification purposes of each item listed below, prepared on samples of size and construction indicated. Where products involve normal color and texture variations, include sample sets showing the full range of variations expected.
 - 1. Each type and composition of tile and for each color and texture required, at least 12 inches square, mounted on plywood or hardboard backing and grouted.
 - 2. Full-size units of each type of trim and accessory for each color required.

1.4 QUALITY ASSURANCE

- A. Single-Source Responsibility for Tile: Obtain each color, grade, finish, type, composition, and variety 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. Single-Source Responsibility for Setting and Grouting Materials: Obtain ingredients of a uniform quality from one manufacturer for each cementitious and admixture component and from one source or producer for each aggregate.
- C. 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 requirement of ANSI A137.1 for labeling sealed tile packages.
- B. Prevent damage or contamination to materials by water, freezing, foreign matter, and other causes.

1.6 PROJECT CONDITIONS

- A. Maintain environmental conditions and protect work during and after installation to comply with referenced standards and manufacturer's printed recommendations.

1.7 EXTRA MATERIALS

- A. Deliver extra materials to Owner. Furnish extra materials that match products installed as described below, packaged with protective covering for storage and identified with labels clearly describing contents.
 - 1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed, for each type, composition, color, pattern, and size.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Reference Sheet A3.00 – FINISH LEGEND.

2.2 PRODUCTS, GENERAL

- A. ANSI Standard for Ceramic Tile: Comply with ANSI A137.1 "American National Standard Specifications for Ceramic Tile" for types, compositions, and grades of tile indicated.

1. Furnish tile complying with "Standard Grade" requirements unless otherwise indicated.
- B. ANSI Standard for Tile Installation Materials: Comply with ANSI standard referenced with products and materials indicated for setting and grouting.
- C. Colors, Textures, and Patterns: Reference Sheet A3.00 – FINISH LEGEND.
- D. Factory Blending: For tile exhibiting color variations within the ranges selected during sample submittals, blend tile in factory and package accordingly so that tile units taken from one package show the same range in colors as those taken from other packages and match approved samples.
- E. Mounting: Where factory-mounted tile is required, provide back- or edge-mounted tile assemblies as standard with manufacturer unless another mounting method is indicated.

2.3 TILE PRODUCTS

- A. Porcelain Paver Tile: Reference Sheet A3.00 – FINISH LEGEND.
- B. Glazed Wall Tile: Reference Sheet A3.00 – FINISH LEGEND.
- C. Trim Units: Reference Sheet A3.00 – FINISH LEGEND.

2.4 STONE THRESHOLDS

- A. General: Provide stone that is uniform in color and finish, fabricated to sizes and profiles indicated or required to provide transition between tile surfaces and adjoining finished floor surfaces.
- B. Marble Thresholds: Provide marble thresholds complying with ASTM C 503 requirements for exterior use and for abrasion resistance where exposed to foot traffic, a minimum hardness of 10 per ASTM C 241.
 1. Provide white, honed marble complying with MIA Group "A" requirements for soundness.
- C. Window Sills: White marble, minimum 1/2" thick.

2.5 SETTING MATERIALS

- A. Thin Set Latex Portland Cement Mortar Installation Materials: Provide materials complying with ANSI A118.4 and as specified below.
 - 1. Mixture of Dry-Mortar Mix and Latex Additive: Factory-mixed formulation of mix and additive.
- B. Portland Cement Mortar Installation Materials: Provide materials complying with ANSI A108.1A.
- C. Wall Base Adhesive: Construction adhesive for securing tile base to gypsum board (except at showers). Do not use thin set mortar for securing porcelain paver tile base to walls.
 - 1. Product: Liquid Nails Ceramic Wall and Floor Tile Adhesive.

2.6 GROUTING MATERIALS

- A. Urethane Grout: Pre0-mixed urethane grout with integral antimicrobial agent in color as selected by Architect from manufacturer's full range. Provide the following:
 - 1. TruColor RapidCure Urethane Grout, Bostick, Inc.

2.7 CRACK SUPPRESSION MEMBRANE

- A. Flexible "Peel-and-Stick" Sheet: Provide a highly flexible elastomeric, self-bonding, pressure-sensitive sheet membrane system for crack isolation that is compatible with latex-modified thinset mortars. Provide one of the following:
 - 1. Mapelastic SM, Mapei
 - 2. ECB Membrane, National Applied Construction Products, Inc.
 - 3. Schluter – KERDI, Schluter Systems

2.8 GROUT RELEASE

- A. Temporary Protective Coating: Product indicated below that is formulated to protect exposed surfaces of tile against adherence of mortar and grout; compatible with tile, mortar, and grout products; and easily removable after grouting is completed without damaging grout or tile.
 - 1. Grout release in form of manufacturer's standard proprietary liquid coating that is specially formulated and recommended for use as temporary protective coating for tile. Provide one of the following:
 - a. "Grout Release," Aqua Mix.
 - b. "SL-90 Summit Shield Grout Release," Summitville.
 - c. "Grout Easy," Aldon.
 - d. "Super Grout Release," Klein and Company, Inc.

2.10 MISCELLANEOUS MATERIALS

- A. Temporary Protective Coating for Porcelain Paver Tile: Provide product indicated below that is formulated to protect exposed surfaces of tile against adherence of mortar and grout; is compatible with tile, mortar, and grout products; and is easily removable after grouting is completed without damaging grout or tile.
 - 1. Grout release in form of manufacturer's standard proprietary liquid coating that is specially formulated and recommended for use as a temporary protective coating for tile.

2.11 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with requirements of referenced standards and manufacturers including those for accurate proportioning of materials, water, or additive content; type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other procedures needed to produce mortars and grouts of uniform quality with optimum performance characteristics for application indicated.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Examine substrates and areas 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, and free from oil or waxy films and curing compounds.
 - 2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed before installing tile.
- B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Blending: For tile exhibiting color variations within the ranges selected during sample submittals, verify that tile has been blended in factory and packaged accordingly so that tile units taken from one package show the same range in 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 Standard: Comply with parts of ANSI 108 series of tile installation standards included under "American National Standard Specifications for the Installation of Ceramic Tile" that apply to type of setting and grouting materials and methods indicated.
- B. TCA Installation Guidelines: TCA "Handbook for Ceramic Tile Installation"; comply with TCA installation methods indicated.
- C. Extend tile work into recesses and under or behind equipment and fixtures to form a complete covering without interruptions except as otherwise shown. 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 that plates, collars, or covers overlap tile.
 - 1. Porcelain paver wall base shall be mitered at inside and outside corners. Ease cut edges at miters.
- E. 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.
 - 1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so that extent of each sheet is not apparent in finished work.
- F. Expansion Joints: Locate expansion joints complying with TCA installation methods recommended or structural drawings and field verify.
 - 1. Provide sealant-filled joints in tile directly above expansion joints in slabs. Use 1 or 2 part pourable polyurethane sealant for Use T in color selected by architect. Follow Tile Council of America Handbook for Ceramic Tile Installation details.
 - 2. Tile expansion joints are not required at concrete slab control joints which are to receive crack suppression membrane.
- G. Grout tile to comply with the requirements of the following installation standards:
 - 1. For ceramic tile grouts comply with ANSI A108.10.
 - 2. Apply grout release when installing porcelain paver tile.

3.4 FLOOR INSTALLATION METHODS

- A. Porcelain Paver Tile for Thin Set Installation Over Concrete Slabs: Install tile to comply with requirements indicated below for setting bed methods, TCA installation method and grout types:

1. Latex – Portland Cement Mortar: Installation Specification – ANSI A108.5.
2. Grout: Urethane grout: Install per manufacturer's directions.
3. TCA Installation Method F113.

- B. Thick set locations: at Restrooms (where a floor depression is indicated), and wherever a floor sloped to a drain is indicated in the construction documents. Tile Installation: Interior floor installation on concrete; cement mortar bed (thickset); TCA F112.

3.5 WALL TILE INSTALLATION METHODS

- A. Install types of tile designated for wall application to comply with requirements indicated below for setting-bed methods, TCA installation methods related to subsurface wall conditions, and grout types:

1. Thin-set latex-Portland Cement Mortar: Installation Specification-ANSI A108.5.
2. Grout: Urethane grout: Install per manufacturer's directions.
3. TCA Installation Method B420 for glass mat tile backer board. Install sanitary cove base flush with floor tile – do not set base on top of floor tile.
4. Secure porcelain paver tile base to drywall partitions using construction adhesive applied in accordance with manufacturer's instructions using V-type trowel with notches 3/16" deep.

3.6 CLEANING AND PROTECTION

- A. Cleaning: Upon 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. Unglazed tile may be cleaned with acid solutions only when permitted by tile and grout manufacturer's printed instructions, but no sooner than 14 days after installation. Protect metal surfaces, cast iron, and vitreous plumbing fixtures from effects of acid cleaning. Flush surface with clean water before and after cleaning.
 1. Remove temporary protective coating by method recommended by coating manufacturer that is acceptable to tile and grout manufacturer.

- B. Finished Tile Work: Leave finished installation clean and free of cracked, chipped, broken, unbonded, and otherwise defective tile work.

- C. Provide final protection and maintain conditions in a manner acceptable to manufacturer and installer that ensure that tile is without damage or deterioration at time of Substantial Completion.

1. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear.

2. Prohibit foot and wheel traffic from tiled floors for at least 7 days after grouting is completed.
- D. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

END OF SECTION 093013

SECTION 095113 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes ceilings composed of acoustical panels and exposed suspension systems.

1.3 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract.
- B. Product data for each type of product specified.
- C. Samples for initial selection in the form of manufacturer's color charts consisting of actual acoustical panels or sections of panels and sections of suspension system members showing the full range of colors, textures, and patterns available for each ceiling assembly indicated.
- D. Samples for verification of each type of exposed finish required, prepared on samples of size indicated below. Where finishes involve normal color and texture variations, include sample sets showing the full range of variations expected.
 - 1. 6-inch square samples of each acoustical panel type, pattern, and color.
 - 2. Set of 12-inch long samples of exposed suspension system members, including moldings, for each color and system type required.
- E. Product test reports from a qualified independent testing agency that are based on its testing of current products for compliance of acoustical panel ceilings and components with requirements.

1.4 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.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels and suspension system components to Project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical 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.

1.6 PROJECT CONDITIONS

- A. Space Enclosure and Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet-work in spaces is completed and dry, work above ceilings is complete, and ambient temperature and humidity conditions are being maintained at the levels required by manufacturer(s) to eliminate sagging or curling of ceiling panels.

1.7 COORDINATION

- A. Coordinate layout and installation of acoustical panels and suspension system components with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system components (if any), and partition assemblies (if any).

1.8 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels clearly describing contents.
 - 1. Acoustical Ceiling Units: Furnish quantity of full-size units equal to 2.0 percent of amount installed.

PART 2 - PRODUCTS

2.1 ACOUSTICAL CEILING UNITS, GENERAL:

- A. Standard for Acoustical Ceiling Units: Provide manufacturer's standard units of configuration indicated that comply with ASTM E 12643 classifications as designated by reference to types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.

1. Mounting Method for Measuring NCR: Type E-400 (plenum mounting in which face of test specimen is 15-3/4 inches away from the test surface) per ASTM RE 795.
- B. Colors and Patterns: Provide products to match appearance characteristics indicated under each product type.

2.2 ACOUSTICAL PANELS

- A. Description: Provide Type III, Form 1, Pattern E I, Fire Class A units per ASTM E 1264 with painted finish; and as follows:
1. Performance Criteria: LR 0.85, min; NRC 0.75, min.; CAC 35.
 2. Edge Detail: Square Lay-in. Install in wide-face suspension system.
 3. Size: 24 inches by 24 inches by 7/8 inch thick.
 4. Color: White.
 5. Panels are scheduled as "ACT-1" on drawings.
- B. Product: Subject to compliance with requirements, provide one of the following:
1. "ULTIMA, High NRC No. 1940"; Armstrong.
- C. Warranty: Provide manufacturer's standard limited 30 year warranty against sagging and warping.

2.3 ACOUSTICAL PANELS

- A. Description: Provide Type III, Form 1, Pattern E I, Fire Class A units per ASTM E 1264 with painted finish; and as follows:
1. Performance Criteria: LR 0.85, min; NRC 0.75, min.; CAC 35.
 2. Edge Detail: Square Lay-in. Install in wide-face suspension system.
 3. Size: 24 inches by 48 inches by 7/8 inch thick.
 4. Color: White.
 5. Panels are scheduled as "ACT-2" on drawings.
- B. Product: Subject to compliance with requirements, provide one of the following:
1. "ULTIMA, High NRC No. 1943"; Armstrong.
- C. Warranty: Provide manufacturer's standard limited 30 year warranty against sagging and warping.

2.4 METAL SUSPENSION SYSTEMS, GENERAL

- A. Metal Suspension System Standard: Provide manufacturer's standard metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable ASTM C 635 requirements.

- B. Finishes and Colors: Provide manufacturer's standard factory-applied finish for type of system indicated.
- C. Attachment Devices: Size for 5 times the design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.
- D. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
 - 1. Zinc-Coated Carbon Steel Wire: ASTM A 641 (ASTM A 641M), Class 1 zinc coating, soft temper.
 - 2. Size: Select wire diameter so that its stress at 3 times the hanger design load (ASTM C 635, Table 1, Direct Hung) will be less than the yield stress of wire, but provide not less than 0.106-inch diameter (12 gage) wire.
- E. Sheet-Metal Edge Moldings and Trim: Type and profile indicated, or if not indicated, manufacturer's standard moldings for edges and penetrations that fit acoustical panel edge details and suspension systems indicated; formed from sheet metal of same material and finish as that used for exposed flanges of suspension system runners.

2.5 NON-FIRE-RESISTANCE-RATED, DIRECT-HUNG SUSPENSION SYSTEMS

- A. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from hot dipped galvanized, cold-rolled steel sheet, with prefinished 15/16-inch wide metal caps on flanges; other characteristics as follows:
 - 1. Structural Classification: Intermediate-duty system.
 - 2. End Condition of Cross Runners: Override (stepped) type.
 - 3. Cap Material and Finish: Hot dipped galvanized steel sheet painted white.
- B. Products: Subject to compliance with requirements, provide one of the following:
 - 1. Standard Grid (for APC-1 and APC-2).
 - a. "Prelude 15/16" Exposed Tee System"; Armstrong World Industries.
 - b. Series 200 – "H" Hot Dipped; Chicago Metallic.
 - c. "Donn DX"; Donn/USG Interiors, Inc., flat white #050.
- C. Warranty: Manufacturer's standard limited 10-year warranty against rusting of grid.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and 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. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Coordination: Furnish layouts for cast-in-place anchors, clips, and other ceiling anchors whose installation is specified in other Sections.
 - 1. Furnish cast-in-place anchors and similar devices to other trades for installation well in advance of time needed for coordinating other work.
- B. Measure each ceiling area and establish the layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and conform to the layout shown on reflected ceiling plans.

3.3 INSTALLATION

- A. General: Install acoustical panel ceilings to comply with publications referenced below per manufacturer's instructions and CISCA "Ceiling Systems Handbook."
 - 1. Standard for Ceiling Suspension System Installations: Comply with ASTM C 636.
- 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 the supporting structure or of the 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 the location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
 - 4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of 3 tight turns. Connect hangers either directly to structures or to inserts, eye screws, or other devices that are secure, that are appropriate for substrate, and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 - 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 shown; and provide hangers not more than 8 inches from ends of each member.

- 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. Screw attach moldings to substrate at intervals not over 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.
 - 2. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- 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 fitted accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide neat, precise fit.
 - 1. Arrange directionally patterned acoustical panels as follows:
 - a. Install panels with pattern running in one direction parallel to long axis of space
 - 2. 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 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 09 65 19 - RESILIENT FLOOR TILE AND BASE**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Resilient Luxury Vinyl Tile (LVT)
 - 3. Resilient wall base and accessories

1.3 SUBMITTALS

- A. Product data for each type of product specified.
- B. Samples for initial selection purposes in form of manufacturer's color charts consisting of actual tiles or sections of tiles showing full range of colors and patterns available for each type of resilient floor tile indicated.
- C. Maintenance data for resilient floor tile.

1.4 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 Performance Characteristics: Provide resilient floor tile with the following fire performance characteristics as determined by testing products per ASTM test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Critical Radiant Flux: 0.45 watts per sq cm or more per ASTM E 648.
- C. Provide only products that are slip resistant, stable, and firm to comply with current Florida Building Code for Accessibility.

1.5 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 flooring materials in dry spaces protected from the weather with ambient temperatures maintained between 50 deg F and 90 deg F.
- C. Store tiles on flat surfaces. Move tiles and installation accessories into spaces where they will be installed at least 48 hours in advance of installation.

1.6 PROJECT CONDITIONS

- A. Maintain a minimum temperature of 70 deg F in spaces to receive tiles for at least 48 hours prior to installation, during installation, and for not less than 48 hours after installation. After this period, maintain a temperature of not less than 55 deg F.
- B. Do not install tiles until they are at the same temperature as the space where they are to be installed.
- C. Close spaces to traffic during tile installation.

1.7 SEQUENCING AND SCHEDULING

- A. Install tiles and accessories after other finishing operations, including painting, have been completed.
- B. Do not install tiles over concrete slabs until the slabs have cured and are sufficiently dry to bond with adhesive as determined by tile manufacturer's recommended bond and moisture test.

1.8 EXTRA MATERIALS

- A. Deliver extra materials to Owner. Furnish extra materials matching products installed as described below, packaged with protective covering for storage and identified with labels clearly describing contents.
 - 1. Furnish not less than one box of each class, wearing surface, color, pattern and size of resilient floor tile installed.

PART 2 - PRODUCTS

2.1 RESILIENT LUXURY VINYL TILE TYPE 1 (LVT-1)

- A. Provided by Rooms To Go.

2.2 RESILIENT BASE - THERMOPLASTIC-RUBBER BASE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Armstrong World Industries, Inc.
 - 2. Burke Mercer Flooring Products, Division of Burke Industries Inc.
 - 3. Flexco.
 - 4. Johnsonite; A Tarkett Company.
 - 5. Roppe Corporation, USA.
- B. Product Standard: ASTM F 1861, Type TP (rubber, vulcanized thermoplastic), Group I (solid, homogeneous).
 - 1. Style and Location:
 - a. Style B, Cove.
- C. Thickness: 0.125 inch (3.2 mm).

- D. Height: 4 inches (102 mm).
- E. Lengths: Coils in manufacturer's standard length.
- G. Outside Corners: Job formed except at conditions where there is less than 2 inches of available wall for anchorage, provide preformed.
- H. Inside Corners: Job formed.
- J. Colors: As selected by Architect from full range of industry colors.

2.3 ACCESSORIES

- A. Resilient Edge/ Transition Strips, as indicated on drawings:
 - 1. Patcraft S142V Snapdown T-Molding Transition.
 - 2. Patcraft S137V Carpet Reducer.
- B. Concrete Slab Primer: Non-staining type as recommended by flooring manufacturer.
- C. Trowelable Underlayments and Patching Compounds: Latex-modified, Portland-cement-based formulation provided or approved by tile manufacturer for applications indicated.
- D. Adhesives (Cements): Water-resistant type recommended by tile manufacturer to suit resilient floor tile products and substrate conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. General: Examine areas where installation of tiles will occur, with Installer present, to verify that substrates and conditions are satisfactory for tile installation and comply with tile manufacturer's requirements and those specified in this Section.
- B. Concrete Sub-floors: 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 whose presence would interfere with bonding of adhesive. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by tile manufacturer.
 - 2. Finishes of sub-floors comply with tolerances and other requirements specified in Division 3 Section "Cast-In-Place Concrete" for slabs receiving resilient flooring.
 - 3. Sub-floors are free of cracks, ridges, depressions, scale, and foreign deposits of any kind.
- C. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 MOISTURE BARRIER

- A. Patcraft/Shaw MoistureShield is a unique and patented technology that is native to concrete and functions in new or old concrete. This specification details are relative to the manufacturers "No Moisture Test Requirement" and approved for this client Rooms To Go Corporate. Each project is individually warranted by the manufacturer Shaw Industries. This Moisture System program can only be installed by manufacturer approved and certified contractors. Contact Patcraft Representative Gina Schiro - 813-244-1668 gina.schiro@patcraft.com for list of approved contractors.
- B. **Step One** (Flooring preparation) - The concrete must be prepared to the IRCI's Concrete Surface Profile of 2-3 (see Section 09 05 51). To achieve this surface profile use Surface Prep EXT spray on concrete cleaner and etcher which replaces bead blasting, eliminating the noise and dust normally created. In circumstances with old adhesive the Shaw Unglued can be used as an alternative to mechanical removal processes prior to the Surface Prep EXT. Other information on floor preparation requirements involving removal of paint, addressing saw cuts, etc. will be addressed by the expertise of our approved contractors.
- C. **Step Two** (Moisture Vapor Emission Control) - MoistureShield is a one-spray application product, designed to penetrate, (2-4mm), inside the paste layer of the concrete substrate, creating a permanent barrier, thus reducing the moisture emission rate, limiting surface RH and reducing the surface pH.
- D. **Step Three** (Moisture Vapor Emission Control) - For "No Moisture Test Requirement" MRP Moisture Resistant Primer step will be performed on top of Moisture Shield. MRP is a water based 2-part barrier primer. Once the system is applied and cured, Patcraft 4151 adhesive type can be used to install Patcraft/Shaw carpet tile (including Ecologix cushion tile) or resilient flooring. Patcraft/Shaw LokDots can also be used to install Carpet tiles with Ecoworx and Strataworx backing.

3.3 INSTALLATION

- A. General: Comply with tile manufacturer's installation directions and other requirements indicated that are applicable to each type of tile installation included in Project.
- B. Lay out tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths at perimeter that equal less than one-half of a tile. Install tiles square with room axis, unless otherwise indicated.

- C. Match tiles for color and pattern by selecting tiles from cartons in same sequence as manufactured and packaged, if so numbered. Cut tiles neatly around all fixtures. Discard broken, cracked, chipped, or deformed tiles.
 - 1. Lay tiles with grain all running in the same direction.
 - 2. Lay tiles in pattern with respect to location of colors, patterns, and sizes where indicated on Drawings.
- D. Scribe, cut, and fit tiles to butt tightly to vertical surfaces, permanent fixtures, built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings.
- E. Extend tiles into toe spaces, door reveals, closets, and similar openings.
- F. Maintain reference markers, holes, or openings that are in place or plainly marked for future cutting by repeating on finish flooring as marked on sub-floor. Use chalk or other non-permanent marking device.
- G. Install tiles on covers for telephone and electrical ducts, and similar items occurring within finished floor areas. Maintain overall continuity of color and pattern with pieces of flooring installed on these covers. Tightly adhere edges to perimeter of floor around covers and to covers.
- H. Adhere tiles to flooring substrates without producing open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, or other surface imperfections in completed tile installation.
- I. Use full spread of adhesive applied to substrate in compliance with tile manufacturer's directions including those for trowel notching, adhesive mixing, and adhesive open and working times.
- J. Hand roll tiles where required by tile manufacturer.

3.4 INSTALLATION OF ACCESSORIES

- A. Wall Base: Apply wall base in lengths as long as practical to walls, columns and all permanent fixtures in rooms or areas where indicated. Provide preformed outside and inside corner units; mitered outside or inside corners are not acceptable. On masonry or other irregular surfaces, fill voids behind base and along top edge with manufacturer's recommended adhesive filler.
- B. Place resilient edge strips tightly butted to flooring and secure with adhesive. Install edging strips at edges of flooring which would otherwise be exposed.

3.5 CLEANING AND PROTECTION

- A. Perform the following operations immediately after completing tile installation:
 - 1. Remove visible adhesive and other surface blemishes using cleaner recommended by tile manufacturers.
 - 2. Sweep or vacuum floor thoroughly.
 - 3. Do not wash floor until after time period recommended by resilient floor tile manufacturer.
 - 4. Damp-mop tile to remove black marks and soil.

- B. Protect flooring against mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods 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.
- C. Clean and polish 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 and polish tiles using method recommended by manufacturer.

END OF SECTION

SECTION 096813 - TILE CARPETING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes modular carpet tile.
- B. Related Requirements:
 - 1. Section 096519 "Resilient Base and Accessories" for resilient wall base and accessories installed with carpet tile.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
 - 2. Include manufacturer's written installation recommendations for each type of substrate.
- B. Shop Drawings: For carpet tile installation, plans showing the following:
 - 1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
 - 2. Carpet tile type, color, and dye lot.
 - 3. Type of subfloor.
 - 4. Type of installation.
 - 5. Pattern of installation.
 - 6. Pattern type, location, and direction.
 - 7. Pile direction.
 - 8. Type, color, and location of insets and borders.
 - 9. Type, color, and location of edge, transition, and other accessory strips.
 - 10. Transition details to other flooring materials.
- C. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
 - 1. Carpet Tile: Full-size Sample.

2. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch- (300-mm-) long Samples.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For carpet tile, for tests performed by a qualified testing agency.

1.5 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. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd. (8.3 sq. m).

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association.
- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
 1. Build mockups at locations and in sizes shown on Drawings.
 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Comply with CRI's "CRI Carpet Installation Standard."

1.8 FIELD CONDITIONS

- A. Comply with CRI's "CRI Carpet Installation Standard" for temperature, humidity, and ventilation limitations.
- B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at levels planned for building occupants during the remainder of the construction period.

- C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.
- D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.9 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, the following:
 - a. More than 10 percent edge raveling, snags, and runs.
 - b. Dimensional instability.
 - c. Excess static discharge.
 - d. Loss of tuft-bind strength.
 - e. Loss of face fiber.
 - f. Delamination.
 - 3. Warranty Period: 15 years (non-prorated) from date of Substantial Completion.

PART 2 - PRODUCTS

2.0 CARPET TILE

- A. Provided by Rooms To Go.

2.1 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 comply with flammability requirements for installed carpet tile, and are recommended by carpet tile manufacturer for releasable installation.
- C. Metal Edge/Transition Strips: Extruded aluminum with finish of profile and width shown, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- 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.
- B. Examine carpet tile for type, color, pattern, and potential defects.
- C. Concrete Slabs: Verify that finishes comply with requirements specified in Section 033000 "Cast-in-Place Concrete" and that surfaces are free of cracks, ridges, depressions, scale, and foreign deposits.
 - 1. Moisture Testing: Perform tests so that each test area does not exceed [200 sq. ft. (18.6 sq. m)] [1000 sq. ft. (304.8 sq. m)] <Insert area>, and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
 - a. Anhydrous Calcium Chloride Test: ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of [3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m)] <Insert emission> in 24 hours.
 - b. Relative Humidity Test: Using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum [75] <Insert number> percent relative humidity level measurement.
 - c. Perform additional moisture tests recommended in writing by adhesive and carpet tile manufacturers. Proceed with installation only after substrates pass testing.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with CRI's "Carpet Installation Standards" and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile.
- B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch (3 mm) wide or wider, and protrusions more than 1/32 inch (0.8 mm) unless more stringent requirements are required by manufacturer's written instructions.
- C. Concrete Substrates: Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by adhesive and carpet tile manufacturers.

- D. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

0.3 MOISTURE BARRIER

- A. Patcraft/Shaw MoistureShield is a unique and patented technology that is native to concrete and functions in new or old concrete. This specification details are relative to the manufacturers "No Moisture Test Requirement" and approved for this client Rooms To Go Corporate. Each project is individually warranted by the manufacturer Shaw Industries. This Moisture System program can only be installed by manufacturer approved and certified contractors. Contact Patcraft Representative Gina Schiro - 813-244-1668 gina.schiro@patcraft.com for list of approved contractors.
- B. **Step One** (Flooring preparation) - The concrete must be prepared to the IRCI's Concrete Surface Profile of 2-3 (see Section 09 05 51). To achieve this surface profile use Surface Prep EXT spray on concrete cleaner and etcher which replaces bead blasting, eliminating the noise and dust normally created. In circumstances with old adhesive the Shaw Unglued can be used as an alternative to mechanical removal processes prior to the Surface Prep EXT. Other information on floor preparation requirements involving removal of paint, addressing saw cuts, etc. will be addressed by the expertise of our approved contractors.
- C. **Step Two** (Moisture Vapor Emission Control) - MoistureShield is a one-spray application product, designed to penetrate, (2-4mm), inside the paste layer of the concrete substrate, creating a permanent barrier, thus reducing the moisture emission rate, limiting surface RH and reducing the surface pH.
- D. **Step Three** (Moisture Vapor Emission Control) - For "No Moisture Test Requirement" MRP Moisture Resistant Primer step will be performed on top of Moisture Shield. MRP is a water based 2-part barrier primer. Once the system is applied and cured, Patcraft 4151 adhesive type can be used to install Patcraft/Shaw carpet tile (including Ecologix cushion tile) or resilient flooring. Patcraft/Shaw LokDots can also be used to install Carpet tiles with Ecoworx and Strataworx backing.

3.4 INSTALLATION

- A. General: Comply with CRI's "CRI Carpet Installation Standard," Section 18, "Modular Carpet" and with carpet tile manufacturer's written installation instructions.
- B. Installation Method: As recommended in writing by carpet tile manufacturer.
- C. Maintain dye-lot integrity. Do not mix dye lots in same area.

- D. Maintain pile-direction patterns recommended in writing by carpet tile manufacturer.
- E. 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.
- F. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- G. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on carpet tile as marked on subfloor. Use nonpermanent, nonstaining marking device.
- H. Install pattern parallel to walls and borders.
- I. Access Flooring: Stagger joints of carpet tiles so carpet tile grid is offset from access flooring panel grid. Do not fill seams of access flooring panels with carpet adhesive; keep seams free of adhesive.

3.5 CLEANING AND PROTECTION

- A. Perform the following operations immediately after installing carpet tile:
 - 1. Remove excess adhesive 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.
- B. Protect installed carpet tile to comply with CRI's "Carpet Installation Standard," Section 20, "Protecting Indoor Installations."
- C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION

SECTION 099100 - PAINTING

PART I - GENERAL**1.01 DESCRIPTION OF WORK**

- A. In general, it is the intent to obtain painter's finishes over all exterior and interior wall surfaces that are exposed to view in accordance with all drawings and with the types of finishes as specified herein.
- B. The Painting Sub-Contractor shall furnish all materials, labor, scaffolding, tools, equipment and services necessary for and incidental to the finishing and application to complete all fielding cleaning of all surfaces and painting. The term "paint" includes primers, paint, enamels, sealers, fillers and other types of coatings whether used as primers or intermediate and finish coats.
- C. Do not paint over any code-required labels, such as, Underwriters' Laboratories and Factory Mutual, or any equipment identification, performance rating, name or nomenclature plates.

1.02 RELATED REQUIREMENTS

- A. All General Conditions, Supplements to General Conditions, any Addenda issued by the Architects are a part of this Section in the same manner as if fully written herein, and shall govern the Work of this Section, except where more stringent articles or requirements are stipulated then they shall govern this Section.
- B. The Contract Documents are complementary and what is required by any one shall be as binding as if required by all.

1.03 QUALITY ASSURANCE

- A. Industry Standards governing this work except as otherwise noted.

1.04 SUBMITTALS

- A. Paint Materials Supplier/Dealer shall certify in writing on his original letterhead, signed by the Authorized Supplier/Dealer stating that all interior type primers and paint materials supplied by him, do not need additives to resist mildew growth, and contain, or have added, USDA and EPA Approved Mildewcide that is safe for use in food plants, and is equal to M-1 as manufactured by Jomaps Co. Alpharetta GA. Each gallon of paint materials, prior to shipping or delivering to Painting Contractor/Applicator, has not less than three (3) or more ounces of mildewcide additive to render the dry paint film to be mildew resistant, for the life of the paint, without negating any guarantees or warranties of any kind.
- B. Field applying mildewcide products to the paint will not be accepted.
- C. Samples:

- a. Samples for Architect's review before painting starts. Resubmit rejected samples. Stamp all samples to show coats.
- b. Prepare 12" x 12" samples of each type of finish, step painted, applying prime coats, base coats and final coats on materials to be finished.
- c. Provide three (3) samples of each color and each gloss for each material on which the finish is specified to be applied.

1.05 PRODUCT HANDLING

- A. Deliver in original containers, labeled as follows:
 1. Name or type number of material.
 2. Manufacturer's name and stock number.
 3. Contents by volume, of major constituents.

PART II - PRODUCTS

2.01 PAINT MATERIALS

- A. All "paint" on this project shall contain minimum amounts of Volatile Organic Compounds and wherever possible (VOC Compliant).
- B. All paint material shall be Premium Quality.
- C. See Exterior and Interior Paint Schedules Section 09900A following this Section

PART III - EXECUTION

3.01 PREPARATION

- A. Prepare surfaces by sanding or cleaning as may be required to remove gloss, chalking and efflorescence.
- B. Ferrous metals, Metal frames.
 1. Comply with applicable articles in SSPC Volume 2, SSPC-SP2 and SSPC-SP3 as may be required for cleaning to provide proper surfaces for paint adhesion.
 2. Clean thoroughly, dust by use of "Tack Cloths" to get surface clean.

3.02 JOB CONDITIONS

- A. Surface Temperatures: Do not apply paints when the humidity is above 85% or the temperature of surfaces to be painted and the surrounding air temperatures are below 50° F., unless otherwise permitted by the manufacturer's printed instructions as approved by Architect.
- B. Protection: Use all means necessary to protect the materials of this Section before, during and after application, protect the adjacent work and materials of all other trades.

3.03 PAINT APPLICATION

- A. General: Examine the Drawings and Specifications thoroughly for surfaces to be painted

or finished.

- B. Paint all exposed surfaces, except where the natural finish of the material is specified or specifically noted as a surface not to be painted.
- C. Metal Frames:
 - 1. Paint both faces and all edges including tops of frames. Remove screw applied stops paint stops and stop recess, paint same color as frames.
- D. All Metal Frames.
Finish: 2-coats - Match Building Standard
- J. Flat Concrete Surfaces: Interior areas not covered by other materials.
 - 1. Clear finish only:
 - a. Two (2) full coats of Sonneborne - KUR-N-Seal.
or

3.04 TOUCH UP WORK

- A. At completion of work, touch up to restore damaged finish; abraded, stained or otherwise disfigured portion or refinish as necessary to produce a smooth, even finish.

3.08 FINAL CLEAN-UP

- A. Remove all Painter's equipment, materials from storage areas, accumulated rubbish, cans, cleaning rags completely off the Owners property.

Note: See Interior and Exterior Paint Schedules following this Section.

END OF SECTION

INTERIOR Paint Schedule

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SHEEN	SUBSTRATE	PRIMER COAT	TWO FINISH COATS
FLAT /MATTE	GYPSUM WALL BOARD	HIGH BUILD INTERIOR LATEX PRIMER B28W08601	EMERALD INTERIOR WASHABLE FLAT K35 SERIES
	CONCRETE & STUCCO	LOXON CONCRETE & MASONRY PRIMER LX02W50	EMERALD INTERIOR WASHABLE MATTE K36 SERIES
	CONCRETE MASONRY UNITS (CMU) (CMU) (CMU)	PRO INDUSTRIAL HEAVY DUTY BLOCK FILLER, B42W150	EMERALD INTERIOR WASHABLE MATTE K36 SERIES
	OPEN CEILING & BAR JOIST	PRO INDUSTRIAL PRO-CRYL PRIMER B66-1300 SERIES (Spot Prime)	PRO INDUSTRIAL WATERBORNE ACRYLIC DRYFALL FLAT, B42W81
EG-SHEL /SATIN /LOW SHEEN	PAINTED WOOD	PREMIUM WALL & WOOD PRIMER B28W08111	PRO INDUSTRIAL WB ALKYD URETHANE LOW SHEEN B53-1250 SERIES
	STAINED WOOD	MINWAX PERFORMANCE SERIES TINTABLE WOOD STAIN	MINWAX PERFORMANCE SERIES FAST-DRY VARNISH Satin
	GYPSUM BOARD PAINT FINISH	HIGH BUILD INTERIOR LATEX PRIMER B28W08601	PROMAR 200 HP ZERO VOC LOW GLOSS EG-SHEL, B41-1900 SERIES
	GYPSUM BOARD EPOXY FINISH	HIGH BUILD INTERIOR LATEX PRIMER B28W08601	PRO INDUSTRIAL PRE-CATALYZED EPOXY EG-SHEL, K45W1150 SERIES
	FERROUS METAL	PRO INDUSTRIAL PRO-CRYL PRIMER B66-1300 SERIES	PRO INDUSTRIAL WB ALKYD URETHANE LOW SHEEN B53-1250 SERIES
	GALVANIZED METAL	PRO INDUSTRIAL PRO-CRYL PRIMER B66-1300 SERIES	PRO INDUSTRIAL WB ALKYD URETHANE LOW SHEEN B53-1250 SERIES
	CONCRETE & STUCCO	LOXON CONCRETE & MASONRY PRIMER LX02W50	PROMAR 200 HP ZERO VOC EG-SHEL, B20-1900 SERIES
	CONCRETE MASONRY UNITS (CMU) PAINT FINISH	PRO INDUSTRIAL HEAVY DUTY BLOCK FILLER, B42W150	PROMAR 200 HP ZERO VOC EG-SHEL, B20-1900 SERIES
	CONCRETE MASONRY UNITS (CMU) EPOXY FINISH	LOXON BLOCK SURFACER LX01W200	PRO INDUSTRIAL PRE-CATALYZED EPOXY EG-SHEL, K45W1150 SERIES
OPEN CEILING & BAR JOIST	PRO INDUSTRIAL PRO-CRYL PRIMER B66-1300 SERIES (Spot Prime)	PRO INDUSTRIAL WATERBORNE ACRYLIC DRYFALL EG-SHEL B42W82	
SEMI - GLOSS	PAINTED WOOD	PREMIUM WALL & WOOD PRIMER B28W08111	PRO INDUSTRIAL WB ALKYD URETHANE SEMI-GLOSS B53-1150 SERIES
	STAINED WOOD	MINWAX PERFORMANCE SERIES TINTABLE WOOD STAIN	MINWAX PERFORMANCE SERIES FAST-DRY VARNISH 1 ct Gloss, 1 ct Satin
	GYPSUM BOARD PAINT FINISH	HIGH BUILD INTERIOR LATEX PRIMER B28W08601	PROMAR 200 HP ZERO VOC SEMI-GLOSS, B31-1900 SERIES
	GYPSUM BOARD EPOXY FINISH	HIGH BUILD INTERIOR LATEX PRIMER B28W08601	PRO INDUSTRIAL PRE-CATALYZED EPOXY SEMI-GLOSS, K46W1150 SERIES
	FERROUS METAL	PRO INDUSTRIAL PRO-CRYL PRIMER B66-1300 SERIES	PRO INDUSTRIAL WB ALKYD URETHANE SEMI-GLOSS, B53-1150 SERIES
	GALVANIZED METAL	PRO INDUSTRIAL PRO-CRYL PRIMER B66-1300 SERIES	PRO INDUSTRIAL WB ALKYD URETHANE SEMI-GLOSS, B53-1150 SERIES
	CONCRETE & STUCCO	LOXON CONCRETE & MASONRY PRIMER LX02W50	PRO INDUSTRIAL ACRYLIC SEMI-GLOSS, B66-650 SERIES
	CONCRETE MASONRY UNITS (CMU) PAINT FINISH	PRO INDUSTRIAL HEAVY DUTY BLOCK FILLER, B42W150	PRO INDUSTRIAL ACRYLIC SEMI-GLOSS, B66-650 SERIES
	CONCRETE MASONRY UNITS (CMU) EPOXY FINISH	LOXON BLOCK SURFACER LX01W200	PRO INDUSTRIAL PRE-CATALYZED EPOXY SEMI-GLOSS, K46W1150 SERIES
OPEN CEILING & BAR JOIST	PRO INDUSTRIAL PRO-CRYL PRIMER B66-1300 SERIES (Spot Prime)	PRO INDUSTRIAL WATERBORNE ACRYLIC DRYFALL SEMI-GLOSS, B42W83	

EXTERIOR Paint Schedule

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SHEEN	SUBSTRATE	PRIMER COAT	TWO FINISH COATS
FLAT	CONCRETE, STUCCO, EIFS, CEMENT BOARD SIDING	(Optional) LOXON CONCRETE & MASONRY PRIMER LX02W50 0	LOXON SELF-CLEANING ACRYLIC COATING, LX13W50 SERIES
	CONCRETE MASONRY UNITS (CMU)	PRO INDUSTRIAL HEAVY DUTY BLOCK FILLER, B42W150	LOXON SELF-CLEANING ACRYLIC COATING, LX13W50 SERIES
SATIN/ Eg-Shel	PAINTED WOOD	EXTERIOR WOOD PRIMER Y24W8020	RESILIENCE EXTERIOR SATIN K43 SERIES
	GYPSUM BOARD	PREPRITE PROBLOCK PRIMER, B51W620	RESILIENCE EXTERIOR SATIN K43 SERIES
	FERROUS METAL	PRO INDUSTRIAL PRO-CRYL PRIMER B66-1310 SERIES	PRO INDUSTRIAL DTM ACRYLIC EG-SHEL, B66-1250 SERIES
	GALVANIZED METAL	PRO INDUSTRIAL PRO-CRYL PRIMER B66-1310 SERIES	PRO INDUSTRIAL DTM ACRYLIC EG-SHEL, B66-1250 SERIES
	CONCRETE, STUCCO, EIFS, CEMENT BOARD SIDING	LOXON CONCRETE & MASONRY PRIMER LX02W50	RESILIENCE EXTERIOR SATIN K43 SERIES
	CONCRETE MASONRY UNITS (CMU)	PRO INDUSTRIAL HEAVY DUTY BLOCK FILLER, B42W150	RESILIENCE EXTERIOR SATIN K43 SERIES
SEMI - GLOSS/GLOSS	PAINTED WOOD	EXTERIOR WOOD PRIMER Y24W8020	PRO INDUSTRIAL WB ALKYD URETHANE SEMI-GLOSS B53-1150 SERIES
	FERROUS METAL	PRO INDUSTRIAL PRO-CRYL PRIMER B66-1300 SERIES	PRO INDUSTRIAL WB ALKYD URETHANE SEMI-GLOSS, B53-1150 SERIES
	GALVANIZED METAL	PRO INDUSTRIAL PRO-CRYL PRIMER B66-1300 SERIES	PRO INDUSTRIAL WB ALKYD URETHANE SEMI-GLOSS, B53-1150 SERIES
	CONCRETE, STUCCO, EIFS, CEMENT BOARD SIDING	LOXON CONCRETE & MASONRY PRIMER LX02W50	RESILIENCE EXTERIOR LATEX GLOSS, K44 SERIES
	CONCRETE MASONRY UNITS (CMU)	PRO INDUSTRIAL HEAVY DUTY BLOCK FILLER, B42W150	RESILIENCE EXTERIOR LATEX GLOSS, K44 SERIES
	CONCRETE WALKWAYS	CONFLEX FLEXIBLE CONCRETE WATERPROOFER, CF14W50 SERIES	AQUARMOR WBU GLOSS, GP4410/GP4410B01
	CONCRETE DRIVEWAYS	NOT REQUIRED	H&C HEAVY SHIELD CONCRETE & DRIVEWAY ENAMEL

SECTION 101400 – SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:

- 1. Panel signs.

1.3 SUBMITTALS

- A. General: Submit the following according to the Conditions of the Contract.
- B. Product data for each type of sign specified, including details of construction relative to materials, dimensions of individual components, profiles, and finishes.
- C. Shop drawings showing fabrication and erection of signs. Include plans, elevations, and large-scale sections of typical members and other components. Show anchors, grounds, layout, reinforcement, accessories, and installation details.
 - 1. Provide message list for each sign required, including large-scale details of wording and lettering layout.
 - 2. Templates: Furnish full-size spacing templates for individually mounted dimensional letters and numbers.
- D. Samples: Provide the following samples of each sign component for initial selection of color, pattern and surface texture as required and for verification of compliance with requirements indicated.
 - 1. Samples for initial selection of color, pattern, and texture:
 - a. Cast Acrylic Sheet and Melamine Sheet: Manufacturer's color charts consisting of actual sections of material including the full range of colors available for each material required.
 - 2. Samples for verification of color, patterns, and texture selected and compliance with requirements indicated:
 - a. Cast Acrylic Sheet and Melamine Sheet: Provide a sample panel not less than 8-1/2 inches by 11 inches for each material, color, texture, and pattern required. On each panel include a representative sample of the graphic image process required, showing graphic style, and colors and finishes of letters, numbers, and other graphic devices.

1.4 QUALITY ASSURANCE

- A. Sign Fabricator Qualifications: Firm experienced in producing signs similar to those indicated for this Project, with a record of successful in-service performance, and sufficient production capacity to produce sign units required without causing delay in the Work.
- B. Single-Source Responsibility: For each separate sign type required, obtain signs from one source of a single manufacturer.
- C. All signs shall conform to all requirements of the Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities, Articles 4.1.2 (7) and 4.30.1 through 4.30.7 (1) inclusive.

1.5 PROJECT CONDITIONS

- A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication to ensure proper fitting. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Manufacturers of Panel Signs:
 - a. Ace Sign Systems, Inc.
 - b. Allen Industries, Inc.
 - c. ASI-Modulex, Inc.
 - d. Best Sign Systems, Inc.
 - e. Mohawk Sign Systems
 - f. APCO Graphics
 - g. In-Pro Corporation
 - h. Signature Signs

2.2 PANEL SIGNS FOR ROOM IDENTIFICATION

- A. Panel signs shall be minimum 1/8" thick (excluding thickness of raised sign letters) melamine or acrylic plastic with 1/32" thick raised characters with Grade 2 Braille.
 - 1. At sign manufacturer's option, the minimum 1/8" thickness of the panel can be achieved by laminating a base layer of melamine or acrylic to the top layer containing the integral raised characters. Edges shall be ground smooth.

2. The characters and background of signs shall be eggshell, matte, or other non-glare finish. Characters and symbols shall contrast with the background – either light characters on a dark background or dark characters on a light background. Submit manufacturer's standard palette of colors meeting these requirements to Architect for selection.
3. Raised Tactile Text shall be achieved by chemically welding 1/16" thick computer cut, colorfast MAP text characters into the 1/32" computer recessed area of the face of the base sheet. The text shall be chemically welded to the recessed surface of the base sheet using methylene chloride and shall, after fabrication, remain raised 1/32" above the face of the base sheet.
4. Grade 2 Braille shall be achieved by pressing optically correct acrylic raster balls into .003 in. computer drilled holes in the base sheet surface. The acrylic raster balls shall be U.V. protected and shall be guaranteed against fading. Bordered, depressed Braille is not acceptable.
5. Sign edges shall be square and the corners shall have a 3/4" radius.
6. Text style shall be Helvetica upper case letters. Text height shall be determined within a range of 5/8" to 2".

B. Room identification signs are to be fabricated and located as follows:

1. At locations indicated on the project drawings
 - a. Fabrication: Sign size as indicated on the project drawings. Sign edges are to be straight and free from saw marks or any other imperfections. Corners shall be rounded, with 3/4" radius.
2. At all Toilet Rooms. In addition to a room name sign provide pictograms of the international symbol of accessibility.
 - a. Example:
 - 1) Room Name Sign: Men's Restroom
 - 2) Pictogram: Accessibility Symbol
 - b. Fabrication: The sign shall be approximately 8-1/2" x 12". Sign edges are to be straight and free from saw marks or any other imperfections. Corners shall be rounded, with 3/4" radius.

C. Occupant Load Signs are to be fabricated and located as follows:

1. Provide at locations indicated on the project drawings.
2. Fabrication: The sign shall be approximately 12" x 7". Sign edges are to be straight and free from saw marks or any other imperfections. Corners shall be rounded, with 3/4" radius.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. General: Locate sign units and accessories where indicated, using mounting methods of the type described and in compliance with the manufacturer's instructions.
 - 1. Install signs level, plumb, and at the height indicated, with sign surfaces free from distortion or other defects in appearance.
- B. Room Identification Signs: Mount on adjoining walls and locate signs adjacent to the latch side of the door. In case of conflicts with closely spaced doors, with vision panels or where there is no wall space to the latch side of the door, notify Architect. Verify all sign locations with Architect prior to installation.
- C. Wall Mounted Signs: Attach signs to wall surfaces using a minimum of two stainless steel screws. For exterior signs, use four stainless steel screws. Use expansion shields for screws set in masonry; use "Molly" type hollow wall fasteners for screws set in gypsum board or plaster.
 - 1. Mounting shall be at a height of 60" to the centerline of the sign (to centerline of top sign when two signs are mounted one above the other).
- D. Dimensional Letters and Numbers: Mount letters and numbers using standard fastening methods recommended by the manufacturer for letter form, type of mounting, wall construction, and condition of exposure indicated. Provide heavy paper template to establish letter spacing and to locate holes for fasteners.
 - 1. Projected Mounting: Mount letters at a 1 inch projection distance from the wall surface indicated.

3.2 CLEANING AND PROTECTION

- A. After installation, clean soiled sign surfaces according to the manufacturer's instruction. Protect units from damage until acceptance by the Owner.

END OF SECTION

SECTION 102113.16 – PLASTIC-LAMINATE-CLAD TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes toilet compartments as follows:
 - 1. Type: Plastic laminate.
 - 2. Compartment Style: Overhead braced and floor anchored.
- B. Related Sections include the following:
 - 1. Division 10 "Toilet and Bath Accessories" for grab bars and toilet paper holders.

1.3 SUBMITTALS

- A. Product Data: For each type and style of toilet compartment and screen specified. Include details of construction relative to materials, fabrication, and installation. Include details of anchors, hardware, and fastenings.
- B. Shop Drawings: For fabrication and installation of toilet compartment assemblies. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Show locations of reinforcement and cutouts for compartment-mounted toilet accessories.
- C. Samples for Initial Selection: 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.
- D. Samples for Verification: Of each compartment color and finish required, prepared on 6-inch-square Samples of same thickness and material indicated for Work.

1.4 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions in areas of installation by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Established Dimensions: Where field measurements cannot be made without

delaying the Work, establish dimensions and proceed with fabricating units without field measurements. Coordinate supports, adjacent construction, and fixture locations to ensure actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Accurate Partitions Corporation.
 2. All American Metal Corp.
 3. American Sanitary Partition Corporation.
 4. Ampco.
 5. Bobrick Washroom Equipment, Inc.
 6. Bradley Corporation; Mills Partitions.
 7. Decolam.
 8. Flush Metal Partition Corp.
 9. General Partitions Mfg. Corp.
 10. Global Partitions.
 11. Knickerbocker Partitions Corp.
 12. Marlite.
 13. Metpar Corp.
 14. Scranton Products.
 15. Tex-Lam Manufacturing, Inc.
 16. Weis-Robert Partitions, Inc.

2.2 MATERIALS

- A. General: Provide materials that have been selected for surface flatness and smoothness. Exposed surfaces that exhibit pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections on finished units are unacceptable.
- B. Plastic Laminate: NEMA LD 3, HGS, 0.048-inch nominal thickness, color and pattern as follows:
1. Color and Pattern: One color and pattern in each room as selected by Architect from manufacturer's full range of colors and patterns.
- C. Core Material for Plastic Laminate: ANSI 208.1, Type M-2 non-urea formaldehyde resin particle board with 45-lb density in thicknesses required to provide minimum nominal thicknesses for components as follows:
1. Doors, Panels, and Screens: 1 inch.
 2. Pilasters: Finished to not less than 1-1/4 inches thick and with internal 0.1196-inch – thick steel-sheet reinforcement.

- D. Pilaster Shoes and Sleeves (Caps): ASTM A 666, Type 302 or 304 stainless steel, not less than 0.0312 inch thick and 3 inches high, finished to match hardware.
- E. Stirrup Brackets: Manufacturer's standard ear or U-brackets for attaching panels and screens to walls and pilasters of the following material:
 - 1. Material: Chrome-plated, nonferrous, cast zinc alloy (zamac) or clear-anodized aluminum.
- F. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories of the following material:
 - 1. Material: Chrome-plated, nonferrous, cast zinc alloy (zamac), clear-anodized aluminum or stainless steel.
- G. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile in manufacturer's standard finish.
- H. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel or chrome-plated steel or brass, finished to match hardware, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use hot-dip galvanized or other rust-resistant, protective-coated steel.

2.3 FABRICATION

- A. General: Provide standard doors, panels, and pilasters fabricated for compartment system. Provide units with cutouts and drilled holes to receive compartment-mounted hardware, accessories, and grab bars, as indicated.
- B. Plastic-Laminate Compartments: Pressure laminate facing sheets to core material without splices or joints in facings or cores. Apply laminate to edges before broad surfaces to seal edges and prevent laminate from being pried loose. Seal exposed core material at cutouts to protect core from moisture.
- C. Overhead-Braced-and-Floor-Anchored Compartments: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, fasteners, and anchors at pilasters to suit floor conditions. Make provisions for setting and securing continuous head rail at top of each pilaster. Provide shoes at pilasters to conceal supports and leveling mechanism.
- D. 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 handicapped accessible.
 - 1. Hinges: Manufacturer's standard self-closing type.
 - a. Outswinging doors to return to fully closed position when unlatched; inswinging doors to stand open approximately 30 degrees when unlatched.

2. Latch and Keeper: Manufacturer's standard surface-mounted latch unit with combination rubber-faced door strike and keeper designed for emergency access. Provide units that comply with accessibility requirements of authorities having jurisdiction at compartments indicated to be handicapped accessible.
3. Coat Hook: For in-swinging doors, manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent door from hitting compartment-mounted accessories; for outswinging doors, Bobrick surface-mounted robe hook #B-818 mounted at 48" above finished floor.
4. Door Bumper: Manufacturer's standard rubber-tipped bumpers at out-swinging doors or entrance screen doors.
5. Door Pull: Manufacturer's standard unit that complies with accessibility requirements of authorities having jurisdiction at out-swinging doors. Provide units on both sides of doors at compartments indicated to be handicapped accessible.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, plumb, and level. Provide clearances of not more than 2 inch between pilasters and panels and not more than 1 inch between panels and walls. Secure units in position with manufacturer's recommended anchoring devices.
 1. Secure panels to walls and pilasters with not less than 3 stirrup brackets attached near top, middle and bottom of panel. Locate wall brackets so holes for wall anchors occur in masonry or tile joints. Align brackets at pilasters with brackets at walls.
- B. Overhead-Braced-and-Floor-Anchored Compartments: Secure pilasters to floor and level, plumb, and tighten. Secure continuous head rail to each pilaster with not less than 2 fasteners. Hang doors and adjust so tops of doors are parallel with overhead brace when doors are in closed position.

3.2 ADJUSTING AND CLEANING

- A. Hardware Adjustment: Adjust and lubricate hardware according to manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors and swing doors in entrance screens to return to fully closed position.
- B. Provide final protection and maintain conditions that ensure toilet compartments are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 102113.16

SECTION 102800 - TOILET AND BATH ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes toilet and bath accessory items as scheduled. (Note: Existing toilet accessories in Restrooms 105 and 108 are to be removed and reinstalled.)

1.3 SUBMITTALS

- A. General: Submit the following according to Conditions of Contract and Division 1 Specifications Sections.
- B. Product data for each toilet accessory item specified, including construction details relative to materials, dimensions, gages, profiles, mounting method, specified options, and finishes.
- C. Setting drawings where cutouts are required in other work, including templates, substrate preparation instructions, and directions for preparing cutouts and installing anchorage devices.
- D. Maintenance instructions including replaceable parts and service recommendations.

1.4 QUALITY ASSURANCE

- A. Inserts and Anchorages: Furnish accessory manufacturers' standard inserts and anchoring devices that must be set in concrete or built into masonry. Coordinate delivery with other work to avoid delay.

1.5 PROJECT CONDITIONS

- A. Coordination: Coordinate accessory locations, installation, and sequencing with other work to avoid interference with and ensure proper installation, operation, adjustment, cleaning, and servicing of toilet accessory items.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Specifications are based upon products by Bobrick Washroom Equipment, Inc. only.

2.2 MATERIALS, GENERAL

- A. Stainless Steel: AISI Type 302/304, with polished No. 4 finish, 0.034 inch minimum thickness.
- B. Brass: Leaded and unleaded, flat products, ASTM B 19; rods, shapes, forgings, and flat products with finished edges, ASTM B 16 (ASTM B 16M); Castings, ASTM B 30.
- C. Sheet Steel: Cold-rolled, commercial quality ASTM A 366 (ASTM A 366M), 0.04 inch minimum. Surface preparation and metal pretreatment as required for applied finish.
- D. Galvanized Steel Sheet: ASTM A 527 G60 (ASTM A 527M Z180).
- E. Chromium Plating: Nickel and chromium electro-deposited on base metal, ASTM B 456, Type SC 2.
- F. Mirror Glass: Nominal 6.0 mm thick, conforming to ASTM C 1036, Type I, Class 1, Quality q2, and with silvering, electro-plated copper coating, and protective organic coating.
- G. Galvanized Steel Mounting Devices: ASTM A 153, hot-dip galvanized after fabrication.
- H. Fasteners: Screws, bolts, and other devices of same material as accessory unit, or of galvanized steel where concealed.

Letters shown in parentheses indicate symbol shown on drawings:

2.3 GRAB BARS (GB)

- A. Stainless Steel Type: Provide grab bars with wall thickness not less than 18 gage (.050 inch) and as follows:
 - 1. Mounting: Concealed, manufacturer's standard flanges and anchorages.
 - 2. Clearance: 1-1/2 inches clearance between wall surface and inside face of bar.
 - 3. Gripping Surfaces: Smooth satin finish.
 - 4. Heavy-Duty Size: Outside diameter of 1-1/2 inches.

5. Product: Bobrick's "Series B-6806", 36 inch (GB-36), and 42 inch(GB-42) lengths at toilet stall/room locations as shown.

2.4 MIRROR UNITS (MIR)

- A. Stainless Steel Framed Mirror Units: Fabricate frame with angle shapes of not less than 18 gage (.050 inch), with square corners mitered, welded, and ground smooth. Provide in No. 4 satin polished finish. Mirror to be 1/4" tempered glass guaranteed against silver spoilage for 15 years.

1. Product: Bobrick "Model B-2908-1836" (for toilet rooms and shower rooms)

2.5 SANITARY NAPKIN DISPOSAL (SND)

- A. Surface-mounted sanitary napkin disposal shall be 22 gage, type 304 stainless steel with satin finish. Self-closing push door shall be attached to cabinet with welded full-length piano hinge. Capacity: 1.2 gallons. Provide tumbler lock for removable napkin receptacle.

1. Product: Bobrick "B-254".

2.6 SHOWER CURTAIN RODS (SCR)

- H. Stainless Steel, heavy duty type: 1" outside diameter; 18-8, type 304, 20 gage tubing with satin finish. Flanges shall be 20 gage stainless steel with satin finish.

1. Product; Bobrick "Model B-6107."

2.7 ANTIBACTERIAL SHOWER CURTAIN (SC)

- H. Antibacterial Shower Curtain: 72-inch wide by 72-inch-high, 10-ounce, nylon-reinforced, antibacterial vinyl fabric with hemmed edges. Fabric to be flameproof, stain-resistant and self-deodorizing, with stainless steel grommets at minimum 6 inches o.c. through top hem. Furnish in color as selected by Architect. Provide one per shower stall.

1. Product: A & J "Model 250A".
2. Shower Hooks: Provide stainless steel hooks in quantity required by number of eyelets in curtains; A & J "Model UX169 Curtain Ring."

2.8 SOAP DISH (SDSH)

- H. Vandal-resistant surface-mounted soap dish. Extra-heavy, chrome-plated cast bronze. Bright polished finish. All edges are rounded for safety. Furnished with tamper resistant mounting screws.

1. Product: Bobrick "Model B-973".

2.9 ROBE HOOK (RH)

- H. Surface-Mounted Hat and Coat Hook: Heavy-duty satin-finished stainless steel hook welded to rectangular flange and support arm with backplate for concealed mounting.

1. Product: Bobrick "Model B-6727".

2.10 ELECTRIC HAND DRYER (HD)

- A. Manufacturer: Provide the following:

1. Bobrick, QuietDry, TerraDry Surface Mounted Hand Dryer shall be Model B-7188 ADA Compliant.

2.11 FABRICATION

- A. General: Only a maximum 1-1/2 inch diameter, unobtrusive stamped manufacturer logo, as approved by Architect, is permitted on exposed face of toilet or bath accessory units. On either interior surface not exposed to view or back surface, provide additional identification by either a printed, waterproof label or a stamped nameplate, indicating manufacturer's name and product model number.
- I. Surface-Mounted Toilet Accessories, General: Except where otherwise indicated, fabricate units with tight seams and joints, exposed edges rolled. Hang doors or access panels with continuous stainless steel piano hinge. Provide concealed anchorage wherever possible.
- J. Recessed Toilet Accessories, General: Except where otherwise indicated, fabricate units of all-welded construction, without mitered corners. Hang doors or access panels with full-length, stainless steel piano hinge. Provide anchorage that is fully concealed when unit is closed.
- K. 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 and full mirror size, with nonabsorptive filler material. Corrugated cardboard is not an acceptable filler material.
- L. Mirror Unit Hangers: Provide system for mounting mirror units that will permit rigid, tamperproof, and theftproof installation, as follows:

1. One-piece, galvanized-steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.
- M. Keys: Provide universal keys for access to toilet accessory units requiring internal access for servicing, resupply, etc. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install toilet accessory units according to manufacturers' instructions, using fasteners appropriate to substrate as recommended by unit manufacturer. Install units plumb and level, 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. Install grab bars to withstand a downward load of at least 250 lbf, complying with ASTM F 446.

3.2 ADJUSTING AND CLEANING

- A. Adjust toilet accessories for proper operation and verify that mechanisms function smoothly. Replace damaged or defective items.
- B. Clean and polish all exposed surfaces strictly according to manufacturer's recommendations after removing temporary labels and protective coatings.

END OF SECTION 102800

SECTION 104415 - FIRE EXTINGUISHERS, CABINETS, AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Fire extinguishers.
 - 2. Fire extinguisher cabinets.

1.3 SUBMITTALS

- A. General: Submit the following according to the Conditions of the Contract.
- B. Product data for cabinets include rough-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type and materials, trim style, door construction, panel style, and materials.
- C. Samples for initial selection purposes in the form of manufacturer's color charts consisting of sections of units showing full range of colors, textures, and patterns available for each type of cabinet finish indicated or exposed to view.

1.4 QUALITY ASSURANCE

- A. Single-Source Responsibility: Obtain extinguishers and cabinets from one source from a single manufacturer.
- B. UL-Listed Products: Fire extinguishers shall be UL listed with UL listing mark for type, rating, and classification of extinguisher.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. J.L. Industries.
2. Larsen's Manufacturing Co.
3. Modern Metal Products by Muckle.
4. Potter-Roemer, Inc.
5. Samson Metal Products, Inc.

2.2 FIRE EXTINGUISHERS

- A. General: Provide fire extinguishers for each cabinet and other locations indicated, in colors and finishes selected by Architect from manufacturer's standard, that comply with authorities having jurisdiction.
- B. Multipurpose Dry Chemical Type: UL-rated 2-A:10:B:C, 5-lb nominal capacity, in enameled steel container.
 1. Provide at all locations except Prep Area 2029.
- C. Wet Chemical "K Class" Type: UL-rated 2A:1B:K, 6 liter nominal capacity, in enameled steel container.
 1. Provide at Prep Area 2029.

2.3 CABINETS

- A. Construction: Manufacturer's standard box, with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated. Weld joints and grind smooth. Miter and weld perimeter door frames.
- B. Fire-Rated Cabinets: UL listed with UL listing mark with fire-resistance rating of wall where it is installed. Provide wherever cabinet is to be installed in a fire-rated wall or partition.
- C. Cabinet Type: Suitable for containing the following:
 1. Fire extinguisher.
- D. Cabinet Mounting: Suitable for the following mounting conditions:
 1. Semi-recessed: Cabinet box (tub) partially recessed in walls of shallow depth.
- E. Trim Style: Fabricate trim in one piece with corners mitered, welded, and ground smooth.
 1. Exposed Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).
 - a. Provide 2-1/2 inch rolled edge.

- F. Door Material and Construction: Manufacturer's standard door construction, of material indicated, coordinated with cabinet types and trim styles selected.
 - 1. Enameled Steel: Manufacturer's standard finish, hollow steel door construction with tubular stiles and rails.
- G. Identify fire extinguisher in cabinet with FIRE EXTINGUISHER lettering applied to door. Provide lettering to comply with authorities having jurisdiction for letter style, color, size, spacing, and location.
 - 1. Application Process: Silk screen.
 - 1. Lettering Style: Horizontal
 - 2. Lettering Color: White.
- H. Door Style: Manufacturer's standard design.
 - 1. Full-Glass Panel: Tempered glass, 1/8 inch thick.
- I. Door Hardware: Provide manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated. Provide either lever handle with cam-action latch, or exposed or concealed door pull and friction latch. Provide concealed or continuous-type hinge permitting door to open 180 degrees.

2.4 FINISHES FOR CABINETS, GENERAL

- A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying temporary strippable protective covering prior to shipping.

2.5 STEEL CABINET FINISHES

- A. Surface Preparation: Solvent-clean surfaces complying with SSPS-SP 1 to remove dirt, oil, grease, and other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5 (white metal blast cleaning) or SSPC-SP 8 (pickling).
- B. Factory-Priming for Field-Painted Finish: Apply shop primer specified below immediately following surface preparation and pretreatment.
 - 1. Shop Primer: Manufacturer's or fabricator's standard fast-curing, lead-free, universal primer, selected for resistance to normal atmospheric corrosion, for compatibility with substrate and field-applied finish paint system indicated, and for capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.
- C. Baked-Enamel Finish: Immediately after cleaning and pretreatment, apply manufacturer's standard two-coat baked-enamel finish consisting of prime coat and

thermosetting topcoat. Comply with paint manufacturer's instructions for applying and baking to achieve a minimum dry film thickness of 2.0 mils.

1. Color: White. Paint the following:
 - a. Exterior of cabinet.
 - b. Interior of cabinet.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls and partitions for thickness and framing for cabinets to verify cabinet depth and mounting prior to cabinet installation.
- B. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Follow manufacturer's printed instructions for installation.
- B. Install in locations indicated. Provide cabinets for extinguishers where indicated on drawings. Provide extinguisher mounting brackets where cabinets are not indicated.
 1. Provide extinguisher mounting brackets in lieu of cabinets at Electrical Rooms, Mechanical Rooms, Elevator Equipment Room, Battery Room, and Mechanical-Electrical Building Addition.
 2. Mount cabinet with bottom edge of trim located 32" above finished floor.
 3. Prepare recesses in walls for cabinets as required by type and size of cabinet and style of trim and to comply with manufacturer's instructions. Recesses in masonry walls shall be neatly sawcut.
 4. Fasten mounting brackets and cabinets to structure, square and plumb. Install mounting brackets at 54" above finished floor to top of fire extinguisher.

END OF SECTION 104415



OFFICE BUILDOUT AND RENOVATION

Seffner, Florida

PROJECT MANUAL

VOLUME 2

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SECTION 210000 – FIRE PROTECTION SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The Bidding Requirements and Contractual Conditions set forth in Division 01 apply to this section.
- B. Examine other sections of the Project Manual for requirements which affect work of this section whether or not such work is specifically mentioned in this section.
- C. Bidders of work in Sections under Division 21 are expected to have read these requirements and, upon subcontracting work called for in such Sections, shall be responsible for compliance with such Sections.

1.2 DEFINITIONS

A. Technical Definitions:

- 1. "Piping" shall mean pipe, fittings, flanges, valves, controls, hangers, traps, drains, insulation, and items customarily required in connection with the transfer of fluids.
- 2. "Concealed" shall mean embedded in masonry or other construction, installed within or behind wall furring, within double partitions or hung ceilings, in attics, in crawl spaces, in chases, in shafts, buried in trenches, etc.
- 3. "Exposed" shall mean not concealed.
- 4. "Demolition" shall be the removal of any existing component, and the capping or plugging or any existing services. Adjacent surfaces shall be restored to existing conditions.
- 5. "Furnish" means to purchase and deliver products and equipment to the project site and prepare for installation.
- 6. "Install" means to assemble, erect, place, anchor and connect furnished products into satisfactory operation.
- 7. "Provide" means to furnish and install.
- 8. "Contract Documents" shall include the written Project Manual and the Drawings.
- 9. Division 21 is the new CSI division replacing the old Division 15 nomenclature, and is hereby defined as interchangeable.
- 10. Division 26 is the new CSI division replacing the old Division 16 nomenclature. They shall be hereby defined as interchangeable.

1.3 QUALITY ASSURANCE

- A. Whenever a reference is made to a standard, installation, or materials, the intention is that the Contractor shall comply with the latest published edition at the time project is bid, unless the edition is otherwise specified herein.
- B. Materials and equipment specified herein shall be new and standard catalogued items manufactured by reputable concerns regularly supplying such materials. Material shall

bear the Underwriters' Laboratories, Inc. label or other appropriate label where such is required or allowed by code, by Contract Documents or by authorities having jurisdiction.

- C. Product deliveries shall be arranged in accordance with construction schedules and to avoid conflict with work and site conditions.
 - 1. Deliver and store products in undamaged condition, in manufacturer's original containers or packaging, with identifying labels intact and legible.
 - 2. Immediately, on delivery, inspect shipments to assure compliance with the requirements of the Contract Documents and approved submittals, and that products are properly protected and undamaged.
 - 3. Provide equipment and personnel to handle products by methods to prevent soiling or damage to products or packaging.

1.4 AMPLIFICATION

- A. Except where modified by a specific notation to the contrary, it shall be understood that the indication and/or description of an item, in the Contract Documents, carries with it the intent to provide the item, regardless of whether or not this is explicitly stated as part of the indication or description.
- B. The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the work. The Contract Documents are complementary, and what is required by any one shall be as binding as if required by all. Work not covered in the Contract Documents will not be required unless it is consistent therewith and is reasonably inferable as being necessary to produce the intended results. Words and abbreviations which have well-known technical or trade meanings are used in the Contract Documents in accordance with such recognized meanings.
- C. In case of discrepancy concerning quality and/or quantity within the Contract Documents, the better quality and/or the greater quantity shall be provided, at no increase to the Contract sum.
- D. No exclusions from, or limitations in, the language used in the Contract Documents shall be interpreted as meaning that the appurtenances or accessories necessary to complete any required system or item of equipment are to be omitted.
- E. The Drawings, of necessity, utilize symbols and schematic diagrams to indicate various items of work. The work shall be installed, in accordance with the diagrammatic intent expressed on the drawings, and in conformity with the dimensions indicated on final architectural and structural drawings.
- F. Where Contract Documents conflict, such conflict shall be brought to the attention of the Architect for clarification. In general, the Architectural Drawings shall take precedence over the Fire Protection Drawings with regard to building construction. Any change from the Drawings necessary to make the work conform to the building as constructed, to fit the work of other trades or to the rules of authorities having jurisdiction, shall be made at no expense to the Owner.

- G. No interpretation shall be made from the limitations of symbols and diagrams that any elements necessary for complete Work are excluded.
- H. Certain details appear on the Drawings, which are specific with regard to the dimensioning and positioning of the Work. These details are intended only for the purpose of establishing general feasibility. They do not obviate responsibility for field coordination for the indicated Work.
- I. The Architect reserves the right to make minor changes in the location of fire protection work or equipment prior to "roughing-in" without additional cost to the contract. Architect approval for deviations from drawing locations and layout shall be obtained prior to installation.
- J. The use of a word in the singular shall not be considered as limiting where other indications denote that more than one item is required.

1.5 QUALIFICATIONS

- A. All entities and personnel performing work for this project shall be regularly engaged and experienced in the type of work to be furnished and shall be licensed for such specialty trades, employ only properly qualified foremen, journeymen and apprentices as appropriate and in keeping with best trade practices.
- B. Each firm shall provide, upon request, a list of similar jobs it has completed.

1.6 CONSTRUCTION REQUIREMENTS

- A. Locations of all pipes, sprinkler heads, etc., as shown on the Drawings are approximate only and are understood to be subject to such revisions as may prove necessary or desirable at the time the work is installed. All work shall be installed with relation to building conditions and shall be installed correct with reference to finished elevations, etc. Exterior utilities shown on the drawings are diagrammatic only, refer to Civil Documents.
- B. The Drawings show the general arrangement of the fire protection piping.
- C. The Contractor is responsible for the proper location and size of all slots, holes or openings in the building structure pertaining to and for the correct location of pipe sleeves.
- D. The Contractor shall so coordinate the work so that it may be installed in the most direct and workmanlike manner. Piping interferences shall be handled by giving precedence to pipe lines, which require a stated slope for proper operation. In all cases, lines requiring a stated grade for their proper operation shall have precedence over electrical conduit, sprinkler piping and ductwork.

- E. All piping in finished areas, except where noted to the contrary, shall be installed in chases, furred spaces or above ceilings, etc. In all cases, pipes shall be installed as high as possible.
- F. All parts of the system requiring adjustments shall be easily accessible. Provide rated access doors, if require, for proper maintenance of all equipment, valves and devices requiring service.

1.7 PROJECT CONDITIONS

- A. All existing utilities shall be located prior to the beginning of work.
- B. Adequate means of protection for all existing utilities shall be provided and, if utilities are damaged during working operations, such shall be repaired to the satisfaction of the utility Owner and at no cost to the contract.
- C. Where existing devices are permanently abandoned, each pipe, etc., shall be completely removed and the pipe plugged or capped at a point well behind the proposed new finished closures, at the nearest valve and within newly finished surfaces.

1.8 COORDINATION

- A. Coordinate the layout of fire protection work with other trades. Locations of structural systems, sprinkler piping, plumbing, and heating/air conditioning work should take preference over the location of conduit runs.

PART 2 – PRODUCTS

2.1 SUPPORTS

- A. UL and FM Compliance: Provide products which are Underwriters Laboratories listed and Factory Mutual approved.
- B. MSS Standard Compliance:
 - 1. Provide pipe hangers and supports of which materials, design and manufacture comply with ANSI/MSS SP-58.
 - 2. Select and apply pipe hangers and supports, complying with MSS SP-69. Size hangers and supports to support pipe weight and fluid conveyed.
 - 3. Fabricate and install pipe hangers and supports, complying with MSS SP-89.
 - 4. Terminology used in this section is defined in MSS SP-90.
- C. Except as otherwise indicated, provide factory-fabricated horizontal piping hangers and supports complying with ANSI/MSS SP-58, of one of the following MSS types listed, selected by installer to suit horizontal piping system, in accordance with MSS SP-69 and manufacturer's published product information. Use only one type by one manufacturer for each piping service. Select size of hangers and supports to exactly fit pipe size for bare piping.

- Adjustable Steel Clevises: MSS Type 1.
- Pipe Hangers: MSS Type 2.
- Steel Double Bolt Pipe Clamps: MSS Type 3.
- Steel Pipe Clamps: MSS Type 4.
- Pipe Hangers: MSS Type 5.
- Adjustable Swivel Pipe Rings: MSS Type 6.
- Adjustable Swivel Rings, Band Type: MSS Type 10.
- Split Pipe Rings: MSS Type 11.
- Extension Split Pipe Clamps: MSS Type 12.
- U-Bolt: MSS Type 24.
- Clips: MSS Type 26.

2.2 PIPE HANGERS

- A. Pipe hangers for all piping shall be Anvil Star or Grinnell of a type suitable for each use. Perforated straps shall not be used in any work. For ferrous pipes up to and including four inches (4") in size, use Anvil Star Fig. 69 carbon steel, adjustable, swivel ring hanger. For piping larger than four inches (4") diameter, use Anvil Star Fig. 260 steel clevis hanger. Where several pipes are parallel at the same elevation, trapeze hangers may be used.

- B. Hanger rods sizes shall conform to the following schedule:

Pipe up to and including 4"	3/8" rod
Pipe 5" up to and including 8"	1/2" rod
Pipe 10" and 12"	5/8" rod

- C. Unless shown otherwise on the Plans, all horizontal runs of ferrous piping shall be suspended from the floor or roof construction, as the case may be, by means of hangers with the following maximum spacing:

Steel Pipe:

Pipe 1" up to and including 1-1/4"	12-0 feet
Pipe 1-1/2" thru 8"	15-0 feet

Threaded Lightwall:

Pipe 1" up to and including 3"	12-0 feet
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- D. There shall be a hanger within two feet (2') of each elbow or tee. Additional supports shall be provided for valves, etc. Vertical risers shall be supported by approved riser clamps at each floor. Vertical pipes within a space shall not have less than two (2) supports.

- E. Supports and hangers shall be installed to permit free expansion and contraction in the piping systems. Hangers shall permit vertical adjustment to maintain proper pitch. Where necessary to control expansion and contraction, the piping shall be guided and firmly anchored. No piping shall be self-supporting; nor shall it be supported from equipment connections.

- F. Inserts shall be used where piping or equipment is to be hung from concrete construction. Inserts shall be Red Head, Drop-in anchors. All inserts shall be galvanized to prevent rusting. After the forms are removed, clip off all nails flush with the exposed surface of the inserts.
- G. Expansion bolts shall be Ackerman-Johnson.
- H. Beam clamps suitable for use with the type of steel construction involved shall be Anvil Star.

2.3 VERTICAL PIPING CLAMPS

- A. General: Except as otherwise indicated, provide factory-fabricated vertical piping clamps complying with ANSI/MSS SP-58, of one of the following types listed, selected by installer to suit vertical piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Select size of vertical piping clamps to exactly fit pipe size of bare pipe.
- B. Two-Bolt Riser Clamps: MSS Type 8.
- C. Four-Bolt Riser Clamps: MSS Type 42.

2.4 HANGER ROD ATTACHMENTS

- A. General: Except as otherwise indicated, provide factory-fabricated hanger-rod attachments complying with ANSI/MSS SP-58, of one of the following MSS types listed, selected by installer to suit horizontal piping hangers and building attachments, in accordance with MSS SP-69 and manufacturer's published product information. Use only one type by one manufacturer for each piping service. Select size of hanger rod attachments to suit hanger rods
- B. Steel Clevises: MSS Type 14.
- C. Swivel Turnbuckles: MSS Type 15.
- D. Malleable Iron Sockets: MSS Type 16.
- E. Steel Weldless Eye Nuts: MSS Type 17.

2.5 BUILDING ATTACHMENTS

- A. General: Except as otherwise indicated, provide factory-fabricated building attachments complying with ANSI/MSS SP-58, of one of the following MSS types listed, selected by Installer to suit building substrate conditions, in accordance with MSS SP-69 and manufacturer's published product information. Select size of building attachments to suit hanger rods.
- B. Concrete Inserts: MSS Type 18.

- C. Top Beam C-Clamps: MSS Type 19.
- D. Side Beam or Channel Clamps: MSS Type 20.
- E. Center Beam Clamps: MSS Type 21.
- F. Welded Attachments: MSS Type 22.
- G. C-Clamps: MSS Type 23.
- H. Top I-Beam Clamps: MSS Type 25.
- I. Side I-Beam Camps: MSS Type 27.
- J. Steel I-Beam Clamps with Eye Nut: MSS Type 28.
- K. Steel WF-Beam Clamps with Eye Nut: MSS Type 29.
- L. Malleable Beam Clamps: MSS Type 30.
- M. Steel Brackets: Heavy Duty: MSS Type 33.
- N. Side Beam Brackets: MSS Type 34.
- O. Plate Lugs: MSS Type 57.
- P. Horizontal Travelers: MSS Type 58.

2.6 MISCELLANEOUS MATERIALS

- A. Metal Framing: Provide products complying with NEMA STD ML 1.
- B. Steel Plates, Shapes and Bars: Provide products complying with ANSI/ASTM A 36.
- C. Cement Grout: Portland cement (ANSI/ASTM C 150, Type I or Type III) and clean uniformly graded, natural sand (ANSI/ASTM C 404, Size No. 2). Mix at a ratio of 1.0 part cement to 3.0 parts sand, by volume, with minimum amount of water required for placement and hydration.
- D. Heavy-Duty Steel Trapezes: Fabricate from steel shapes selected for loads required; weld steel in accordance with AWS standards.
- E. Install hangers, supports, clamps and attachments to support piping properly from building structure; comply with MSS SP-69. Arrange for grouping of parallel runs of horizontal piping to be supported together on trapeze type hangers where possible. Install supports with maximum spacing complying with MSS SP-69. Where piping of various sizes is to be supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipe. Do not use

wire or perforated metal to support piping, and do not support piping from other piping, ductwork or other supported mechanical or electrical items.

- F. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers and other accessories. Except as otherwise indicated for exposed continuous pipe runs, install hangers and supports of same type and style as installed for adjacent similar piping. Provide section drawing for hanger locations to avoid duct interference.
- G. Support fire suppression piping independently of all other piping.

2.7 MANUFACTURERS AND INSTALLATION OF PIPE, HANGERS, AND SUPPORTS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturer's offering hangers and supports which may be incorporated in the work include, but are not limited to, the following: Anvil Star and ITT Grinnel Corp.

2.8 PIPE PAINTING

<u>TYPE OF SERVICE</u>	<u>BACKGROUND COLOR</u>
Fire Protection Water Sprinkler-Fire	Red Red

2.9 BASIC PIPE, TUBE AND FITTINGS

- A. Interior Piping:
 - 1. Black Steel Pipe:
 - a. Pipe Weight: Schedule 40 up to 2"; Schedule 10 for 2-1/2" and larger.
 - b. Fittings: Class 125, cast-iron threaded.
 - c. Fittings: Mechanical grooved pipe couplings and fittings; cut-groove type.
 - d. Fittings: Mechanical grooved pipe couplings and fittings; roll-groove or mechanical locking type.

2.10 BASIC SUPPORTS, ANCHORS AND SEALS

- A. Provide supports, anchors, and seals in accordance with the following listing:
 - 1. Adjustable steel clevises, adjustable steel band hangers, adjustable band hangers, for horizontal piping hangers and supports.
 - 2. Two-bolt riser clamps for vertical piping supports.
 - 3. Steel turnbuckles, and malleable iron sockets for hanger-rod attachments.
 - 4. Concrete inserts, top-beam C-clamps, side beam or channel clamps, and center beam clamps for building attachments.

2.11 BASIC VALVES

A. Interior Valves:

1. Sectional: Butterfly valves, Gate valves, O, S & Y UL listed, supervised.
2. Check: Swing check valves, UL listed.

2.12 SPECIAL VALVES

A. Provide valves, UL listed, of sizes and types which mate and match piping and equipment connections.

B. Hose Outlet Valves: Provide chrome plated brass angle hose valves, 2-1/2" size where not otherwise indicated, complete with caps and chains.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering fire hydrants which may be incorporated in the work include, but are not limited to, the following: ITT Grinnel Valve Co. Inc., Kennedy Valve, Nibco, and Viking.

2.13 BASIC METERS AND GAUGES

A. General: Provide meters and gauges in accordance with the following listing:

Pressure gauges 0-250 PSI range.

2.14 FIRE PROTECTION SPECIALTIES

A. Provide fire protection specialties, UL listed, in accordance with the following listing. Provide sizes and types which mate and match piping and equipment connections.

B. Water Flow Indicators: Provide vane-type water flow detectors with retard switch adjustable up to 2 minutes.

C. Electric Bell: Provide 8" waterproof, red enameled finish.

D. Supervisory Switches: Provide products recommended by manufacturer for use in service indicated.

E. Automatic Sprinklers: Provide quick response automatic sprinklers of type indicated on drawings, and in accordance with the following listing. Provide glass bulb 155°F unless otherwise indicated. Provide glass bulbs for 200°F in areas indicated and in electrical closets when required by code.

F. Sprinkler Cabinet and Wrench: Furnish steel, baked red enameled, sprinkler box with spare head capacity per NFPA 13.

G. Available Manufacturers: Subject to compliance with requirements, manufacturers offering fire protection specialties which may be incorporated in the work include, but are

not limited to, the following: Elkhart Brass Manufacturing Co., Croker Division, Potter-Roemer, Inc., Automatic Sprinkler Corp. of America, Grinnell Fire Sprinkler Systems Co., Inc., Reliable Sprinklers, Star Sprinkler Corporation, Viking Corporation and Tyco.

2.15 FIRE PROTECTION VALVES

A. VALVES

Provide factory-fabricated valves recommended by manufacturer for use in service indicated. Provide valves of types and pressure ratings indicated; provide proper selection as determined by Installer to comply with installation requirements. Provide sizes as indicated, and connections which properly mate with pipe, tube, and equipment connections.

B. GATE VALVES

1. Packing: Select valves designed for repacking under pressure when fully opened, equipped with packing suitable for intended service. Select valves designed so back seating protects packing and stem threads from fluid when valve is fully opened, and equipped with gland follower.
2. Comply with the following standards:
 - a. Cast-Iron Valves: MSS SP-70.
 - b. Bronze Valves: MSS SP-80.
 - c. Steel Valves: ANSI B16.34.
3. For Fire Protection Service:
 - a. Threaded Ends 2" and Smaller: Class 175, bronze body, screwed bonnet, rising stem, OS&Y, solid wedge, UL listed.
 - b. Flanged Ends 2-1/2" and Larger: Class 175, iron body, bolted bonnet, rising stem, OS&Y, solid wedge, UL listed.
 - c. Mechanical Joint Ends 4" and Larger: Class 175, iron body, bolted bonnet, non-rising stem, indicator post flange, solid wedge, UL listed.
 - d. Vertical Indicator Post: Cast-iron body, cast-iron sleeve, steel extension rod, target plates and window, malleable iron operating wrench, length of sleeve to suit depth of bury.
4. Available Manufacturers: Subject to compliance with requirements, manufacturers offering gate valves which may be incorporated in the work include, but are not limited to, the following: Kennedy, Grinnell, NIBCO, Inc., United Brass Works, Inc.

C. DRAIN VALVES

1. For Low Pressure Drainage Service:
 - a. Threaded Ends 2" and Smaller: Class 150, bronze body, screwed bonnet, rising stem, composition disc, 3/4" hose outlet connection.

- b. Soldered Ends 2" and Smaller: Class 150, bronze body, screwed bonnet, rising stem, composition disc, 3/4" hose outlet connection.
2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering drain valves which may be incorporated in the work include, but are not limited to, the following: NIBCO, Inc., AGF.

D. BUTTERFLY VALVES

1. Comply with MSS SP-67. Provide gear operators on butterfly valves 6" and larger. Butterfly valves shall have a minimum working pressure rating of 150 psig at 150°F and be capable of bubble tight shut-off without a downstream flange at full rated pressure. Available Manufacturers: Subject to compliance with requirements, manufacturers offering butterfly valves which may be incorporated in the work include, but are not limited to the following: Grinnell, NIBCO, Inc., Kennedy, and Viking.

E. SWING CHECK VALVES

1. Construct pressure containing parts of valves as follows:
 - a. Bronze Valves, 150 psi: ANSI/ASTM B 62.
2. Comply with MSS SP-71 for design, workmanship, material and testing.
3. Construct valves of pressure castings free of any impregnating materials.
4. Construct valves of bronze, regrinding with seating angle 40 degrees to 45 degrees, unless composition disc is specified.
5. Provide stop plug as renewable stop for disc hanger, unless otherwise specified.
6. Construct disc and hanger as separate parts, with disc free to rotate.
7. Support hanger pins on both ends by removable side plugs.
8. For Fire Protection Service:
 - a. Threaded Ends 2-1/2" and Larger: Class 175, iron body bronze mounted, bolted cap, horizontal swing, malleable iron disc, UL listed.
 - b. Flanged Ends 2-1/2" and Larger: Class 175, iron body bronze mounted, bolted cap, horizontal swing, malleable iron disc, UL listed.
9. Available Manufacturers: Subject to compliance with requirements, manufacturers offering swing check valves which may be incorporated into the work include, but are not limited to, the following: Grinnell, NIBCO, Inc., Kennedy, United Brass Works, Inc., and Viking.

2.16 IDENTIFICATION OF VALVES

1. All control, drain, and test connection valves shall be provided with a permanently marked weatherproof metal or rigid plastic identification signs.
2. The identification sign shall be secured with corrosion-resistant wire, chain, or other approved means.
3. The control valve sign shall identify the portion of the building served.

PART 3 - EXECUTION

3.1 ORGANIZATION OF THE WORK:

- A. All work shall be installed as required to meet all construction schedules.
- B. Prior to starting the work, carefully verify all measurements at the site and determine that the work will properly clear openings, structural members and work of other trades. Correlate the time of each work item with all other trades to the best advantage of the completed job. Furnish, in ample time to avoid delays in the work, all information required to revise footing elevations, structural elements, chases and openings in floors and walls, and to provide clearances which may be required to accommodate the work.
- C. Should uncharted or incorrectly charted piping or other utilities be encountered during work operations, notify the Architect/Engineer immediately for clarification.
- D. Immediately act to put any damaged utilities back in functioning conditions.
- E. At all times while work is taking place, a competent Superintendent in charge shall be on site.
- F. Maintain a complete file of all Contract Documents and approved shop drawings at the site.
- G. Installation and shop drawings shall be initialed and dated upon installation. This procedure will enable the Architect/Engineer to verify the work in progress.
- H. The Contractor shall be responsible for the work until its completion and formal final Substantial Completion. Replace any work which may be damaged, lost or stolen without additional cost to the Owner, while the site is under the control of the contractor.
- I. Provide all scaffolding, rigging, hoisting, and services necessary for erection of the work and for delivery to and removal from the premises of any equipment and apparatus furnished. Remove same from premises when no longer required.
- J. Keep the premises free from accumulations of waste material or rubbish.
- K. Minimize construction noise levels in all locations adjacent to or in occupied areas.
- L. The Owner reserves the right to prevent use of any tools which cause detrimental vibration or noise when the facility is occupied.
- M. Protect equipment and materials during construction from damage from water, dirt, welding and cutting splatter, paint drippings, etc., by use of shields and drop cloths. Damaged materials shall be repaired or replaced to the Architect's satisfaction.
- N. Products stored outside shall be covered with waterproof drop cloth or tarpaulins. Condensation shall be prevented by heating and ventilating as may be required.
- O. Provide the following accessory materials for sprinkler systems.
 - 1. All pipe penetrations of rated floors and walls shall be properly sealed in accordance with UL and UL approved details. Coordinate penetrations with the appropriate detail as referenced on the Architectural Drawings.

- P. Provide written copy of the approval of the authority having jurisdiction.

3.2 SHOP DRAWINGS AND SUBMITTALS

- A. The Architect/Engineer shall have the authority to determine the method of submitting shop drawings.
- B. Submittals are required for all sprinkler items.
- C. Electronic transmittal (Fax or email) of submittals will not be acknowledged or reviewed.
- D. For items reviewed and marked "Rejected" or "Revise and Resubmit", only one additional submittal will be reviewed to verify product compliance with the Contract Documents. Should further submittals be required for the Design Professional to verify the submittal with the requirements of the Contract Documents, the hourly rate of \$150.00 will be billed to the Contractor for the Professional(s) time spent on the review.
- E. Manufacturer's catalog cuts may be submitted for all standard cataloged equipment, provided that the item required to meet the project specification is not modified in any way from the standard catalog version. Where multiple products are included on the same cut sheet, clearly identify the product proposed for installation by striking through all sections not applicable to the proposed product.
- F. Cuts shall be clearly marked to indicate the exact size, type, rating, capacity, etc., of the item to be provided.
- G. Bind shop drawings/catalog-cuts in three ring binders with a title sheet and identification on front and side of the binder. Submit shop drawings and cut sheets all at one time. Allow space for Contractor, Project Architect and Engineer review stamps.
- H. All submittals must bear the handwritten signature of the Contractor and his stamp of approval before being considered for review by the Architect/Engineer.
- I. Shop drawings that deviate from the requirements of the contract documents shall list all differences in a cover letter attached to top of the submittal. Any unlisted deviations found during review will result in the rejection of the entire submittal. Pipe routes may not be altered strictly for the Contractor's convenience.

3.3 EXAMINATION OF EXISTING CONDITIONS

- A. Visit and carefully examine those portions of the site and/or present buildings affected by this work so as to become familiar with existing conditions and difficulties that will affect the execution of the work, before submitting proposals.
- B. Submission of a proposal will be construed as evidence that such examination has been made. Later claims for labor, equipment, materials, etc. required because of difficulties encountered, which could have been foreseen had such examination been made, will not be recognized.

3.4 ACCESS DOORS AND PANELS

- A. Furnish access doors and panels for proper and adequate access to all valves and other equipment which is concealed in walls, furring and hung ceilings, or where may additionally be necessary.
- B. Material and Finish: Access doors shall conform to the finish and rating of adjacent construction as indicated in the finish schedule.

3.5 PAINTING

- A. Field painting shall be as specified in the Painting Section of the Specifications. All work shall be left clean and free from oil, dirt and grease prior to field painting.
- B. Upon completion, thoroughly clean all piping and other work to remove all dirt, grease, rust and oil. Thoroughly prepare all such work for painting.
- C. All fire risers and exposed fire sprinkler piping shall be painted red.

3.6 PENETRATION OF SOUND PROOFING

- A. The penetration of any sound proofing materials shall include all necessary materials and labor to provide thorough and complete caulking of all penetrations through walls, partitions and decks, whether such penetration occurs above or below dropped ceiling lines.

3.7 EXCAVATION AND BACKFILL

- A. Trench and pit excavating and backfilling inside and outside the building, as required, including shoring and bracing, pumping and protection for safety of persons and property shall be provided as required.

3.8 UNDERGROUND PIPING PROTECTION

- A. Protect the exterior surface of all underground steel piping against rust and corrosion. For piping not specified elsewhere to be furnished with factory applied pipe corrosion resistant wrapping, the piping surfaces shall be cleaned of rust, dirt, etc. with a wire brush and shall be free of oil and grease and completely dry. Brush on or otherwise apply as recommended by the manufacturer, a heavy full coating of TC Mastic (Tape Coat Company, Evanston, Illinois) or Reilly Protective Coast Tar Enamel No. 3302 (Reilly Tar and Chemical Company, Indianapolis, Indiana). Dry coating shall be not less than twelve mils thickness.

3.9 CHASING, CUTTING AND PATCHING

- A. Provide and place required sleeves, forms and inserts before walls, ceilings, partitions, floors or roofs are built.

- B. When it becomes necessary to cut finished materials, submit to the Architect for approval, drawings showing the work required and obtain approval before doing such cutting.
- C. Provide exact dimensions and locations of these openings (to suit the apparatus to be used) before such walls are built.
- D. No cutting or altering the work of others will be permitted without the approval of the Architect. No structural members shall be cut without the previous written approval of the Architect.
- E. Any holes in existing slabs or other concrete or finished work required for the installation of new piping shall be core bored and sealed.

3.10 CLEANING

- A. Upon completion, piping and equipment shall be thoroughly cleaned of dirt, grease, rust and oil, primed where necessary, and made ready for painting.
- B. Clean gauges and fittings.

3.11 TEST AND INSTRUCTIONS

- A. Make tests necessary to establish the adequacy, quality, safety, completed status and satisfactory operation of all systems and components. Tests shall be made to the satisfaction of the Architect/Engineer and the authority having jurisdiction.
- B. Provide a letter addressed to the Owner advising that the completed systems have been installed in accordance with the Contract Documents and that such are in proper operating condition. The Owner shall receive a written guarantee covering all defects in workmanship and material for a period of one (1) year from date of Substantial Completion.

3.12 INSTRUCTIONS

- A. After the systems are in operation, and tests are complete, instruct the designated personnel of the Owner on the operation and maintenance of all equipment and systems in accordance with NFPA Standards.

3.13 PROJECT CLOSEOUT

- A. Prior to request for substantial completion, all fire protection systems shall be verified for proper operation. Substantiation of complete and operational systems shall be verified by submission of the following documents and forms:
 - 1. Completed Operation and Maintenance Manuals.
 - 2. Fire sprinkler certification reports signed by the authority having jurisdiction.

3.14 ADJUST AND CLEAN

- A. Sprinkler Piping Flushing: Prior to connecting sprinkler risers for flushing, flush water feed mains, lead-in connections and control portions of sprinkler piping. After fire sprinkler piping installation has been completed and before piping is placed in service, flush entire sprinkler system, as required to remove foreign substances, under pressure as specified in ANSI/NFPA 13. Continue flushing until water is clear, and check to ensure that debris has not clogged sprinklers.

3.15 FIELD QUALITY CONTROL

- A. Hydrostatic Testing: After flushing system, test fire sprinkler piping hydrostatically, for period of 2 hours, at not less than 200 psi or at 50 psi in excess of maximum static pressure when maximum static pressure is in excess of 150 psi. Check system for leakage of joints. Measure hydrostatic pressure at low point of each system or zone being tested.
- B. Repair or replace piping system as required to eliminate leakage in accordance with ANSI/NFPA standards for "little or no leakage", and retest as specified to demonstrate compliance.

3.16 STOCK OF SPARE SPRINKLERS

- A. There shall be maintained on the premises a supply of spare sprinklers (never less than 6) so that any sprinklers that have operated or been damaged in anyway may be promptly replaced. These sprinklers shall correspond to the types and temperature ratings of the sprinklers in the property. The sprinklers shall be kept in a cabinet located where the temperature to which they are subjected will at no time exceed 100°F (38°C).
- B. A special sprinkler wrench shall also be provided and kept in the cabinet to be used in the removal and installation of sprinklers. One sprinkler wrench shall be provided for each type of sprinkler installed.
- C. The stock of spare sprinklers shall include all types and ratings installed and shall be as follows:

For protected facilities having under 300 sprinklers, not less than six (6) sprinklers.

For protected facilities having 300 to 1,000 sprinklers, not less than twelve (12) sprinklers.

For protected facilities having over 1,000 sprinklers, not less than twenty-four (24) sprinklers.

END OF SECTION 210000

SECTION 220000 – PLUMBING SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The Bidding Requirements and Contractual Conditions set forth apply to this section.
- B. Examine other sections of the Project Manual for requirements which affect work of this section whether or not such work is specifically mentioned in this section.
- C. Bidders of work in other Sections are expected to have read these requirements and, upon subcontracting work called for in such Sections, shall be responsible for compliance with such Sections.

1.2 DEFINITIONS

A. Technical Definitions:

- 1. "Piping" shall mean pipe, fittings, flanges, valves, controls, hangers, traps, drains, insulation, vents and items customarily required in connection with the transfer of fluids.
- 2. "Concealed" shall mean embedded in masonry or other construction, installed within or behind wall furring, within double partitions or hung ceilings, in attics, in crawl spaces, in chases, in shafts, buried in trenches, etc.
- 3. "Exposed" shall mean not concealed.
- 4. "Demolition" shall be the removal of any existing equipment, and the capping or plugging or any existing services to that equipment. Adjacent surfaces shall be restored to existing conditions and adjacent surfaces.
- 5. "Furnish" means to purchase and deliver products and equipment to the project site and prepare for installation.
- 6. "Install" means to assemble, erect, place, anchor and connect furnished products into satisfactory operation.
- 7. "Provide" means to furnish and install.
- 8. "Contract Documents" shall include the written Project Manual and the Drawings.
- 9. Divisions 21, 22 and 23 are the new CSI divisions replacing the old Division 15 nomenclature. They shall be hereby defined as interchangeable.
- 10. Division 26 is the new CSI division replacing the old Division 16 nomenclature. They shall be hereby defined as interchangeable.

1.3 QUALITY ASSURANCE

- A. Standards: Certain standard materials and installation requirements are described by reference to standard specifications. These standards include the following:

ASA - American Standards Association

ASTM - American Society for Testing Materials

ASME - American Society of Mechanical Engineers

NEMA - National Electrical Manufacturers Association
UL - Underwriters Laboratories
ANSI - American National Standards Institute
ASPE - American Society of Plumbing Engineers
AMA - Acoustical Materials Association
NEC - National Electric Code

- B. Whenever a reference is made to a standard, installation or a material the intention is that such shall comply with the latest published edition at the time project is bid, unless the edition is otherwise specified herein.
- C. Materials and equipment herein shall be new and standard catalogued items manufactured by reputable concerns regularly supplying such materials. Material shall bear the Underwriters' Laboratories, Inc. label or other appropriate label where such is required or allowed by code, by the Contract Documents or by authorities having jurisdiction.
- D. Product deliveries shall be arranged in accordance with construction schedules and to avoid conflict with work and site conditions.
 - 1. Deliver and store products in undamaged condition, in manufacturer's original containers or packaging and with identifying labels intact and legible.
 - 2. Immediately upon delivery, inspect shipments to assure compliance with the requirements of the Contract Documents and approved submittals; and that products are properly protected and undamaged.
 - 3. Provide equipment and personnel to handle products by methods that prevent soiling or damage to the products or their packaging.

1.4 AMPLIFICATION

- A. Except where modified by a specific notation to the contrary, it shall be understood that the indication and/or description of an item in the Contract Documents carries with it the intent to provide that item, regardless of whether or not it is explicitly stated as part of the indication or description.
- B. The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the work. The Contract Documents are complementary, and what is required by any one shall be as binding as if required by all. Work not covered in the Contract Documents will not be required unless it is consistent therewith and is reasonably inferred as being necessary to produce the intended results. Words and abbreviations which have well-known technical or trade meanings are used in the Contract Documents in accordance with such recognized meanings.
- C. In case of discrepancy concerning quality and/or quantity within the Contract Documents, the better quality and/or the greater quantity shall be provided, at no increase to the Contract sum.

- D. No exclusions from or limitations in the language used in the Contract Documents shall be interpreted as meaning that the appurtenances or accessories necessary to complete any required system or item of equipment are to be omitted.
- E. The Drawings, of necessity, utilize symbols and schematic diagrams to indicate various items of work. The work shall be installed, in accordance with the diagrammatic intent expressed on the drawings, and in conformity with the dimensions indicated on final architectural and structural drawings.
- F. Where Contract Documents conflict, such conflict shall be brought to the attention of the Architect/Engineer for clarification. In general, the Architectural Drawings shall take precedence over the Mechanical Drawings with regard to building construction. Any change from the Drawings necessary to make the work conform to the building as constructed, to fit the work of other trades or to comply with the rules of authorities having jurisdiction, shall be made at no expense to the Owner.
- G. No interpretation shall be made from the limitations of symbols and diagrams that any elements necessary for complete Work are excluded.
- H. Certain details appear on the Drawings, which are specific with regard to the dimensioning and positioning of the Work. These details are intended only for the purpose of establishing general feasibility. They do not prevent responsibility for field coordination of the indicated Work.
- I. Capacities, sizes and conditions specified or shown are allowable minimums. Based on design and rated operating conditions of systems, motors shall not be overloaded. Equipment shall not operate at speeds or temperatures greater than manufacturer's published recommendations, and no strain or demand shall be imposed upon any component to any system, structure or building.
- J. The Architect/Engineer reserves the right to make minor changes in the location of mechanical work or equipment prior to "roughing-in" without additional cost to the contract. Architect/Engineer approval for deviations from drawing locations and layout shall be obtained prior to installation.
- K. The use of a word in the singular shall not be considered as limiting where other indications denote that more than one item is required.

1.5 QUALIFICATIONS

- A. All entities and personnel performing work for this project shall be regularly engaged and experienced in the type of work to be provided and shall be licensed for such specialty trades, employ only properly qualified foremen, journeymen and apprentices as appropriate and in keeping with best trade practices.
- B. Each firm shall provide, upon request, a list of similar jobs it has completed.

1.6 CONSTRUCTION REQUIREMENTS

- A. Locations of all pipes, fixtures, equipment, etc., as shown on the Drawings are approximate only and are understood to be subject to such revisions as may prove necessary or desirable at the time the work is installed. All work shall be installed with relation to building conditions and shall be installed correct with reference to finished elevations, etc. Exterior utilities shown on the drawings are diagrammatic only. Their exact locations, depths and invert elevations shall be as required for proper flow and coordination with other trades.
- B. If equipment, piping and fixtures are installed requiring space conditions other than those shown, or arranged, and rearrangement of the space is necessitated, the Architect/Engineer shall review the change before the Contractor proceeds with the work. The request for such changes shall be accomplished by submission of Shop Drawings for the space in question.
- C. The Contractor is responsible for the proper location and size of all slots, holes and/or openings in the building structure pertaining to pipe installation and for the correct location of pipe sleeves.
- D. The Contractor shall so coordinate the work so that it may be installed in the most direct and workmanlike manner. Piping interferences shall be handled by giving precedence to pipe lines, which require a stated slope for proper operation. Storm and sewer lines and condensate piping shall take precedence over water lines in determination of elevations. Where there is interference between storm and/or sewer lines and condensate lines, the sewer lines shall have precedence and provisions shall be made in the condensate lines for offsetting them around the sewer lines. In all cases, lines requiring a stated grade for their proper operation shall have precedence over electrical conduit and ductwork.
- E. All piping in finished areas, except where noted to the contrary, shall be installed in walls, chases, furred spaces, above ceilings, etc. In all cases, pipes shall be installed as high as possible. Runs of piping shall be grouped whenever it is feasible.
- F. All oiling devices and all parts of equipment requiring adjustments shall be easily accessible. Provide access doors, if required, for proper maintenance of all equipment and devices requiring service.

1.7 PROJECT CONDITIONS

- A. All existing utilities shall be located prior to the beginning of work. Any conflicts shall be resolved and noted on the Record Documents.
- B. Adequate means of protection for all utilities shall be provided and, if utilities are damaged during working operations, such shall be repaired to the satisfaction of the utility Owner, at no cost to the contract.

- C. Where existing devices are permanently abandoned, each pipe, etc., shall be completely removed and the pipe plugged or capped at a point well behind the proposed new finished closures or newly finished surfaces.

1.8 COORDINATION

- A. Coordinate the layout of the plumbing work with all other trades. Locations of plumbing work should take preference over the location of conduit runs.

PART 2 - PRODUCTS

NOT APPLICABLE

PART 3 - EXECUTION

3.1 ORGANIZATION OF THE WORK:

- A. All work shall be installed as required to meet all construction schedules.
- B. Prior to starting the work, carefully verify all measurements at the site and determine that the work will properly clear openings, structural members and work of other trades. Correlate the time of each work item with all other items to the best advantage of the completed job. Furnish, in ample time to avoid delays in the work, all information required to revise footing elevations, structural elements, chases and openings in floors and walls, and to provide clearances which may be required to accommodate the work. Set all sleeves, anchor bolts and inserts required to accommodate equipment before concrete is poured or masonry is started.
- C. Locate existing utilities prior to beginning work. Reroute or replace existing utilities where necessary to permit installation of work. Provide adequate means of protection for all work, new and existing. Repair existing utilities damaged during work operations to the satisfaction of the utility and at no cost to the contract.
- D. Should uncharted or incorrectly charted piping, or other utilities be encountered during work operations, notify the Architect immediately for clarification. Cooperate with utility companies to maintain active utilities in operation.
- E. Immediately act to put any damaged utilities back in functioning conditions.
- F. At all times while work is taking place, a competent Superintendent in charge shall be on site.
- G. Maintain a complete file of all Contract Documents and approved shop drawings at the site.
- H. Installation and equipment shop drawings shall be initialed and dated upon installation. This procedure will enable the Architect/Engineer to verify the work in progress.

- I. The Contractor shall be responsible for the work until its completion and the formal final Substantial Completion. Replace any work which may be damaged, lost or stolen without additional cost to the Owner, while the site is under the control of the contractor.
- J. Provide all scaffolding, rigging, hoisting, and services necessary for erection of the work and for delivery to and removal from the premises of any equipment and apparatus furnished. Remove same from premises when no longer required.
- K. Keep the premises free from accumulations of waste material or rubbish.
- L. Minimize construction noise levels in all locations adjacent to or in occupied areas.
- M. The Owner reserves that right to prevent use of any tools which cause detrimental vibration or noise when the facility is occupied.
- N. Protect equipment and materials during construction from damage from water, dirt, welding and cutting splatter, paint drippings, etc., by use of shields and drop cloths. Damaged equipment or materials shall be repaired or replaced to the Architect's/Engineer's satisfaction.
- O. Products stored outside shall be covered with waterproof drop cloths or tarpaulins. Condensation shall be prevented by heating and ventilating as may be required.
- P. During construction, maintain materials and equipment in an orderly and protected manner.
- Q. Provide the following accessory materials for mechanical systems.
 - 1. Anchor bolts or other anchoring devices shall be of the size and type recommended by equipment manufacturer for specific application.
 - 2. Structural support (steel) for elevated or suspended mechanical items shall be made with connections using "simple" framing.
 - 3. Resilient isolation pads for motors and equipment shall be rubber-in-shear pads and of type recommended by manufacturers of the motor and equipment. All air handlers and cooling equipment shall be provided with isolation pads between the equipment and the concrete housekeeping pad.
 - 4. Dielectric fittings shall be provided where copper piping joins steel or iron piping, insulating bushings or unions.
 - 5. Escutcheons shall be provided where pipes pierce exposed partitions, floors, walls or ceilings. Escutcheons shall be chrome plated.
 - 6. All pipe penetrations of rated floors and walls shall be properly sealed in accordance with UL and UL approved details. Coordinate penetrations with the appropriate detail or reference on the Architectural Drawings.
- R. Provide a secondary drain pan under all water heaters. Drain pan shall include a full size drain piped to the building exterior.

- S. Where specific instructions are not indicated or specified, provide the following items on the installation of motor driven equipment:
1. Provide templates and anchor bolts.
 2. For equipment placed on the ground floor or on the structural system, provide a minimum of six inch (6") thick reinforced concrete equipment pad. Provide resilient isolation pads between equipment and slab. Such slabs shall be designed and reinforced to meet the conditions.
 3. For suspended equipment, provide structural supports designed to carry all loads, with "simple" framing, anchoring devices and vibration isolation devices reviewed by the Architect/Engineer.

3.2 SHOP DRAWINGS AND SUBMITTALS

- A. The Architect/Engineer shall have the authority to determine the method of submitting shop drawings whether in multiple sets or by the reproducible transparency technique.
- B. Submittals are required for all items of equipment and all plumbing products.
- C. Electronic transmittal (Fax or email) of shop drawings will not be acknowledged or reviewed.
- D. For items reviewed and marked "Rejected" or "Revise and Resubmit", only one additional submittal will be reviewed to verify product compliance with the Contract Documents. Should further submittals be required for the Design Professional to verify the submittal with the requirements of the Contract Documents, the hourly rate of \$125.00 will be billed to the Contractor for the Professional(s) time spent on the review.
- E. Submittals shall be referenced to the Contract Documents. For all equipment, which has been scheduled directly on the Drawings, provide within the submittal, a performance schedule for the proposed equipment in the same format as included on the Contract Documents.
- F. Manufacturer's catalog cut sheets may be submitted for all standard cataloged equipment, provided that the item required to meet the project specification is not modified in any way from the standard catalog version. Where multiple products are included on the same cut sheet, clearly identify the product proposed for installation by striking through all sections not applicable to the proposed product.
- G. Cut sheets shall be clearly marked to indicate the exact size, type, rating, capacity, etc., of the item to be provided.
- H. Bind shop drawings/catalog-cuts in three ring binders with a title sheet and identification on front and side of the binder. Submit drawings and cut sheets all at one time. Allow space for Contractor, Project Architect and Engineer review stamps. Index all items to the Project Manual or Drawings as applicable.

- I. All submittals must bear the handwritten signature of the Contractor and his stamp of approval before being considered for review by the Architect/Engineer. Submittals shall include sufficient area on the cover for the Architect's/Engineer's stamp.
- J. Shop drawings and submittals which have not been reviewed and so marked by the Contractor, will be returned to the Contractor for such action before the Architect or his Engineers will review and comment on such submittals.
- K. Full submittal shall be made for all equipment (whether or not it is exactly as specified) on the basis of design. Any items marked REJECTED shall be resubmitted and provided exactly as specified. Partial submittals will not be accepted for review and approval.
- L. Full electrical characteristics for each motor, piece of equipment or device shall be prominently displayed on the shop drawings or submittal. Additionally, a statement signed by maker of the submittal shall be included indicating that he or she has carefully examined the electrical characteristics specified in the Contract Documents (and if remodeling or an addition, as to existing electrical characteristics), and that the motors, equipment or devices proposed to be furnished are compatible.

The responsibility to provide motors and equipment compatible with the electric service provided shall rest with the supplier furnishing the equipment, at no additional cost to the Contract.

A similar statement shall be included stating the supplier has reviewed the space requirements of the project and that the submitted equipment will fit in the space provided and adequate service requirements have been met.

- M. Shop drawings that deviate from the requirements of the contract documents shall list all differences in a cover letter attached to top of the submittal. Any unlisted deviations found during review will result in the rejection of the entire submittal.

3.3 EXAMINATION OF EXISTING CONDITIONS

- A. Before submitting proposals, visit and carefully examine those portions of the site and/or existing buildings affected by this work so as to become familiar with the existing conditions and difficulties that will affect the execution of the work.
- B. Submission of a proposal will be construed as evidence that such examination has been made. Later claims for labor, equipment, materials, etc. required because of difficulties encountered, which could have been foreseen had such examination been made, will not be recognized.

3.4 ACCESS DOORS AND PANELS

- A. Furnish access doors and panels for proper and adequate access to all dampers and other mechanical equipment which is concealed in walls, furring and non-accessible

ceilings, or where may additionally be necessary for access to valves and other equipment needing service.

- B. Material and Finish: Access doors shall conform to the finish of adjacent construction as indicated in the finish schedule and matches the wall and/or ceiling construction rating.

3.5 ELECTRICAL CONNECTIONS

- A. Provide all electrical work and connections except those specifically set forth below as being provided under Division 26 work.

1. The Electrical Subcontractor shall provide under Division 26 all wiring except the following which will be provided under Division 22:
 - a. Interlock Wiring.
2. The Electrical Subcontractor shall furnish and install under Division 26 all power wiring complete from power source to motor or equipment junction box.
3. The Electrical Subcontractor shall furnish and install under Division 26 all motor starters and contactors except when specified to be furnished by the equipment manufacturer under Division 22.
4. Conduits:
 - a. When Conduit is required for wiring, the Electrical Subcontractor shall provide and install same under Division 26. Conduit shall be provided for all work installed within mechanical spaces (exposed) and in walls.
5. Motors:
 - a. Motors shall be furnished by the manufacturer or supplier of the specified equipment. All motors shall be of the premium efficiency type.
 - b. General purpose motors shall be open drip-proof conforming to NEMA Design B, Class B insulation, continuous 40°C ambient, 60 Hz, 1.15 service factor, and 1800 RPM maximum speed unless specified otherwise. All motors smaller than 3/4 HP shall be self lubricating.
 - c. Motors shall be protected with thermal overload devices in the motor, or by the motor starter. Disconnect switch at motors are for service purposes and shall be unfused type.
 - d. Single phase motors 1/2 HP and smaller shall have built-in overload protection; over 1/2 HP shall have motor starters as overload protection.
 - e. Single Phase motors shall be capacitor start, capacitor run.
 - f. Equipment requiring 1,000 Watts or more shall have a power factor of 85% or greater at rated load conditions. Equipment with power factor less than 85% shall be corrected to at least 90% under full load operating conditions. Power factor corrective devices shall be switched with related equipment.
 - g. Motor characteristics which change from that specified, due to the Contractor electing to use one of the optional manufacturers, or an updated model, etc., shall be coordinated with the Electrical Contractor prior to bid. This Contractor is responsible for the cost and design of any revisions necessary to provide proper power and control connections in full accordance with the National Electric Code and state and local codes.
 - h. Motors 1/2 HP and smaller shall be self lubricated. Larger motors shall be self-lubricated if specified.

- B. Each Subcontractor under Division 22 shall furnish and install all low voltage (120V and under) temperature control wiring, for the equipment he furnishes, from the point of connection provided under Division 26.
- C. Electrical work provided and installed by Subcontractors under Division 22 shall be performed by licensed Electrical Contractors.
- D. Equipment containing various electrical components within its housing shall be furnished with internal wiring arranged to terminate at one set of electrical power lugs. Components shall be approved for group operation as defined by National Electrical Code, or auxiliary equipment must be provided as required to satisfy the National Electrical Code and UL Labels (or other labels) of the unit.

3.6 PAINTING

- A. Field painting shall be as specified in the Painting Section of the Specifications. All work shall be left clean and free from oil, dirt and grease prior to field painting.
- B. Upon completion, thoroughly clean all equipment, piping and other work to remove all dirt, grease, rust and oil. Clean piping in exposed areas with diluted acetic acid. Thoroughly prepare all such work for painting.
- C. Equipment:
 - 1. All equipment shall have factory standard finish.
 - 2. Factory finished equipment which has rusted or been damaged shall be repaired, cleaned, spot primed and entirely repainted the original color.
 - 3. Insulation coverings shall be cleaned, sized (if necessary), and painted for service identification.
- D. Ferrous metals which are not exposed to view within the building, such as piping, pipe hangers, angle supports, supports for apparatus, black iron partitions or casings, tanks, etc..., shall be painted with one coat of priming zinc chromate.
- E. Ferrous metals which are exposed to view or to the weather, such as pipes, pipe supports, supporting or stiffening angles, vent pipes, etc., shall be painted in accordance with the Painting Section of the Project Manual.

3.7 PENETRATION OF WATERPROOFING (INCLUDING WATERPROOF CONCRETE)

- A. Where any work pierces waterproofing, including waterproof concrete, the method of installation shall be approved by the Architect/Engineer before the work is completed.
- B. Provide all necessary sleeves, sealant and flashing materials required to make openings absolutely water tight.

3.8 EXCAVATION AND BACKFILL

- A. Trench and pit excavating and backfilling inside and outside the building, as required, including shoring and bracing, pumping and protection for safety of persons and property shall be provided as required.
- B. Backfill shall be compacted in layers not exceeding six inches (6") in depth. Completed backfill shall conform to surrounding ground and finish grade and with compaction requirements of Division Two of the Project Manual.
 - 1. Concrete encasement: Piping passing under footings, foundations and other locations as shown on drawings shall be encased by eight inches (8") minimum concrete on all sides. Concrete shall conform to Division 03 requirements.
 - 2. Extend concrete encasement eight (8") inches around piping and twelve (12) each side of footings or foundations.
- C. Remove non-usable excavated material from the site. Do not remove reusable material from site.
- D. Provide and maintain bracing, shoring or sheathing as required to safely support sides of excavations.
- E. Provide and operate pumping equipment to keep excavations free of water.
- F. Repair and restore paving, streets, curbs, walks, and other work in the area where excavations are made.
- G. Provide additional excavation and backfill where required to resolve conflicts in buried lines.
- H. Coordinate timing of excavations in advance with other trades.
- I. Excavation shall be open cut from the surface.
- J. Hold trench width to a minimum.
- K. Do not excavate utility trenches parallel to building footings closer than four feet (4') from the footings except by approval of the Architect/Engineer. When parallel trenches require cuts deeper than the building footings, the horizontal distance from the footing shall be equal to, or greater than one and one half (1-1/2) times the vertical distance below the footing, but in no case shall the horizontal distance be less than four (4') feet except by the approval of the Architect/Engineer.
- L. Mechanical excavation shall be held to four inches (4") above final grade of the bottom of trench. The remainder shall be shaped by manual excavation, so that piping is fully supported on undisturbed soil. Shoring of piping in trench will not be allowed. Piping must be suspended from above.

- M. Bell joint holes shall be carefully excavated so that none of the load is supported by the bells or joints.
- N. Whenever, in the opinion of the Architect /Engineer, the soil is unsuitable for supporting piping and appurtenances, provisions for proper foundations shall be made at no additional cost to the contract. Soil test reports are bound in the Project Manual.
- O. Wherever trenching or excavating, assume utilities may exist in area without such being shown on the drawings. Exercise extreme caution. Should existing facilities be damaged, repair such to Architect's satisfaction at no additional cost to the Contract.

3.9 UNDERGROUND PIPING PROTECTION

- A. Protect the exterior surface of all underground steel piping against rust and corrosion. For piping not specified elsewhere to be furnished with factory applied pipe corrosion resistant wrapping, the piping surfaces shall be cleaned of rust, dirt, etc. with a wire brush and shall be free of oil and grease and completely dry. Brush on, or otherwise apply as recommended by the manufacturer, a heavy full coating of TC Mastic (Tape Coat Company, Evanston, Illinois) or Reilly Protective Coast Tar Enamel No. 3302 (Reilly Tar and Chemical Company, Indianapolis, Indiana). Dry coating shall be not less than twelve mils thickness. Protect freshly covered surfaces and delay applying insulation (if required) and delay covering with earth for at least 12 hours as recommended by the manufacturers, and depending on the weather. Cathodic protection shall be provided for all buried ferrous piping.

3.10 CHASING, CUTTING AND PATCHING

- A. Provide and place required sleeves, forms and inserts before walls, ceilings, partitions, floors or roofs are built.
- B. When it becomes necessary to cut finished materials, submit to the Architect/Engineer for approval, drawings showing the work required and obtain approval before doing such cutting.
- C. Provide exact dimensions and locations of these openings (to suit the apparatus to be used) before such walls are built.
- D. No cutting or altering the work of others will be permitted without the approval of the Architect/Engineer. No structural members shall be cut without the previous written approval of the Architect/Engineer.
- E. Any holes in existing slabs or other concrete slabs or finished work required for the installation of new piping shall be core bored and sealed.
- F. Finish patch cut areas with floor tile, drywall, plaster, ceiling panels or tiles as required to match the existing. Paint entire disturbed area to match the existing. Provide new ceiling panels and grid, which may have damaged during construction. Such work shall match existing.

3.11 SLEEVES

- A. Sleeves up through 8" diameter shall be Schedule 40 steel pipe (Schedule 40 PVC) and machine cut, as specified below.
- B. Sleeves, 10" diameter and larger, shall be fabricated from 12 gauge steel sheet.
- C. Watertight seals: "Linkseal" by Thunderline Corporation. Provide correct sleeve size as recommended by the manufacturer.
- D. Size sleeves shall provide 1/2" minimum clearance all around pipe or pipe insulation passing through the sleeve. Insulation shall be continuous through sleeves where indicated.
- E. Fill space around pipes in sleeves in exposed areas and through fire walls and partitions with non-flammable sealing compound equal to the wall or partition ratings with a UL Rated sealing system.
- F. Sleeves through walls shall be cut flush with each surface.
- G. Install sleeves plumb and true to line, grade and position.
- H. Unused sleeves shall be plugged and finished to match adjacent surface.
- I. Pipe sleeves penetrating outside walls shall be packed with insulating material, sealed and made waterproof.

3.12 CLEANING

- A. Upon completion, piping and equipment shall be thoroughly cleaned of dirt, grease, rust and oil, primed where necessary, and made ready for painting. Vacuum clean the inside and outside of equipment.
- B. Clean galvanized piping in exposed areas with diluted acetic acid.
- C. Clean copper piping in exposed areas with emery cloth and solvent.
- D. Clean gauges, thermometers, traps, strainers and fittings.

3.13 TEST AND INSTRUCTIONS

- A. Make tests necessary to establish the adequacy, quality, safety, completed status and satisfactory operation of all systems and components. Tests shall be made to the satisfaction of the Architect/Engineer. Provide instruments and labor necessary to conduct these tests and have them verified by the Architect/Engineer.
- B. Provide a letter addressed to the Owner advising that the completed systems have been installed in accordance with all codes, the Contract Documents and that such are in

proper operating condition. The Owner shall receive a written guarantee covering all defects in workmanship and material for a period of one (1) year from date of Substantial Completion. This time period shall be automatically extended until the corrective action is fully complete and satisfactory.

3.14 INSTRUCTIONS

- A. After the systems are in operation, and tests are complete, instruct the designated personnel of the Owner on the operation and maintenance of all equipment and systems. Entire session shall be videotaped, with copy provided to the Owner and Architect/Engineer.

3.15 ENGINEER'S PROJECT SITE VISITS

- A. When the engineer or his designated representative visits the site to review the installation, all tools, ladders, etc. necessary for the review of the work shall be provided.
- B. The Engineer will provide a typed list of deficiencies noted during the site visit for corrective action. Prior to request for supplementary visits, provide an initialed and dated copy of the last report indicating the current status of the noted deficiency corrections.

3.16 PROJECT CLOSEOUT

- A. Prior to request for substantial completion, all plumbing systems shall be verified for proper operation and control. Substantiation of complete and operational systems shall be verified by submission of the following documents and forms:
 - 1. Completed Operation and Maintenance Manuals.
 - 2. Health department certification of the potable water systems.
 - 3. Certificate of Compliance with the Boiler Safety Code (F.S. 554.103, 554.109 and 554.110)

END OF SECTION 220000

REQUEST FOR PRIOR APPROVAL

NOTE TO CONTRACTOR: This letter must be sent to the Architect, with copy to the Engineer as per Prior Approval Requirements of the Project Manual (Seven or Ten days as applicable). **Facsimile or email is not acceptable.** Requests received after the date of Prior Approval will be discarded.

[DATE:]

[ARCHITECT NAME]

Re: [PROJECT NAME]
[ARCHITECT/OTHER] Project No.: _____

Dear _____:

We hereby request approval to bid the following products for this project:

REFER TO PROJECT MANUAL:

Section _____, Paragraph _____: We request that _____ be added as an acceptable manufacturer.

Section _____, Paragraph _____: We request that _____ be added as an acceptable manufacturer.

Section _____, Paragraph _____: We request that _____ be added as an acceptable manufacturer.

We understand that listing of the above manufacturers is for bidding purposes only. The Manufacturer is responsible to meet all capacity, controllability of equipment, space requirements, and service clearances as per basis of design.

[CLOSING SIGNATURE]

SECTION 220523 – GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The Bidding Requirements and Contractual Conditions set forth in Division 01 apply to this section.

1.2 DESCRIPTION OF WORK

- A. Extent of valves required by this section is indicated on drawings and/or specified in other Division 22 specifications.
- B. Types of valves specified in this section include the following:

- Ball valves
 - Butterfly valves
 - Check valves

- C. Valves furnished as part of factory-fabricated equipment, are specified as part of the equipment assembly in other Division 22 sections.

1.3 QUALITY ASSURANCE

- A. Manufacturers: Firms regularly engaged in the manufacture of valves, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Marking of Valves: Comply with MSS SP-25.
- C. Valve Dimensions: For face-to-face and end-to-end dimensions of flanged or welding-end valve bodies, comply with ANSI B16.10.
- D. Valves Installed in Boiler Rooms: Comply with ASME Boiler and Pressure Vessel Code.
- E. Valve types: Provide valves of same type by same manufacturer.

1.4 SUBMITTALS

- A. Product Data: Submit catalog cuts, specifications, installation instructions, and dimensional drawings for each type of valve. Include pressure drop curve or chart for each type and size of valve. Submit valve schedule showing manufacturer's figure number, size, location, and valve features for each required valve.
- B. Maintenance Data: Submit maintenance data and spare parts lists for each type of valve. Include this data in Maintenance Manual.

PART 2 - PRODUCT

2.1 VALVES

- A. Provide factory-fabricated valves recommended by manufacturer for use in service indicated. Provide valves of types and pressure ratings indicated; provide proper selection as determined by Installer to comply with installation requirements. Provide sizes as indicated, and connections which properly mate with pipe, tube, and equipment connections.

2.2 BALL VALVES

- A. General: Select with full port opening, blow-out proof stem, hard chrome plated forged brass vented ball, adjustable packing nut, rated not less than 600# W.O.G., 150 W.S.P.

1. Comply with the following standards:

Ball Valves: MSS SP-110

- B. For Domestic Water Service:

1. Threaded Ends 3" and Smaller: #600 W.O.G., 150 W.S.P., bronze two piece body, hard chrome plated forged brass vented ball, true adjustable packing nut, blow-out proof stem: Kitz #68, Nibco T-585-70, Milwaukee BA-125, Apollo 77-100 Series, or equal.
2. Soldered Ends 3" and Smaller: 600# W.O.G., 150 W.S.P., bronze two piece body, hard chrome plated forged brass vented ball, true adjustable packing nut, blow-out proof stem: Kitz #69, Nibco S-585-70, Milwaukee BA-155, Apollo 77-200 Series, or equal.

- C. Manufacturer: Subject to compliance with requirements, provide ball valves with one of the following:

1. Kitz
2. Milwaukee
3. Nibco
4. Apollo

2.3 BUTTERFLY VALVES

- A. General: Where butterfly valves are used as shut-off for termination, or equipment removal or repair, select ductile iron lug type valves, bi-directional, dead-end service rated to the full working pressure of the valve. Select wafer type valves for other applications.

- B. Provide gear operators on butterfly valves 8" and larger. Valve bodies to have extended necks to provide for 2-1/4" insulation as needed. Butterfly valves 12 inch and smaller rated to 200 psi, 14 inch and larger 150 psi.

1. Comply with the following standards:
 - a. Butterfly valves: MSS SP-67

C. Manufacturer: Subject to compliance with requirements, provide butterfly valves with one of the following: Kitz #5122B (Wafer type), Kitz #6122E (Lug Type), Milwaukee MW123 (Wafer), ML123 (Lug), Nibco WD2000 (Wafer), LD2000 (Lug) or equal.

2.4 SWING CHECK VALVES

A. Comply with the following standards for design, workmanship, material and testing:

1. Bronze Valves: MSS SP-80
2. Cast Iron Valves: MSS SP-71

B. For Domestic Water Service:

1. Threaded Ends 2" and Smaller: Class 125, bronze body, screwed cap, "Y" pattern swing, bronze disc: Kitz #22, Nibco S-413B, Milwaukee 508 or equal.
2. Soldered Ends 2" and Smaller: Class 125, bronze body, screwed cap, "Y" pattern swing, bronze disc: Kitz #23, Nibco S-413B, Milwaukee 1509 or equal.
3. Flanged Ends 2-1/2" and Larger: Class 125, iron body, bronze mounted, horizontal swing, cast-iron disc: Kitz #78, Nibco F918-B, Milwaukee F2974 or equal.

2.5 VALVE FEATURES

- A. General: Provide valves with features indicated and where not otherwise indicated, provide proper valve features as outlined in this specification. Comply with ANSI B31.1.
- B. Flanged: Valve flanged comply with ANSI B16.1 (cast iron), ANSI B16.24 (bronze).
- C. Threaded: Valve ends complying with B2.1.
- D. Solder Joint: Valve ends complying with ANSI B16.18.
- E. Wafer: Flangeless valves.
- F. Trim: Fabricate pressure-containing components of valves, including stems and seats from brass or bronze materials; of standard allow recognized in valve manufacturing that resist de zincification.
- G. Non-Metallic Disc: Non-metallic material selected for service indicated in accordance with manufacturer's published literature.

- H. Renewable Disc: Non-metallic material selected for service indicated in accordance with manufacturer's published literature.
- I. Bonnet: Part of gate or globe valve through which stem passes to valve body, and attached to valve body threads, bolts, union, or welding.
- J. Solid Wedge: One-piece tapered disc in gate valve, designed for contact with both sides.
- K. Outside Screw and Yoke (OS&Y): Stem and hand wheel designed to rotate without rising when valve is operated from closed to open position.
- L. Tight Shutoff: Butterfly valve designed for flow regulation, and manufactured to be tight in closed position. Test pressures in accordance with MSS SP-67 as follows: Seat 2-12" 220 psi. No leakage permitted under test.
- M. Solder Joint: Valve ends complying with ANSI B.16.18.
- N. Extended Stem: Increase stem length by 2" minimum, to accommodate insulation applied over valve.
- O. Double Disc: Two-piece tapered disc in gate valve, designed for contact on one side of each disc.
- P. Parallel Double Disc: Two parallel discs in gate valve, designed for contact by action of separate wedging block.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install valves with stems pointed up, in vertical position where possible, but in no case with stems pointed downward for horizontal plane unless unavoidable. Install valve drains with hose-end adapter for each valve that must be installed with stem below horizontal plane.
- B. Insulation: Where insulation is indicated, install extended-stem valves, arranged in proper manner to receive insulation.
- C. Applications Subject to Shock: Install valves with bodies of metal other than cast-iron where thermal or mechanical shock is indicated or can be expected to occur.
- D. Applications Subject to Corrosion: Do not install bronze valves and valve components in direct contact with steel, unless bronze and steel are separated by dielectric insulator. Install bronze valves in steam and condensate service and in other services where corrosion is indicated or can be expected to occur.

- E. Selection of Valve Ends (Pipe Connections): Except as otherwise indicated, select and install with the following ends or types of pipe/tube connections.
1. Tube Size 2" and Smaller: Solder joint valves.
 2. Pipe Size 2" and Smaller:
Threaded valves
Grooved end valves
 3. Pipe Size 2-1/2" and Larger:
Grooved end valves
Flanged valves
Wafer valves
Single flange valves
- F. Valve System: Select and install valves with outside screw and yoke stems, provide inside screw non-rising stem valves where headroom prevents full opening of OS&Y valves.
- G. Non-Metallic Disc: Limit selection and installation of valves with non-metallic discs to locations indicated and where foreign material in piping system can be expected to prevent tight shutoff of metal seated valves.
- H. Renewable Seats: Select and install valves with renewable seats, except where otherwise indicated.
- I. Fluid Control: Except as otherwise indicated, install gate, ball and/or globe valves to comply with ANSI B31.1. Where throttling is indicated or recognized as principal reason for valve, install globe or butterfly valves.
- J. Installation of Check Valves:
1. Swing Check Valves: Install in horizontal position with hinge pin horizontally perpendicular to centerline of pipe. Install for proper direction of flow in pump discharge lines.
 2. Horizontal Lift Check Valve: Install in horizontal piping line with stem vertically upward, position for proper direction of flow.
 3. Vertical Lift Check Valve: Install in vertical piping line with upward flow with stem vertically upward.
 4. Spring Loaded Horizontal Lift Check Valve: Install in horizontal piping line with stem vertically upward, position for proper direction of flow.
- K. Valves shall have shaft extension to facilitate insulation installation.

END OF SECTION 220523

SECTION 220529 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide supports and hangers for all piping and piping system components.
- B. Provide supports and hangers for all equipment.
- C. Examine other sections of the Project Manual for requirements which affect work of this section whether or not such work is specifically mentioned in this section.
- D. Provide steel angles and channels between structural members as necessary to support piping and equipment.

1.2 RELATED WORK

- A. The Bidding Requirements and Contractual Conditions set forth in Division 01 apply to this section.

1.3 QUALITY ASSURANCE

- A. Meet the requirements of the following:
 - 1. MSS SP 58-2002 Pipe Hangers and Supports.
 - 2. ANSI Code for Pressure Piping.
 - 3. Hangers and supports shall have a stress safety factor of 5.
 - 4. ASTM, UL, NFPA.

1.4 SUBMITTALS

- A. Submit manufacturer's product data for the following:

Hangers
Supports
Inserts

1.5 COORDINATION

- A. Obtain Structural Engineer's approval before welding, drilling or cutting any structural members.
- B. Coordinate runs of piping and install equipment as may be required to utilize available structural members.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products are based on Grinnell as a standard, unless specified otherwise.
- B. Optional manufacturers: Grinnell, Elcen, F & S, Fee & Mason or Michigan.

2.2 STRUCTURE ATTACHMENT DEVICES

- A. Riser clamp, steel: Grinnell Fig. 261. Provide masonry or concrete bearing.
- B. Riser clamp, copper: Grinnell Fig. CT-121, copper plated. Provide masonry or concrete bearing.
- C. Top beam clamp: Grinnell Fig. 227 with Fig. 157 extension.
- D. Bottom beam clamp: Grinnell Fig. 229. (Use only where top clamps are not possible. Obtain approval from Engineer).
- E. Side beam bracket: Grinnell Fig. 202. (For wood construction only.)
- F. Horizontal traveler: Grinnell Fig. 170
- G. Concrete inserts: Grinnell Fig. 282, galvanized.
- H. Concrete fasteners: Phillips "Red Head."
- I. Copper tube strap: Grinnell Fig. 9124.
- J. Pipe strap: Grinnell Fig. 153.
- K. Pipe hanger flange: Grinnell Fig. 153.
- L. Bottom channel clamp: Grinnell Fig. 226 with 157 extension. (Obtain approval from Engineer prior to use.)
- M. Bottom beam/joist C clamp: Grinnell Fig. 87 with retaining clip and locknut. (Obtain approval from Engineer prior to use on pipes 2" and smaller.)

2.3 HANGERS AND ACCESSORIES

- A. Adjustable copper tubing ring: Grinnell Fig. CT-99, copper plated.
- B. Adjustable swivel split ring: Grinnell Fig. 104, black finish.
- C. Adjustable pipe ring, plastic coated: Grinnell Fig. CT-99c, plastic coated.
- D. Heavy adjustable clevis: Grinnell Fig. 260, black finish.

- E. Lightweight adjustable clevis: Grinnell Fig. 65, black finish.
- F. Pipe roll stand (base supported): Grinnell Fig. 271, cast iron roll.
- G. Adjustable pipe roll: Grinnell Fig. 181.
- H. Pre-engineered spring hanger: Grinnell Figs. B-268, 82 or 98.
- I. Insulated pipe saddle: Hot lines - high density pre-compressed fiberglass support segment with 18 gage galvanized steel shield. Cold lines - provide "Foamglass" pipe insulation with jacket and 18 ga. galvanized steel shield. Insulation thickness shall be same as specified in the insulation section of this specification.

2.4 HANGER RODS AND ACCESSORIES

- A. Provide plated steel threaded rods.
- B. Provide all necessary couplings, turnbuckles, nuts, washers, and accessories for a complete installation.

2.5 TRAPEZE COMPONENTS

- A. Horizontal trapeze member: Unistrut P-2700 series channel, standard or heavy duty according to load.
- B. Trapeze clamp: Unistrut two piece bolted pipe clamp; steel for steel pipes, copper for copper pipes.

2.6 EQUIPMENT SUPPORTS

- A. Provide 3 x 3 x 1/4 angles or heavier, if required, spanning 3 structural joints to support hung equipment.
- B. Provide channels (strength as required) to span between beams. Weld to beams. Obtain approval of Structural Engineer before proceeding.

PART 3 - EXECUTION

3.1 PIPE SUPPORT METHODS

A.	<u>CONDITION</u>	<u>SUPPORT METHOD</u>
	Uninsulated copper pipe horizontal, hung.	Adjustable plastic coated tubing ring and hanger rod.
	Uninsulated copper pipe horizontal, bottom support.	Plastic coated tube strap. Provide necessary angle braces.

Uninsulated copper pipe vertical	Plastic coated tube strap to walls with anchors. Riser clamp at floors.
Uninsulated metal drain pipe horizontal, hung.	Heavy adjustable clevis, hanger rod.
Uninsulated metal drain pipe vertical.	One hole clamp at walls. Riser clamp, steel at floors.
Insulated pipe horizontal, bottom support.	Insulated pipe saddle, pipe roll stand.

Notes:

1. Install pipe saddles as pipe is installed.
2. Trapeze hangers may be used for multiple horizontal hung pipe runs. Trapeze consists of hanger rods, horizontal trapeze member, and trapeze clamps. Each pipe shall be individually attached to trapeze.
3. Hangers shall be isolated from dissimilar metals with dielectric fittings.

3.2 SUPPORT SPACING AND HANGER ROD DIAMETERS

- A. Cast iron, ductile iron, steel and copper pipes shall be in compliance with the FBC, Plumbing, Table 308.5 Hanger Spacing.
1. Maximum support spacing for horizontal cast iron drain and vent lines is one support at each joint (i.e., 5' spacing for 5' lengths, 10' spacing for 10' lengths, etc.).
 2. Provide additional supports at turns, valves, concentrated loads connections to equipment and where necessary for proper alignment.

3.3 STRUCTURE ATTACHMENT METHODS

A.	<u>CONDITION</u>	<u>SUPPORT METHOD</u>
	Hanger rod to steel bar or truss.	Top beam clamp.
	Hanger rod to steel beam (Corrugated metal deck above).	Top beam clamp.
	Hanger rod to steel beam (concrete deck above, temporary form).	Bottom beam clamp.
	Hanger rod to precast or existing concrete deck.	Concrete fasteners, pipe hanger flange.
	Hanger rod to new cast-in-	Concrete insert.

place concrete deck.

Hanger rod to any structure at elbows with significant lateral movement.

Horizontal traveler

Hanger rod to any structure at risers with significant vertical movement.

Pre-engineered spring hanger.

Hanger rod to any structure at risers from vibrating equipment.

Pre-engineered spring hanger.

Notes:

1. Do not install hangers from metal roof deck.
2. Avoid drilling concrete by using inserts.
3. Explosive powder driven fasteners are not acceptable and shall not be used.
4. Weld to steel structural members. In wood construction where pipe is parallel to, and hanging from joists, rafters, or beams bolt angles to side of members vertically, bolt horizontal angles to side of members vertically, bolt horizontal angles to vertical angles, attach hanger rods to horizontal angles. Consult with Structural Engineer and affected trades regarding procedure.
5. Vertical piping shall be anchored to building with two-point bearing.

3.4 VIBRATING EQUIPMENT

- A. In-line pump support: Contractor shall provide a calibrated spring-hanger as approved by the pump manufacturer. The spring shall support the pump at approximately the center of gravity and shall reduce the piping load to less than 10% of the weight of the pump at room temperature.
- B. Support piping at pumps and equipment from floor, ceiling or walls, so that piping weight is not supported from pumps or equipment. Provide pipe stands as required.

3.5 WET AREA AND EXTERIOR SUPPORTS

- A. Use non-ferrous, galvanized steel, plated steel or plastic coated steel supports and hangers in exterior applications.

3.6 ADDITIONAL REQUIREMENTS

- A. Properly support pipe to maintain required alignment, slopes, and expansion capabilities.
- B. Piping shall be supported independently from the building structure. Where interferences occur, provide trapeze type hangers or other suitable supports for each system. Locate hangers and supports where they will not interfere with access to valves and other appurtenances requiring service.

- C. Whenever mechanical equipment rooms are located within or immediately adjacent to the occupied building, vibration dampening hangers and supports shall be used.

END OF SECTION 220529

SECTION 220530 - SUPPORTS, ANCHORS AND SEALS - PLUMBING

PART 1 - GENERAL

1.1 WORK INVOLVED

- A. Extent of supports, anchors, and seals required by this section is indicated on drawings and/or specified in other Division 22 sections.
- B. Types of supports, anchors, and seals specified in this section include the following:
 - 1. Horizontal piping hangers and supports
 - 2. Vertical piping clamps
 - 3. Hanger rod attachments
 - 4. Building attachments
 - 5. Saddles and shields
 - 6. Flashing materials
 - 7. Miscellaneous materials
 - 8. Anchors
- C. Supports, anchors and seals furnished as part of factory-fabricated equipment are specified as part of the equipment assembly in other Division 22 sections.

1.2 RELATED WORK

- A. The Bidding Requirements and Contractual Conditions set forth in Division 01 apply to this section.

1.3 QUALITY ASSURANCE

- A. Manufacturers: Firms regularly engaged in the manufacture of supports, anchors and seals of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. MSS Standard Compliance:
 - 1. Provide pipe hangers and supports of which materials, design and manufacture comply with ANSI/MSS SP-58.
 - 2. Select and apply pipe hangers and supports, complying with MSS SP-69. Size hangers and supports to support pipe weight and fluid conveyed.
 - 3. Fabricate and install pipe hangers and supports, complying with MSS SP-89.
 - 4. Terminology used in this section is defined in MSS SP-90.

1.4 SUBMITTALS

- A. Product Data: Submit catalog cuts, specifications, installation instructions and dimensioned drawings for each type of support, anchor and seal. Include a schedule of supports, anchors and seals to be used.

PART 2 - PRODUCTS

2.1 HORIZONTAL PIPING HANGERS AND SUPPORTS

- A. General: Except as otherwise indicated, provide factory-fabricated horizontal piping hangers and supports complying with ANSI/MSS SP-58, of one of the following MSS types listed, selected by installer to suit horizontal piping system, in accordance with MSS SP-69 and manufacturer's published product information. Use only one type by one manufacturer for each piping service. Select size of hangers and supports to exactly fit pipe size for bare piping, and to exactly fit around piping insulation with saddle or shield for insulated piping. Provide copper-plated hangers and supports for copper piping systems.
- B. Adjustable Steel Clevises: MSS Type 1.
- C. Pipe Hangers: MSS Type 2.
- D. Steel Double Bolt Pipe Clamps: MSS Type 3.
- E. Steel Pipe Clamps: MSS Type 4.
- F. Pipe Hangers: MSS Type 5.
- G. Adjustable Swivel Pipe Rings: MSS Type 6.
- H. Adjustable Swivel Rings, Band Type: MSS Type 10.
- I. Split Pipe Rings: MSS Type 11.
- J. Extension Split Pipe Clamps: MSS Type 12.
- K. U-Bolt: MSS Type 24.
- L. Clips: MSS Type 26.
- M. Pipe Saddle Supports: MSS Type 36, including steel pipe base support and cast-iron floor flange.
- N. Pipe Stanchion Saddles: MSS Type 37, including steel pipe base support and cast-iron floor flange.
- O. Adjustable Pipe Saddle Supports: MSS Type 38 including steel pipe base support and cast-iron floor flange.
- P. Single Pipe Rolls: MSS Type 41.
- Q. Adjustable Roller Hangers: MSS Type 43.
- R. Pipe Roll Stands: MSS Type 44.

- S. Pipe Rolls and Plates: MSS Type 45.
- T. Adjustable Pipe Roll Stands: MSS Type 46.

2.2 PIPE HANGERS

- A. Pipe hangers for all piping including sprinkler piping shall be Fee and Mason or Grinnell of a type suitable for each use. Perforated straps shall not be used in any work. For ferrous pipes up to and including four inches (4") in size, use Fee and Mason Fig. 199 malleable iron, adjustable, split ring, swivel hanger. For plumbing piping larger than four inches (4") diameter, use Fee and Mason Fig. 239 steel clevis hanger. Where several pipes are parallel at the same elevation, trapeze hangers may be used. Where trapeze hangers are used, the pipes shall be supported on rollers where rollers are called for by the above specifications. For copper pipes up to and including three inches (3") in size, use Fee and Mason Fig. 360 malleable iron, plastic coated hangers. For copper pipes larger than three inches (3") use Fee and Mason Fig. 364 plastic coated clevis hanger.

- B. Hanger rods sizes shall conform to the following schedule:

Pipe up to and including 2"	3/8" rods
Pipe 2-1/2", 3" and 3-1/2"	1/2" rods
Pipe 4" and 5"	5/8" rods
Pipe 6"	3/4" rods
Pipe 8", 10" and 12"	7/8" rods
Pipe 14" and larger	1" rods

- C. Unless shown otherwise on the Plans, all horizontal runs of ferrous piping shall be suspended from the floor or roof construction, as the case may be, by means of hangers with the following maximum spacing:

Pipe up to and including 8"	5 feet
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- D. Unless shown otherwise on the Plants, all horizontal runs of copper tubing shall be suspended from the floor or roof construction as the case may be, by means of hangers with the following maximum spacing:

Pipe up to 1-1/4" in size	6 feet
Pipe 1-1/2" and larger.	10 feet

- E. There shall be a hanger within two feet (2') of each elbow or tee. Additional supports shall be provided at valves, strainers, etc. Cast iron pipe shall have not less than one hanger per length of pipe. Vertical risers shall be supported by approved riser clamps at each floor. Vertical pipes within a space shall not have less than two (2) supports.

- F. Supports and hangers shall be installed to permit free expansion and contraction in the piping systems. Hangers shall permit vertical adjustment to maintain proper pitch. Where necessary to control expansion and contraction, the piping shall be guided and firmly anchored. No piping shall be self-supporting; nor shall it be supported from equipment connections.

- G. Inserts shall be used where piping or equipment is to be hung from concrete construction. Inserts shall be Grinnell Fig. 281, wedge type, concrete inserts. All inserts shall be galvanized to prevent rusting. After the forms are removed, clip off all nails flush with the exposed surface of the inserts.
- H. Expansion bolts shall be Ackerman-Johnson.
- I. Beam clamps suitable for use with the type of steel construction involved shall be Grinnell.
- J. Domestic hot water, domestic cold water piping, and horizontal rainwater piping hangers shall be sized to go around the insulation with saddles being provided to protect the insulation.

2.3 VERTICAL PIPING CLAMPS

- A. General: Except as otherwise indicated, provide factory-fabricated vertical piping clamps complying with ANSI/MSS SP-58, of one of the following types listed, selected by installer to suit vertical piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Select size of vertical piping clamps to exactly fit pipe size of bare pipe. Provide plastic coated clamps for copper piping systems.
- B. Two-Bolt Riser Clamps: MSS Type 8.
- C. Four-Bolt Riser Clamps: MSS Type 42.

2.4 HANGER ROD ATTACHMENTS

- A. General: Except as otherwise indicated, provide factory-fabricated hanger-rod attachments complying with ANSI/MSS SP-58, of one of the following MSS types listed, selected by installer to suit horizontal piping hangers and building attachments, in accordance with MSS SP-69 and manufacturer's published product information. Use only one type by one manufacturer for each piping service. Select size of hanger rod attachments to suit hanger rods. Provide plastic coated hanger rod attachments for copper piping systems.
- B. Steel Clevises: MSS Type 14.
- C. Swivel Turnbuckles: MSS Type 15.
- D. Malleable Iron Sockets: MSS Type 16.
- E. Steel Weldless Eye Nuts: MSS Type 17.

2.5 BUILDING ATTACHMENTS

- A. General: Except as otherwise indicated, provide factory-fabricated building attachments complying with ANSI/MSS SP-58, of one of the following MSS types listed, selected by Installer to suit building substrate conditions, in accordance with MSS SP-69 and

manufacturer's published product information. Select size of building attachments to suit hanger rods. Provide plastic coated building attachments for copper piping systems.

- B. Concrete Inserts: MSS Type 18
- C. Top Beam C-Clamps: MSS Type 19
- D. Side Beam or Channel Clamps: MSS Type 20.
- E. Center Beam Clamps: MSS Type 21.
- F. Welded Attachments: MSS Type 22.
- G. C-Clamps: MSS Type 23.
- H. Top I-Beam Clamps: MSS Type 25.
- I. Side I-Beam Camps: MSS Type 27.
- J. Steel I-Beam Clamps with Eye Nut: MSS Type 28.
- K. Steel WF-Beam Clamps with Eye Nut: MSS Type 29.
- L. Malleable Beam Clamps: MSS Type 30.
- M. Steel Brackets: One of the following for indicated loading:
 - Heavy Duty: MSS Type 33
- N. Side Beam Brackets: MSS Type 34.
- O. Plate Lugs: MSS Type 57.
- P. Horizontal Travelers: MSS Type 58.

2.6 SADDLES AND SHIELDS

- A. General: Except as otherwise indicated, provide saddles or shields for piping hangers and supports, factory-fabricated, for all insulated piping. Size saddles and shields for exact fit to mate with pipe insulation.
- B. Protection Saddles: MSS Type 39; fill interior voids with segments of insulation matching adjoining insulation.
- C. Protection Shields: MSS Type 40; of length recommended by manufacturer to prevent crushing of insulation.
- D. Thermal Hanger Shields: Constructed of 360 degrees of high density, 100 psi, water-proofed calcium silicate, encased in 360 degrees sheet metal shield. Provide assembly of same thickness as adjoining insulation.

- E. Available Manufacturers: Subject to compliance with requirements, manufacturer's offering thermal hanger shields which may be incorporated in the work include, but are not limited to the following:

C & S Mfg. Corp.
Elcen Metal Products Co.
Fee & Mason Manufacturing Co., Div. of A-T-O Inc.
ITT Grinnel Corp.
Pipe Shields, Inc.

2.7 MANUFACTURERS OF HANGERS AND SUPPORTS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturer's offering hangers and supports which may be incorporated in the work include, but are not limited to, the following:

C & S Mfg. Corp.
Elcen Metal Products Co.
Fee & Mason Mfg. Co., Div. of A-T-O Inc.
ITT Grinnel Corp.

2.8 MISCELLANEOUS MATERIALS

- A. Metal Framing: Provide products complying with NEMA STD ML 1.
- B. Steel Plates, Shapes and Bars: Provide products complying with ANSI/ASTM A 36.
- C. Cement Grout: Portland cement (ANSI/ASTM C 150, Type I or Type III) and clean uniformly graded, natural sand (ANSI/ASTM C 404, Size No. 2). Mix at a ratio of 1.0 part cement to 3.0 parts sand, by volume, with minimum amount of water required for placement and hydration.
- D. Heavy-Duty Steel Trapezes: Fabricate from steel shapes selected for loads required; weld steel in accordance with AWS standards.
- E. Pipe Guides: Provide factory-fabricated guides, of cast semi-steel or heavy fabricated steel, consisting of a bolted two-section outer cylinder and base with a two-section guiding spider bolted tight to pipe. Size guide and spider to clear pipe and insulation (if any) and cylinder. Provide guides of length recommended by manufacturer to allow indicated travel.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Proceed with installation of hangers, supports and anchors only after required building structural work has been completed in areas where the work is to be installed. Correct

inadequacies including (but not limited to) proper placement of inserts, anchors and other building structural attachments as may be required.

3.2 INSTALLATION OF BUILDING ATTACHMENTS

- A. Install building attachments at required locations, within concrete or on structural steel for proper piping support. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional building attachments where support is required for additional concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten insert securely to forms. Where concrete with compressive strength less than 2500 psi is indicated, install reinforcing bars through openings at top of inserts.

3.3 INSTALLATION OF HANGERS AND SUPPORTS

- A. Install hangers, supports, clamps and attachments to support piping properly from building structure; comply with MSS SP-69. Arrange for grouping of parallel runs of horizontal piping to be supported together on trapeze type hangers where possible. Install supports with maximum spacing complying with MSS SP-69. Where piping of various sizes is to be supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipe. Do not use wire or perforated metal to support piping, and do not support piping from other piping, ductwork or other supported mechanical or electrical items.
- B. Supports and hangers shall be installed to permit free expansion and contraction in the piping systems. Hangers shall permit vertical adjustment to maintain proper pitch. Where necessary to control expansion and contraction, the piping shall be guided and firmly anchored. No piping shall be self-supporting; nor shall it be supported from equipment connections.
- C. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers and other accessories. Except as otherwise indicated for exposed continuous pipe runs, install hangers and supports of same type and style as installed for adjacent similar piping. Provide section drawing for hanger locations to avoid duct interference.
- D. Prevent electrolysis in support of copper tubing by use of hangers and support which are copper-plated, or by other recognized industry methods.
- E. Provisions for Movement:
 - 1. Install hangers and supports to allow controlled movement of piping systems and to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends and similar units.
 - 2. Load Distribution: Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.
 - 3. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes, and so that maximum pipe deflections allowed by ANSI B31 are not exceeded.
 - 4. Insulated Piping: Comply with the following installation requirements.

- a. Clamps: Attach clamps, including spacers (if any), to piping with clamps projecting through insulation; do not exceed pipe stresses allowed by ANSI B31.
- b. Shields: Where low compressive strength insulation or vapor barriers are indicated on cold or chilled water piping, install coated protective shields.
- c. Saddles: Where insulation without vapor barrier is indicated, install protection saddles.

3.4 INSTALLATION OF ANCHORS

- A. Install anchors at proper locations to prevent stresses from exceeding those permitted by ANSI B31, and to prevent transfer of loading and stresses to connected equipment.
- B. Fabricate and install anchor by welding steel shapes, plates and bars to piping and to structure. Comply with ANSI B31 and with AWS standards.
- C. Where expansion compensators are indicated, install anchors in accordance with expansion unit manufacturer's written instructions, to limit movement of piping and forces to maximum recommended by manufacturer for each unit.
- D. Anchor Spacing: Where not otherwise indicated, install anchors at ends of principal pipe-runs, at intermediate points in pipe-runs between expansion loops and bends. Make provisions for preset of anchors as required accommodating both expansion and contraction of piping.

3.5 ADJUSTMENT OF HANGERS AND SUPPORTS

- A. Adjust hangers and supports and place grout as required under supports to bring piping to proper levels and elevations.

END OF SECTION 220530

SECTION 220553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide pipe identification for all exposed piping in Equipment Rooms, on pipe mains above accessible ceilings, access panels, and piping exposed to view.
- B. Provide valve tags for all valves. Provide valve tag chart, enclosed in a minimum 8-1/2" x 11" frame, in each mechanical room. Master chart(s) to be included in the maintenance manual.
- C. Provide equipment nameplates for all major equipment, such as water heaters, pumps, etc... Nameplates shall include all information on standard nameplates, but shall be of an engraved metal or plastic type, mechanically secured to the equipment.
- D. Examine other sections of the Project Manual for requirements which affect work of this section whether or not such work is specifically mentioned in this section.

1.2 RELATED DOCUMENTS

- A. The Bidding Requirements and Contractual Conditions set forth in Division 01 apply to this section.

1.3 QUALITY ASSURANCE

- A. Meet the requirements of:
 - 1. ANSI A13.1-1981: Scheme for the Identification of Piping System.
 - 2. ANSI 253.1: Safety Color Code for Marking Physical Hazards.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Pipe markers shall be "SET MARK" semi-rigid plastic identification markers as manufactured by Seton Name Plate Corporation. Markers shall conform to ANSI A13.1 for correct color background, color of letters and correct marker length. Use Type STR markers on outside diameters 3/4" through 5", and Type STR markers on outside diameters of 6" and larger. Direction of flow arrows shall be included on each marker. Letter height and length of color background shall be as follows:

<u>OUTSIDE DIAMETER</u>	<u>LETTER HEIGHT</u>	<u>LENGTH OF</u> <u>COLOR FIELD</u>
3/4" - 1-1/4"	1/2"	8"
1-1/2" - 2"	3/4"	8"
2-1/2" - 6"	1-1/4"	12"
8" - 10"	2-1/2"	24"

Over 10

3-1/2"

32"

- B. For pipes less than 3/4" O.D. a permanently legible tag shall be used.
- C. Valve tags shall be 1-1/2" diameter, 19 gauge brass attached with copper meter seal wire, brass chain, or "S" hook. Service designation letter shall be 1/4" high minimum and black filled. Valve numbers shall be 1/2" high and black filled. Stamp tags with service designation and number consecutively for each system - Style 250-BL.
- D. Equipment name plates shall be 1½" x 4" aluminum or plastic with black enamel background and with the equipment designation engraved in natural aluminum or white lettering not less than 1/2" high. Equipment name plates shall also include the area that the equipment serves, either by room name or number as approved by the Architect/Engineer.

2.2 MANUFACTURERS

- A. Model numbers of Seton Name Plate Corporation, CT are used as standard. Optional manufacturers: W. H. Brady.

2.3 SUBMITTALS

- A. Submit manufacturer's product data for tags and identification with colors and wording indicated.

PART 3 - EXECUTION

3.1 PIPE IDENTIFICATION (use colors for services that apply to this project).

<u>TYPE OF SERVICE</u>	<u>BACKGROUND COLOR</u>	<u>LETTER COLOR</u>	<u>SERVICE DESIGNATION</u>
Wtr. Domestic Cold Wtr.	Green	White	Cold
Wtr. Domestic Hot Wtr.	Green	White	Hot
Wtr Rtrn Domestic Hot Wtr. Rtrn.	Green	White	Hot
Condensate	Green	White	Condensate

3.2 INSTALLATION

- A. Pipe markers:
 1. Service designation shall be readable from a standing position from the floor.
 2. Provide pipe markers at 25 ft. maximum intervals on mains above ceilings.
 3. Provide markers at each major branch from mains and at each branch line.
 4. Provide a marker at each equipment connection.

B. Valve tagging:

1. Attach tags to valve handles in such a manner that valve shall be operable without damaging or removing tag.
2. Prepare valve charts showing tag number, locations, sizes, and services. Frame under glass and mount in equipment room. A copy of chart shall be included in the service manual.

C. Equipment nameplates:

1. Nameplate designation shall consist of unit number and area served.
2. Locate nameplates where readable from a standing position on the floor.
3. Secure nameplates securely with rivets or screws.
4. Nameplates identifying manufacturer model number, serial number, voltage, etc. for equipment shall be of the engraved type. Painted labels are not acceptable.

END OF SECTION 220553

SECTION 220700 - PLUMBING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 22 Specification sections, apply to work of this section.
- B. The Bidding Requirements and Contractual Conditions set forth in Division 01 apply to this section.

1.2 DESCRIPTION OF WORK

- A. Extent of insulation required by this section is indicated on drawings, and by requirements of this section.
- B. Insulation shall be provided by an independent insulating contractor.
- C. Types of mechanical insulation specified in this section include the following:
 - 1. Piping System Insulation:
 - Domestic Water Piping Systems
 - Storm Water Piping Systems
 - Condensate Piping Systems
 - 2. Equipment Insulation:
 - Hot Surfaces of Equipment
 - Bottom of Roof Drain Bodies

1.3 QUALITY ASSURANCE

- A. Firms regularly engaged in manufacturer of mechanical insulation products, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following: Armstrong, Certainteed Corp., Johns-Manville Corp., Knauf Fiber Glass, Owens-Corning Fiberglass Corp., Pittsburgh Corning Corp.
- C. Installer: A firm with at least 5 years successful installation experience on projects with mechanical insulation similar to that required for this project.
- D. Flame/Smoke Ratings: Provide composite mechanical insulation (insulation, jackets, coverings, sealers, mastics and adhesives) with flame-spread rating of 25 or less, and Smoke-developed rating of 50 or less, as tested by ANSI/ASIM E 84 (NFPA 255) method.

- E. Appropriate ASTM, ANSI, UL, ASME and NFPA standards shall be met.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's specifications and installation instructions for each type of mechanical insulation. Submit schedule showing manufacturer's product number, thickness, and furnished accessories for each mechanical system requiring insulation.
 - 1. Certified Tests: With product data submit certified test reports on performances including burning characteristics and thermal insulating values.
- B. Maintenance Data: Submit maintenance data and replacement material lists for each type of mechanical insulation. Include this data in Maintenance Manual.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver insulation, coverings, cements, adhesives, and coatings to site in containers with manufacturer's stamp or label, affixed showing fire hazard ratings of products.
- B. Protect insulation against dirt, water, and chemical and mechanical damage. Do not install damaged insulation; remove from project site.
- C. Protect cements, adhesives and coatings from freezing.

PART 2 - PRODUCTS

2.1 PIPE INSULATION MATERIALS

- A. Foam Glass Pipe Insulation: FS HH-I-1751/3A, Type I, Class 4 with white fire retardant jacket finish for interior above grade insulation.
- B. Adhesives, Sealers, and Protective Finishes: As recommended by insulation manufacturer for applications indicated.
- C. Fiberglass Insulation: Factory applied white vapor barrier jacket.

2.2 EQUIPMENT INSULATION MATERIALS

- A. Rigid Fiberglass Equipment Insulation: FS HH-1-558, Form A, Class as indicated. $K = .27$ at 75°F .
 - 1. Provide Class 1 (non-load bearing) for temperatures up to and including 400°F (204°C) and where insulation is not subjected to compressive loading.
 - 2. Provide Class 2 (load bearing) for temperatures up and including 400°F (204°C) and where insulation is not subjected to compressive loading.
 - 3. Flexible Fiberglass Equipment Insulation: FS HH-I-558, Form B, Type I, Class as indicated.
 - 4. Provide Class 6 for temperatures up to and including 350°F (177°C).

- B. Wire-Faced Fiberglass Equipment Insulation: FS HH-I-558, Form C, Class as indicated.
- C. Cellular Glass Equipment Insulation: FS HH-I-551, Type I.
- D. Flexible Unicellular Equipment Insulation: FS HH-I-573, Class S.
- E. Jacketing Material for Equipment Insulation:
 - 1. Provide pre-sized glass cloth jacketing material, not less than 7.8 ounces per square yard, except as otherwise indicated.
- F. Equipment Insulation Compounds: Provide adhesives, cements, sealers, mastics and protective finishes as recommended by insulation manufacturer for applications indicated.
- G. Equipment Insulation Accessories: Provide staples, bands, wire, wire netting, tape corner angles, anchors, stud pins and metal covers as recommended by insulation manufacturer for applications indicated.

PART 3 - EXECUTION

3.1 PLUMBING PIPING SYSTEM INSULATION

- A. Insulation Omitted: Omit insulation on exposed plumbing fixture runouts from faces of wall or floor to fixture; on unions, flanges, strainers, flexible connections, and expansion joints.
- B. Cold Piping:
 - 1. Application Requirements: Insulate the following cold plumbing piping systems:
 - Interior above-ground storm water piping
 - Condensate piping
 - 2. Insulate each piping system specified above with one of the following types and thicknesses of insulation.
 - a. Insulation: Fiberglass, 1" thickness up to an including 6", 1-1/2" thick for piping larger than 6".
 - b. Insulation: At rated wall penetrations, provide cellular glass, 1-1/2" thickness.
 - c. All hot water lines running underground shall be insulated with 1" thick Foamglass insulation, the interior surface of which shall be factory coated with a thick application of Hydrocal A-11 cement. "Stay-dry" factory jacket shall be stapled on pipe. Miter insulation at elbows. Sand or dirt bed and fill, for a minimum of 3" surrounding insulation, shall be rock free. See section on buried piping outside of building.
- C. Hot Piping:
 - 1. Application Requirements: Insulate the following hot plumbing piping systems:

- Domestic hot water piping
- Domestic hot water circulating piping
- Exposed hot supply and drain piping
- 2. Insulate each hot water piping system specified above with one of the following types and thicknesses of insulation:
 - a. Insulation: Fiberglass, 1" thick for pipe sizes up to and including 6", 1-1/2" thick for pipe sizes over 6".
 - b. Insulation: Foam glass; 2" for all tanks.
 - c. Insulation: At rated wall penetrations, provide cellular glass, 1-1/2" thick for pipe sizes up to and including 6", 2-1/2" thick for pipe sizes over 6".
 - d. All hot water and hot water circulating lines running underground shall be insulated with 1" thick Foamglass insulation, the interior surface of which shall be factory coated with a thick application of Hydrocal A-11 cement. "Stay-dry" factory jacket shall be stapled on pipe. Miter insulation at elbows. Sand or dirt bed and fill, for a minimum of 3" surrounding insulation, shall be rock free. See section on buried piping outside of building.

3.2 INSTALLATION OF PIPING INSULATION

- A. General: Install insulation products in accordance with manufacturer's written instructions, and in accordance with recognized industry practices to ensure that insulation serves its intended purpose.
- B. Install insulation on pipe systems subsequent to testing and acceptance of tests.
- C. Install insulation materials with smooth and even surface. Insulate each continuous run of piping with full-length units of insulation, with single cut piece to complete run. Do not use cut pieces or scraps abutting each other.
- D. Clean and dry pipe surfaces prior to insulating. Butt insulation joints firmly together to ensure complete and tight fit over surfaces to be covered.
- E. Maintain integrity of vapor-barrier jackets on pipe insulation, and protect to prevent puncture or other damage.
- F. Cover valves, fittings and similar items in each piping system with equivalent thickness and composition of insulation as applied to adjoining pipe run. Install factory molded, precut or job fabricated units (at Installer's option) except where specific form or type is indicated.
- G. Extend piping insulating without interruption through walls, floors and similar piping penetrations, except where otherwise indicated.
- H. Install protective metal shields and insulated inserts wherever needed to prevent compression of insulation.
- I. Pipe Hanger Insulation Inserts: Butt pipe insulation against pipe hanger insulation inserts. For hot pipes, apply 3" wide vapor barrier tape or band over the butt joints. For

cold piping apply wet coat of vapor barrier lap cement on butt joints and seal joints with 3" wide vapor barrier tape or band.

- J. Fiberglass cloth jacket may be used in concealed areas.

3.3 INSTALLATION OF EQUIPMENT INSULATION

- A. General: Install equipment thermal insulation products in accordance with manufacturer's written instructions, and in compliance with recognized industry practices to ensure that insulation serves intended purpose.
- B. Install insulation materials with smooth and even surfaces and on clean and dry surfaces. Redo poorly fitted joints. Do not use mastic or joint sealer as filler for gaping joints and excessive voids resulting from poor workmanship.
- C. Maintain integrity of vapor-barrier on equipment ductwork insulation, and protect it to prevent puncture and other damage.
- D. Do not apply insulation to equipment while hot.
- E. Apply insulation using the staggered joint method for both single and double layer construction, where feasible. Apply each layer of insulation separately.
- F. Cover insulated surfaces with glass cloth jacketing neatly fitted and firmly secured. Lap seams at least two inches. Apply over vapor barrier where applicable.
- G. Provide removable insulation sections to cover parts of equipment which must be opened periodically for maintenance; include metal vessel covers, fasteners, flanges, frames and accessories.
- H. Equipment Exposed to Weather: Protect outdoor insulation from weather by installation of weather-barrier mastic protective finish, or jacketing, as recommended by manufacturer.

3.4 PROTECTION AND REPLACEMENT

- A. Replace damaged insulation which cannot be repaired satisfactorily, including units with vapor barrier damage and moisture saturated units.
- B. Protection: Insulation Installer shall advise Contractor of required protection for insulation work during remainder of construction period, to avoid damage and deterioration.

END OF SECTION 220700

SECTION 221000 – INSTALLATION OF PIPING PLUMBING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The Bidding Requirements and Contractual Conditions set forth in Division 01 apply to this section.

1.2 WORK INCLUDED

- A. Install above ground piping as specified below.

PART 2 - PRODUCTS

2.1 UNIONS

- A. Unions in copper pipe shall be Bronze 150# ground joint, solder end. Mueller, Chase or Nibco are acceptable alternative manufacturers.
- B. Unions in steel pipe shall be Black malleable iron, bronze ground ball joint. Mueller, Chase or Nibco are acceptable alternative manufacturers.
- C. Dielectric unions: Capitol, Dart, or Vogt.

2.2 VALVES

- A. Drain valves: 3/4" bronze or brass hose and gate, Powell 503 HS where exposed, Powell 502 HS with cap and chain where concealed.
- B. Flanged joints of valves: Spirotallic-Condren #913, 304 stainless steel with carbon steel guide, 150# flanges.

2.3 NIPPLES

- A. Nipples shall be same weight and material as pipe in which they are installed.
- B. Close and shoulder nipples shall be extra heavy.

2.4 EXPANSION LOOPS

- A. For piping systems fabricated from pipe and couplings, use one of the following methods for expansion compensation.

Combination Couplings and Nipples: Provide expansion joints constructed of short pipe nipples and couplings, designed by manufacturer to suit intended service. Provide removable ties to hold joint compressed or expanded during piping fabrication. Select couplings and gasket materials to match balance of piping system.

- B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering expansion joints for grooved piping which may be incorporated in the work include, but are not limited to, the following:

Stockham Valves & Fittings, Inc.
Vitaallic

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

- A. Cut pipe accurately, remove burrs by reaming, and work into place without forcing or springing.
- B. Use pipe lubricant on male threads only. Teflon pipe joint tape may be used.
- C. Make all changes of direction with fittings, rather than bending.
- D. Install piping level, except where specifically required to pitch. Arrange piping to allow draining the entire system.
- E. Use eccentric reducers, keeping top of pipe level in water systems.
- F. Bull head connections in any piping service are prohibited.
- G. All piping shall be installed in a neat and workmanlike manner and parallel to building walls, floors, etc.
- H. Properly support all relief valve discharge piping.
- I. No pipes shall cross over or within 3'-0" of electrical panels.
- J. Condensate piping shall be pitched a minimum of 1/8" per foot and cleanouts provided at every 90 degree bend and at convenient intervals in straight lines. A trap shall be provided at each equipment connection to drain. Water seal must exceed maximum pressure developed by the equipment.

3.2 VALVES AND SPECIALTIES

- A. Install with hand wheel/lever at or above center line of pipe.
- B. Install with union downstream of valve.
- C. Install with sweat adapters upstream of valve.
- D. Install where accessible.
- E. Provide drain valve at low points in piping.

- F. Install the thermometers and gauges to be readable from the floor.
- G. Install air vents at all highpoints, piping drops and other points where necessary for air removal.

3.3 ESCUTCHEONS

- A. Provide chrome plated escutcheons for exposed piping passing through walls, floors and ceilings or finished areas.
- B. Protect from tool marks.

3.4 UNIONS AND FLANGES

- A. Flanged joints shall be accessible, faced true and square.
- B. Provide unions or flanges at all connections to equipment and fixtures to facilitate removal and servicing.
- C. Provide dielectric unions or flanges between dissimilar metals, such as copper to steel.

3.5 COORDINATION

- A. Drawings are schematic.
- B. Where interferences develop, piping shall be offset or rerouted as required.
- C. Where piping is installed in accessible chases, keep all piping to sides of chase, except for portions which must be in the center of the chase. Offset vents to side immediately above connection to waste line.
- D. Piping shall be concealed except in unfinished rooms and except as otherwise shown.

3.6 EXPANSION CONTROL

- A. Install piping to permit free expansion and contraction without damage to joints and hangers.
- B. Provide pipe loops or offsets in supply and return lines where required or necessary for accurate control of movement.
- C. Pipe branches from mains must incorporate at least one change of direction in horizontal plane, and one change of direction in vertical plane, before connecting to equipment or fixtures, unless main is anchored at branch take-off.
- D. Install flexible connections to vibrating equipment.
- E. Provide securely supported pipe anchors and guides where required or necessary to control expansion and contraction of piping.

3.7 EXPANSION LOOPS

- A. Fabricate expansion loops as indicated, in locations indicated, and elsewhere as determined by Installer for adequate expansion of installed piping system. Subject loop to cold spring which will absorb 50% of total expansion between hot and cold conditions.

Provide pipe anchors and pipe alignment guides as indicated, and elsewhere as determined by Installer to properly anchor piping in relationship to expansion loops. See drawings for detail of anchors.

- B. Install expansion loops where indicated and elsewhere as determined by Installer for adequate expansion of installed piping system. Install in accordance with manufacturer's instructions. Provide pipe anchors alignment guides as indicated, and in accordance with manufacturer's recommendations. Align units properly to avoid end loading and stress.

3.8 EXPANSION JOINTS

- A. Install expansion joints where indicated, and elsewhere as determined by Installer for adequate expansion of installed piping system. Install in accordance with manufacturer's instructions. Provide pipe anchors and pipe alignment guides as indicated, and in accordance with manufacturer's recommendations. Align units properly to avoid end loading and stress.

END OF SECTION 221000

SECTION 221100 – PIPE, TUBE AND FITTINGS – PLUMBING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The bidding requirements and contractual conditions of Division 01 are applicable to this section.

1.2 DESCRIPTION OF WORK

- A. Extent of pipe, tube, and fittings required by this section is indicated on drawings and/or specified in other Division 22 sections. Drawings are diagrammatic and do not indicate every bend, fitting, etc. required for installation in the space allotted. Coordinate the work of this section with other work to avoid conflicts.
- B. Types of pipe, tube, and fittings specified in this section include the following:
 - 1. Piping Materials:
 - Copper tube
 - Cast-iron soil pipe
 - PVC Pipe
 - 2. Pipe/Tube Fittings:
 - Fittings for copper tube
 - Fittings for cast-iron soil pipe
 - Fittings for PVC Pipe
 - 3. Grooved piping products.
 - 4. Miscellaneous piping materials/products.

1.3 QUALITY ASSURANCE

- A. Manufacturers: Firms regularly engaged in the manufacture of pipe, tube, and fittings of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Brazing: Certify brazing procedures, brazers, and operators in accordance with ANSI B31.5, paragraph 527.5 for shop and job-site brazing of piping work.
- C. Appropriate ASTM, ANSI, UL, ASME, and NFPA Standards must be met.

1.4 SUBMITTALS

- A. Product Data: Submit catalog cuts, specifications, installation instruction, and dimensional drawings for each type of pipe, tube, and fitting. Submit piping schedule showing manufacturer, pipe or tube weight, fitting type, and joint type for each piping system.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Except for concrete, hub-and-spigot, and similar types of pipe, factory-applied plastic end-caps on each length of pipe and tube shall be provided. Maintain end-caps through shipping, storage and handling as required to prevent pipe end damage and to eliminate dirt and moisture from inside the pipe and tube.
- B. Where possible, store pipe and tube inside and protected from the weather. Where necessary to store outside, elevate above ground and enclose with durable, waterproof wrapping.
- C. Protect flange and fittings from moisture and dirt by inside storage and enclosure, or by packaging with durable, waterproof wrapping.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Provide pipe and tube of type, joint type, grade, size and weight (wall thickness or class) indicated for each service. Where type, grade or class is not indicated, provide proper selection as determined by Installer for the installation and comply with governing regulations and industry standards.
- B. Copper Tube: ANSI/ASTM B 88; Type (L not buried), Type K (buried), hard-drawn temper, except as otherwise indicated.
 - 1. DWV Copper Tube: ANSI/ASTM B 306.
- C. Cast-Iron Soil Pipe:
 - 1. Hubless Cast-Iron Soil Pipe: CISPI 301, ASTM A 888, or ASTM A 74. Pipe and Fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute.
 - 2. Cast-Iron Hub and Spigot Soil Pipe: CISPI 301, ASTM A 888 or ASTM A 74. Pipe and Fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute.
- D. PVC Pipe:
 - 1. PVC Pipe Type DWV (Above ground): ASTM D 2665, ASTM D 2949, CSA B181.2, ASTM F 1488.
 - 2. PVC Pipe Type DWV (Underground): ASTM D 2665, ASTM D 2949, ASTM F 891, CSA-B181.2.

2.2 PIPE/TUBE FITTINGS

- A. Provide factory-fabricated fittings of type, materials, grade, class and pressure rating indicated for each service and pipe size. Provide sizes and types matching pipe, tube, valve or equipment connections in each case. Where not otherwise indicated, comply with governing regulations and industry standards for selections, and with pipe manufacturer's recommendations.
- B. Fittings for Copper Tube:
 - 1. Cast-Copper Solder-Joint Fittings: ANSI B16.18.
 - 2. Cast-Copper Solder-Joint Drainage Fittings: ANSI B16.23.
 - 3. Cast-Copper Flared Tube Fittings: ANSI B16.26, Class 150.
 - 4. Non-Ferrous Pipe Flanges: ANSI B16.31, Class 150.
 - 5. Copper-Tube Unions: Provide standard products recommended by manufacturer for use in service indicated.
- C. Fittings for Cast-Iron Soil Pipe:
 - 1. Hubless-Cast-Iron Soil Pipe Fittings: CISPI 301; and complying with governing regulations as manufactured by Clamp-All, Inc., Alpha or MG, Inc..
 - 2. Cast-Iron Hub-and-Spigot Soil Pipe Fittings: Match soil pipe units; complying with same standards (ANSI/ASTM A 74).
 - 3. Compression Gaskets: CISPI Standard HSN.
- D. Fittings for PVC Pipe:
 - 1. PVC Pipe Fittings: ASTM D 3311, ASTM D 2665, ASTM F 1866.

2.3 MISCELLANEOUS PIPING MATERIALS/PRODUCTS

- A. Soldering Materials: Provide soldering materials as determined by Installer to comply with the following installation requirements:
 - 1. Tin-Antimony Solder: Water ANSI/ASTM B 32, Grade 95TA.
 - 2. Silver Solder: Medical Gas, Refrigeration, ANSI/ASTM B 32, Grade 96.5TS.
- B. Brazing Materials: Provide brazing materials as determined by Installer to comply with Section IX, ASME Boiler and Pressure Vessel Code.
- C. Piping Connectors for Dissimilar Non-Pressure Pipe: Elastomeric annular ring insert, or elastomeric flexible coupling secured at each end with stainless steel clamps, sized for exact fit to pipe ends and subject to approval by plumbing code.
- D. Available Manufacturers: Subject to compliance with requirements, manufacturers offering piping connectors which may be incorporated in the work include, but are not limited to, the following: Fernco, Inc.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install pipe, tube and fitting in accordance with recognized industry practices which will achieve permanently leakproof piping systems, capable of performing each indicated service without piping failure. Install each run with minimum joints and couplings, but with adequate and accessible unions for disassembly and maintenance/replacement of valves and equipment. Reduce sizes (where indicated) by use of reducing fittings. Align piping accurately at connections, within 1/16" misalignment tolerance. Comply with ANSI B31 Code for pressure piping.
- B. Locate piping runs vertically and horizontally (pitched to drain) and avoid diagonal runs wherever possible. Orient horizontal runs parallel with walls and column lines. Locate runs as shown or described by diagrams, details and notations or, if not otherwise indicated, run piping in shortest route which does not obstruct usable space or block access for servicing building and its equipment. Hold piping close to walls, overhead construction, columns and other structural and permanent enclosure elements of buildings; limit clearance to 1/2" where furring is shown for enclosure or concealment of piping, but allow for insulation thickness, if any. Where possible, locate insulated piping for maximum 1.0" clearance outside insulation. Wherever possible in finished and occupied spaces, conceal piping from view, by locating in column enclosures, in hollow wall construction or above suspended ceilings; do not encase horizontal runs in solid partitions, except as indicated.
- C. Do not run piping through transformer vaults and other electrical or electronic equipment spaces and enclosures unless unavoidable. Install drip pans under piping that must be run through electrical spaces, verify with Engineer prior to running of pipe.
- D. Provide joints of type indicated in each piping system.
 - 1. Braze copper tube and fitting joints in accordance with ANSI B31.
 - 2. Solder copper tube-and-fitting joints where indicated, in accordance with recognized industry practice. Cut tube ends squarely, ream to full inside diameter, and clean outside of tube ends and inside of fittings. Apply solder flux to joint areas of both tubes and fittings. Insert tube full depth into fitting, and solder in manner which will draw solder full depth and circumference of joint. Wipe excess solder from joint before it hardens.
 - 3. Weld pipe joints in accordance with ANSI B31.
 - 4. Weld pipe joints in accordance with recognized industry practices.
 - 5. Weld pipe joints of steel water pipe in accordance with AWWA C206.
 - 6. Hubless Cast-Iron Joints: Comply with CISPI 310.

3.2 CLEANING, FLUSHING AND FILLING

- A. Remove strainer, automatic air vents, and flow regulators from all piping systems and ensure all control and shut-off valves are fully open. Flush each system for a minimum of two hours.

- B. Replace strainers, air vents, and flow regulators and fill system with clean water.

3.3 PIPING TESTS

- A. Test pressure piping in accordance with ANSI B31.
- B. Provide temporary equipment for testing, including pump and gauges. Test piping system before insulation is installed. Remove control devices before testing. Test each natural section of each piping system independently but do not use piping system valves to isolate sections where test pressure exceeds valve pressure rating. Fill each section with water and pressurize for indicated pressure and time.
- C. Required test period is 24 hours with no pressure drop.
- D. Test each piping system at 150% of operating pressure indicated, but not less than 125 PSI test pressure.
- E. Observe each test section for leakage at end of test period. Test fails if leakage is observed or if pressure drop exceeds 5% of test pressure.
- F. Repair piping systems sections which fail required piping test, by disassembly and re-installation, using new materials to extent required to overcome leakage. Do not use chemicals, stop-leak compounds, mastics, or other temporary repair methods.
- G. Drain test water from piping systems after testing and repair work has been completed.

END OF SECTION 221100

SECTION 221101 – CONDENSATE PIPING SYSTEMS – PLUMBING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK

- A. Extent of condensate piping work is indicated on the drawings and schedules, as indicated in Mechanical General Provisions and by requirements of this section.
- B. Applications for condensate piping include the following:
 - 1. Conductor piping from air handling equipment to building storm drain or as indicated on drawings.
 - 2. Refer to appropriate Division 23 sections for exterior condensate system required in conjunction with storm water piping.
 - 3. Refer to appropriate Division 22 sections for insulation required in conjunction with condensate piping; not work of this section.
 - 4. Trenching and backfill required in conjunction with storm water piping is specified in applicable Division 33 sections, and is included as work of this section.

PART 2 - PRODUCTS

2.1 CONDENSATE PIPING MATERIALS AND PRODUCTS

- A. Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, and capacities as indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide sizes and types matching piping and equipment connections; provide fittings of materials which match pipe materials used in storm water piping systems.

2.2 BASIC PIPE, TUBE AND FITTINGS

- A. Provide pipe, tube and fittings complying with Division 22 Basic Materials and Methods section, "Pipe, Tube and Fittings", in accordance with the following listing:
- B. Condensate Drain Piping:
 - 1. Pipe Size 6" and Smaller: Polyvinyl chloride pipe (PVC) DWV-ASTM D2665-82.
 - 2. Pipe Class: Schedule 40
 - 3. Fittings: PVC-DWV fittings with solvent weld cement ASTM D2564-80.

2.3 BASIC SUPPORTS, ANCHORS AND SEALS

- A. Provide supports, anchors and seals complying with Division 22 Basic Materials and Methods section, "Supports, Anchors and Seals", in accordance with the following listing:
- B. Adjustable steel clevises, steel pipe clamps and pipe saddle supports for horizontal piping hangers and supports.
- C. Two-bolt riser clamps for vertical piping supports.
- D. Concrete inserts, C-clamps, and steel brackets for building attachments.
- E. Copper flashings for piping penetrations.

2.4 DRAINAGE PIPING PRODUCTS

- A. Provide factory fabricated drainage piping products of size and type indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements and governing regulations.
- B. Cleanout Plugs: Cast-bronze or brass, threads complying with ANSI B2.1 countersunk head.
- C. Floor Cleanouts: Cast-iron body and frame: cleanout plug; adjustable round top as follows:

Nickel-Bronze Top: Manufacturer's standard cast unit of pattern indicated.
- D. Available Manufacturers: Subject to compliance with requirements, manufacturers offering piping products which may be incorporated in the work include the following: Ancon, Inc., Josam Manufacturing Co., J.R. Smith Manufacturing Co., Wade Div., Tyler Pipe, Zurn.

PART 3 - EXECUTION

3.1 INSTALLATION OF BUILDING DRAIN PIPING

- A. Install condensate building drains as indicated and in accordance with the latest version of the Florida Building Code. Lay building drains beginning at low point of systems, true to grades and alignment indicated with unbroken continuity of invert. Clear the interior of piping from dirt and other superfluous material. Place plugs in ends of uncompleted piping at end of day or whenever work stops.
- B. Install condensate piping pitched to drain at minimum slope of 1/4" per foot (2%) for piping 3" and smaller, and 1/8" per foot (1%) for piping 4" and larger.

3.2 EQUIPMENT CONNECTIONS

- A. Provide union and P-trap with cleanout and union connection to equipment. Refer to details on drawings.

- B. Provide condensate piping as required and make connection to all Owner furnished/Contractor installed equipment.

3.3 INSTALLATION OF DRAINAGE PIPING PRODUCTS

- A. Cleanouts: Install in condensate piping as indicated, as required by the Florida Building Code; at each change in direction of piping greater than 45°; at minimum intervals of 50' for piping 4" and smaller and 100' for larger piping; and at base of each conductor. Install floor and wall cleanout covers for concealed piping. Select type to match adjacent building finish.
- B. Flashing Flanges: Install flashing flange and clamping device with each cleanout passing through water proof membrane.

3.4 PIPING TESTS

- A. Test condensate piping system in accordance with requirements of the Florida Building Code.

END OF SECTION 221101

SECTION 221116 – DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The Bidding Requirements and Contractual Conditions set forth in Division 01 apply to this section.

1.2 DESCRIPTION OF WORK

- A. Extent of domestic water piping systems is indicated on drawings and schedules and by requirements of this section.
- B. Applications for domestic water piping systems include the following:
 - 1. Domestic cold water piping
 - 2. Domestic hot water piping

1.3 QUALITY ASSURANCE

- A. Manufacturers: Firms regularly engaged in the manufacture of domestic water piping systems products, of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. ANSI Standards: Comply with applicable American National Standards pertaining to products and installation of domestic water piping systems.

1.4 SUBMITTALS

- A. Submit manufacturer's data for domestic water piping systems, materials and products.

PART 2 - PRODUCTS

2.1 DOMESTIC WATER PIPING MATERIALS AND PRODUCTS

- A. Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, temperature ratings, and capacities as indicated. Provide sizes and types matching piping and equipment connections provide fittings of materials which match pipe materials used in domestic water piping systems.

2.2 BASIC PIPE, TUBE, AND FITTINGS

- A. Provide pipe, tube, and fittings complying with Division 22 Basic Materials and Methods section "Pipe, Tube, and Fittings", in accordance with the following listing:
- B. Domestic Water Piping - above grade
 - 1. Tube Size 2" and smaller: Copper tube.

2. Wall Thickness: Type L, hard-drawn temper.
 3. Fittings: Malleable copper, solder joints.
- C. Tube Size 2-1/2" and larger: Copper tube.
1. Wall thickness: Type K, hard-drawn temper.
 2. Fittings: Malleable copper, solder joints.
- D. Domestic Water Piping - below grade
1. Tube Size 3/4" and smaller: Copper tube.
 2. Wall Thickness: Type K, soft-annealed temper.
 3. Fittings: Cast-copper, flared tube or solder joints.
 4. Tube size 1" through 2": Copper tube.
 5. Wall Thickness: Type K, soft-annealed temper.
 6. Fittings: Wrought copper, solder joints.
- 2.3 Schedule 40 and 80 CPVC
- A. Alternate Water System: Corzan® CPVC Schedule 40 and 80 Pressure Pipe and Fitting System
- B. CPVC is intended for pressure applications where the operating temperature will not exceed 200°F.
- C. Pipe and fittings shall be manufactured from virgin rigid CPVC (chlorinated polyvinyl chloride) vinyl compounds with a Cell Class of 23447-B as identified in ASTM D 1784. CPVC Schedule 40 and 80 pipe shall be Iron Pipe Size (IPS) conforming to ASTM F 441. CPVC Schedule 80 fittings shall conform to ASTM F 439. CPVC Schedule 80 threaded fittings shall conform to ASTM F 437. Pipe and fittings shall be manufactured as a system and be the product of one manufacturer. All pipe and fittings shall be manufactured in the United States. Pipe and fittings shall conform to National Sanitation Foundation (NSF) Standard 61 or the health effects portion of NSF Standard 14.
- D. Installation shall comply with the latest installation instructions published by Charlotte Pipe and Foundry and shall conform to all local plumbing, building, and fire code requirements. Solvent cement joints shall be made in a two step process with primer manufactured for thermoplastic piping systems and solvent cement conforming to ASTM F 493. The system shall be protected from chemical agents, fire stopping materials, thread sealant, plasticized vinyl products, or other aggressive chemical agents not compatible with CPVC compounds. Systems shall be hydrostatically (water) tested after installation. Testing with compressed air or gas is not recommended.
- 2.4 SPECIAL PIPING SPECIALTIES
- A. Water Hammer Arresters: Provide bellows type water hammer arresters, stainless steel casing and bellows, pressure rated for 250 PSI, tested and certified in accordance with PDI Standard WH-201.

- B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering water hammer arresters which may be incorporated in the work include, but are not limited to, the following: Amtrol Inc., Smith (Jay H.) Mfg. Co., Wade Div., Tyler Pipe, Zurn Industries, Inc.

2.5 BASIC SUPPORTS, ANCHORS, AND SEALS

- A. Provide supports, anchors, and seals complying with Division 22 Basic materials and Methods section "Supports, Anchors and Seals", in accordance with the following listing:
 - 1. Adjustable steel clevises, adjustable roller hangers, and adjustable pipe roll stands for horizontal piping hangers and supports.
 - 2. Two-bolt riser clamps for vertical piping supports.
 - 3. Concrete inserts, C-clamps, and steel brackets for building attachments.
 - 4. Protection shields for insulated piping support in hangers.

2.6 BASIC VALVES

- A. Provide valves complying with Division 22 Basic Materials and Methods section "Valves", in accordance with the following listing:
- B. Sectional Valves:
 - 1. 2" or Smaller: Ball or Gate valves.
 - 2. 2-1/2" and Larger: Gate valves.
- C. Shutoff Valves:
 - 1. 2" and Smaller: Ball or Gate valves.
 - 2. 2-1/2" and Larger: Gate valves.
- D. Drain Valves:
 - 1. 2" and Smaller: Ball or Gate valves.
 - 2. 2-1/2" and Larger: Gate valves.
- E. Check Valves:
 - 1. All Sizes: Swing check valves.

2.7 SPECIAL VALVES

- A. Special valves required for domestic water piping systems include the following types:
- B. Balance Cocks:
 - 1. Threaded Ends 2" and Smaller: Class 125, bronze body, bronze plug, screw driver operated, straight or angle pattern.

2. Soldered Ends 2" and Smaller: Class 125, bronze body, bronze plug, screw driver operated, straight or angle pattern.
 3. Available Manufacturers: Subject to compliance with requirements, manufacturers offering balance cocks which may be incorporated in the work include, but are not limited to, the following: Bell & Gossett, Hammond Valve Corp., Illinois Products, American Air Filter Company, Milwaukee Valve Company, Inc., Sarco Company, Taco, Inc.
- C. Hose Bibbs: Threaded Ends: Bronze body, renewable composition disc, tee handle, 3/4" NPT inlet, 3/4" hose outlet with vacuum breaker.
- D. Available Manufacturers: Subject to compliance with requirements, manufacturers offering hydrants which may be incorporated in the work include, but are not limited to, the following: Ancon, Inc., Smith, (Jay R.) Mfg. Co., Wade Division, Tyler Pipe, Zurn Industries, Inc.

2.8 BACKFLOW PREVENTERS

- A. Provide reduced pressure principal backflow preventers consisting of assembly including shutoff valve on inlet and outlet and strainer on inlet. Backflow preventers shall include test cocks, and pressure differential relief valve located between two positive seating check valves. Construct in accordance with ASSE Standard 1013.
- B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering backflow preventers which may be incorporated in the work include, but are not limited to, the following: Hersey Products, Inc., Lawler, Watts Regulator Company

2.9 BASIC EXPANSION COMPENSATION

- A. Provide expansion compensation products complying with Division 22 Basic Materials and Methods section "Extension Compensation, in accordance with the following listing:
1. Expansion compensators for hot water and hot water recirculating piping.
 2. Pipe alignment guides.

PART 3 - EXECUTION

3.1 INSTALLATION OF DOMESTIC WATER DISTRIBUTION PIPING

- A. Install water distribution piping in accordance with Division 22 Basic Materials and Methods section "Pipe, Tube, and Fittings".
- B. Sterilization solution shall be 400 ppm to 1000 ppm chlorine made from a sanitation grade chlorine or sodium hypochlorite. Solution shall remain in system for twenty-four (24) hours during which time valves and faucets are to be opened and closed several times. Outlets shall be tested to ensure an adequate amount of chlorine is present. At conclusion of sterilization, entire system shall be flushed with clean water until chlorine content is at a level approved by the Health Department.

3.2 INSTALLATION OF EXTERIOR WATER PIPING

- A. Install exterior water service piping system in compliance with local governing regulations.
- B. Copper Tube: Install in accordance with recommended procedures of the Copper Development Association.
- C. Sterilization solution shall be 400 ppm to 1000 ppm chlorine made from a sanitation grade chlorine or sodium hypochlorite. Solution shall remain in system for twenty-four (24) hours during which time valves and faucets are to be opened and closed several times. Outlets shall be tested to ensure an adequate amount of chlorine is present. At conclusion of sterilization, entire system shall be flushed with clean water until chlorine content is at a level approved by the Health Department.
- D. Installation of all underground water lines shall include 14 GA irrigation wire, blue coated, secured to the pipe at 3'-0" on-centers in accordance with the manufacturer's installation instructions.

3.3 INSTALLATION OF PIPING SPECIALTIES

- A. Install piping specialties in accordance with Division 22 Basic Materials and Methods section "Piping Specialties".
- B. Water Hammer Arresters: Install in upright position, in locations and of sizes in accordance with PDI Standard WH-201, and elsewhere as indicated.

3.4 INSTALLATION OF SUPPORT, ANCHORS, AND SEALS

- A. Install supports, anchors, and seals in accordance with Division 22 Basic Materials and Methods section "Supports, Anchors, and Seals".

3.5 INSTALLATION OF VALVES

- A. Install valves in accordance with Division 22 Basic Materials and Methods section "Valves".
- B. Sectional Valves: Install on each branch and riser, close to main, where branch or riser serves two or more plumbing fixtures or equipment, connections, and elsewhere as indicated.
- C. Shutoff Valves: Install on inlet of each plumbing equipment item, and on inlet of each plumbing fixture, and elsewhere as indicated.
- D. Drain Valves: Install on each plumbing equipment item located to completely drain equipment for service or repair. Install at base of each riser, at base of each rise or drop in piping system, and elsewhere where indicated or required to completely drain domestic water piping system.

- E. Check Valves: Install spring loaded check valves on discharge side of each pump, and swing check valves elsewhere as indicated.
- F. Balance Cocks: Install in each hot water recirculating loop, and elsewhere as indicated.
- G. Hose Bibbs: Install where indicated with vacuum breaker.

3.6 INSTALLATION OF BACKFLOW PREVENTERS

- A. Install backflow preventers where indicated, and where required by the Florida Building Code. Locate in the same room as equipment being protected and pipe relief outlet to the nearest floor drain.

3.7 INSTALLATION OF PRESSURE REGULATING VALVES

- A. Install pressure regulating valves where indicated. Provide inlet and outlet shutoff valves, and glove valve bypass. Provide pressure gauge on valve outlet.

3.8 INSTALLATION OF EXPANSION COMPENSATION PRODUCTS

- A. Install expansion compensation products in accordance with Division 22 Basic Materials and Methods section "Expansion Compensation".

3.9 EQUIPMENT CONNECTIONS

- A. Piping Runouts to Fixtures: Provide hot and cold water piping runouts to fixtures of sizes indicated, but in no case smaller than required by Code.
- B. Equipment Connections: Connect hot and cold water piping system to mechanical equipment as indicated, and comply with equipment manufacturer's installation instructions. Provide shutoff valve and union for each connection, provide drain valve on drain connection.

3.10 SPARE PARTS

- A. Furnish to Owner, one valve key to each key operated hydrant, bibb, or faucet installed.

END OF SECTION 221116

SECTION 221316 – SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The Bidding Requirements and Contractual Conditions set forth in Division 01 apply to this section.

1.2 DESCRIPTION OF WORK

- A. Extent of soil and waste piping system work is indicated on drawings and schedules, and by requirements of this section.
- B. Applications for soil and waste piping systems include the following:
 - 1. Above ground soil, waste and vent piping within buildings including soil stacks vent stacks, horizontal branches, traps, and connections to fixtures and drains.
 - 2. Underground building drain piping including mains, branches, traps, connections to fixtures and drains, and connections to stacks, terminating at connection to sanitary sewers outside foundation wall. Verify inverts of mains and make final connection.
 - 3. Refer to appropriate Division 22 sections for insulation required in conjunction with soil and waste piping; not work of this section.
 - 4. Provide trenching and backfill required in conjunction with underground building drain piping.

1.3 QUALITY ASSURANCE

- A. Manufacturers: Firms regularly engaged in the manufacture of piping, products of types, materials and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. ANSI Compliance: Comply with applicable American National Standards pertaining to products and installation of soil and waste piping systems.
- C. PDI Compliance: Comply with applicable Plumbing and Drainage Institute Standards pertaining to products and installation of soil and waste piping systems.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's data for soil and waste piping systems materials and products.

PART 2 - PRODUCTS

2.1 SOIL AND WASTE PIPING MATERIALS AND PRODUCTS

- A. Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, and capacities as indicated. Provide sizes and types matching piping and equipment connections; provide fittings of materials which match pipe materials used in soil and waste piping systems.

2.2 BASIC PIPE, TUBE, AND FITTINGS

- A. Provide pipe, tube, and fittings complying with Division 22 Basic Materials and Methods section "Pipe, Tube, and Fittings", in accordance with the following listing:

- B. Above ground building piping.

1. Pipe size 10" and smaller shall be hubless cast-iron soil pipe and fittings and shall conform to CISPI Standard 301, ASTM A 888, or ASTM A 74.
2. Pipe Class: Service weight.
3. Joints shall be No-hub couplings and shall conform to CISPI Standard 310, and ASTM C 1277. Heavy-duty couplings with type 304 stainless steel shield, heavy-duty clamps tightened to minimum 80 inch pounds of torque and neoprene gasket shall conform to ASTM C 1540.

- C. Underground Building Drain Piping:

1. Pipe Size 10" and Smaller shall be Cast-iron hub-and-spigot soil pipe and fittings and shall conform to CISPI Standard 301, ASTM A 888 or ASTM A 74.
2. Pipe Class: Service weight.
3. Joints shall be lead and oakum or hub-and-spigot compression gaskets and shall conform to the requirements of ASTM C564 and ASTM C 1563.
4. Pipe and Fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute.

- D. Building Drain Piping (PVC) Alternate:

1. PVC piping shall be Schedule 40 Solid Wall Pipe and PVC DWV Fitting System.
2. PVC shall be Schedule 40 solid wall pipe and PVC DWV fittings used in sanitary drain, waste, and vent (DWV), sewer, and storm drainage applications. This system is intended for use in non-pressure applications where the operating temperature will not exceed 140°F.
3. Pipe and fittings shall be manufactured from virgin rigid PVC (polyvinyl chloride) vinyl compounds with a Cell Class of 12454-B as identified in ASTM D 1784. PVC Schedule 40 pipe shall be Iron Pipe Size (IPS) conforming to ASTM D 1785 and ASTM D 2665. PVC DWV fittings shall conform to ASTM D 2665. Pipe and fittings shall be manufactured as a system and be the product of one manufacturer. All pipe and fittings shall be manufactured in the United States. Pipe and fittings shall conform to National Sanitation Foundation Standard 14.
4. Installation shall comply with the latest installation instructions published by the manufacturer and shall conform to all local plumbing, building, and fire code requirements. Solvent cement joints shall be made in a two-step process with primer manufactured for thermoplastic piping systems and solvent cement conforming to ASTM D 2564. The system shall be protected from chemical agents, fire stopping materials, thread sealant, plasticized vinyl products, or other

aggressive chemical agents not compatible with PVC compounds. Systems shall be hydrostatically tested after installation.

2.3 BASIC SUPPORTS, ANCHORS, AND SEALS

- A. Provide supports, anchors, and seals complying with Division 22 Basic Materials and Methods section "Supports, Anchors, and Seals", in accordance with the following listing:
 - 1. Adjustable steel clevises, steel pipe clamps, and pipe saddle supports for horizontal piping hangers and supports.
 - 2. Two-bolt riser clamps for vertical piping supports.
 - 3. Concrete inserts, C-clamps, and steel brackets for building attachments.

2.4 SPECIAL VALVES

- A. Special valves required for soil and waste piping systems include the following types:

Backwater Valves: Cast-iron body, bronze backwater valve assembly. Hang flapper in such manner to provide maximum 1/4" clearance between flapper and seat for air circulation. Provide end to suit piping material; bolted cover.

- B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering backwater valves which may be incorporated in the work include, but are not limited to, the following: Ancon, Inc., Smith (Jay R.) Mfg. Co., Wade Div., Tyler Pipe, Zurn Industries, Hydromechanics Div.

2.5 SPECIAL EXPANSION COMPENSATION

- A. Special expansion compensation products required for soil and waste piping systems include the following types:

Expansion Joints: Cast-iron body, adjustable bronze sleeves, bronze bolts with wing nuts, for vertical installation only.

- B. Available Manufacturers: Subject to compliance with manufacturers offering expansion joints which may be incorporated in the work include, but are not limited to the following: Ancon, Inc., Smith (Jay R.) Mfg. Co., Wade Div., Tyler Pipe, Zurn Industries.

2.6 DRAINAGE PIPING PRODUCTS

- A. Provide factory fabricated drainage piping products of size and type indicated on the drawings. Where not indicated by schedule on the drawings, provide proper selection as determined by Installer to comply with installation requirements and governing regulations.
 - 1. Cleanout Plugs: Cast-bronze or brass, threads complying with ANSI B2.1 countersunk head.

2. Floor Cleanouts: Cast-iron body and frame; cleanout plug; adjustable round top as follows:
 - a. Nickel-Bronze Top; Manufacturer's standard cast unit of pattern indicated.
 - b. Pattern: Exposed rim type, with recess to receive 1/8" thick resilient floor finish.
 3. Wall Cleanouts: Cast-iron body adaptable to pipe; cast-bronze or brass cleanout plug; stainless steel cover including screws.
 4. Flashing Flanges: Cast-iron watertight stack or wall sleeve with membrane flashing ring. Provide underdeck clamp and sleeve length as required.
 5. Vent Flashing Sleeves: Cast-iron caulking-type roof coupling for cast-iron stacks, cast-iron threaded type roof coupling for steel stacks, and cast-bronze stack flashing sleeve for copper tubing.
- B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering drainage piping products which may be incorporated in the work include, but are not limited to, the following: Ancon, Inc.) Mfg. Co., Smith (Jay R.) Mfg. Co., Wade Div., Tyler Pipe, Zurn Industries

2.7 FLOOR DRAINS

- A. Provide floor drains of size as indicated on drawings.
- B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering floor drains which may be incorporated in the work include, but are not limited to, the following: Ancon, Inc., Smith (Jay R.) Mfg. Co., Wade Div., Tyler Pipe, Zurn Industries.

PART 3 - EXECUTION

3.1 INSTALLATION OF SOIL AND WASTE ABOVE GROUND PIPING

- A. Install soil and waste piping in accordance with Division-15 Basic Materials and Methods section, "Pipe, Tube, and Fittings", and with Code.
- B. Soil, waste, and vent drain piping - Plug and fill system to highest point to provide at least ten (10) feet minimum head on all parts of system. Piping shall be watertight for at least one (1) hour under observed testing.

3.2 INSTALLATION OF BUILDING DRAIN PIPING

- A. Install building drains as indicated and in accordance with the Florida Building Code. Lay underground building drains beginning at low point of systems, true to grades and alignment indicated with unbroken continuity of invert. When installing building drains below grade, care shall be taken to ensure that the installed system is capable of withstanding anticipated earth loads and live loads to be exerted.
- B. Place bell ends of piping facing upstream. Install required gaskets in accordance with manufacturer's recommendations for use of lubricants, cements, and other special installation requirements. Clear the interior of piping of dirt and other superfluous

material as work progresses. Maintain swab or drag-in line and pull past each joint as it is completed. Place plugs in ends of uncompleted piping at end of day or whenever work stops.

- C. Install soil and vent piping pitched to drain at minimum slope of 1/4" per foot (2%) for piping 2-1/2" and smaller, 1/8" per foot (1%) for piping 3" to 6", and 1/16" per foot (2%) for piping 8" or larger.
- D. Below grade pipe installations shall be performed in accordance with the manufacturer's installation instructions, the Florida Building Code.
- E. Trench excavation, bedding, and backfill procedures shall be in accordance with Chapter IV of the Cast Iron Soil Pipe and Fittings Handbook.

3.3 INSTALLATION OF SPECIAL VALVES

- A. Backwater Valves: Install in sanitary building drain piping as indicated, and as required by Code. For interior installation, provide cleanout cover flush to floor centered over backwater valve cover, and of adequate size to remove valve cover for service.

3.4 INSTALLATION OF SPECIAL EXPANSION COMPENSATION PRODUCTS

- A. Install expansion joints on vertical risers as indicated, and as required by the Florida Building Code.

3.5 INSTALLATION OF DRAINAGE PIPING PRODUCTS

- A. Cleanouts: Install in sanitary above ground piping and sanitary building drain piping as indicated, as required by Code; at each change in direction of piping greater than 45 degrees; at minimum intervals of 50' for piping 4" and smaller and 75' for larger piping; and at base of each vertical soil or waste stack. Install floor and wall cleanout covers for concealed piping, select type to match adjacent building finish.
- B. Flashing Flanges: Install flashing flange and clamping device with each stack and cleanout passing through waterproof membrane.

3.6 INSTALLATION OF DRAINS

- A. Install drains in accordance with manufacturer's written instructions and in locations indicated.
- B. Coordinate with soil and waste piping as necessary to interface drains with drainage piping systems.
- C. Install drains at low points of surface areas to be drained, or as indicated. Set tops of drains flush with finished floor.
- D. Install drain flashing collar or flange so that no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes, where penetrated.

- E. Position drains so that they are accessible and easy to maintain.

3.7 EQUIPMENT CONNECTIONS

- A. Piping Runouts to Fixtures: Provide soil and waste piping runouts to plumbing fixtures and drains, with approved trap, of sizes indicated; but in no case smaller than required by Code.
- B. Locate piping runouts as close as possible to bottom of floor slab supporting fixtures or drains.

3.8 PIPING TESTS

- A. Test soil and waste piping system in accordance with requirements of the Florida Building Code.

END OF SECTION 221316

SECTION 221413 – FACILITY STORM DRAINAGE PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The Bidding Requirements and Contractual Conditions set forth in Division 01 apply to this section.

1.2 DESCRIPTION OF WORK

- A. Extent of storm water piping work is indicated on drawings and schedules, and by requirements of this section.
- B. Applications for storm water piping include the following:
 - 1. Conductor piping from drains and deck drains to building storm drain.
 - 2. Building storm drain piping from conductor piping and area drains to storm sewers outside foundation wall.
- C. Refer to appropriate Division 02 sections for exterior storm sewer system required in conjunction with storm water piping. Verify inverts and make final connections.
- D. Refer to appropriate Division 22 sections for insulation required in conjunction with storm water piping.
- E. Trenching and backfill required in conjunction with storm water piping is specified in applicable Division 02 sections.

1.3 QUALITY ASSURANCE

- A. Manufacturers: Firms regularly engaged in the manufacture of piping products of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's data for storm water piping systems materials and products.
- B. Roof drain piping: Plug and fill system to highest point to provide at least ten (10) feet minimum on all parts of system. Piping shall be watertight for at least one (1) hour under observed testing.

PART 2 - PRODUCTS

2.1 STORM WATER PIPING MATERIALS AND PRODUCTS

- A. Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, and capacities as indicated. Provide sizes and types matching piping and equipment connections; provide fittings of materials which match pipe materials used in storm water piping systems.

2.2 BASIC PIPE, TUBE, AND FITTINGS

- A. Provide pipe, tube, and fittings complying with Division 22 Basic Materials and Methods section "Pipe, Tube, and Fittings", in accordance with the following listing:

- B. Above ground building piping.

1. Pipe size 10" and smaller: Hubless cast-iron soil pipe.
2. Pipe Class: Service weight.
3. Fittings: Hubless cast-iron soil pipe fittings, no-hub joints, extra wide, heavy-duty couplings with type 304 stainless steel shield, heavy-duty clamps tightened to minimum 80 inch pounds of torque and ASTM neoprene gasket.

- C. Underground Building Drain Piping:

1. Pipe Size 10" and Smaller: Cast-iron hub-and-spigot soil pipe.
2. Pipe Class: Service weight.
3. Fittings: Cast-iron, hub-and-spigot soil pipe fittings, lead and oakum or compression gasket joints.

- D. PVC Piping Alternate:

1. This specification covers PVC Schedule 40 solid wall pipe and PVC DWV fittings used in sanitary drain, waste, and vent (DWV), sewer, and storm drainage applications. This system is intended for use in non-pressure applications where the operating temperature will not exceed 140°F.
2. Pipe and fittings shall be manufactured from virgin rigid PVC (polyvinyl chloride) vinyl compounds with a Cell Class of 12454-B as identified in ASTM D 1784. PVC Schedule 40 pipe shall be Iron Pipe Size (IPS) conforming to ASTM D 1785 and ASTM D 2665. PVC DWV fittings shall conform to ASTM D 2665. Pipe and fittings shall be manufactured as a system and be the product of one manufacturer. All pipe and fittings shall be manufactured in the United States. Pipe and fittings shall conform to National Sanitation foundation Standard 14.
3. Installation shall comply with the latest installation instructions published by the manufacturer and shall conform to all local plumbing, building, and fire code requirements. Solvent cement joints shall be made in a two step process with primer manufactured for thermoplastic piping systems and solvent cement conforming to ASTM D 2564. The system shall be protected from chemical agents, fire stopping materials, thread sealant, plasticized vinyl products, or other aggressive chemical agents not compatible with PVC compounds. Systems shall be hydrostatically tested after installation.
4. Referenced Standards:

ASTM D 1784 Rigid Vinyl Compounds
ASTM D 1785 PVC Plastic Pipe, Schedule 40
ASTM D 2665 PVC Drain, Waste, and Vent Pipe & Fittings
ASTM D 2564 Solvent Cements for PVC Pipe and Fittings
NSF Standard 14 Plastic Piping Components and Related Materials

5. Place color coded 6" wide 0.004" thick polyethylene printed plastic identification tape approximately 12" below finished grade directly above all underground piping systems. Tapes shall be continuously printed with "CAUTION" in large bold letters. The printed second line shall indicate the type of service below (print type of service on tape, i.e. acid waste.). Provide a Tracer Wire along all plastic pipe which runs in the ground. Installation of all plastic lines shall include 14 GA irrigation wire, blue coated, secured to the pipe at 3'-0" on-centers.

2.3 BASIC SUPPORTS, ANCHORS, AND SEALS

- A. Provide supports, anchors, and seals complying with Division 22 Basic Materials and Methods section, "Supports, Anchors, and Seals", in accordance with the following listing:

1. Adjustable steel clevises, steel pipe clamps, and pipe saddle supports for horizontal piping hangers and supports.
2. Two-bolt riser clamps for vertical piping supports.
3. Concrete inserts, C-clamps, and steel brackets for building attachments.

- B. General: Special expansion compensation products required for storm water piping systems include the following types:

Expansion Joints: Cast-iron body, adjustable bronze sleeve, bronze bolts with wing nuts, for vertical installation only.

- C. Available Manufacturers: Subject to compliance with requirements, manufacturers offering expansion joints which may be incorporated in the work include, but are not limited to, the following: Ancon, Inc., Smith (Jay R.) Mfg. Co., Wade Div., Tyler Pipe, Zurn Industries.

2.4 DRAINAGE PIPING PRODUCTS

- A. Provide factory fabricated drainage piping products of size and type indicated. Where not indicated by schedule on the drawings, provide proper selection as determined by Installer to comply with installation requirements and governing regulations.

1. Cleanout Plugs: Cast-bronze or brass, threads complying with ANSI B2.1 countersunk head.
2. Floor Cleanouts: Cast-iron body and frame; cleanout plug; adjustable round top as follows:
 - a. Nickel-Bronze Top: Manufacturer's standard cast unit of pattern indicated.

- b. Pattern: Exposed rim type, with recess to receive 1/8" thick resilient floor finish.
 - 3. Wall Cleanouts: Cast-iron body adaptable to pipe with cast-bronze or brass cleanout plug; stainless steel cover and screws.
 - 4. Flashing Flanges: Cast-iron watertight stack or wall sleeve with membrane flashing ring. Provide underdeck clamp and sleeve length as required.
- B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering drainage piping products which may be incorporated in the work include, but are not limited to, the following: Ancon, Inc., Smith (Jay R.) Mfg. Co., Wade Div., Tyler Pipe, Zurn Industries.
- 2.5 ROOF DRAINS
- A. Provide roof drains of size and type as indicated on drawings.
 - B. Downspout Nozzles: Cast-bronze body and flange, polished bronze finish, inside thread connection, 3 mounting holes in wall flange.
 - C. Available Manufacturers: Subject to compliance with requirements, manufacturers offering roof drains which may be incorporated in the work include, but are not limited to, the following: Ancon, Inc., Smith (Jay R.) Mfg. Co., Wade Div., Tyler Pipe, Zurn Industries.

PART 3 - EXECUTION

3.1 INSTALLATION OF STORM WATER PIPING ABOVE GROUND

- A. Install storm water piping in accordance with Division 22 Basic Materials and Methods section "Pipe, Tube, and Fittings", and with the Florida Building Code.

3.2 INSTALLATION OF BUILDING DRAIN PIPING

- A. Install storm water building drains as indicated and in accordance with the Florida Building Code. Lay storm building drains beginning at low point of systems, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install required gaskets in accordance with manufacturer's recommendations for use of lubricants, cements, and other special installation requirements. Clear interior of piping of dirt and other superfluous material as work progresses. Maintain swab or drag in line and pull past each joint as it is completed. Place plugs in ends of uncompleted piping at end of day or whenever work stops. Piping shall be water tight under 50 foot head.
- B. Install storm water piping pitched to drain at minimum slope of 1/4" per foot (2%) for piping 3" and smaller, and 1/8" per foot (1%) for piping 4" and larger.

3.3 INSTALLATION OF SPECIAL VALVES

- A. Backwater Valves: Install in sanitary building drain piping as indicated, and as required by the Florida Building Code. For interior installation, provide cleanout cover flush to floor centered over backwater valve cover, and of adequate size to remove cover for service.

3.4 INSTALLATION OF SPECIAL EXPANSION COMPENSATION PRODUCTS

- A. Expansion Joints: Install expansion joints on vertical risers as indicated, and as required by the Florida Building Code.

3.5 INSTALLATION OF DRAINAGE PIPING PRODUCTS

- A. Cleanouts: Install in conductor piping and storm building drain piping as indicated, as required by the Plumbing Code; at each change in direction of piping greater than 50'; at minimum intervals of 50' for piping 4" and smaller and 75' for larger piping; and at base of each conductor. Install floor and wall cleanout covers for concealed piping. Select type to match adjacent building finish.
- B. Flashing Flanges: Install flashing flange and clamping device with each cleanout passing through waterproof membrane.

3.6 INSTALLATION OF DRAINS

- A. Install drains in accordance with manufacturer's written instructions and in locations indicated.
- B. Coordinate flashing work with work of roofing, waterproofing and adjoining substrate work.
- C. Coordinate with roofing as necessary to interface roof drains with roofing work.
- D. Coordinate with storm water piping as necessary to interface drains with drainage piping systems.
- E. Install drains at low points of surface areas to be drained, or as indicated.
- F. Install drain flashing collar or flange so that no leakage occurs between drain and adjoining roofing. Maintain integrity of water-proof membranes, where penetrated.
- G. Position drains so that they are accessible and easy to maintain.

3.7 PIPING TESTS

- A. Test storm water piping system in accordance with requirements of the Florida Building Code.

END OF SECTION 221413

SECTION 223000 – PLUMBING EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The Bidding Requirements and Contractual Conditions set forth in Division 01 apply to this section.

1.2 WORK INCLUDED

- A. Extent of plumbing equipment work is indicated on drawings and provisions of this section, including schedules and equipment lists associated with either drawings or this section.
- B. Types of plumbing equipment required for project include the following:
 - 1. Domestic water heaters:
Commercial electric water heaters

1.3 QUALITY ASSURANCE

- A. Manufacturer: Firms regularly engaged in the manufacture of plumbing equipment of type and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. UL and NEMA Compliance: Provide electric motors and electrical components required as part of plumbing equipment, which have been listed and labeled by Underwriters Laboratories and comply with NEMA standards.
- C. NEC Compliance: Comply with National Electrical Code (ANSI/NFPA 70) as applicable to installation and electrical connections of ancillary electrical components of plumbing equipment.
- D. ANSI Compliance: Comply with ANSI Z223.1 (NFPA 54) "National Fuel Gas Code", as applicable to installation of gas-fired water heaters.
- E. AGA and NSF Labels: Provide water heaters which have been listed and labeled by American Gas Association and National Sanitation Foundation.
- F. USDA Approval: Comply with requirements of United States Department of Agriculture for approved materials and installation practices for protective liners for potable water storage tanks.
- G. ASME Code Symbol Stamps: For the following equipment, comply with ASME Boiler and Pressure Vessel Code for construction, and stamp with ASTM Code Symbol:

Commercial water heaters

- H. ASME Relief Valve Stamps: Provide water heaters with safety relief valves bearing ASME valve markings.
 - I. Mineral Standards: Provide mineral products for water softeners, acceptable under state and local public health control regulations.
 - J. AWWA Compliance: Comply with applicable American Water Works Association standards pertaining to steel water tanks.
 - K. PDI Compliance: Comply with applicable Plumbing and Drainage Institute standards pertaining to grease interceptors and acid neutralization tanks.
- 1.4 SUBMITTALS
- A. Product Data: Submit manufacturer's plumbing equipment specifications, installation and start-up instructions, and capacity and ratings, with selection points clearly indicated.
 - B. Shop Drawings: Submit assembly type shop drawings indicating dimensions, weights, required clearances, and methods of assembly of all components.
 - C. Wiring Diagrams: Submit ladder-type wiring diagrams for all components, clearly indicating all required field electrical connections.
 - D. Maintenance Data: Submit maintenance data and parts lists for each item of plumbing equipment. Include "trouble-shooting" maintenance guides. Include this data in maintenance manual.
 - E. Submit certificate indicating USDA approval of potable water storage tank.

PART 2 - PRODUCTS

2.1 DOMESTIC WATER HEATERS

- A. Commercial Electric Water Heaters:
 - 1. Provide commercial electric water heaters of size, capacity, and electrical characteristics as indicated on schedule. Comply with ANSI/ASHRAE/IES 90.1 for energy efficiency. Provide UL listing, and NSF approval.
 - 2. Heater: Working pressure of 150 psi, magnesium anode rod; glass lining on internal surfaces exposed to water.
 - 3. Heating Elements: Heavy-duty, medium watt density, with incoloy sheath, thermostat stepped through magnetic contactors.
 - 4. Safety Controls: Double pole, manual reset, high limit; probe-type electric low water cutoff; both factory wired.
 - 5. Jacket: Equip with full size control compartments with front panel opening. Insulate tank with vermin-proof glass fiber insulation. Provide outer steel jacket with bonderized undercoat and baked enamel finish.
 - 6. Warranty: Furnish 3 year limited warranty for tank leakage.

7. Accessories: Provide brass drain valve; 3/4" temperature and pressure relief valve; ASME tank construction for 125 psi working pressure; and 4" x 6" handhole cleanout.
8. Controls: Adjustable immersion thermostat; power circuit fusing; pilot light and switch controlling control circuit; 3-stage time delay sequencer; and 7-day time clock.
9. Available Manufacturers: Subject to compliance with requirements, manufacturers offering commercial electric water heaters products which may be incorporated in the work include, but are not limited to, the following: A. O. Smith, Rheem Water Heater Div., Ruud Water Heater Div., State Industries, Viking Superior Corp.

PART 3 - EXECUTION

3.1 INSTALLATION OF DOMESTIC WATER HEATERS

A. Electric Water Heaters:

1. Install electric water heaters as indicated, in accordance with manufacturer's installation instructions, and in compliance with applicable codes.
2. Support: Set units on concrete pads, orient so controls and devices needing service and maintenance have adequate access. Level and plumb unit.
3. Electrical Supply: Furnish wiring diagram to Electrical Installer. Refer to Division 16000 for wiring of units.
4. Piping: Connect hot and cold water piping to units with shutoff valves and unions. Connect recirculating water line to unit with shutoff valve, check valve, and union.
5. Start-Up: Start-up, test, and adjust electric water heaters in accordance with manufacturer's start-up instructions. Check and calibrate controls.

END OF SECTION 223000

SECTION 224000 – PLUMBING FIXTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. All work of this section shall be governed by all provisions of the general, supplementary and special conditions of these specifications and the drawings.
- B. Examine other sections of the Project Manual for requirements which affect work of this section whether or not such work is specifically mentioned in this section.

1.2 SCOPE

- A. All plumbing fixtures shall be of "First Quality" as defined and set forth in Commercial Standard CS77-28 as promulgated by the US Department of Commerce. All fixtures are to be white vitreous china unless otherwise specifically noted. Where enameled iron fixtures are specified, they shall be furnished with acid resisting enamel.
- B. Fixtures and fittings proposed shall be from one manufacturer and of similar character in any room or location. Escutcheons, handles, etc., on the different fixtures shall be of the same design.
- C. The fixture numbers and types are scheduled on the drawings and are used to indicate type and quality of fixtures desired.
- D. All fixtures and fittings proposed shall be submitted for approval with cuts and full description.

PART 2 - PRODUCTS

2.1 PLUMBING FIXTURES

- A. Provide factory-fabricated fixtures of type, style and material indicated. For each type fixture, provide fixture manufacturer's standard trim, carrier, seats and valves as indicated by their published product information, either as designed and constructed or as recommended by the manufacturer, and as required for a complete installation. Where more than one type is indicated, selection is Installer's option; but, all fixtures of same type must be furnished by single manufacturer.

2.2 MATERIALS

- A. Unless otherwise specified, comply with applicable Federal Specification WW-P-541/-Series sections pertaining to plumbing fixtures, fittings, trim, metals and finishes. Comply with requirements of WW-P-541/-specification relative to quality of ware, glazing enamel, composition and finish of metals, air gaps and vacuum breakers, even though some plumbing fixtures specified in this section are not described in WW-P-451/-Series.

1. Provide materials which have been selected for their surface flatness and smoothness. Exposed surfaces which exhibit pitting, seam marks, roller marks, foundry sand holes, stains, discoloration, or other surface imperfections on finished units are not acceptable.
2. Where fittings, trim and accessories are exposed or semi-exposed, provide bright chrome-plated or polished stainless steel units. Provide copper or brass where not exposed.

B. Stainless Steel Sheets: ANSI/ASTM A 167, Type 302/304, hardest workable temper.

Finish: No. 4, bright, directional polish on exposed surfaces.

C. Galvanized Steel Sheet: ANSI/ASTM A 526, except ANSI/ASTM A 527, for extensive forming; ANSI/ASTM A 252, G90 zinc coating, chemical treatment.

D. Aluminum: ANSI/ASTM B 209/B 221 sheet, plate and extrusions, as indicated; alloy, temper and finish as determined by manufacturer, except 0.40 mil natural anodized finish on exposed work unless another finish is indicated.

E. Vitreous China: High quality, free from fire cracks, spots, blisters, pinholes and specks; glaze exposed surfaces and test for crazing resistance in accordance with ANSI/ASTM C 554.

2.3 PLUMBING FITTINGS, TRIM AND ACCESSORIES

A. Water Outlets: At locations where water is supplied (by manual, automatic or remote control), provide commercial quality faucets, valves, or dispensing devices, of type and size indicated and as required to operate as indicated. Include manual shutoff valves and connecting stem pipes to permit outlet servicing without shutdown of water supply piping systems.

B. Vacuum Breakers: Provide with flush valves and locations where water outlets are equipped for hose attachment.

C. P-Traps: Include adjustable and removable P-traps with cleanouts where drains are indicated for direct connection to drainage system.

D. Carriers: Provide carriers indicated, or, if not indicated, provide rectangular floor mounted cast-iron supports for fixtures of either graphitic gray iron, ductile iron, or malleable iron as required.

E. Fixture Bolt Caps: Provide manufacturer's standard exposed fixture bolt caps finished to match fixture finish.

F. Escutcheons: Where fixture supplies and drains penetrate walls in exposed locations, provide chrome-plated, cast-brass escutcheons with set screw.

G. All faucets, stops and fittings must each be of one manufacturer with interchangeable parts, unless otherwise specified. All units are to be manufactured from brass and monel metal and be of institutional quality.

- H. Comply with additional fixture requirements contained in fixture schedule included at the end of section.

2.4 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering plumbing fixtures and trim which may be incorporated in the work include the following:

Plumbing Fixtures: American Standard, Briggs, Crane, Eljer, Kohler.

Plumbing Trim: American Standard, Delta, Elkay, Moen, Just Company, Kohler Co., T & S Brass.

Flush Valves: Zurn Aqua Flush, Delaney, Sloan.

Fixture Seats: Bemis, Beneke, Church, Olsonite, Sperzel.

Water Coolers: Ebco (Oasis), Elkay, Halsey Taylor, Haws, Sunroc.

Mop Basins: Creative Industries, Fiat Products, Mustee, Stern-Williams.

Stainless Steel Sinks: Elkay Manufacturing Co., Just Manufacturing Co.

Shower Fittings Sets: American Standard, Delta, Elkay, Moen, Just, Kohler, T & S Brass.

Fixture Carriers: Jonespec, Josam, J.R. Smith, Zurn Industries, Wade.

Traps and Supplies: Brasscraft, Engineered Brass Company, Eljer Plumbingware, McGuire.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Layout fixtures and indicated on the drawings.
- B. Carefully install fixtures in accordance with manufacturer's data with sufficient clearances to coordinate with accessories, specialties and equipment specified in other divisions of these specifications and/or as shown on the drawings.
- C. Hangers and carriers shall be installed in accordance with manufacturer's recommendations and in accordance with good practice and workmanship.
- D. Clean all exposed metal surfaces from grease, dirt, paint or other foreign material.

- E. Fixtures shall be properly protected from damage during construction and shall be cleaned in accordance with manufacturer's instruction under this section of the specification.
- F. Fixtures, chrome-plated piping, fittings and trim shall be polished before requesting acceptance of the system.

END OF SECTION 224000

SECTION 230000 – HEATING, VENTILATING, AND AIR CONDITIONING SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The Bidding Requirements and Contractual Conditions set forth in Division 01 apply to this section.
- B. Examine other sections of the Project Manual for requirements which affect work of this section whether or not such work is specifically mentioned in this section.
- C. Bidders of work in Sections under Division 23 are expected to have read these requirements and, upon subcontracting work called for in such Sections, shall be responsible for compliance with such Sections.

1.2 REQUIREMENTS OF REGULATORY AGENCIES

- A. All work under Division 23 shall comply with the codes and standards as listed on the project drawings.

1.3 DEFINITIONS

A. Technical Definitions:

- 1. "Piping" shall mean pipe, fittings, flanges, valves, controls, hangers, traps, drains, insulation, vents and items customarily required in connection with the transfer of fluids.
- 2. "Concealed" shall mean embedded in masonry or other construction, installed within or behind wall furring, within double partitions or hung ceilings, in attics, in crawl spaces, in chases, in shafts, buried in trenches, etc.
- 3. "Exposed" shall mean not concealed.
- 4. "Demolition" shall be the removal of any existing equipment, and the capping or plugging or any existing services to that equipment. Adjacent surfaces shall be restored to existing conditions and adjacent surfaces.
- 5. "Furnish" means to purchase and deliver products and equipment to the project site and prepare for installation.
- 6. "Install" means to assemble, erect, place, anchor and connect furnished products into satisfactory operation.
- 7. "Provide" means to furnish and install.
- 8. "Contract Documents" shall include the written Project Manual and the Drawings.
- 9. Divisions 21, 22 and 23 are the new CSI divisions replacing the old Division 15 nomenclature. They shall be hereby defined as interchangeable.
- 10. Division 26 is the new CSI division replacing the old Division 16 nomenclature. They shall be hereby defined as interchangeable.

1.4 QUALITY ASSURANCE

- A. Standards: Certain standard materials and installation requirements are described by reference to standard specifications. These standards include the following:

ASTM - American Society for Testing Materials
ASME - American Society of Mechanical Engineers
NFPA - National Fire Protection Association
NEMA - National Electrical Manufacturers Association
UL - Underwriters Laboratories
EPA – Environmental Protection Agency
ANSI - American National Standards Institute
ASHRAE - American Society of Heating, Refrigerating and Air Conditioning Engineers
SMACNA - Sheet Metal and Air Conditioning Contractors' National Association
AMCA - Air Moving and Conditioning Association
ARI - Air Conditioning and Refrigeration Institute
AMA - Acoustical Materials Association
NEC - National Electric Code
ISO – International Organization for Standardization

- B. Whenever a reference is made to a standard, installation or materials the intention is such shall comply with the latest published edition at the time project is bid, unless the edition is otherwise specified herein.
- C. Materials and equipment herein shall be new and standard catalogued items manufactured by reputable concerns regularly supplying such materials. Material shall bear the Underwriters Laboratories, Inc. label or other appropriate label where such is required or allowed by code, by Contract Documents or by authorities having jurisdiction (AHJ).
- D. Product deliveries shall be arranged in accordance with construction schedules and to avoid conflict with work and site conditions.
1. Deliver and store products in undamaged condition, in manufacturer's original containers or packaging, with identifying labels intact and legible.
 2. Immediately, on delivery, inspect shipments to assure compliance with the requirements of the Contract Documents and approved submittals, and that products are properly protected and undamaged.
 3. Provide equipment and personnel to handle products by methods to prevent soiling or damage to products or packaging.

1.5 AMPLIFICATION

- A. Except where modified by a specific notation to the contrary, it shall be understood that the indication and/or description of an item, in the Contract Documents, carries with it the intent to provide the item, regardless of whether or not this is explicitly stated as part of the indication or description.
- B. The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the work. The Contract Documents are complementary, and what is required by any one shall be as binding as if required by all. Work not covered in the Contract Documents will not be required unless it is consistent therewith

and is reasonably inferable as being necessary to produce the intended results. Words and abbreviations which have well-known technical or trade meanings are used in the Contract Documents in accordance with such recognized meanings.

- C. In case of discrepancy concerning quality and/or quantity within the Contract Documents, the better quality and/or the greater quantity shall be provided, at no increase to the contract sum.
- D. No exclusions from, or limitations in, the language used in the Contract Documents shall be interpreted as meaning that the appurtenances or accessories necessary to complete any required system or item of equipment are to be omitted.
- E. The Drawings, of necessity, utilize symbols and schematic diagrams to indicate various items of work. The work shall be installed, in accordance with the diagrammatic intent expressed on the drawings, and in conformity with the dimensions indicated on the architectural and structural drawings.
- F. Where Contract Documents conflict, such conflict shall be brought to the attention of the Architect for clarification. In general, the Architectural Drawings shall take precedence over the HVAC Drawings with regard to building construction. Any change from the Drawings necessary to make the work conform to the building as constructed, to fit the work of other trades or to the rules of authorities having jurisdiction, shall be made at no expense to the Owner.
- G. No interpretation shall be made from the limitations of symbols and diagrams that any elements necessary for complete Work are excluded.
- H. Certain details appear on the Drawings, which are specific with regard to the dimensioning and positioning of the Work. These details are intended only for the purpose of establishing general feasibility. They do not obviate responsibility for field coordination for the indicated Work.
- I. Capacities, sizes and conditions specified or shown are allowable minimums. Based on design and rated operating conditions of systems, motors shall not be overloaded. Equipment shall not operate at speeds or temperatures greater than manufacturer's published recommendations, and no strain or demand shall be imposed upon any component to any system, structure or building.
- J. The Architect reserves the right to make minor changes in the location of HVAC work or equipment prior to "roughing-in" without additional cost to the contract. Architect approval for deviations from drawing locations and layout shall be obtained prior to installation.
- K. The use of a word in the singular shall not be considered as limiting where other indications denote that more than one item is required.
- L. In the event that extra work is authorized, work shown on Drawings depicting such work, and/or described by Addendum, Architectural Supplemental Instruction, or by Change Order, shall be subject to the basic requirements set forth in Division One and Contract Documents in all respects.

1.6 QUALIFICATIONS

- A. All entities and personnel performing work for this project shall be regularly engaged and experienced in the type of work to be furnished and shall be licensed for such specialty trades, employ only properly qualified foremen, journeymen and apprentices as appropriate and in keeping with best trade practices.
- B. Each firm shall provide, upon request, a list of similar jobs it has completed.

1.7 CONSTRUCTION REQUIREMENTS

- A. Locations of all pipes, ducts, panels, appliances, etc., as shown on the Drawings are approximate only and are understood to be subject to such revisions as may prove necessary or desirable at the time the work is installed. All work shall be installed with relation to building conditions and shall be installed correct with reference to finished elevations, etc. Exterior utilities shown on the drawings are diagrammatic only. Their exact locations, depths and invert elevations shall be as required for proper flow and coordination with other trades.
- B. If equipment, piping and ductwork, are installed requiring space conditions other than those shown, or arranged, and rearrangement of the space is necessitated, the Architect shall review the change before proceeding with the work. The request for such changes shall be accomplished by submission of Shop Drawings of the space in question.
- C. The Contractor is responsible for the proper location and size of all slots, holes or openings in the building structure pertaining, and for the correct location of pipe sleeves.
- D. The Contractor shall so coordinate the work so that it may be installed in the most direct and workmanlike manner. Piping interferences shall be handled by giving precedence to pipe lines, which require a stated slope for proper operation. Sewer lines and condensate piping shall take precedence over water lines in determination of elevations. Where there is interference between sewer lines and condensate lines, the sewer lines shall have precedence and provisions shall be made in the condensate lines for looping them around the sewer lines. In all cases, lines requiring a stated grade for their proper operation shall have precedence over electrical work and ductwork.
- E. All piping and ductwork in finished areas, except where noted to the contrary, shall be installed in chases, furred spaces, above ceilings, etc. In all cases, pipes and ducts shall be installed as high as possible. Runs of piping shall be grouped whenever feasible.
- F. All oiling devices and all parts of equipment requiring adjustments shall be easily accessible. Provide access doors and panels if required for proper maintenance of all equipment and devices requiring service.

1.8 PROJECT CONDITIONS

- A. All existing utilities shall be located prior to the beginning of work. Any conflicts shall be resolved and noted on the Record Documents.

- B. Adequate means of protection for all utilities shall be provided and, if utilities are damaged during working operations, such shall be repaired to the satisfaction of the Owner, at no cost to the contract.
- C. Where existing devices are permanently abandoned, each duct, pipe, etc., shall be completely removed and the duct or pipe plugged or capped at a point well behind the proposed new finished closures or newly finished surfaces.

1.9 COORDINATION

- A. Coordinate the layout of mechanical work with other trades. Locations of structural systems, plumbing, and HVAC work should take preference over the location of conduit runs.

1.10 AIR CONDITIONING SYSTEM OPERATION

- A. The operation of air conditioning equipment during construction is prohibited unless the following procedures are strictly followed:
 - 1. Contractor shall notify the Owner in writing of his intent to use the equipment to dehumidify the building and/or to control air borne contaminants.
 - 2. For each piece of equipment used, a record log shall be maintained which indicates starting date and every day operation. Log shall indicate all service and maintenance work completed on the equipment.
 - 3. A minimum MERV 8 filters shall be in place in all return air intakes and the filter section of all air handling units. Record of filter change shall be maintained at each filter location.
 - 4. Upon completion of the work, and prior to the Substantial Completion, the interior of air handling units shall be vacuum cleaned. Coils and drain pans shall be washed.
 - 5. Test and Balance Agency shall measure and record temperature and humidity throughout the facility. Report to be available at Substantial Completion Inspection.
 - 6. Failure to keep and present required records will mandate that all air moving equipment and ducts be opened and cleaned in the presence of the Owner. The Contractor will be responsible for the cost of the personnel assigned by the Owner, Architect and Engineer to witness the cleaning process.

PART 2 - PRODUCTS

NOT APPLICABLE

PART 3 - EXECUTION

3.1 ORGANIZATION OF THE WORK:

- A. All work shall be installed as required to meet all construction schedules.

- B. Prior to starting the work, carefully verify all measurements at the site and determine that the work will properly clear openings, structural members and other work. Correlate the time of each work item with all other items to the best advantage of the completed job. Furnish, in ample time to avoid delays in the work, all information required to revise footing elevations, structural elements, chases and openings in floors and walls, and to provide clearances which may be required to accommodate the work. Set all sleeves, anchor bolts and inserts required to accommodate equipment before concrete is poured or masonry work is started.
- C. Should uncharted or incorrectly charted piping, ductwork or other utilities be encountered during work operations, notify the Architect immediately for clarification. Cooperate with utility companies to maintain active utilities in operation.
- D. Immediately act to put any damaged utilities back in functioning conditions.
- E. Installation and equipment shop drawings shall be initialed and dated upon installation. This procedure will enable the Architect to verify the work in progress.
- F. The Contractor shall be responsible for the work until its completion and formal final Substantial Completion. Replace any work which may be damaged, lost or stolen without additional cost to the Owner.
- G. Provide all scaffolding, rigging, hoisting, and services necessary for erection of the work and for delivery to and removal from the premises of any equipment and apparatus furnished. Remove same from premises when no longer required.
- H. Minimize construction noise levels in all locations adjacent to or in occupied areas. The Owner reserves that right to prevent use of any tools which cause detrimental vibration or noise when the facility is occupied.
- I. Protect equipment and materials during construction from damage from water, dirt, welding and cutting splatter, paint drippings, etc., by use of shields and drop cloths. Damaged equipment or materials shall be repaired (or replaced) to the Architect's satisfaction.
- J. Provide the following accessory materials for mechanical systems.
 - 1. Anchor bolts or other anchoring devices shall be of the size and type recommended by equipment manufacturer for specific application.
 - 2. Structural support (steel) for elevated or suspended mechanical items shall be made with connections using "simple" framing.
 - 3. Resilient isolation pads for motors and equipment shall be rubber-in-shear pads and of type recommended by manufacturers of the motor and equipment. All air handlers and cooling equipment shall be provided with isolation pads between the equipment and the concrete housekeeping pad.
 - 4. Dielectric fittings shall be provided between dissimilar metals such as copper piping joins steel or iron piping, insulating bushings or unions.
 - 5. Escutcheons shall be provided where pipes pierce partitions, floors, walls or ceilings. Escutcheons shall be chrome plated.

6. All pipe and duct penetrations of rated floors and walls shall be properly sealed in accordance with UL approved details. Coordinate penetrations with the appropriate detail or reference on the Contract Drawings.
 7. Provide a secondary drain pan under all condensate producing equipment. Drain pan shall include a float switch wired to shut down the air handler and cooling once tripped.
- K. Delay caused by equipment not being on the job site when required shall be avoided in the following manner:
- Provide temporary substitute equipment (subject to approval of the project Architect), allowing the building to become operative. The temporary substitute equipment shall later be removed and replaced with that originally specified or approved when it arrives, all at the convenience of and at no additional cost to the Owner.
- L. All products with compressor sections shall be started by a factory trained service technician. Provide written report indicating start-up results. Provide extended compressor parts warranty for all compressors for a total five year warranty on all compressors. Provide manufacturer's phase loss protection.

3.2 SHOP DRAWINGS AND SUBMITTALS

- A. The Architect shall have the authority to determine the method of submitting shop drawings whether in multiple sets or by the reproducible transparency technique.
- B. Submittals are required for all items of mechanical equipment and products.
- C. For items reviewed and marked "Rejected" or "Revise and Resubmit", only one additional submittal will be reviewed to verify product compliance with the Contract Documents. Should further submittals be required for the Design Professional to verify the submittal with the requirements of the Contract Documents, the hourly rate of \$ 150.00 will be billed to the Contractor for the Professional(s) time spent on the review.
- D. Submittals shall be referenced to the Contract Documents. For all equipment, which has been scheduled directly on the Drawings, provide within the submittal, a performance schedule for the proposed equipment in the same format as included on the Contract Documents.
- E. Manufacturer's catalog cuts may be submitted for all standard cataloged equipment, provided that the item required to meet the project specification is not modified in any way from the standard catalog version. Where multiple products are included on the same cut sheet, clearly identify the product proposed for installation by striking through all sections not applicable to the proposed product. Do not provide useless or unnecessary pages in the submittal package.
- F. Cut sheets shall be clearly marked to indicate the exact size, type, rating, capacity, etc., of the item to be provided.
- G. Bind shop drawings/catalog-cuts in three ring binders with a title sheet and identification on front and side of the binder. Allow space for Contractor, Project Architect and

Engineer review stamps. Index all items to the Project Manual or Drawings as applicable.

- H. All submittals must bear the handwritten signature of the Contractor and his stamp of approval before being considered for review by the Architect.
- I. Full electrical characteristics for each device requiring power shall be prominently displayed on the shop drawings or submittal. Additionally, a statement signed by maker of the submittal shall be included indicating that he or she has carefully examined the electrical characteristics specified in the Contract Documents (and if remodeling or an addition, as to existing electrical characteristics), and that the motors, equipment or devices proposed to be furnished are fully compatible.

A similar statement shall be included stating the supplier has reviewed the space requirements of the project and that the submitted equipment will fit in the space provided and the manufacturer's required service requirements have been met.

- J. Shop drawings that deviate from the requirements of the contract documents shall list all differences in a cover letter attached to top of the submittal.

3.3 COORDINATION DRAWINGS

- A. Prior to the installation and fabrication of HVAC systems, submit detailed, overlaid coordination drawings at a minimum 1/4" = 1'-0" scale. Drawings are to include, but not necessarily be limited to, the following items:
 - 1. Detailed sheet metal drawings indicating all ductwork, volume dampers, access doors, smoke/fire dampers, grilles, registers and diffusers, air handling equipment, penetrations through roofs, floors, etc. Include elevation, and appropriate section, of all air handling systems.
- B. Coordinate with other trades for installation without conflict.

3.4 EXAMINATION OF EXISTING CONDITIONS

- A. Visit and carefully examine those portions of the site and/or present buildings affected by this work so as to become familiar with existing conditions and difficulties that will affect the execution of the work, before submitting proposals.
- B. Submission of a proposal will be construed as evidence that such examination has been made. Later claims for labor, equipment, materials, etc. required because of difficulties encountered, which could have been foreseen had such examination been made, will not be recognized.

3.5 OWNERSHIP OF EXISTING EQUIPMENT AND HANDLING THEREOF

- A. Provide demolition of existing work in remodeled areas as indicated on Drawings. Demolition includes, but is not limited to, the removal of all equipment, controls, piping, ducts, supports, etc. and filling, patching and painting to match existing surfaces. When

the Owner does not desire to retain Ownership of the removed equipment, the equipment shall be properly disposed.

- B. Where HVAC equipment is to be removed, recover and properly dispose of all refrigerant recovered from the system. Evacuation, storage, transportation and disposal or recovery shall be in strict accordance with EPA Regulations.

3.6 ACCESS DOORS AND PANELS

- A. Furnish access doors and panels for proper and adequate access to all dampers, smoke detectors, and other mechanical equipment which is concealed in walls, furring and hung ceilings, or where may additionally be necessary.
- B. Material and Finish: Access doors shall conform to the finish of adjacent construction as indicated in the finish schedule.

3.7 ELECTRICAL CONNECTIONS

- A. Provide all electrical work and connections except those specifically set forth below as being provided under Division 26 work.
 - 1. The Electrical Subcontractor shall provide under Division 26 all wiring except the following which will be provided under Division 23:
 - a. Temperature Control Wiring.
 - b. Equipment Control Wiring.
 - c. Interlock Wiring.
 - d. 120V power for energy management controllers. Power for controllers shall be provided by the sub-contractor providing the controls and shall be installed by licensed electricians.
 - 2. The Electrical Subcontractor shall provide all power wiring complete from power source to motor or equipment junction box, including power wiring through starters and shall connect to power lugs on the equipment.
 - 3. The Electrical Subcontractor shall provide all motor starters and contactors except when specified to be furnished by the equipment manufacturer under Division 23.
 - 4. Conduits:
 - a. When Conduit is required for control wiring, the Electrical Subcontractor shall provide under Division 26. Conduit shall be provided for all control work installed within mechanical spaces (exposed) and in walls.
 - 5. Motors:
 - a. Motors shall be furnished by the manufacturer or supplier of the specified equipment. All motors shall be of the premium efficiency type.
 - b. General purpose motors shall be open drip-proof conforming to NEMA Design B, Class B insulation, continuous 40°C ambient, 60 Hz, 1.15 service factor, and 1800 RPM maximum speed unless specified otherwise. All motors smaller than 3/4 HP shall be self-lubricating.
 - c. Motors shall be protected with thermal overload devices in the motor, or by the motor starter.

- d. Motors which are required to operate in conjunction with variable frequency drives shall be specifically rated for such application.
 - e. Single phase motors 1/2 HP and smaller shall have built-in overload protection; over 1/2 HP shall have motor starters as overload protection.
 - f. Single Phase motors shall be capacitor start, capacitor run.
 - g. Equipment requiring 1,000 Watts or more shall have a power factor of 85% or greater at rated load conditions. Equipment with power factor less than 85% shall be corrected to at least 90% under full load operating conditions. Power factor corrective devices shall be switched with related equipment.
 - h. Motor characteristics which change from that specified, due to the Contractor electing to use one of the optional manufacturers, or an updated model, etc., shall be coordinated with the Electrical Contractor prior to bid. This Contractor is responsible for the cost of any revisions necessary to provide proper power and control connections in full accordance with the National Electric Code.
- B. Air conditioning equipment containing various electrical components within its housing shall be furnished with internal wiring arranged to terminate at one set of electrical power lugs. Components shall be approved for group operation as defined by National Electrical Code, or auxiliary equipment must be provided as required to satisfy the National Electrical Code and UL Labels (or other labels) of the unit.
- C. All three phase compressorized units (i.e. chillers, condensing units, rooftop units, custom units, etc.) shall be provided with the manufacturer's standard phase loss protection option.

3.8 PAINTING

- A. All work shall be left clean and free from oil, dirt and grease prior to field painting.
- B. Upon completion, thoroughly clean all equipment, ductwork, piping and other work to remove all dirt, grease, rust and oil. Thoroughly prepare all such work for painting.
- C. Equipment:
 - 1. All equipment shall have factory standard finish.
 - 2. Factory finished equipment which has rusted or been damaged shall be repaired, cleaned, spot primed and entirely repainted the original color.
 - 3. Insulation coverings shall be cleaned, sized (if necessary), and painted for service identification.
- D. Ferrous metals which are not exposed to view within the building, such as piping, pipe hangers, angle supports, supports for apparatus, black iron partitions or casings, tanks, etc., shall be painted with one coat of priming zinc chromate.
- E. Ferrous metals which are exposed to view or to the weather, such as pipes, pipe supports, supporting or stiffening angles for exhaust elbows, exhaust heads, air conditioning units, etc., shall be painted in accordance with the Painting Section of the Project Manual.

- F. Paint inside of all ductwork where visible through register or through diffuser or grille faces with one coat of dull black.

3.9 PENETRATION OF WATERPROOFING (INCLUDING WATERPROOF CONCRETE)

- A. Where any work pierces waterproofing, including waterproof concrete, the method of installation shall be approved by the Architect before the work is completed.
- B. Provide all necessary sleeves, sealant and flashing materials required to make openings absolutely water tight.

3.10 PENETRATIONS

- A. The penetration of any sound proofing materials shall include all necessary materials and labor to provide thorough and complete caulking of all penetrations through walls, partitions and decks, whether such penetration occurs above or below dropped ceiling lines.
- B. Penetrations of special materials (such as face brick, plaster, dry wall, precast concrete, etc.) shall be done by the trades doing such original work.
- C. Penetrations shall be cut or patched by such skilled mechanics in a manner that the hole is uniformly 1/8 inch clear all around the item penetrating it (including insulation) so that a full penetration (but not excessive) sealant bead can be installed.
- D. Sealing work shall be completed in compliance with the requirements of the Caulking and Sealants Section of the Project Manual.
- E. Any pipe, duct, conduit or other item penetrating a wall, partition or deck which tends to vibrate, shall have sufficient corrective methods affected to one or both sides of the penetration that no vibration occurs at point of penetration.

3.11 EXCAVATION AND BACKFILL

- A. Trench and pit excavating and backfilling inside and outside the building, as required, including shoring and bracing, pumping and protection for safety of persons and property shall be provided as required.
- B. Backfill shall be compacted in layers not exceeding six inches (6") in depth. Completed backfill shall conform to surrounding ground and finish grade and with compaction requirements of the Project Manual.
 - 1. Concrete encasement: Piping passing under footings, foundations and other locations as shown on drawings shall be encased by eight inches (8") minimum concrete on all sides. Concrete shall conform to Division Three requirements.
 - 2. Extend concrete encasement eight (8") inches around piping and twelve (12) each side of footings or foundations.

- C. Remove non-usable excavated material from the site. Do not remove usable material from site.
- D. Provide and operate pumping equipment to keep excavations free of water.
- E. Repair and restore paving, streets, curbs, walks, and other work in the area where excavations are made.
- F. Provide additional excavation and backfill where required to resolve conflicts in buried lines.
- G. Hold trench width to a minimum.
- H. Do not excavate utility trenches parallel to building footings closer than four feet (4') from the footings except by approval of the Architect. When parallel trenches require cuts deeper than the building footings, the horizontal distance from the footing shall be equal to, or greater than one and one half (1-1/2) times the vertical distance below the footing, but in no case shall the horizontal distance be less than four (4') feet except by the approval of the Architect.
- I. Mechanical excavation shall be held to four inches (4") above final grade of the bottom of trench. The remainder shall be shaped by manual excavation, so that piping is fully supported on undisturbed soil. Shoring of piping in trench will not be allowed.
- J. Whenever, in the opinion of the Architect, the soil is unsuitable for supporting piping and appurtenances, provisions for proper foundations shall be made at no additional cost to the contract. Soil test reports are bound in the Project Manual.
- K. Wherever trenching or excavating, assume utilities may exist in area without such being shown on the drawings. Exercise extreme caution. Should existing facilities be damaged, repair such to Architect's satisfaction at no additional cost to the contract.

3.12 UNDERGROUND PIPING PROTECTION

- A. Protect the exterior surface of all underground steel piping against rust and corrosion. For piping not specified elsewhere to be furnished with factory applied pipe corrosion resistant wrapping, the piping surfaces shall be cleaned of rust, dirt, etc. with a wire brush and shall be free of oil and grease and completely dry. Brush on or otherwise apply as recommended by the manufacturer, a heavy full coating of TC Mastic (Tape Coat Company, Evanston, Illinois) or Reilly Protective Coast Tar Enamel No. 3302 (Reilly Tar and Chemical Company, Indianapolis, Indiana). Dry coating shall be not less than twelve mils thickness. Protect freshly covered surfaces and delay applying insulation (if required) and delay covering with earth for at least 12 hours as recommended by the manufacturers, and depending on the weather. Cathodic protection shall be provided for all buried ferrous piping.

3.13 CHASING, CUTTING AND PATCHING

- A. Provide and place required sleeves, forms and inserts before walls, ceilings, partitions, floors or roofs are built.
- B. When it becomes necessary to cut finished materials, submit to the Architect for approval, drawings showing the work required and obtain approval before doing such cutting.
- C. Provide exact dimensions and locations of these openings (to suit the apparatus to be used) before such walls are built.
- D. No cutting or altering the work of others will be permitted without the approval of the Architect. No structural members shall be cut without the previous written approval of the Architect.
- E. Any holes in existing slabs or other concrete or finished work required for the installation of new piping shall be core bored and sealed.
- F. Finish patch cut areas with floor tile, drywall, plaster, ceiling panels or tiles as required to match the existing surface. Paint entire disturbed painted area to match the existing. Provide new ceiling panels and grid, which may have damaged during construction.

3.14 SLEEVES

- A. Sleeves up through 8" diameter shall be Schedule 40 steel pipe and machine cut.
- B. Sleeves, 10" diameter and larger, shall be fabricated from 12 gauge steel sheet.
- C. Watertight seals: "Linkseal" by Thunderline Corporation.
- D. Sleeves shall provide 1/2" minimum clearance all around passing pipe or pipe insulation. Insulation shall be continuous through sleeves.
- E. Fill space around ducts and pipes in sleeves in exposed areas and through fire walls and partitions with non-flammable sealing compound equal to Dow Corning Silicone RTV Foam.
- F. Close off all spaces around rectangular ducts through walls with sheet metal collars.
- G. Sleeves through walls shall be cut flush with each surface.
- H. Install sleeves plumb and true to line, grade and position.
- I. Pipe sleeves penetrating outside walls shall be packed with insulating material, sealed and made waterproof.

3.15 LUBRICATION AND PACKING

- A. Equipment shall be lubricated, using manufacturer's recommended lubricants, with correct type and quantity of lubricant before placing into service.

- B. Packing glands shall be examined for proper packing.
- C. When filling systems initially for hydrostatic pressure tests, adjust valve packing glands to finger tight, and allow packing to absorb water for 5 minutes prior to tightening packing nuts.

3.16 QUIET OPERATION AND VIBRATION

- A. All equipment shall operate (under all conditions of load) free of noise and vibration. Sound and vibration conditions considered objectionable by the Architect shall be corrected by whatever additional work is required in an approved manner at no cost to the Contract.
- B. Vibration control shall be by means of approved vibration eliminators (or suppressors) in a manner as recommended by the manufacturer of the eliminators and as required by the manufacturer of the equipment. Submit shop drawings for review by the Architect.

3.17 CLEANING

- A. Upon completion, ductwork, piping and equipment shall be thoroughly cleaned of dirt, grease, rust and oil, primed where necessary, and made ready for painting. Vacuum clean the inside and outside of fan plenums, air handling units and equipment cabinets. Vacuum clean coils and comb out damaged fins.
- B. Clean galvanized piping and ductwork in exposed areas with diluted acetic acid.
- C. Clean copper piping in exposed areas with emery cloth and solvent.
- D. Clean gauges, thermometers, traps, strainers and fittings.

3.18 TEST AND INSTRUCTIONS

- A. Make tests necessary to establish the adequacy, quality, safety, completed status and satisfactory operation of all systems and components. Tests shall be made to the satisfaction of the Architect and as required by code. Provide instruments and labor necessary to conduct these tests and have them verified by the Architect.
- B. Provide a letter addressed to the Owner advising that the completed systems have been installed in accordance with the Contract Documents and that such are in proper operating condition. The Owner shall receive a written guarantee covering all defects in workmanship and material for a period of one (1) year from date of Substantial Completion. Unless otherwise stated, provide extended compressor parts warranty, for a total five year warranty, for all compressors.

3.19 INSTRUCTIONS

- A. After the systems are in operation, and tests are complete, instruct the designated personnel of the Owner on the operation and maintenance of all equipment and

systems. Entire session shall be video and audio recorded, with copy provided to the Owner and Architect.

- B. Provide a minimum of twenty four (24) hours total instruction. Instructions shall include the following:
 - 1. Location of equipment and explanation of function.
 - 2. Review of operating instruction manual for record and clarity.
 - 3. Explanation of specific maintenance requirements to be performed by the Owner.
 - 4. Complete review of the equipment's Sequence of Operation and critical schedules and setpoints.
- C. Certify in writing that the designated personnel of the Owner (indicated above) were fully instructed in the care, operation and maintenance of all mechanical equipment. This certification shall be signed by all persons attending acknowledging they attended the full instructional program.

3.20 ENGINEER'S PROJECT SITE VISITS

- A. When the engineer or his designated representative visits the site to review the installation, all tools, ladders, up to date Contract Documents, etc. necessary for the review of the work shall be provided.
- B. The Engineer will provide a typed list of deficiencies noted during the site visit for corrective action. Prior to request for supplementary visits, provide an initialed and dated copy of the last report indicating the current status of the noted deficiency corrections.

3.21 PROJECT CLOSEOUT

- A. Prior to request for substantial completion, all HVAC systems shall be verified for proper operation and control. Substantiation of complete and operational systems shall be verified by submission of the following documents and forms:
 - 1. Completed Test and Balance Report. Reports submitted with comments or punch lists will be rejected and substantial completion inspection rescheduled at the Contractor's expense.
 - 2. A letter signed by a corporate officer of the Temperature Controls Installer certifying that the control system operation has been verified through a point-to-point inspection and that the system is calibrated and operates as intended.
 - 3. Completed Operation and Maintenance Manuals. Manuals shall be prepared in accordance with the latest edition of ASHRAE Guideline 4, Preparation of Operating and Maintenance Documentation for Building Systems.

END OF SECTION 230000

REQUEST FOR PRIOR APPROVAL

NOTE TO CONTRACTOR: This letter must be sent to the Architect, with copy to the engineer as per Prior Approval Requirements of the Project Manual (Seven or Ten days as applicable).

[DATE:]

[ARCHITECT NAME]

Re: [PROJECT NAME]
[ARCHITECT/OTHER] Project No.: _____

Dear _____:

We hereby request approval to bid the following products for this project:

REFER TO PROJECT MANUAL:

Section _____, Paragraph _____: We request that _____ be added as an acceptable manufacturer.

Section _____, Paragraph _____: We request that _____ be added as an acceptable manufacturer.

Section _____, Paragraph _____: We request that _____ be added as an acceptable manufacturer.

We understand that listing of the above manufacturers is for bidding purposes only. The Manufacturer is responsible to meet all capacity, controllability of equipment, space requirements, and service clearances as per basis of design.

[CLOSING SIGNATURE]

SECTION 230513 – ELECTRICAL COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The Bidding Requirements and Contractual Conditions set forth in Division 01 apply to this section.
- B. Examine other sections of the Project Manual for requirements which affect work of this section whether or not such work is specifically mentioned in this section.

1.2 RELATED WORK

- A. Electrical work required:
 - 1. All power wiring and conduit. (Provided under Division 26).
 - 2. Control wiring. (Provided under Division 23).
 - 3. Motor disconnects. (Provided under Division 26).
 - 4. Starters furnished and installed under Division 26, except when furnished with packaged equipment; wiring under Division 26.
 - 5. Conduit and control wiring for Division 23 work.

1.3 QUALITY ASSURANCE

- A. All electrical work shall conform to the National Electrical Code 2008 (NFPA 70).
- B. Electrical equipment shall conform to NEMA standards and shall be UL listed.

1.4 SUBMITTALS

- A. Furnish to Electrical Contractor equipment shop drawings that indicate all required power connections.
- B. Prepare complete terminal-to-terminal wiring diagrams that show terminal designation on control items and equipment. Diagrams may be part of temperature control submittals.
- C. Provide letter on mechanical subcontractor's letterhead certifying that coordination has taken place with the electrical subcontractor and all electrical requirements for mechanical equipment have been met. Additionally, mechanical submittals shall be provided to the electrical subcontractor.

PART 2 - PRODUCTS

2.1 MOTORS

- A. All motors shall be premium efficiency.

- B. General purpose motors shall be open drip-proof conforming to NEMA Design, Class B insulation, continuous 40° C ambient, 60 Hz, 1.15 service factor, and 1800 RPM maximum speed unless specified otherwise. Voltage and phase shall be as specified.
- C. Motors shall be single phase below 3/4 HP and three phase 3/4 HP and larger, unless specified otherwise.
 - 1. Single phase motors shall have built in overload protection.
 - 2. Single phase motors shall be capacitor start, capacitor run.

2.2 EQUIPMENT POWER FACTOR

- A. Equipment requiring 1000 watts or more shall have a factor of 85% or greater at rated load conditions. Equipment with power factor less than 85% shall be corrected to at least 90% under full load operating conditions. Power factor corrective devices shall be switched with related equipment.

PART 3 - EXECUTION

3.1 CONTROL WIRING INSTALLATION

- A. Control wiring in walls and exposed in Mechanical Rooms and spaces shall be run in thin wall conduit.

3.2 ADDITIONAL REQUIREMENTS

- A. Motor characteristics which change from that specified, due to the Contractor electing to use one of the optional manufacturers, or an updated model, etc., shall be coordinated with the Electrical Contractor. All modifications required to the electrical or mechanical designs as a result of the change shall be included at no additional cost to the Owner.

END OF SECTION 230513

SECTION 23 05 30 – SUPPORTS, ANCHORS AND SEALS

PART 1 - GENERAL

1.1 WORK INVOLVED

- A. Extent of supports, anchors, and seals required by this section is indicated on drawings and/or specified in other Division 23 sections.
- B. Types of supports, anchors, and seals specified in this section include the following:
 - 1. Horizontal piping hangers and supports
 - 2. Vertical piping clamps
 - 3. Hanger rod attachments
 - 4. Building attachments
 - 5. Saddles and shields
 - 6. Flashing materials
 - 7. Miscellaneous materials
 - 8. Anchors
- C. Supports, anchors and seals furnished as part of factory-fabricated equipment are specified as part of the equipment assembly in other Division 23 sections.

1.2 RELATED WORK

- A. The Bidding Requirements and Contractual Conditions set forth in Division 01 apply to this section.

1.3 QUALITY ASSURANCE

- A. Manufacturers: Firms regularly engaged in the manufacture of supports, anchors and seals of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. MSS Standard Compliance:
 - 1. Provide pipe hangers and supports of which materials, design and manufacture comply with ANSI/MSS SP-58.
 - 2. Select and apply pipe hangers and supports, complying with MSS SP-69. Size hangers and supports to support pipe weight and fluid conveyed.
 - 3. Fabricate and install pipe hangers and supports, complying with MSS SP-89.
 - 4. Terminology used in this section is defined in MSS SP-90.

1.4 SUBMITTALS

- A. Product Data: Submit catalog cuts, specifications, installation instructions and dimensioned drawings for each type of support, anchor and seal. Include a schedule of supports, anchors and seals to be used.

PART 2 – PRODUCTS

2.1 HORIZONTAL PIPING HANGERS AND SUPPORTS

- A. Except as otherwise indicated, provide factory-fabricated horizontal piping hangers and supports complying with ANSI/MSS SP-58, of one of the following MSS types listed, selected by installer to suit horizontal piping system, in accordance with MSS SP-69 and manufacturer's published product information. Use only one type by one manufacturer for each piping service. Select size of hangers and supports to exactly fit pipe size for bare piping, and to exactly fit around piping insulation with saddle or shield for insulated piping. Provide copper-plated hangers and supports for copper piping systems.

Adjustable Steel Clevises: MSS Type 1.

Pipe Hangers: MSS Type 2.

Steel Double Bolt Pipe Clamps: MSS Type 3.

Steel Pipe Clamps: MSS Type 4.

Pipe Hangers: MSS Type 5.

Adjustable Swivel Pipe Rings: MSS Type 6.

Adjustable Swivel Rings, Band Type: MSS Type 10.

Split Pipe Rings: MSS Type 11.

Extension Split Pipe Clamps: MSS Type 12.

U-Bolt: MSS Type 24.

Clips: MSS Type 26.

Pipe Saddle Supports: MSS Type 36, including steel pipe base support and cast-iron floor flange.

Pipe Stanchion Saddles: MSS Type 37, including steel pipe base support and cast-iron floor flange.

Adjustable Pipe Saddle Supports: MSS Type 38 including steel pipe base support and cast-iron floor flange.

Single Pipe Rolls: MSS Type 41.

Adjustable Roller Hangers: MSS Type 43.

Pipe Roll Stands: MSS Type 44.

Pipe Rolls and Plates: MSS Type 45.

Adjustable Pipe Roll Stands: MSS Type 46.

2.2 PIPE HANGERS

- A. Pipe hangers for all piping shall be Fee and Mason or Grinnell of a type suitable for each use. Perforated straps shall not be used in any work. For ferrous pipes up to and including four inches (4") in size, use Fee and Mason Fig. 199 malleable iron, adjustable, split ring, swivel hanger. HVAC piping larger than four inches (4"), but not larger than twelve inches (12") shall be Fee and Mason Fig. 170. Where several pipes are parallel at the same elevation, trapeze hangers may be used. Where trapeze hangers are used, the pipes shall be supported on rollers where rollers are called for by the above specifications. For copper pipes up to and including three inches (3") in size, use Fee and Mason Fig. 360 malleable iron, copper plated hangers. For copper pipes larger than three inches (3") use Fee and Mason Fig. 364 copper plated clevis hanger.
- B. Hanger rods sizes shall conform to the following schedule:

Pipe up to and including 2": 3/8" rods
Pipe 2-1/2", 3" and 3-1/2": 1/2" rods
Pipe 4" and 5": 5/8" rods
Pipe 6": 3/4" rods
Pipe 8" and 10": 7/8" rods
Pipe 12" and larger: 1" rods

- C. Unless shown otherwise, all horizontal runs of ferrous piping shall be suspended from the floor or roof construction, as the case may be, by means of hangers with the following maximum spacing:

Pipe up to and including 1-1/4": 6 feet
Pipe 1-1/2" and 2": 9 feet
Pipe 2-1/2" and 3": 11 feet
Pipe 3-1/2" and 4": 12 feet
Pipe 6": 12 feet
Pipe 8" and larger: 12 feet

- D. Unless shown otherwise, all horizontal runs of copper tubing shall be suspended from the floor or roof construction as the case may be, by means of hangers with the following maximum spacing:

Pipe up to 3/4" in size: 5 feet
Pipe 1" and 1-1/4": 8 feet
Pipe 1-1/2" and larger: 10 feet

- E. There shall be a hanger within two feet (2') of each elbow or tee. Additional supports shall be provided for valves, strainers, etc. Vertical risers shall be supported by approved riser clamps at each floor. Vertical pipes within a space shall not have less than two (2) supports.
- F. Supports and hangers shall be installed to permit free expansion and contraction in the piping systems. Hangers shall permit vertical adjustment to maintain proper pitch. Where necessary to control expansion and contraction, the piping shall be guided and firmly anchored. No piping shall be self-supporting; nor shall it be supported from equipment connections.
- G. Inserts shall be used where piping or equipment is to be hung from concrete construction. Inserts shall be Grinnell Fig. 281, wedge type, concrete inserts. All inserts shall be galvanized to prevent rusting. After the forms are removed, clip off all nails flush with the exposed surface of the inserts.
- H. Expansion bolts shall be Ackerman-Johnson.
- I. Beam clamps suitable for use with the type of steel construction involved shall be Grinnell.

- J. Chilled and hot water piping hangers shall be sized to go around the insulation with saddles being provided to protect the insulation and so the insulation can be continuous through the hanger.

2.3 VERTICAL PIPING CLAMPS

- A. Except as otherwise indicated, provide factory-fabricated vertical piping clamps complying with ANSI/MSS SP-58, of one of the following types listed, selected by installer to suit vertical piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Select size of vertical piping clamps to exactly fit pipe size of bare pipe. Provide copper-plated clamps for copper piping systems.

Two-Bolt Riser Clamps: MSS Type 8.

Four-Bolt Riser Clamps: MSS Type 42.

2.4 HANGER ROD ATTACHMENTS

- A. Except as otherwise indicated, provide factory-fabricated hanger-rod attachments complying with ANSI/MSS SP-58, of one of the following MSS types listed, selected by installer to suit horizontal piping hangers and building attachments, in accordance with MSS SP-69 and manufacturer's published product information. Use only one type by one manufacturer for each piping service. Select size of hanger rod attachments to suit hanger rods. Provide copper-plated hanger rod attachments for copper piping systems.

Steel Clevises: MSS Type 14.

Swivel Turnbuckles: MSS Type 15.

Malleable Iron Sockets: MSS Type 16.

Steel Weldless Eye Nuts: MSS Type 17.

2.5 BUILDING ATTACHMENTS

- A. Except as otherwise indicated, provide factory-fabricated building attachments complying with ANSI/MSS SP-58, of one of the following MSS types listed, selected by Installer to suit building substrate conditions, in accordance with MSS SP-69 and manufacturer's published product information. Select size of building attachments to suit hanger rods.

Concrete Inserts: MSS Type 18

Top Beam C-Clamps: MSS Type 19

Side Beam or Channel Clamps: MSS Type 20.

Center Beam Clamps: MSS Type 21.

Welded Attachments: MSS Type 22.

C-Clamps: MSS Type 23.

Top I-Beam Clamps: MSS Type 25.

Side I-Beam Camps: MSS Type 27.

Steel I-Beam Clamps with Eye Nut: MSS Type 28.

Steel WF-Beam Clamps with Eye Nut: MSS Type 29.

Malleable Beam Clamps: MSS Type 30.

Steel Brackets – Heavy Duty: MSS Type 33

Side Beam Brackets: MSS Type 34.

Plate Lugs: MSS Type 57.
Horizontal Travelers: MSS Type 58.

2.6 SADDLES AND SHIELDS

- A. Except as otherwise indicated provide saddles or shields for piping hangers and supports, factory-fabricated, for all insulated piping. Size saddles and shields for exact fit to mate with pipe insulation.
- B. Protection Saddles: MSS Type 39; fill interior voids with segments of insulation matching adjoining insulation.
- C. Protection Shields: MSS Type 40; of length recommended by manufacturer to prevent crushing of insulation.
- D. Thermal Hanger Shields: Constructed of 360 degrees of high density, 100 psi, water-proofed calcium silicate, encased in 360 degrees sheet metal shield. Provide assembly of same thickness as adjoining insulation.

2.7 MANUFACTURERS OF HANGERS AND SUPPORTS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturer's offering hangers and supports which may be incorporated in the work include, but are not limited to, the following:

C & S Mfg. Corp.
Elcen Metal Products Co.
Fee & Mason Mfg. Co.
Grinnel Corp.

2.8 MISCELLANEOUS MATERIALS

- A. Metal Framing: Provide products complying with NEMA STD ML 1.
- B. Steel Plates, Shapes and Bars: Provide products complying with ANSI/ASTM A 36.
- C. Cement Grout: Portland cement (ANSI/ASTM C 150, Type I or Type III) and clean uniformly graded, natural sand (ANSI/ASTM C 404, Size No. 2). Mix at a ratio of 1.0 part cement to 3.0 parts sand, by volume, with minimum amount of water required for placement and hydration.
- D. Heavy-Duty Steel Trapezes: Fabricate from steel shapes selected for loads required; weld steel in accordance with AWS standards.
- E. Pipe Guides: Provide factory-fabricated guides, of cast semi-steel or heavy fabricated steel, consisting of a bolted two-section outer cylinder and base with a two-section guiding spider bolted tight to pipe. Size guide and spider to clear pipe and insulation (if any) and cylinder. Provide guides of length recommended by manufacturer to allow indicated travel.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Proceed with installation of hangers, supports and anchors only after required building structural work has been completed in areas where the work is to be installed. Correct inadequacies including (but not limited to) proper placement of inserts, anchors and other building structural attachments as may be required.

3.2 INSTALLATION OF BUILDING ATTACHMENTS

- A. Install building attachments at required locations, within concrete or on structural steel for proper piping support. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional building attachments where support is required for additional concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten insert securely to forms. Where concrete with compressive strength less than 2500 psi is indicated, install reinforcing bars through openings at top of inserts.

3.3 INSTALLATION OF HANGERS AND SUPPORTS

- A. Install hangers, supports, clamps and attachments to support piping properly from building structure; comply with MSS SP-69. Arrange for grouping of parallel runs of horizontal piping to be supported together on trapeze type hangers where possible. Install supports with maximum spacing complying with MSS SP-69. Where piping of various sizes is to be supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipe. Do not use wire or perforated metal to support piping, and do not support piping from other piping, ductwork or other supported mechanical or electrical items.
- B. Supports and hangers shall be installed to permit free expansion and contraction in the piping systems. Hangers shall permit vertical adjustment to maintain proper pitch. Where necessary to control expansion and contraction, the piping shall be guided and firmly anchored. No piping shall be self-supporting; nor shall it be supported from equipment connections.
- C. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers and other accessories. Except as otherwise indicated for exposed continuous pipe runs, install hangers and supports of same type and style as installed for adjacent similar piping. Provide section drawing for hanger locations to avoid duct interference.
- D. Prevent electrolysis in support of copper tubing by use of hangers and support which are copper-plated, or by other recognized industry methods.
- E. Provisions for Movement:

1. Install hangers and supports to allow controlled movement of piping systems and to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends and similar units.
2. Load Distribution: Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.
3. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes, and so that maximum pipe deflections allowed by ANSI B31 are not exceeded.
4. Insulated Piping – comply with the following installation requirements:
 - a. Clamps: Attach clamps, including spacers (if any), to piping with clamps projecting through insulation; do not exceed pipe stresses allowed by ANSI B31.
 - b. Shields: Where low compressive strength insulation or vapor barriers are indicated on cold or chilled water piping, install coated protective shields.
 - c. Saddles: Where insulation without vapor barrier is indicated, install protection saddles.

3.4 INSTALLATION OF ANCHORS

- A. Install anchors at proper locations to prevent stresses from exceeding those permitted by ANSI B31, and to prevent transfer of loading and stresses to connected equipment.
- B. Fabricate and install anchor by welding steel shapes, plates and bars to piping and to structure. Comply with ANSI B31 and with AWS standards.
- C. Where expansion compensators are indicated, install anchors in accordance with expansion unit manufacturer's written instructions, to limit movement of piping and forces to maximum recommended by manufacturer for each unit.
- D. Anchor Spacings: Where not otherwise indicated, install anchors at ends of principal pipe-runs, at intermediate points in pipe-runs between expansion loops and bends. Make provisions for preset of anchors as required to accommodate both expansion and contraction of piping.

3.5 ADJUSTMENT OF HANGERS AND SUPPORTS

- A. Adjust hangers and supports and place grout as required under supports to bring piping to proper levels and elevations.

END OF SECTION 23 05 30

SECTION 23 05 53 – IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Provide pipe identification for all exposed piping in Mechanical Equipment Rooms, on pipe mains above accessible ceilings, access panels, and piping exposed to view.
- B. Provide valve tags for all valves. Provide valve tag chart, enclosed in a minimum 8-1/2" x 11" frame, in each mechanical room. Master chart(s) to be included in the maintenance manual.
- C. Provide equipment nameplates for all major mechanical equipment, such as chillers, boilers, pumps, air handling units, fans, condensing units, disconnects, starters, etc. Nameplates shall include all information on manufacturers' standard nameplates, but shall be of an engraved metal type, secured to the equipment.
- D. Provide a framed, under glass, typed sequence of operation and system diagram for each system, located on the wall of the Mechanical Room.
- E. Examine other sections of the Project Manual for requirements which affect work of this section whether or not such work is specifically mentioned in this section.

1.2 RELATED DOCUMENTS

- A. The Bidding Requirements and Contractual Conditions set forth in Division 01 apply to this section.

1.3 QUALITY ASSURANCE

- A. Meet the requirements of:
 - 1. ANSI/ASME (American Society of Testing and Materials) A13.1 2007, Scheme for Identification of Piping Systems.
 - 2. ANSI 253.1: Safety Color Code for Marking Physical Hazards.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Pipe markers shall be "SET MARK" semi-rigid plastic identification markers as manufactured by Seton Name Plate Corporation. Markers shall conform to ANSI A13.1 for correct color background, color of letters and correct marker length. Direction of flow arrows shall be included on each marker. Pipe markers located outdoors shall be UV-resistant and labeled for such use. Letter height and length of color background shall be as follows:

<u>OUTSIDE DIAMETER</u>	<u>LETTER HEIGHT</u>	<u>LENGTH OF COLOR FIELD</u>
3/4" - 1-1/4"	1/2"	8"
1-1/2" - 2"	3/4"	8"
2-1/2" - 6"	1-1/4"	12"
8" - 10"	2-1/2"	24"
Over 10"	3-1/2"	32"

- B. Valve tags shall be 1-1/2" diameter, 19 gauge brass attached with copper meter seal wire, brass chain, or "S" hook. Service designation letter shall be 1/4" high minimum and black filled. Valve numbers shall be 1/2" high and black filled. Stamp tags with service designation and number consecutively for each system.
- C. Equipment name plates shall be 1½" x 4" aluminum with black enamel background and with the equipment designation engraved in natural aluminum lettering not less than 1/2" high. Equipment name plates shall also include the area that the equipment serves, either by room name or number as approved by the Architect. Name plates located outdoors shall be UV-resistant and labeled for outdoor use.

2.2 MANUFACTURERS

- A. Acceptable Manufacturers: Seton, W. H. Brady.

PART 3 - EXECUTION

3.1 PIPE IDENTIFICATION (use colors for services that apply to this project).

<u>TYPE OF SERVICE</u>	<u>BACKGROUND COLOR</u>	<u>LETTER COLOR</u>	<u>SERVICE DESIGNATION</u>
Heating Hot Water Supply	Green	White	Heating Supply
Heating Hot Water Return	Green	White	Heating Return
Condensate	Green	White	Condensate
Chilled Water Supply	Green	White	Chilled Supply
Chilled Water Return	Green	White	Chilled Supply

3.2 INSTALLATION

- A. Pipe markers:
 1. Service designation shall be readable from a standing position from the floor.
 2. Provide pipe markers at 25 ft. maximum intervals on mains above ceilings.
 3. Provide markers at each major branch from mains and at each branch line.
 4. Provide a marker at each equipment connection.
- B. Valve tagging:

1. Attach tags to valve handles in such a manner that valve shall be operable without damaging or removing tag.
2. Prepare valve charts showing tag number, location, manufacturer, model, size, and service. Frame under glass and mount in equipment room. A copy of chart shall be included in the service manual.

C. Equipment nameplates:

1. Nameplate designation shall consist of unit number and area served.
2. Locate nameplates where readable from a standing position on the floor.
3. Secure nameplates securely with rivets or screws.
4. Nameplates identifying manufacturer model number, serial number, voltage, etc. for equipment shall be of the engraved type. Painted labels are not acceptable.

END OF SECTION 23 05 53

SECTION 230593 - TESTING, ADJUSTING AND BALANCING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The requirements set forth in the Bidding Requirements and the Contractual Conditions of Division 01 shall apply to this Section.
- B. Examine other sections of the Project Manual for requirements which affect work of this section whether or not such work is specifically mentioned in this section.

1.2 SUMMARY STATEMENT

- A. Test and balance of HVAC systems (both heating and cooling) and air exhaust systems shall be performed by an independent AABC or NEBB certified test and balance agency. Acceptable Agencies in the Tampa Bay Region include: Southern Independent Testing, Inc., The Phoenix Agency, Test and Balance Corporation, Pro-Tech Diversified Services, Inc., and SpecTec.
- B. The Contractor and the Test and Balance Agency, shall coordinate all work required so that the test and balance work is complete and the final report delivered one week prior to the scheduled Substantial Completion date. The Test and Balance Agency shall be at the site with his test equipment during the Substantial Completion Inspection so that random report values may be verified.
- C. Test and balance work shall not begin until all systems have been completed and are in full working order. Place all systems and equipment into full operation during each working day of testing and balancing.

1.3 DESCRIPTION OF WORK

- A. Extent of testing, adjusting and balancing work is indicated by requirements of this section, and also by drawings and schedules, and is defined to include, but is not necessarily limited to, air distribution systems, hydronic distribution systems and associated equipment and apparatus of mechanical work. The work consists of setting speed and volume (flow), adjusting facilities provided for systems, recording data, conducting tests, preparing and submitting reports and recommending modifications to work as required by contract documents.
- B. Component types of testing, adjusting and balancing specified in this section includes the following, but not limited to, as applied to mechanical equipment:

- Fans
- Air Conditioning units
- Ductwork systems

- C. Testing and balancing shall be begun and completed during each season, heating and cooling; i.e. cooling system during the cooling season and heating system during the

heating season. All systems shall be tested and balanced under full load conditions and a report submitted.

1. The HVAC system shall be started, operated and stopped to determine that it operates according to the design specifications and sequence of operations. Each element in the system shall be systematically and individually started, operated and stopped.
 2. Temperature and humidity shall be measured and recorded in each room during each season's testing. Test and calibrate all temperature and humidity sensors.
 3. Notification to perform the opposite season test and balance will be made by the Owner. The work shall then be scheduled by mutual agreement. The report shall be submitted within fifteen (15) days after completion of the work and shall include:
 - a. Characterization of the system quality of operation.
 - b. Data and results of test and balance work.
 - c. Description of system deficiencies found and recommendations.
- D. Cooperate with the test and balance agency in establishing a schedule to perform this work. If changes in the construction schedule affecting test and balance work are necessary, all such changes shall be coordinated with the test and balance firm.
- E. Replacement pulleys (adjustable and non-adjustable), additional balancing dampers, pressure taps, balancing valves, cocks and fittings, etc., required to effect proper air and water balance shall be provided by the Contractor at no additional cost to the contract. The test and balance firm shall furnish the Contractor and Project Architect/Engineer at the end of each day a list of items that must be repaired, replaced or adjusted.
- F. Air filters shall be replaced and strainers shall be cleaned before proceeding with test and balance and thereafter as required by the test and balance firm.
- G. Systems shall be placed into service using approved startup procedures. The Contractor shall be responsible for proper initial setting and adjustment of HVAC equipment, air handlers, VAV boxes, exhaust fans, etc. furnished and installed by him and shall verify same for the test and balance firm.
- H. Contractor shall provide test openings as required, shall operate HVAC equipment and provide trade persons to assist and make adjustments for test and balance during the process.
- I. The test and balance firm shall periodically visit the site during construction of the HVAC system. No less than two visits shall be made. After each visit, the test and balance firm shall report in writing to the Architect, with copy to the Engineer, its observations from the visit and potential problem areas. Should methods, materials or workmanship being used adversely affect balancing and adjusting work, the test and balance agency shall report its findings in the report to the Architect with recommendations for correction.
- J. The test and balance firm executing this test and balance work shall hold valid Certificate of Authorization from the State of Florida Board of Professional Engineers to provide services under the firm name.

- K. The test and balance firm shall carry out the test and balance work in accordance with the AABC National Standards for Total Systems Balance or the NEBB Procedural Standard for Testing, Adjusting and Balancing of Environmental systems, and in conformance with ASHRAE Handbook, Testing, Adjusting and Balancing.
- L. The Contractor shall furnish to the testing and balancing agency a complete set of plans and specifications, addenda, shop drawings, schedules and change orders as may be required.

1.4 QUALITY ASSURANCE

- A. Installer: A firm with not less than 3 years of similar experience and certified by Associated Air Balance Council (AABC) or NEBB in testing and balancing disciplines similar to those required for this project shall be employed.
- B. Industry Standards: Comply with American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc. (ASHRAE) recommendations pertaining to measurements, instruments and testing, adjusting and balancing, except as otherwise indicated.
- C. The final result of balancing shall be to provide uniform air temperatures within a 2° F spread in the conditioned space at peak load conditions. All air flows shall be within – 5/+10% of design air flows.
- D. Gages and Thermometers installed as part of the project are not to be used for Test and Balance. The test and balance firm shall calibrate all such gages and thermometers and shall affix a permanent tag to each stating the corrections to be applied.
- E. In the event of dispute with regard to test results, the Owner or Project Architect/Engineer may choose to provide verification of test and balance reports, and such verification shall be by a second independent agency selected by the Project Architect/Engineer or the Owner. Reports found to be inaccurate will be disallowed, and the test and balance firm will be required to repeat operations under the supervision of the second independent agency until accurate reports are completed and agreed upon. The cost of initial test and balance work will be borne by the Owner. The cost of verification test and balance work shall be borne by the Owner or Contractor or Project Architect/Engineer (whichever demanded the second opinion). If the original test and balance reports are found inaccurate and subsequent costs of supervision are necessary in order to secure acceptable reports, such will be borne by the original test and balance firm.

1.5 SUBMITTALS

- A. Submit five (5) certified test reports signed by Test and Balance Supervisor who performed testing and balancing work to Engineer and to the Architect one (1) week prior to substantial completion inspection.
 - 1. Include identification and types of instruments used and their most recent calibration date with submission of final test report. Calibration shall be within six months of the date of equipment used on this project.

2. Report shall include a schematic diagram indication the system tested and the device number of the report correlated to the actual device of the system.

B. Maintenance Data: Include in maintenance manuals, copies of certified test reports.

1.6 JOB CONDITIONS

A. Do not proceed with testing, adjusting and balancing work until work has been completed and is operable. Ensure that there is no latent residual work still to be completed.

B. Do not proceed until work scheduled for testing, adjusting and balancing is clean and free from debris, dirt and discarded building materials.

1.7 GUARANTEE

A. The test and balance firm shall include extended services for six months after completion of test and balance work, during which time the Project Architect/ Engineer and/or Owner, at their discretion, may request a recheck or resetting of any piece of equipment listed in the test report believed to not be performing properly. The Contractor shall assist in this extended service.

B. The test and balance firm shall provide technicians to assist in making any tests required. Should the system be found to not work properly any time during the first year of operation it shall then be required to be rebalanced.

C. The test and balance agency shall provide to the Architect five (5) copies of a certified statement that the HVAC systems have been balanced to optimum performance capabilities in accordance with the intent of the Drawings and Specifications.

PART 2 - PRODUCTS

2.1 PATCHING MATERIALS

A. Except as otherwise indicated, use same products as used by original Installer for patching holes in insulation, ductwork and housings which have been cut or drilled for test purposes, including access for test instruments, attaching jigs, and similar purposes. At Tester's option, plastic plugs with retainers may be used to patch drilled holes in ductwork and housings. Test and Balance Agency shall coordinate with the system insulator to rework any void in the thermal insulation or moisture barrier.

2.2 TEST INSTRUMENTS

A. Utilize test instruments and equipment for testing and balancing work required, of type, precision and capacity as recommended in the following testing and balancing standards:

AABC's Manual MN-1 "AABC National Standards"

PART 3 - EXECUTION

3.1 TESTING, ADJUSTING AND BALANCING

- A. Examine installed work and conditions under which testing is to be done to ensure that work has been completed, cleaned and is operable. Do not proceed with testing and balancing work until unsatisfactory conditions have been corrected in manner acceptable to Tester.
- B. Test, adjust and balance environmental systems and components, as indicated, in accordance with procedures outlined in applicable standards.
- C. Prepare report of test results, including instrumentation calibration reports, in format recommended by applicable standards. The report shall include a system schematic for each air handling system; clearly identifying which air device in the field corresponds to the air device in the Report.
- D. Patch holes in insulation, ductwork and housings which have been cut or drilled for test purposes.
- E. Mark equipment settings, including damper control positions, valve indicators, fan speed control levers and similar controls and devices, to show final settings at completion of testing and balancing work. Provide markings with paint or other suitable permanent identification materials.
- F. Prepare a report of recommendations for correcting unsatisfactory mechanical performance when system cannot be successfully balanced; including, where necessary, modifications which exceed requirements of contract documents for mechanical work.
- G. Retest, adjust and balance systems subsequent to significant system modifications, and resubmit test results.
- H. The Test and Balance Contractor shall assist the Architect/Engineer in verifying that proper measuring instruments and methods were used.

3.2 TESTS

- A. Direct Expansion Systems:
 - 1. Air Distribution:
 - a. Measure fan speeds, motor voltages, operating currents, CFM and static pressure at fan outlet.
 - b. Adjust dampers, air supply and return and exhaust outlets to $-5/+10\%$ of design quantities. Supply grilles shall be adjusted to provide proper throw and uniform pattern.
 - c. Measure air flow at duct connected return or exhaust grilles.
 - d. Record the specified horsepower and all electrical characteristics of all motors.

- e. Record the actual installed motors as to horsepower and electrical characteristics.
2. Verify function and calibration of temperature controls to +/- 2.0 degree F. of set point.
3. Perform the following Cooling Cycle Temperature Measurements:
 - a. "Entering air" temperature. (D.B. and W.B.)
 - b. "Leaving air" temperature. (D.B. and W.B.)
 - c. Outside air temperature. (D.B. and W.B.)
 - d. Room temperature (D.B. and W.B.) measured near thermostats, four feet above floor.
 - e. Air CFM at unit discharge. (D.B. and W.B.)
4. Perform the following heating cycle measurements:
 - a. "Entering" and "Leaving" air temperatures. (D.B.)
 - b. Outside air temperature. (D.B. and W.B.)
 - c. Room temperature measured near thermostats four feet above floor.
 - d. Air CFM at unit discharge. (D.B. and W.B.)

B. Temperature Control Systems:

1. The temperature controls installer shall cooperate fully with the test and balance firm to ensure maximum effective systems operation. The controls installer shall initially set, adjust, relocate (if necessary), calibrate and test all controls. The test and balance firm shall verify proper operation of controls and set controls to proper settings.
2. The Temperature Control Contractor shall:
 - a. Verify that all control components are installed in accordance with project requirements and are functional, including electrical interlocks, damper sequences, air and water reset, and fire and freeze stats. Controls installer shall provide systems printouts to all points to ensure operation and communications with all terminal points.
 - b. Verify that all controlling instruments are calibrated and set for design operating conditions.
 - c. Calibrate room thermostats after installation and before the thermostat control verification tests are performed. The balancing agency shall prove the accuracy of final settings by taking temperature readings in the controlled space compared to the computer readings.
 - d. The temperature control contractor shall allow sufficient time in the project to provide sufficient assistance and instruction to the balancing agency in the proper use and setting of control components such as computers, static pressure controllers, variable air volume boxes, or any other device that may need set points changed so that the testing and balancing work may be performed. All required hardware and software related to the installed control system shall be provided by the temperature control installer to the test and balance agency and the owner in order to allow testing of the systems and continued operation.
3. The test and balance firm shall perform the following:
 - a. Check for proper location of humidistats, sensors and thermostats as well as verify proper design settings.
 - b. Verify proper operation of switches, damper motors, motorized valves,

solenoids and interlocks.

- c. Verify that proper sequence of operation occurs in all control modes and is in accordance with shop drawings and control diagrams (or point list).
- d. Verify proper calibration of all controls and list those controls requiring adjustment or recalibration.

C. Exhaust Fans:

- 1. Measure exhaust fan static pressures, total CFM, makeup air and fan RPM.
- 2. Measure motor operating voltage and amperage.
- 3. Record the specified against the actual supplied horsepower and electrical characteristics of all motors. Record if specified to be self or permanently lubricated.
- 4. Record the actual installed motors as to horsepower and electrical characteristics.

END OF SECTION 230593

SECTION 230700 – HVAC INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 23 Specification sections, apply to work of this section.
- B. The Bidding Requirements and Contractual Conditions set forth in Division 01 apply to this section.

1.2 DESCRIPTION OF WORK

- A. Extent of HVAC insulation required by this section is indicated on drawings, and by requirements of this section.
- B. Types of mechanical insulation specified in this section include the following:
 - 1. Piping System Insulation:
Condensate Piping Systems
 - 2. Ductwork System Insulation:
Cold Supply Air and Return Air Ductwork
Air Plenums and Equipment Housings

1.3 QUALITY ASSURANCE

- A. Firms regularly engaged in manufacturer of HVAC insulation products, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following: Armstrong, Certainteed Corp., Johns-Manville Corp., Knauf Fiber Glass, Owens-Corning Fiberglass Corp., and Pittsburgh Corning Corp.
- C. Installer: A firm with at least 5 years successful installation experience on projects with HVAC insulation similar to that required for this project.
- D. Flame/Smoke Ratings: Provide composite HVAC insulation (insulation, jackets, coverings, sealers, mastics and adhesives) with flame-spread rating of 25 or less, and Smoke-developed rating of 50 or less, as tested by ANSI/ASIM E 84 (NFPA 255) method.
- E. Appropriate ASTM, ANSI, UL, ASME and NFPA standards shall be met.

1.4 SUBMITTALS

- A. Submit manufacturer's specifications and installation instructions for each type of HVAC insulation. Submit schedule showing manufacturer's product number, thickness, and furnished accessories for each HVAC system requiring insulation. Include reference to minimum FBC and Florida Energy Efficiency Code values on the submittal. Submit certified test reports on performances including burning characteristics and thermal insulating values.
- B. Submit maintenance data and replacement material lists for each type of HVAC insulation. Include this data in the Operation and Maintenance Manual.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver insulation, coverings, cements, adhesives, and coatings to site in containers with manufacturer's stamp or label, affixed showing fire hazard ratings of products.
- B. Protect insulation against damage. Do not install damaged insulation; remove from project site.
- C. Protect cements, adhesives and coatings from freezing.

PART 2 - PRODUCTS

2.1 PIPE INSULATION MATERIALS

- A. Adhesives, Sealers, and Protective Finishes:
 - 1. Vapor Barrier Coatings--Permeance shall be no greater than 0.08 perms at 37 mils dry as tested at 100F and 90% RH by ASTM F1249. Foster 30-80 AF, or approved equal
 - 2. Lagging Adhesives—used in conjunction with canvas or glass lagging cloth to protect equipment/piping indoors. Foster 30-36 AF, Childers CP-137 AF, or approved equal. Coatings shall meet ASTM D 5590 with 0 growth rate.
 - 3. Weather Barrier Mastic—used outdoors to protect above ambient insulation from weather. Foster 46-50 Weatherite, Childers CP-10 Vi Cryl, or approved equal
 - 4. Insulation Joint Sealant—used as a vapor sealant on below ambient piping with cellular glass insulation. Foster 95-50; Childers CP-76; or approved equal.
 - 5. Metal Jacketing Sealant—used as a sealant on metal jacketing seams to prevent water entry. Foster 95-44; Childers CP-76; approved equal
 - 6. Reinforcing Mesh—used in conjunction with coatings/mastics to reinforce. Foster Mast A Fab; Childers Chil Glas #10; or approved equal

2.2 DUCTWORK INSULATION MATERIALS

- A. Rigid Fiberglass Ductwork Insulation: FS-HH-I-558, Form A, Type Rigid, Class as indicated. $K = .27$ at 75° F. Installed minimum R-value shall be 6.0.
1. Provide Class 1 (non-load bearing) where insulation is not subjected to compressive loading.
 2. Provide Class 2 (load bearing) where insulation is subjected to compressive loading; except provide higher Class where indicated. Provide on exposed ductwork in Mechanical Room from floor to six (6) feet above floor.
- B. Flexible Fiberglass Ductwork Insulation: FS HH-I-558, Form B. Type I, Class as indicated:
1. Provide Class 6 for temperatures up to and including 350° F (177° C). $K = .25$ at 75° F.
- C. Vapor Barrier Material for Ductwork: FS HH-B-100; paper-backed aluminum foil, except as otherwise indicated; strength and permeability rating equivalent to factory-applied vapor barriers on adjoining ductwork insulation, where available; with following additional construction characteristics.
1. High Puncture Resistance: Type I, low vapor transmission (for ducts in exposed areas).
 2. Vapor Barrier Coating--Permeance shall be no greater than 0.08 perms at 45 mils dry as tested by ASTM E96/ASTM F1249. Foster 30-65, Childers CP-34, or approved equal (for vapor seal of all taped seams, breaks, punctures in duct insulation)
- D. Ductwork Insulation Accessories: Provide staples, bands, wires, tape, anchors, corner and angles and similar accessories as recommended by insulation manufacturer for applications indicated.

PART 3 - EXECUTION

3.1 HVAC PIPING SYSTEM

- A. Sub-Freezing Piping (0 to 39° F) (-18 to 4° C).
1. Insulate sub-freezing refrigerant suction HVAC piping systems with one-inch thick Armaflex insulation. When exposed outdoors, paint with two coats of white Armaflex paint or Foster 30-64 coating.
- B. Cold Piping (40° F [4.4° C] to ambient):
1. Insulate the following cold HVAC piping systems:
HVAC condensate piping.
 2. Insulate each piping system specified above with the following:
 - a. Condensate: $3/4$ " thick Armaflex.

3.2 DUCTWORK SYSTEM INSULATION

A. Ductwork:

1. Insulate the following cold ductwork:
 - a. Outdoor air intake ductwork air entrance and fan inlet or HVAC unit inlet.
 - b. HVAC supply ductwork between fan discharge, or HVAC unit discharge, and room terminal outlet.
 - c. HVAC return air ductwork between room terminal inlet and return fan inlet, or HVAC unit inlet.
 - d. HVAC plenums and unit housings not pre-insulated at factory.
2. Insulate with one of the following type and thickness of insulation:
 - a. Insulation: Rigid fiberglass; 1-1/2" thick, increase thickness to 2" in machine, fan and equipment rooms, $K = .25$ at 75° F.
 - b. Insulation: Flexible fiberglass; 1-1/2" thick, application limited to concealed locations, $K = .25$ at 75° F.

3.3 INSTALLATION OF PIPING INSULATION

- A. Install insulation products in accordance with manufacturer's written instructions, and in accordance with recognized industry practices to ensure that insulation serves its intended purpose.
- B. Install insulation on pipe systems subsequent to testing and acceptance of pressure tests.
- C. Install insulation materials with smooth and even surface. Insulate each continuous run of piping with full-length units of insulation, with single cut piece to complete run. Do not use cut pieces or scraps abutting each other.
- D. Clean and dry pipe surfaces prior to insulating. Butt insulation joints firmly together to ensure complete and tight fit over surfaces to be covered.
- E. Maintain integrity of vapor-barrier jackets on pipe insulation, and protect to prevent puncture or other damage.
- F. Cover valves, fittings and similar items in each piping system with equivalent thickness and composition of insulation as applied to adjoining pipe run. Install factory molded, precut or job fabricated units (at Installer's option) except where specific form or type is indicated. On all cold piping, coat insulated valves, fittings, and elbows with vapor barrier coating and reinforcing mesh.
- G. On all cold piping, seal all longitudinal and butt insulation joints (foam glass) with insulation joint sealant as specified. Coat all, all service jacket (ASJ) seams, both longitudinal and butt, with vapor barrier coating.
- H. Extend piping insulating without interruption through walls, floors and similar piping penetrations.

- I. Install protective metal shields (saddles) and insulated inserts wherever needed to prevent compression of insulation.
- J. Pipe Hanger Insulation Inserts: Butt pipe insulation against pipe hanger insulation inserts. For hot pipes, apply 3" wide vapor barrier tape or band over the butt joints. For cold piping apply wet coat of vapor barrier lap cement on butt joints and seal joints with 3" wide vapor barrier tape or band.

3.4 INSTALLATION OF DUCTWORK INSULATION

- A. Install insulation products in accordance with manufacturer's written instructions, and in accordance with recognized industry practices to ensure that insulation serves its intended purpose.
- B. Install insulation materials with smooth and even surfaces.
- C. Clean and dry ductwork prior to insulating. Butt insulation joints firmly together to ensure complete and tight fit over surfaces to be covered.
- D. Maintain integrity of vapor-barrier on ductwork insulation, and protect it to prevent puncture and other damage. Coat all taped seams and punctures with vapor barrier coating.
- E. Extend ductwork insulation without interruption through walls, floors and similar ductwork penetrations.
- F. Protect outdoor insulation from weather by installing weather barrier mastic/reinforcing mesh or jacketing as recommended by manufacturer, or as indicated on drawings.
- G. Corner Angles: Except for oven and hood exhaust duct insulation, install corner angles on external corners of insulation on ductwork up to seven (7) feet above finished floor in exposed finished spaces before covering with jacketing.

3.5 PROTECTION AND REPLACEMENT

- A. Replace damaged insulation which cannot be repaired satisfactorily, including units with vapor barrier damage and moisture saturated units. If insulation has been allowed to become wet during the construction process, said materials shall be removed from the jobsite, and clean, dry materials installed.
- B. Insulation Installer shall advise Contractor of required protection for insulation work during remainder of construction period, to avoid damage and deterioration.

END OF SECTION 230700

SECTION 230900 – INSTRUMENTATION AND CONTROL FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The Bidding Requirements and Contractual Conditions set forth in Division 01 apply to this section.
- B. Examine other sections of the Project Manual for requirements which affect work of this section whether or not such work is specifically mentioned in this section.

1.2 WORK INCLUDED

- A. Connect to existing Trane HVAC Control Systems currently serving the building. The operator's terminal, all global controllers, logic controllers, and all input/output devices shall communicate using the protocols and local area network (LAN) standards as defined by ANSI/ASHRAE Standard 135, BACnet. No gateways shall be used. Items of work included (but not limited to) are as follows:
 - 1. Provide all necessary BACnet-compliant hardware and software to meet the system's functional specifications. Provide Protocol Implementation Conformance Statement (PICS) for every controller in system, including unitary controllers. All direct digital topic hardware is to comply with BACnet.
 - 2. Prepare individual hardware layouts, interconnection drawings, and software configuration from project design data.
 - 3. Implement the detailed design for all system-standard analog and binary objects, distributed control and system databases, graphic displays, logs, and management reports based on control descriptions, logic drawings, configuration data, and bid documents.
 - 4. Provide all equipment cabinets, panels, data communication network cables needed, and all associated hardware.
 - 5. Provide and install all interconnecting cables between supplied cabinets, logic controllers, and input/output devices.
 - 6. Provide all interconnecting cables between all operator's terminals and peripheral devices (such as printers, etc.) supplied under this section.
 - 7. Provide complete manufacturer's specifications for all items that are supplied. Include vendor name of every item supplied.
 - 8. Provide supervisory specialists and technicians at the job site to assist in all phases of system installation, startup and commissioning.
 - 9. Provide a comprehensive operator and technician training program as described herein.
 - 10. Provide as-built documentation, operator's terminal software, diagrams, and all other associated project operational documentation (such as technical manuals) on approved media, the sum total of which accurately represents the final system.

1.3 SYSTEM DESCRIPTION

A. General Requirements:

1. A distributed logic control system complete with Direct Digital Control (DDC) and Direct Analog Control (DAC) software shall be provided. This system shall control all mechanical equipment, including but not limited to unitary equipment, air handling units, chillers, cooling tower(s), electric heaters, pumps, split systems and any other listed equipment using native BACnet-compliant components.
2. The entire processing system shall be in complete compliance with the BACnet standard: ANSI/ASHRAE 135.
3. All logic controllers for air handlers, central mechanical equipment, and Microsoft Windows-based operator's terminal(s) shall communicate and share data, utilizing only BACnet communication protocols.
4. All logic controllers shall be fully programmable. That is, programmable controllers for every air handler, all central plant equipment, and any other piece of controlled equipment shall be provided. Programming tools shall be provided as part of operator workstation for every controller supplied for this project.
5. The controls contractor shall assume complete responsibility for the entire controls system as a single source. The controls contractor shall be qualified to engineer, program, debug, and service all portions of the BACnet based logic control system. This shall include operator's terminal, global controllers, routers, terminal unit controllers, sensors and all other sections of the system.
6. Approved control manufacturers are Trane.

B. Basic System Features

1. Zone-by-zone direct digital logic control of space temperature, scheduling, optimum start, equipment alarm reporting, and override timers for after-hours usage.
2. Operator's terminal software shall be Microsoft Windows based. The EMCS application program shall be written to communicate specifically utilizing BACnet protocols. Software shall be multi-tasking, capable of executing and displaying multiple instances in individual windows while running concurrently with other Windows programs such as word processors or database programs. Operation of the terminal software shall be simple and intuitive.
3. Operator's terminal software shall contain an easy-to-operate system-allowing configuration of system-wide BACnet controllers, including management and display of the controller programming. This system shall provide the capability to configure binary and analog inputs/outputs.
4. Operator's terminal operating system shall be capable of utilizing third-party Windows-based programs for such things as spreadsheet analysis, graphing, charting, custom report generation, and graphics design packages.
5. At least one operator's terminal shall be equipped to act as a system server. This system server shall store copies of loadable software for all field components and shall be capable of automatic or manual reloading of such software into the field components as required. The system server shall also gather and archive system-operating data, such as trend logs, energy logs, and other historical operating data.
6. Complete energy management firmware, including self-adjusting optimum start, demand limiting, global control strategies and logging routines for use with total

control systems shall be supplied. All energy management firmware shall be resident in field hardware and shall not be dependent on the operator's terminal for operation. Operator's terminal software is to be used for access to field-based energy management control firmware.

7. Priority password security systems shall prevent unauthorized use. Each user shall have an individual password. The user shall only be given access to the system functions required for individual job performance.
8. Equipment monitoring and alarm functions, including information for diagnosing equipment problems shall be included with the system.
9. The complete system shall auto-restart, without operator intervention, on resumption of power after a power failure. Database stored in global controller memory shall be battery-backed up for a minimum of 1 year. Logic controllers for all air handlers and all unitary equipment shall utilize EEPROM for all variable data storage.
10. System design shall be modular and of proven reliability.
11. All software and/or firmware interface equipment for connection to remote monitoring station from field hardware or the operator's terminal shall be provided.
12. System shall be capable of equipment runtime totalization of fans, heaters, etc. and capable of alarm generation and alarm dial out to remote sites.
13. Room sensors shall be provided with digital readout that allow the user to view room temperature, view outside air temperature, adjust the room setpoint within preset limits and set desired override time. In conjunction with a unitary logic controller, user shall also be able to start and stop unit from the digital sensor.
14. Communication wiring for field controllers shall not be run in star patterns.
15. All controllers shall communicate using protocols and LAN types contained in the ANSI/ASHRAE Standard 135, BACnet.
16. All DDC hardware and software shall be designed and manufactured by U.S. corporations. All hardware shall be Listed Underwriters Laboratory for Open Energy Management Equipment (PAZX) under the UL Standard for Safety 916 with integral labels showing rating.
17. All hardware shall be in compliance with FCC Part 15, Subpart J, Class A.

1.4 QUALITY ASSURANCE

- A. The supplier of the HVAC digital logic control system shall be responsible for inspection and Quality Assurance (QA) for all materials and workmanship.
- B. Maximum reliability shall be achieved through extensive use of high-quality, pre-tested components. Each and every controller, sensor and all other DDC components shall be individually tested by the manufacturer prior to shipment.
- C. The control system supplier shall provide all tools, testing and calibration equipment necessary to ensure reliability and accuracy of the control system.

1.5 REFERENCE STANDARDS

- A. The latest edition of the following standards and codes in effect and amended as of supplier's proposal date, and any applicable subsections thereof, shall govern design and selection of equipment and material supplied:

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1. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE).
2. ANSI/ASHRAE Standard 135, BACnet.
3. UL 916 Underwriters Laboratories Standard for Energy Management Equipment Canada and the U.S.
4. National Electrical Code (NEC)
5. FCC Part 15, Subpart J
6. EMC Directive 89/336/EEC

1.6 SUBMITTALS

A. Drawings:

1. Submit engineered drawings, control sequence, and bill of materials.
2. Drawings shall be submitted in the following standard sizes: 11" x 17" (ANSI B).
3. Drawings shall be submitted with general product data, in three ring binder format.

B. System documentation by the vendor shall include the following as a minimum:

1. System configuration diagrams in simplified block format.
2. All input/output object listings and an alarm point summary listing.
3. Electrical drawings that show all system internal and external connection points, terminal block layouts, and terminal identification.
4. Manufacturer's instructions and drawings for installation, maintenance, and operation of all purchased items.
5. System operation and maintenance instructions-including preventive maintenance and troubleshooting instructions.
6. Provide BACnet Protocol Implementation Conformance Statements (PICS) for all system elements.

1.7 SCHEDULING AND COORDINATION

- A. Provide a detailed project design and installation schedule with time markings and details for hardware items and software development phases.
- B. The schedule shall show all the target dates for transmission of project information and documents and shall indicate timing and dates for system installation, debugging and commissioning.

1.8 WARRANTY

- A. Warranty shall cover all costs for parts, labor, associated travel and expenses for a period of one year from the date of Substantial Completion.
- B. Hardware and software personnel supporting this warranty agreement shall provide on-site or off-site service in a timely manner after failure notification to the vendor. The maximum acceptable response time to provide this service at the site shall be 24 hours.

PART 2 - PRODUCTS

2.1 OPERATOR'S TERMINAL

A. BACnet Conformance:

1. Operator's terminal shall as a minimum support Point-to-Point (PTP) and either Ethernet or ARCnet BACnet LAN types. It shall communicate directly via these BACnet LANs as a native BACnet device. Operator's terminal shall comply with the requirements of a BACnet conformance class 6 device and support all BACnet services necessary to provide the following BACnet functional groups:
 - a. Clock Functional Group
 - b. Hand Held Workstation Functional Group.
 - c. Personal Computer Workstation Functional Group
 - d. Event Initiation Functional Group
 - e. Event Response Functional Group
 - f. COV Event Response Functional Group
 - g. Files Functional Group
 - h. Time Master Functional Group
2. Standard BACnet object types supported shall include as a minimum Calendar, command, Device, Event Enrollment, File and Schedule object types. All proprietary object types, if used in the system shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.

B. Displays:

1. Operator's terminal shall display all data associated with project as called out on drawings and/or object type list supplied. Graphic files shall be created using scanned, full color photographs of system installation, AutoCAD drawing files of field installation drawings and wiring diagrams from as-built drawings. System shall be capable of displaying graphic file, text, and dynamic object data together on each display. Information shall be labeled with descriptors and shall be shown with the appropriate engineering units. All information on any display shall be dynamically updated without any action by the user. Terminal shall allow user to change all field-resident EMCS functions associated with the project, such as setpoints, weekly schedules, exception schedules, etc. from any screen no matter if that screen shows all text or a complete graphic display.
2. All displays shall be generated and customized in such a manner by the local DDCS supplier that they fit the project. Canned displays will not be accepted. Displays shall use Standard English for labeling and readout. All graphics and DDC programming shall be supported locally by the installing contractor without factory dependency or assistance.
3. Binary objects shall be displayed as ON/OFF/NULL or with customized text. Allow binary objects to be displayed as individual change-of-state bitmap objects on the display screen such that they overlay the system graphic. Each binary object displayed in this manner shall be assigned up to three bitmap files for display when the point is ON, OFF or in alarm. For binary outputs, toggle the object's command status when the bitmap is selected with the system digitizer (mouse). Similarly, allow the terminal operator to toggle the object's status by

selecting (with the mouse) a picture of a switch or light, for example, which then displays a different picture (such as an "ON" switch or lighted lamp). Additionally, allow binary objects to be displayed as an animated graphic.

Animated graphic objects shall be displayed as a sequence of multiple bitmaps to simulate motion. For example: when a pump is in the OFF condition, display a stationary picture of the pump. When the operator selects the pump picture with the mouse, the represented object's status is toggled and the picture of the pump's impeller rotates in a time-based animation. The operator shall be able to click on an animated graphical object or switch it from the OFF position to ON, or ON to OFF. Allow operator to change bitmap file assignment and also create new and original bitmaps online. System shall be supplied with a library of standard bitmaps, which may be used unaltered or modified by the operator.

4. Analog objects shall be displayed with operator modifiable units. Analog input objects may also be displayed as individual bitmap items on the display screen as an overlay to the system graphic. Each analog input object may be assigned to a minimum office bitmap files, each with high/low limits for automatic selection and display of the bitmaps. As an example, a graphic representation of a thermometer would rise and fall in response to either the room temperature or its deviation from the controlling setpoint. Analog output objects, when selected with the mouse, shall be displayed as a prompted dialog (text only) box. Analog object values may be changed by selecting either the "increase" or "decrease" arrow in the analog object spinner box without using the keypad. Pressing the button on the right side of the analog object spinner box allows direct entry of an analog value and accesses various menus where the analog value may be used, such as trendlogs.
5. Analog objects may also be assigned to an area of a system graphic, where the color of the defined area would change based on the analog object's value. For example, an area of a floor plan graphic served by a single control zone would change color with respect to the temperature of the zone or its deviation from setpoint.
6. A customized menu label (push-button) shall be used for display selection. Menu items on a display shall allow penetration to lower level displays or additional menus. Dynamic point information and menu label push buttons may be mixed on the same display to allow sub-displays to exist for each item.
7. A mouse, or other form of digitizer, shall be used to move the pointer arrow to the desired item for selection of new display or to allow the operator to make changes to object data.
8. Displays may be modified on site or via remote communications.
9. Display resolution shall be limited by the CRT hardware and Windows software driver.
10. Entire system shall operate without dependency on the operator's terminal.

C. Password Protection:

1. Provide security system that prevents unauthorized use unless operator is logged on. Access shall be limited to operator's terminal functions unless user is logged on. This includes displays as outlined above.
2. Each operator's terminal shall provide security for at least 200 users. Each user shall have an individual User ID, User Name and Password. Each system user shall be allowed individual assignment of only those control functions and menu

items to which that user requires access. All passwords, user names, and access assignments shall be adjustable online at the operator's terminal. Each user shall also have a set security level, which defines access to displays and individual objects the user may control.

D. Display of Scheduling Object Information:

1. Operator's terminal display of weekly schedules shall show all information in easy-to-read 7-day (weekly) format for each schedule. This includes all ON/OFF times (to the minute) for each day's events.
2. BACnet exception schedules (non-normal schedules, such as holidays or special events) shall display all dates that are an exception to the weekly schedules. These specialty schedules shall be displayed at the operator's terminal in a format similar to the weekly schedules, again allowing easy data entry. User shall be able to scroll easily through the months for each year.
3. At the operator's terminal, the system user shall be able to change all information for a given weekly or exception schedule if logged on with the appropriate security access.

E. Alarm Indication:

1. Operator's terminal shall provide audible, visual, and printed means of alarm indication. The alarm dialog box shall always become the top dialog box regardless of the application(s), currently running (such as a word processor). Printout of alarms shall be sent to the assigned terminal and port.
2. System shall provide log of alarm messages. Alarm log shall be archived to the hard disk of the system operator's terminal. Each entry shall include a description of the event-initiating object generating the alarm, time and date of alarm occurrence, time and date of object state return to normal, and time and date of alarm acknowledgment.

F. Trend log Information:

1. System shall periodically gather historically recorded selected samples of object data stored in the field equipment (global controllers, field controllers) and archive the information on the operator's terminal (server) hard disk. Archived files shall be appended with new sample data, allowing samples to be accumulated over several years. Samples may be viewed at the operator's terminal in a Trendlog. Logged data shall be stored in spreadsheet format. Operator shall be able to scroll through all Trendlog data. System shall automatically open archive files as needed to display archived data when operator scrolls through the data vertically.
2. Software shall be included that is capable of graphing the trend logged object data. Software shall be capable of creating two-axis (x,y) graphs that display up to six object types at the same time in different colors. Graphs shall show object type value relative to time.
3. Operator shall be able to change trend log setup information. This includes the information to be logged as well as the interval at which it is to be logged. All input, output, and value object types in the system may be logged. All operations

shall be password protected. Setup and viewing may be accessed directly from any and all graphics object is displayed.

G. Energy Log Information:

1. System shall be capable of periodically gathering energy log data stored in the field equipment and archive the information on the operator terminal's hard disk. Archive files shall be appended with the new data, allowing data to be accumulated over several years. System shall automatically open archive files as needed to display archived data when operator scrolls through the data. Display all energy log information in standard engineering units.
2. System software shall be provided that is capable of graphing the energy log data. Software shall be capable of creating two-axis (x,y) graph that show recorded data, relative to time. All data shall be stored in comma delimited file format for direct use by third-party spreadsheet or other database programs. Operation of system shall not be affected by this operation.
3. Operator shall be able to change the energy log setup information as well. This includes the meters to be logged, meter pulse value, and the type of energy units to be logged. All meters monitored by the system may be logged. All operations shall be password protected.

H. Configuration/Setup:

1. Provide means for operator to display and change system configuration. This shall include, but not be limited to, system time, day of the week, date of daylight savings set forward/set back, printer termination, port addresses, port and speed, etc.

I. Programming Tools:

1. Operator's terminal shall include programming tools for all controllers. All controllers shall be programmed using graphical tools that allow the user to connect function blocks on screen that provide sequencing of all control logic. Function blocks shall be represented by graphical displays that are easily identified and distinct from different types of blocks. Graphical programming that uses simple rectangles and squares is not acceptable.
2. User shall be able to pick graphical function block from the menu and place it on the screen. Programming tools shall place lines connecting appropriate function blocks together automatically.
3. Programming tools shall include a test mode. Test mode shall show user real-time data on top of graphical display of selected function blocks. Data shall be updated real-time with no interaction by the user. Function blocks shall be animated to show status of data inputs and outputs. Animation shall show change of status on logic devices and countdown of timer devices in graphical format.

J. As-Built Display Viewer:

1. Provide software tool that displays as-built drawings supplied on disk with system. As-built drawing viewer shall as a minimum display AutoCad (*.dwg)

files and all other drawing types supplied on disk. User shall be able to display drawings with no degradation in system performance or operation. As-built drawings may be displayed while real-time data is shown and updated on screen along with as-built drawings.

K. Terminal Hardware:

1. Operator's terminal shall be provided and shall include the following as a minimum:

- Compatible PC (computer)
- 1 CD-ROM drive
- Microsoft Windows
- Bus mouse or equal (compatible with Windows)
- Keyboard
- Color printer

2.2 GLOBAL CONTROLLER (GC)

A. General:

1. Global controller shall provide battery-packed real-time (hardware) clock functions. It shall also provide communications via BACnet standard protocols to all field controllers. Global controller shall interface with operator terminal(s) via BACnet protocols for information display.
2. Global controller shall incorporate as a minimum, the functions of a 3-way BACnet router. Controller shall route BACnet messages between the high-speed LAN (Ethernet and/or ARCNET), master slave token passing (MS/TP), and point-to-point (PTP) or modem ports. GC shall have capability to easily function as a 4-way router with the addition of simple plug-in modules.
3. Global controller shall be capable of deciding global strategies for the system based on information from any objects in the system regardless if the object is directly monitored by the controller or by another controller. The program that implements these strategies shall be completely flexible and user definable. Program execution at global controller shall be a minimum of once per second.
4. Programming shall be object-oriented using control program blocks. Documentation in flowchart form for all programming shall be provided as part of the final system as-built documentation. Samples of flowchart documentation shall be included in submittals. All flowcharts shall be generated and automatically downloaded to controller. No reentry of database information shall be necessary.
5. Provide means to graphically view inputs and outputs to each program block in real-time as program is executing. This function may be performed via the operator's terminal, field computer, or modem.
6. Controller shall have a minimum of 2 MB battery-backed static RAM, expandable to 4 MB, along with 64K of EPROM. Battery shall retain static RAM memory and clock functions for a minimum of 1 year. Battery shall be a field replaceable (non-rechargeable) lithium type.

7. Global controller shall include display for network setup and monitoring. Display shall be backlit (LCD with 2-line by 20-character display. Include 8-key keypad for operator entry of data.

B. BACnet Conformance:

1. Global Controller shall as a minimum support Point-to-Point (PTP), MS/TP and either Ethernet or ARCNET BACnet LAN types. It shall communicate directly via these BACnet LANs as a native BACnet device and shall support simultaneous routing functions between all supported LAN types. Global controller shall be a BACnet conformance class 6 device and support all BACnet services necessary to provide the following BACnet functional groups:
 - a. Clock Functional Group
 - b. Hand Held Workstation Functional Group
 - c. Personal Computer Workstation Functional Group
 - d. Event Initiation Functional Group
 - e. Event Response Functional Group
 - f. COV Event Initiation Functional Group
 - g. Files Functional Group
 - h. Reinitialize Functional Group
 - i. Device Communications Functional Group
 - j. Time Master Functional Group
2. Standard BACnet object types supported shall include as a minimum: Analog Value, Binary Value, Calendar, Command, Device, File, Group, Notification Class, Program and Schedule object types.

C. Remote Communications:

1. Provide all functions that will allow remote communications to off-site locations.
2. Provide Windows software for off-site computer that allows operator to view and change all information associated with system on color graphic displays. Operator shall be able to change all parameters in this section from off-site location including all programming of global controllers and all programmable logic controllers including all terminal unit controllers. Web based programs are also acceptable.
3. Global controller shall have capability to call out alarm conditions automatically. Alarm message and site description shall be set to off-site computer or printer. All global controllers connected to the local LAN shall be capable of calling out alarm messages through one shared modem connected to one or more of the global controllers on the local LAN.
4. Global controller shall have capability to call a minimum of 20 different phone numbers. Numbers called may be controlled by type of alarm, time schedule, holiday schedule, or other selectable program parameters. Email notification is also acceptable.
5. Owner shall provide standard voice-grade phone line or LAN for remote communication function.

D. Schedules:

1. Each global controller shall support a minimum of 100 BACnet Schedule Objects and 100 BACnet Calendar Objects.
2. Each schedule object (Weekly or Exception) shall be capable of performing an optimum start. Optimum start calculation shall be based on outside air temperature, zone air temperature, deviation from zones, daytime heating and cooling setpoints, and individual zone adaptive heating and cooling coefficients that are adjusted each day based on performance parameters of the individual zone.

E. Logging Capabilities:

1. Each global controller shall log as a minimum 150 user selectable object types with a minimum of 100 samples per object with standard memory configuration. Logging shall be expandable (user defined), with additional memory in global controller. Any object in the system (real or calculated) may be logged. Sample time interval shall be adjustable at the operator's terminal. Start of sampling may be by one of the following: Selectable log beginning and ending by using BACnet Calendar and Schedule Objects.
Object change of value (all types of analog objects)
Object change of state (all types of binary objects)
2. Logs may be viewed both on-site or off-site via remote communication.
3. Global controller shall periodically upload trended data to operator's terminal for long term archiving if desired.
4. Archived data stored in database format shall be available for use in third party spreadsheet or database programs.

F. Alarm Generation:

1. Object change of values and change of states may be identified as alarm conditions. When such conditions exist, the global controller identifies each alarm through BACnet Get Alarm Summary Service. This summary of active alarms (Event State property value not equal to NORMAL) is presented to and displayed at the operator's terminal for system user action.
Alarms may be generated within the system for any object change of value or state either real or calculated. This includes things such as analog object value changes, binary object state changes, and various controller communication failure.
2. Alarm log shall be provided for alarm viewing. Log may be viewed on site at the operator's terminal or off-site via remote communications.

G. Demand Limiting:

1. System shall monitor energy demand. Energy demand may be from any type of energy source such as electrical or gas. Provide a demand-limiting routine which shall shed appropriate system objects to prevent the demand from exceeding preset limits. Demand-limiting routine shall be a priority shed type allowing automatic override of specified object type sheds when assigned analog object (temperature sensor) exceeds limits as set by system user at operator's terminal. Routine shall be able to change between sets of demand limit and restore

setpoints based on BACnet Schedule Objects or system user manual commands at operator's terminal.

2. Zone shed method shall be by either preventing zone heating and cooling operations, or by shifting zone heating and cooling setpoints.
3. All parameters of the demand limiting routine shall be modifiable from the operator's terminal or via remote communications.

2.3 ROUTER, CONVERTER, REPEATER

A. Routing functions shall be performed using only BACnet standard protocols as defined by ANSI/ASHRAE Standard 135. The converter interconnects a standard computer serial port with an MS/TP LAN. Repeater functions shall be handled by a device designed to selectively interconnect four (4) portions of MS/TP LAN as a minimum.

1. **ROUTERS:** The router shall perform the BACnet definition functions of interconnecting two or more BACnet LANs together, forming a BACnet internetwork. The router shall have optional plug-on boards permitting the following BACnet communication methods:
 - a. The router shall have the routing functionality of interconnecting BACnet Ethernet and/or ARCNET high-speed LAN to BACnet MS/TP LAN and one or more PTP LANs.
 - b. The router shall have capability of interconnecting BACnet Ethernet high-speed LAN to BACnet ARCNET high-speed LAN.
 - c. BACnet PTP (RS-232 point-to-point) communication shall be available on the global controller by including an (optional) modem. The PTP/modem option shall operate under the BACnet half router communication protocol.
 - d. BACnet messages may be routed to all LANs installed on the router at the same time with no operator intervention.
2. **CONVERTER:** A converter shall be provided to interface an portable filed service computer from its serial port (RS-232) to the BACnet MS/TP LAN (RS-485).
3. **REPEATERS:** BACnet repeaters shall provide selective interconnection to 4 segments of MS/TP LAN as a minimum. The repeater shall be an active device, containing logic capable of detecting and repeating signals from one MS/TP LAN segment to all other segments. Repeaters shall permit additional nodes to be added to the MS/TP LAN, up to a maximum of 254 nodes.

2.4 AIR HANDLER LOGIC CONTROLLER

- A. Provide one or more native BACnet logic controllers for each air handler. All controllers shall interface to global controller via MS/TP LAN using BACnet protocol. No gateways shall be used. Controllers shall include input, output and self-contained logic program as needed for complete control of units. Controllers shall be fully programmable.
- B. Logic controllers shall as a minimum support MS/TP BACnet LAN types. They shall communicate directly via this BACnet LAN at 9.6, 19.2, 38.4 and 76.8 Kbps, as native BACnet devices. Logic controllers shall be of BACnet conformance class 3 and support all BACnet services necessary to provide the following BACnet functional groups:

1. Files Functional Group
 2. Reinitialize Functional Group
 3. Device Communications Functional Group
- C. Logic controllers shall include universal inputs with 10-bit resolution that accept 3K and 10K thermistors, 0-10VDC, 4-20 mA and dry contact signals. Any input on controller may be either analog or digital. Controller shall also include support and modifiable programming for interface to intelligent room sensor with digital display. Controller shall include binary and analog outputs on board. Analog outputs shall be switch selectable as either 0-10VDC or 0-20mA. Software shall include scaling features for analog outputs. Logic controller shall include 24 VDC voltage supply for use as power supply to external sensors.
- D. All program sequences shall be stored on board logic controller in EEPROM. No batteries shall be needed to retain logic program. All program sequences shall be executed by controller 10 times per second and capable of multiple PID loops for control of multiple devices. All calculations shall be completed using floating-point math and system shall support display of all information in floating-point nomenclature at operator's terminal.

Programming of logic controller shall be completely modifiable in the field over installed BACnet LANs or remotely via modem interface. Operator shall program logic sequences by graphically moving function blocks on screen and tying blocks together on screen. Logic controller shall be programmed using programming tools as described in operator's terminal section.

All programming tools shall be provided as part of system. Provide documentation in flowchart form of all programming as part of the final system as-built documentation. Include samples of flowchart documentation in submittals.

- E. Logic controller shall include software scheduling functions on board without depending on any external device. Scheduling shall be via a BACnet schedule object for seven-day of the week scheduling. Controller shall include interface capability for optional plug-in hardware clock with battery back-up. Provide optional hardware clock as shown on object list given in drawing set.
- F. Logic controller shall include support for intelligent field sensor (see section 2.9B). Display on field sensor shall be programmable at logic controller and include an operating mode and a field service mode. All button functions and display data shall be programmable to show specific controller data in each mode based on which button is pressed on the sensor.

2.5 VALVE AND ACTUATORS

A. Electronic Actuator Specification

1. Electronic Valve Actuators:
 - a. Actuator shall be fully modulating, floating (tri-state), two position, and/or spring return. Specified fail safe actuators shall require mechanical spring return.

- b. Modulating valves shall be positive positioning, responding to a 2-10VDC or 4-20mA signal. There shall be a visual valve position indicator.
 - c. The actuator shall have the capability of adding auxiliary switches or feedback potentiometer if specified.
 - d. Actuator shall provide minimum torque required for proper valve close-off. The actuator shall be designed with a current limiting motor protection. A release button, clutch or handle on the actuator shall be provided to allow for manual override (except when actuator is spring return type).
 - e. Actuators shall be UL listed.
2. All actuators shall be manufactured by Belimo.

2.6 DAMPERS AND ELECTRONIC DAMPER ACTUATORS

- A. Provide 5100 model parallel or opposed blade control dampers as manufactured by Vent Products. Blades to be 16 ga. V-reinforced galvanized steel. Welded frame to be Fasten E/Z press formed 14 ga. Galvanized steel complete with fully adjustable linkage and control rods. Blades to be custom sized for maximum free area without blank-offs. Ruskin and Greenheck are acceptable manufacturers.
- B. Electronic Damper Actuators:
1. Actuator shall be direct coupled (over the shaft), enabling it to be mounted directly to the damper shaft without the need for connecting linkage. The actuator-to-shaft clamp shall use a "V" bolt and "V" shaped, toothed cradle to attach to the damper shaft for maximum holding strength.
 2. Actuator shall have electronic overload or digital rotation sensing circuitry to prevent damage to the actuator throughout the rotation of the actuator.
 3. For power failure/safety applications, a mechanical, spring return mechanism shall be used.
 4. Actuators with spring return mechanisms shall be capable of either clockwise or counterclockwise spring return operation by simply changing the mounting orientation.
 5. Proportional actuators shall accept a 2-10VDC, 4-20mA signal, or be of the 2-point floating type and provide a 2-10VDC actuator position feedback signal.
 6. All actuators shall have external manual gear release (clutch) or manual crank to aid in installation and for allowing manual positioning when the actuator is not powered.
 7. All actuators shall have external direction of rotation switch to aid in installation and to allow proper control response.
 8. Actuators shall be provided with factory-mounted 3-foot electrical cable and conduit fitting to provide easy hook-up to an electrical junction box.
 9. Actuators shall be listed under Underwriters Laboratories Standard 873.
 10. All Actuators shall be manufactured by Belimo.

2.7 SENSORS

- A. Temperature Sensors:

All temperature sensors to be solid state electronic, factory-calibrated to within 0.5°F, totally interchangeable. Wall sensors are to be housed in tamperproof enclosures. Duct sensors are to be electronically identical, housing suitable for the application.

B. Wall Sensor (other than VAV box sensors):

Standard wall sensor shall use solid state sensor and shall be packaged in aesthetically pleasing enclosure. Sensor shall provide override function, warmer/cooler lever for setpoint adjustment and jack for plug-in of service tool for field adjustments. Override time shall be stored in controller and be adjustable on a zone-by-zone basis. Adjustment range for warmer/cooler lever shall also be stored EEPROM on controller.

C. All sensors installed on outside walls shall be provided with an insulated sub-base.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Prior to starting work, carefully inspect installed work of other trades and verify that such work is complete to the point where work of this Section may properly commence.
- B. Notify the Owners representative in writing of conditions detrimental to the proper and timely completion of the work.
- C. Do not begin work until all unsatisfactory conditions are resolved.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide all miscellaneous devices, hardware, software, interconnections installation and programming required to ensure a complete operating system in accordance with the sequences of operation and point schedules.

3.3 LOCATION AND INSTALLATION OF COMPONENTS

- A. Locate and install components for easy accessibility; in general, mount with a minimum 3' – 0" clear access space in front of units. Obtain approval on locations from Owner's representative prior to installation.
- B. All instruments, switches, transmitters, etc. shall be suitable wired and mounted to protect them from vibration, moisture and high or low temperatures.
- C. Identify all equipment and panels. Provide permanently mounted tags for all panels.
- D. Provide stainless steel or brass thermowells suitable for respective application and for installation under other sections sized to suit pipe diameter without restricting flow.

3.4 INTERLOCKING AND CONTROL WIRING

- A. Provide all interlock and control wiring. All wiring shall be installed neatly and professionally, in accordance with Specification Division 26 and all the NEC.
- B. Provide wiring as required by functions as specified and as recommended by equipment manufacturers, to serve specified control functions.
- C. Control wiring shall not be installed in power circuit raceways. Magnetic starters and disconnect switches shall not be used as junction boxes. Provide auxiliary junction boxes as required.
- D. Provide auxiliary pilot duty relays on motor starters as required for control function.
- E. Provide power for all control components from nearest electrical control panel or as indicated on the electrical drawings. Coordinate with electrical contractor prior to bid, so that all power required for the Energy Management System is included in the bid.
- F. All control wiring in the mechanical, electrical, and telephone rooms to be installed in raceways. All other wiring is to be installed neatly and inconspicuously per local code requirements. All underground conduit and wall sensor conduit shall be provided and installed with pull string. The contractor shall coordinate with the Division 26 installer prior to bids such that all required conduit is in the contract sum.
- G. All exhaust air fans shall be interlocked with the motorized outside air damper such that the fans operation is prohibited if the outside air damper is closed. Refer to control sections for further requirements and scheduling.

3.5 DDC OBJECT TYPE SUMMARY

- A. Provide all database generation.
- B. System displays shall show all analog and binary object types within the system. They shall be logically laid out for easy use by the Owner. Provide outside air temperature indication on all system displays associated with economizer cycles
- C. At a minimum, run time totalization shall be incorporated for each monitored supply fan, return fan, exhaust fan, and chilled/hot/condensing water pumps. Warning limits for each point shall be entered for alarm and or maintenance purposes.
- D. All binary and analog object types (including zones) shall have the capability to be automatically trended.
- E. All analog inputs (high/low limits) and selected binary input alarm points shall be prioritized and routed (locally or remotely) with alarm message per owner's requirements.
- F. Provide back-up database for all stand-alone logic controllers on disk.

3.6 FIELD SERVICES

- A. Prepare and start logic control system.
- B. Start-up and commission systems. Allow sufficient time for start-up and commissioning prior to placing control systems in permanent operation. Control system installer shall be on site during the Test and Balance Procedure and provide all training/assistance as necessary for proper commissioning of the system.
- C. Provide the capability for off-site monitoring at control contractor's local or main office. At a minimum, off-site facility shall be capable of system diagnostics and software download.
- D. Provide Owner's Representative with spare parts list. Identify equipment critical to maintaining the integrity of the operating system.

3.7 TRAINING

- A. Provide application engineer to instruct owner in operation of systems and equipment.
- B. Provide system operator's training to include (but not limited to) such items as the following: modification of data displays, alarm and status descriptors, requesting data, execution of commands and request of logs. Provide this training to a minimum of 3 persons.
- C. Provide training as required, up to 40 hours as part of this contract.

3.8 DEMONSTRATION

- A. Demonstrate complete operating system to Owner's representative.
- B. Provide certificate stating that control system has been tested and adjusted for proper operation, on a point to point basis (Control System's Certification).

END OF SECTION 230900

SECTION 232100 – INSTALLATION OF HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The Bidding Requirements and Contractual Conditions set forth in Division 01 apply to this section.
- B. Examine other sections of the Project Manual for requirements which affect work of this section whether or not such work is specifically mentioned in this section.
- C. The requirements of Section 230000 - HVAC apply to this section.

PART 2 - PRODUCTS

2.1 UNIONS

- A. Unions in copper pipe shall be Bronze 150# ground joint, solder end. Mueller, Chase or Nibco are acceptable alternative manufacturers.
- B. Unions in steel pipe shall be Black malleable iron, bronze ground ball joint. Mueller, Chase or Nibco are acceptable alternative manufacturers.
- C. Dielectric unions: Capitol, Dart, or Vogt.

2.2 VALVES

- A. Drain valves: 3/4" bronze or brass hose and gate, Powell 503 HS where exposed, Powell 502 HS with cap and chain where concealed.
- B. Flanged joints of valves: Spirotallic-Condren #913, 304 stainless steel with carbon steel guide, 150# flanges.

2.3 NIPPLES

- A. Nipples shall be same weight and material as pipe in which they are installed.
- B. Close and shoulder nipples shall be extra heavy.

2.4 EXPANSION LOOPS

- A. For piping systems fabricated from pipe and couplings, use one of the following methods for expansion compensation.

Combination Couplings and Nipples: Provide Victaulic Style 150 or Style 155 expansion joints constructed of short pipe nipples and couplings, designed by manufacturer to suit intended service. Provide removable ties to hold joint compressed or expanded during

pipng fabrication. Select couplings and gasket materials to match balance of piping system.

Expansion Loops: Provide (8) Victaulic flexible couplings, (4) 90 degree elbows, and (3) grooved end pipe spools, provided in water piping systems up to 250 deg F. in accordance with Victaulic recommendations for expansion compensation.

- B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering expansion joints for grooved piping which may be incorporated in the work include, but are not limited to, the following:

Stockham Valves & Fittings, Inc.
Victaulic

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

- A. Cut pipe accurately, remove burrs by reaming, and work into place without forcing or springing.
- B. Use pipe lubricant on male threads only. Teflon pipe joint tape may be used.
- C. Make all changes of direction with fittings, rather than bending.
- D. Install piping level, except where specifically required to pitch. Arrange piping to allow draining the entire system.
- E. Use eccentric reducers, keeping top of pipe level in water systems.
- F. Bull head connections in any piping service are prohibited.
- G. All piping shall be installed in a neat and workmanlike manner and parallel to building walls, floors, etc.
- H. Properly support all relief valve discharge piping.
- I. No pipes shall cross over or within 3-0" of electrical panels.
- J. Condensate piping shall be pitched a minimum of 1/8" per foot and cleanouts provided at every 90 degree bend and at convenient intervals in straight lines. A trap shall be provided at each equipment connection to drain, refer to detail on the drawings. Water seal must exceed maximum pressure developed by the equipment.
- K. Grooved piping products shall be installed in accordance with the manufacturer's (Victaulic) guidelines and recommendations. All grooved couplings, fittings, valves, and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components. The gasket style and elastomeric material (grade) shall be verified as suitable for the intended service as specified. Gaskets shall be molded and produced by Victaulic. Grooved end shall be clean and

free from indentations, projections, and roll marks in the area from pipe end to groove for proper gasket sealing. A Victaulic factory-trained field representative shall provide on-site training for contractor's field personnel in the proper use of grooving tools and installation of grooved piping products. Factory-trained representative shall periodically review the product installation. Contractor shall remove and replace any improperly installed products.

3.2 VALVES AND SPECIALTIES

- A. Install with hand-wheel at or above center line of pipe.
- B. Install with union downstream of valve.
- C. Install with sweat adapters upstream of valve.
- D. Install where accessible.
- E. Provide drain valve at low points in piping.
- F. Install the thermometers and gauges to be readable from the floor.
- G. Blow down valves and strainers shall be installed to allow removal of strainer baskets and servicing.
- H. Install air vents at all highpoints, piping drops and other points where necessary for air removal.

3.3 ESCUTCHEONS

- A. Provide chrome plated escutcheons for exposed piping passing through walls, floors and ceilings or finished areas.
- B. Protect from tool marks.

3.4 UNIONS AND FLANGES

- A. Flanged joints shall be accessible, faced true and square.
- B. Provide unions or flanges at all connections to equipment and fixtures to facilitate removal and servicing.
- C. Provide dielectric unions or flanges between dissimilar metals, such as copper to steel.

3.5 COORDINATION

- A. Drawings are schematic.
- B. Where interferences develop, piping shall be offset or rerouted as required.

- C. Where piping is installed in accessible chases, keep all piping to sides of chase, except for portions which must be in the center of the chase. Offset vents to side immediately above connection to waste line.
- D. Piping shall be concealed except in unfinished rooms and except as otherwise shown.

3.6 EXPANSION CONTROL

- A. Install piping to permit free expansion and contraction without damage to joints and hangers.
- B. Provide pipe loops or offsets in supply and return lines where required or necessary for accurate control of movement.
- C. Pipe branches from mains must incorporate at least one change of direction in horizontal plane, and one change of direction in vertical plane, before connecting to equipment or fixtures, unless main is anchored at branch take-off.
- D. Install flexible connections or Victaulic flexible couplings to vibrating equipment.
- E. Provide securely supported pipe anchors and guides where required or necessary to control expansion and contraction of piping.

3.7 WELDING

- A. All welding shall be completed by certified welders.
- B. Welding and non-destructive examinations shall meet the requirements of ANSI B31.1, Power Piping, recent published edition.
- C. Provide safety barriers and fireproof clothes to protect personnel and materials near welding operations.

3.8 EXPANSION LOOPS

- A. Fabricate expansion loops as indicated, in locations indicated, and elsewhere as determined by Installer for adequate expansion of installed piping system. Subject loop to cold spring which will absorb 50% of total expansion between hot and cold conditions.

Provide pipe anchors and pipe alignment guides as indicated, and elsewhere as determined by Installer to properly anchor piping in relationship to expansion loops. See drawings for detail of anchors.

- B. Install expansion loops where indicated and elsewhere as determined by Installer for adequate expansion of installed piping system. Install in accordance with manufacturer's instructions. Provide pipe anchors alignment guides as indicated, and in accordance with manufacturer's recommendations. Align units properly to avoid end loading and stress.

3.9 EXPANSION JOINTS

- A. Install expansion joints where indicated, and elsewhere as determined by Installer for adequate expansion of installed piping system. Install in accordance with manufacturer's instructions. Provide pipe anchors and pipe alignment guides as indicated, and in accordance with manufacturer's recommendations. Align units properly to avoid end loading and stress.

END OF SECTION 232100

SECTION 232101 – HVAC PIPE, TUBE AND FITTINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The bidding requirements and contractual conditions of Division 01 are applicable to this section.
- B. Examine other sections of the Project Manual for requirements which affect work of this section whether or not such work is specifically mentioned in this section.
- C. Requirements of Section 230000 – HVAC shall apply to this section.

1.2 DESCRIPTION OF WORK

- A. Extent of pipe, tube, and fittings required by this section is indicated on drawings and/or specified in other Division 23 sections. Drawings are diagrammatic and do not indicate every bend, fitting, etc. required for installation in the space allotted. Coordinate the work of this section with other work to avoid conflicts.
- B. Types of pipe, tube, and fittings specified in this section include the following:
 - 1. Piping Materials:
 - Steel pipe
 - Copper tube
 - PVC Pipe
 - 2. Pipe/Tube Fittings:
 - Fittings for steel pipe
 - Fittings for copper tube
 - Fittings for PVC Pipe
 - Fittings for steel pipe (underground)
 - 3. Grooved piping products.
 - 4. Expansion Compensation.
 - 5. Miscellaneous piping materials/products.
- C. HVAC Pipe, tube, and fittings furnished as part of factory-fabricated equipment, are specified as part of the equipment assembly in other Division 23 sections.

1.3 QUALITY ASSURANCE

- A. Manufacturers: Firms regularly engaged in the manufacture of pipe, tube, and fittings of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Welding procedures, welders and operators shall be in accordance with ANSI B31.1, for shop and project site welding of piping work.
 - 1. All welding shall be accomplished by certified welders.

2. Repair or replace any welding work not in accordance with this specification. Contractor shall at his own expense and when directed by the Architect, X-ray and randomly selected welds using the services of a certified test laboratory.

- C. Brazing: Certify brazing procedures, brazers, and operators in accordance with ANSI B31.5, paragraph 527.5 for shop and job-site brazing of piping work.
- D. Requirements of the Florida Building Code 2004 with 2005 Revisions must be met.
- E. Appropriate ASTM, ANSI, UL, ASME, and NFPA Standards must be met.
- F. To assure uniformity and compatibility of piping components in grooved piping systems, all grooved products utilized shall be supplied by a single manufacturer. Grooving tools shall be supplied by the same manufacturer as the grooved components.

1.4 SUBMITTALS

- A. Product Data: Submit catalog cuts, specifications, installation instruction, and dimensional drawings for each type of pipe, tube, and fitting. Submit piping schedule showing manufacturer, pipe or tube weight, fitting type, and joint type for each piping system.
- B. Grooved joint couplings and fittings shall be shown on drawings and product submittals and shall be specifically identified with the applicable Victaulic style or series number.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Except for concrete, hub-and-spigot, and similar types of pipe, factory-applied plastic end-caps on each length of pipe and tube shall be provided. Maintain end-caps through shipping, storage and handling as required to prevent pipe end damage and to eliminate dirt and moisture from inside the pipe and tube.
- B. Where possible, store pipe and tube inside and protected from the weather. Where necessary to store outside, elevate above ground and enclose with durable, waterproof wrapping.
- C. Protect flange and fittings from moisture and dirt by inside storage and enclosure, or by packaging with durable, waterproof wrapping.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Provide pipe and tube of type, joint type, grade, size and weight (wall thickness or class) indicated for each service. Where type, grade or class is not indicated, provide proper selection as determined by Installer for the installation and comply with governing regulations and industry standards.
- B. Steel Pipe (Schedule 40):

1. Black Steel Pipe: ANSI/ASTM A 53, A 106 or A 120; except comply with ANSI/ASTM A 53 or A 106 where close coiling or bending is required.
2. Electric-Resistance-Welded Steel Pipe: ANSI/ASTM A 135.
3. Electric-Fusion-Welded Steel Pipe: ANSI/ASTM A 672.

C. Copper Tube: ANSI/ASTM B 88; Type (L not buried), Type K (buried), hard-drawn temper, except as otherwise indicated.

1. DWV Copper Tube: ANSI/ASTM B 306.

2.2 PIPE/TUBE FITTINGS

A. Provide factory-fabricated fittings of type, materials, grade, class and pressure rating indicated for each service and pipe size. Provide sizes and types matching pipe, tube, valve or equipment connections in each case. Where not otherwise indicated, comply with governing regulations and industry standards for selections, and with pipe manufacturer's recommendations.

B. Fittings for steel pipe: Class 125 (low pressure), 150 (high pressure).

1. Malleable Iron Threaded Fittings: ANSI B16.3; plain, Class 150.
2. Malleable Iron Threaded Unions: ANSI B16.39; selected by Installer for proper piping fabrication and service requirements, including style, end connections, and metal-to-metal seats (iron, bronze or brass); plain, Class 150.
3. Threaded Pipe Plugs: ANSI B16.14.
4. Steel Flanges/Fittings: ANSI B16.5, Class 150, including bolting and gasketing of the following material group, end connection and facing, except as otherwise indicated.
 - a. Material Group: Group 1.1.
 - b. End Connections: Butt welding.
 - c. Facings: Raised-face.

C. Fittings for Copper Tube:

1. Cast-Copper Solder-Joint Fittings: ANSI B16.18.
2. Cast-Copper Solder-Joint Drainage Fittings: ANSI B16.23.
3. Cast-Copper Flared Tube Fittings: ANSI B16.26, Class 150.
4. Non-Ferrous Pipe Flanges: ANSI B16.31, Class 150.
5. Copper-Tube Unions: Provide standard products recommended by manufacturer for use in service indicated.

2.3 GROOVED PIPING PRODUCTS

A. Mechanical grooved pipe couplings and fittings may be used for piping systems having operating conditions not exceeding 250°F. (120°C.), in lieu of welded, flanged, or threaded methods, and may also be used as unions, seismic joints, flexible connections, expansion joints, expansion compensators, or vibration reducers.

- B. Coupling Housings: Ductile iron conforming to ANSI/ASTM A 536.
- C. Coupling Housings Description: Grooved mechanical type, which engages grooved or shouldered pipe ends, encasing an elastomeric gasket which bridges pipe ends to create seal. Cast in two parts, secure together during assembly with nuts and bolts. Permit degree of constriction and expansion as specified in manufacturer's latest published literature.
- D. Gaskets: Mechanical grooved coupling design, pressure responsive so that internal pressure serves to increase seal's tightness, constructed of elastomeric having properties as designated by ANSI/ASTM D 2000.
1. Water Services: EPDM Grade E, for temp range -30°F to $+230^{\circ}\text{F}/-34^{\circ}\text{C}$ to $+110^{\circ}\text{C}$, with green color code identification.
 2. Water services: EPDM Grade EHP, for temp range -30°F to $+250^{\circ}\text{F}/-34^{\circ}\text{C}$ to $+121^{\circ}\text{C}$, with red color code identification.
 3. Other Services: As recommended by Manufacturer.
- E. Bolts and Nuts: Heat treated carbon steel, ANSI/ASTM A 183, or ASTM A 449, minimum tensile 110,000 psi.
1. Exposed Locations: Tamper resistant nuts.
- F. Rigid Type: Coupling housings cast with offsetting, angle-pattern bolt pads shall be used to provide system rigidity and support and hanging in accordance with ANSI B31.1 and B31.9.
1. Victaulic Style 107 "Quick Vic™" Installation ready rigid coupling designed for direct "stab" installation onto grooved end pipe without prior disassembly of the coupling. Gasket shall be Grade "EHP" EPDM compound with red color code designed for water temperatures to 250 deg F.
 2. Victaulic Style 07 "Zero-Flex®" standard rigid coupling with Grade "E" EPDM compound with green color code designed for water temperatures to 230 deg F.
- G. Flexible Type: Use in locations where vibration attenuation and stress relief are required. Flexible couplings may be used in lieu of flexible connectors for vibration isolation at equipment connections. Three (3) couplings, for each connector, shall be placed in close proximity to the vibration source.
1. Victaulic Style 177 "Quick Vic™" Installation ready flexible coupling designed for direct "stab" installation onto grooved end pipe without prior disassembly of the coupling. Gasket shall be Grade "EHP" EPDM compound with red color code designed for water temperatures to 250 deg F.
 2. Victaulic Style 75 or 77 standard flexible coupling with Grade "E" EPDM compound with green color code designed for water temperatures to 230 deg F.
- H. AGS "W" Series Couplings 14" through 24": Two ductile iron housings cast with a wide key profile, lead-in chamfer and flat bolt pads for metal-to-metal contact. Gaskets shall be wide-width, pressure-responsive synthetic rubber of a FlushSeal® design, and plated steel bolts and nuts.

1. Rigid Type: Provides a rigid joint that corresponds with support spacings as defined by ASME B31.1 and B31.9. Victaulic Style W07.
 2. Flexible Type: Allows linear and angular movement, vibration attenuation and stress relief. Victaulic Style W77.
- I. Branch Stub-Ins: Upper housing with full locating collar for rigid positioning engaging machine-cut hole in pipe, encasing elastomeric gasket conforming to pipe outside diameter around hole, and lower housing with positioning lugs, secured together during assembly with nuts and bolts.
- J. Fittings: Grooved or shouldered end design to accept grooved mechanical couplings.
1. Ductile Iron: ANSI/ASTM A536 or ASTM A395/A395M.
 2. Fabricated Steel: ANSI/ASTM A 523, Type F for 3/4" to 1-1/2"; Type E or S, Grade B for 2" to 20". 53
 3. Steel: ANSI/ASTM A234.
- K. Flanges: Conform to Class 125 cast iron and Class 150 steel bolt alignment. Victaulic Style 741 and W741.
1. Ductile Iron: ASTM A536.
- L. Grooved End Fittings for Copper Tube: ASME B16.22 wrought copper or ASME B16.18 bronze sand castings with copper tube dimensioned grooved ends designed to accept Victaulic installation ready couplings (flaring of tube and fitting ends to IPS dimensions is not permitted).
1. "Installation Ready" stab-on couplings shall be designed for direct 'stab' installation onto roll grooved copper tube without prior field disassembly and no loose parts. Housings shall be cast ductile iron, with offsetting, angle-pattern bolt pads, coated with copper-colored enamel. Gasket shall be Grade "EHP" EPDM suitable for hot water temperatures up to 250 deg F, and plated steel bolts and nuts. Victaulic Style 607 QuickVic™.
 2. Flange adapters shall be copper tube dimensioned, flat face, ductile Iron housing coated with copper-colored enamel, conform to Class 125 and Class 150 bolt-hole alignment. Victaulic Style 641.
- M. Grooves: Conform to the following:
1. Standard Steel: Standard Square cut or roll grooved.
 2. Cast Iron: Radius cut grooved, ANSI/AWWA C606.
- N. Available Manufacturers: Subject to compliance with requirements, manufacturers offering grooved piping products which may be incorporated in the work include, but are not limited to, the following:

Stockham Valves & Fittings, Inc.
Victaulic

2.4 MISCELLANEOUS PIPING MATERIALS/PRODUCTS

- A. Welding Materials: provide welding materials as determined by Installer to comply with Section II, Part C, ASME Boiler and Pressure Vessel Code for welding materials.
- B. Soldering Materials: Provide soldering materials as determined by Installer to comply with the following installation requirements:
 - 1. Tin-Antimony Solder: Water ANSI/ASTM B 32, Grade 95TA.
 - 2. Silver Solder: Medical Gas, Refrigeration, ANSI/ASTM B 32, Grade 96.5TS.
- C. Brazing Materials: Provide brazing materials as determined by Installer to comply with Section IX, ASME Boiler and Pressure Vessel Code.
- D. Gaskets for Flanged Joints: ANSI B16.21; full-faced for cast-iron flanges, raised-face for steel flanges, unless otherwise indicated.
- E. Piping Connectors for Dissimilar Non-Pressure Pipe: Elastomeric annular ring insert, or elastomeric flexible coupling secured at each end with stainless steel clamps, sized for exact fit to pipe ends and subject to approval by plumbing code.
- F. Available Manufacturers: Subject to compliance with requirements, manufacturers offering piping connectors which may be incorporated in the work include, but are not limited to, the following: Fernco, Inc.

2.5 EXPANSION LOOPS

- A. General: For piping systems fabricated from pipe and couplings, use one of the following methods for expansion compensation.
 - 1. Combination Couplings and Nipples: Provide Victaulic Style 150 or Style 155 expansion joints constructed of short pipe nipples and couplings, designed by manufacturer to suit intended service. Provide removable ties to hold joint compressed or expanded during piping fabrication. Select couplings and gasket materials to match balance of piping system.
 - 2. Expansion Loops: Provide (8) Victaulic couplings, (4) 90 degree elbows, and (3) grooved end pipe spools, provided in copper or steel water piping systems up to 250 deg F. in accordance with Victaulic recommendations for expansion compensation.
- B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering expansion joints for grooved piping which may be incorporated in the work include, but are not limited to, the following:

Stockham Valves & Fittings, Inc.
Victaulic Co. of America

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install pipe, tube and fitting in accordance with recognized industry practices which will achieve permanently leakproof piping systems, capable of performing each indicated service without piping failure. Install each run with minimum joints and couplings, but with adequate and accessible unions for disassembly and maintenance/replacement of valves and equipment. Reduce sizes (where indicated) by use of reducing fittings. Align piping accurately at connections, within 1/16" misalignment tolerance. Comply with ANSI B31 Code for pressure piping.
- B. Locate piping runs vertically and horizontally (pitched to drain) and avoid diagonal runs wherever possible. Orient horizontal runs parallel with walls and column lines. Locate runs as shown or described by diagrams, details and notations or, if not otherwise indicated, run piping in shortest route which does not obstruct usable space or block access for servicing building and its equipment. Hold piping close to walls, overhead construction, columns and other structural and permanent enclosure elements of buildings; limit clearance to 1/2" where furring is shown for enclosure or concealment of piping, but allow for insulation thickness, if any. Where possible, locate insulated piping for 1.0" clearance outside insulation. Wherever possible in finished and occupied spaces, conceal piping from view, by locating in column enclosures, in hollow wall construction or above suspended ceilings; do not encase horizontal runs in solid partitions, except as indicated.
- C. Do not run piping through transformer vaults and other electrical or electronic equipment spaces and enclosures unless unavoidable. Install drip pan under piping that must be run through electrical spaces, verify with Engineer prior to running of pipe.
- D. Provide joints of type indicated in each piping system.
 - 1. Thread pipe in accordance with ANSI B2.1; cut threads full and clean using sharp dies. Ream threaded ends to remove burrs and restore full inside diameter. Apply pipe joint compound, or pipe joint tape (Teflon) where recommended by pipe/fitting manufacturer, on male threads at each joint and tighten joint to leave not more than 3 threads exposed.
 - 2. Braze copper tube and fitting joints in accordance with ANSI B31.
 - 3. Solder copper tube-and-fitting joints where indicated, in accordance with recognized industry practice. Cut tube ends squarely, ream to full inside diameter, and clean outside of tube ends and inside of fittings. Apply solder flux to joint areas of both tubes and fittings. Insert tube full depth into fitting, and solder in manner which will draw solder full depth and circumference of joint. Wipe excess solder from joint before it hardens.
 - 4. Weld pipe joints in accordance with ANSI B31.
 - 5. Weld pipe joints in accordance with recognized industry practices.
 - 6. Weld pipe joints of steel water pipe in accordance with AWWA C206.
 - 7. Flanged Joints: Match flanges within piping system, and at connections with valves and equipment. Clean flange faces and install gaskets. Tighten bolts to provide uniform compression of gaskets.

8. Grooved Pipe Joints: Comply with fitting manufacturer's instructions for making grooves in pipe ends. Remove burrs and ream pipe ends. Assemble joints in accordance with manufacturer's instructions. The gasket style and elastomeric material (grade) shall be verified as suitable for the intended service as specified. Gaskets shall be molded and produced by Victaulic. Grooved end shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove for proper gasket sealing. A Victaulic factory-trained field representative shall provide on-site training for contractor's field personnel in the proper use of grooving tools and installation of grooved piping products. Factory-trained representative shall periodically review the product installation. Contractor shall remove and replace any improperly installed products.

3.2 EXPANSION LOOPS

- A. General: Fabricate expansion loops as indicated, in locations indicated, and elsewhere as determined by Installer for adequate expansion of installed piping system. Subject loop to cold spring which will absorb 50% of total expansion between hot and cold conditions.

Provide pipe anchors and pipe alignment guides as indicated, and elsewhere as determined by Installer to properly anchor piping in relationship to expansion loops. See drawings for detail of anchors.

- B. Install expansion loops where indicated and elsewhere as determined by Installer for adequate expansion of installed piping system. Install in accordance with manufacturer's instructions. Provide pipe anchors alignment guides as indicated, and in accordance with manufacturer's recommendations. Align units properly to avoid end loading and torsional stress.

3.3 EXPANSION JOINTS

- A. General: Install expansion joints where indicated, and elsewhere as determined by Installer for adequate expansion of installed piping system. Install in accordance with manufacturer's instructions. Provide pipe anchors and pipe alignment guides as indicated, and in accordance with manufacturer's recommendations. Align units properly to avoid end loading and torsional stress.

3.4 CLEANING, FLUSHING AND FILLING

- A. Remove strainer, automatic air vents, and flow regulators from all HVAC piping systems and ensure all control and shut-off valves are fully open. Flush each HVAC system for a minimum of two hours.
- B. Each HVAC piping system shall be thoroughly cleaned by filling with a solution of commercial cleaning chemicals designed to remove deposits such as pipe dope, oils, loose mill scale, rust and other extraneous materials. The recommended dosages and characteristics of the cleaner shall be such that the water need only be at ambient temperature. After the recommended dosages are added, the water shall be circulated for 36-72 hours. Systems shall then be drained, filled and flushed with clean water until

no foreign matter is observed and total alkalinity of rinse water is equal to that of the makeup water.

- C. Replace strainers, air vents, and flow regulators and fill system with clean water. In closed systems ensure expansion tank is approximately 2/3 water at system working pressure.
- D. Each system shall be properly treated to prevent scaling and corrosion in accordance with the Water Treatment section of this Project Manual.

3.5 PIPING TESTS

- A. Test pressure piping in accordance with ANSI B31.
- B. Provide temporary equipment for testing, including pump and gauges. Test piping system before insulation is installed. Remove control devices before testing. Test each natural section of each piping system independently but do not use piping system valves to isolate sections where test pressure exceeds valve pressure rating. Fill each section with water and pressurize for indicated pressure and time.
- C. Required test period is 24 hours with no pressure drop.
- D. Test long runs of Schedule 40 pipe at 150 psi, except where fittings are a lower Class or pressure rating.
- E. Test each piping system at 150% of operating pressure indicated, but not less than 25 PSI test pressure.
- F. Observe each test section for leakage at end of test period. Test fails if leakage is observed or if pressure drop exceeds 5% of test pressure.
- G. Repair piping systems sections which fail required piping test, by disassembly and re-installation, using new materials to extent required to overcome leakage. Do not use chemicals, stop-leak compounds, mastics, or other temporary repair methods.
- H. Drain test water from piping systems after testing and repair work has been completed.

END OF SECTION 232101

SECTION 232115 – CONDENSATE PIPING SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to work of this section.
- B. Division 23 Basic Materials and Methods sections apply to work of this section.
- C. Examine other sections of the Project Manual for requirements which affect work of this section whether or not such work is specifically mentioned in this section.

1.2 DESCRIPTION OF WORK

- A. Extent of condensate piping work is indicated on the drawings and schedules, as indicated in Mechanical General Provisions and by requirements of this section.
- B. Applications for condensate piping include the following:
 - 1. Conductor piping from air handling equipment to building storm drain or as indicated on drawings.
 - 2. Refer to appropriate Division 2 sections for exterior condensate system required in conjunction with storm water piping.
 - 3. Refer to appropriate Division 23 sections for insulation required in conjunction with condensate piping.
 - 4. Trenching and backfill required in conjunction with storm water piping is specified in applicable Division 2 sections, and is included as work of this section.

PART 2 - PRODUCTS

2.1 CONDENSATE PIPING MATERIALS AND PRODUCTS

- A. Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, and capacities as indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide sizes and types matching piping and equipment connections; provide fittings of materials which match pipe materials used in storm water piping systems.

2.2 BASIC PIPE, TUBE AND FITTINGS

- A. Provide pipe, tube and fittings in accordance with the following listing:
- B. Condensate Drain Piping:
 - 1. Pipe Size 6" and Smaller: Polyvinyl chloride pipe (PVC) DWV-ASTM D2665-82.
 - 2. Pipe Class: Schedule 40
 - 3. Fittings: PVC-DWV fittings with solvent weld cement ASTM D2564-80.

2.3 BASIC SUPPORTS, ANCHORS AND SEALS

- A. Provide supports, anchors and seals complying with Division 23 Basic Materials and Methods section, "Supports, Anchors and Seals", in accordance with the following listing:
- B. Adjustable steel clevises, steel pipe clamps and pipe saddle supports for horizontal piping hangers and supports.
- C. Two-bolt riser clamps for vertical piping supports.
- D. Concrete inserts, C-clamps, and steel brackets for building attachments.
- E. Copper flashings for piping penetrations.

2.4 DRAINAGE PIPING PRODUCTS

- A. Provide factory fabricated drainage piping products of size and type indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements and governing regulations.
- B. Cleanout Plugs: Cast-bronze or brass, threads complying with ANSI B2.1 countersunk head.
- C. Floor Cleanouts: Cast-iron body and frame: cleanout plug; adjustable round top as follows:

Nickel-Bronze Top: Manufacturer's standard cast unit of pattern indicated.
- D. Available Manufacturers: Subject to compliance with requirements, manufacturers offering piping products which may be incorporated in the work include the following: Ancon, Inc., Josam Manufacturing Co., J.R. Smith Manufacturing Co., Wade Div., Tyler Pipe, Zurn

PART 3 - EXECUTION

3.1 INSTALLATION OF BUILDING DRAIN PIPING

- A. Lay building drains beginning at low point of systems, true to grades and alignment indicated with unbroken continuity of invert. Clear the interior of piping from dirt and other superfluous material. Place plugs in ends of uncompleted piping at end of day or whenever work stops.
- B. Install condensate piping pitched to drain at minimum slope of 1/4" per foot (2%) for piping 3" and smaller, and 1/8" per foot (1%) for piping 4" and larger.

3.2 EQUIPMENT CONNECTIONS

- A. Provide union and P-trap with cleanout and union connection to equipment. Refer to details on drawings.
- B. Provide condensate piping as required and make connection to all Owner furnished/Contractor installed equipment.

3.3 INSTALLATION OF DRAINAGE PIPING PRODUCTS

- A. Cleanouts: Install in condensate piping as indicated, as required by the Florida Building Code; at each change in direction of piping greater than 45°; at minimum intervals of 50' for piping 4" and smaller and 100' for larger piping; and at base of each conductor. Install floor and wall cleanout covers for concealed piping. Select type to match adjacent building finish.
- B. Flashing Flanges: Install flashing flange and clamping device with each cleanout passing through water proof membrane.

END OF SECTION 232115

SECTION 233000 – AIR DISTRIBUTION SYSTEM

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. The requirements of the General Conditions, Supplementary General Conditions, and of Section 230000 - HVAC shall apply to all work under this Section.
- B. Examine other sections of the Project Manual for requirements which affect work of this section whether or not such work is specifically mentioned in this section.
- C. Coordinate work with that of other trades affecting, or affected by, work of this Section. Cooperate with such trades to assure the steady progress of all work under the contract.

1.2 SCOPE

- A. Work under this Section shall include providing the following:
 - 1. Sheet metal supply and return air ductwork, round or rectangular from each air handling unit to each terminal air device.
 - 2. Terminal air distribution devices including diffusers, grilles, registers, and all special air flow control and directing devices. Provide frame required for ceiling construction type.
 - 3. Hangers and supports for all duct systems and duct mounted equipment.
 - 4. Air volume control devices, balancing dampers and flexible connections to all air moving equipment subject to vibration.
 - 5. Install duct mounted devices being provided under another Section of the contract documents, such as temperature control dampers, temperature control devices, etc. Assist in the coordination of such work. Meet and fully comply with manufacturers installation instructions.
 - 6. Labor to operate air systems and make adjustments to achieve complete test and balance in cooperation with work performed under Test and Balance.
 - 7. Assist in the development of coordination drawings for all ceiling spaces indicating location of air distribution systems and all systems sharing ceiling space.
 - 8. All ductwork indicated on drawings is schematic and shall not be scaled. Therefore, changes in duct sizes and/or location may be made where necessary to conform to space conditions without additional cost to the Owner. All duct dimensions are clear inside dimensions.

1.3 QUALITY ASSURANCE

- A. The following codes and standards are to be considered a part of this specification to establish quality of materials and labor.

NFPA 90A	Installation of Air Conditioning and Ventilation Systems (2009)
NFPA 90B	Installation of Warm Air Heating and Air Conditioning Systems (2009)
SMACNA	HVAC Duct Construction Standards, Metal and Flexible (2005)

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SMACNA	Fire, Smoke and Radiation Damper Installation Guide, Fifth Edition
SMACNA	HVAC Air Duct Leakage Test Manual
ASHRAE	Method of Testing HVAC Air Ducts and Fittings Standard 126-2008

- B. Reference made to the "Manual" shall mean applicable SMACNA Standards as published by Sheet Metal and Air Conditioning Contractors National Association, Inc.
- C. Tables, descriptions and drawings in the Manual show methods of fabrication of items such a ductwork, dampers, louvers, and air intakes. These methods shall be followed unless manufactured products are specified for these items.
- D. Manufacturer's model names and numbers used in this section of the specifications are subject to change per manufacturer's action. Contractor shall, therefore, verify them with manufacturer's representative before ordering any product or equipment. Immediately notify architect/engineer of any changes.

1.4 SHOP DRAWINGS

- A. Submit catalog cuts and specification sheets for the following items:

Flexible duct
 Flexible Connections
 Duct Construction Standards
 Dampers
 Turning Vanes
 Test Reports
 Operating and Maintenance Data
 Guarantees
 Pressure Sensitive Tape
 Duct Sealing Materials
 Grilles, Registers, and Diffusers
 Control Dampers
 Fire Dampers
 Smoke Dampers
 Fire and Smoke Dampers
 Duct Access Doors

- B. Prior to commencing work, submit detailed 1/4" scale ductwork installation drawings. Drawings shall indicate coordination with other ceiling devices, ceiling plenum materials and the bottom elevation of all ducts.
- C. At project closeout, submit 1/4" scale record drawings of installed ductwork, duct accessories, and outlet/inlets, etc.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect shop-fabricated and factory-fabricated ductwork, accessories and purchased products from damage during shopping, storage and handling. Prevent end damage and prevent dirt and moisture from entering ducts and fittings.

- B. Where possible, store ductwork inside and protect from weather. Where necessary to store outside, store above grade and enclose with waterproof wrapping.

PART 2 - PRODUCTS

2.1 MATERIALS GENERAL

A. Ductwork

1. Where ductwork is indicated to be exposed to view in occupied spaces, provide materials which are free from visual imperfections including pitting, seam marks, roller marks, oil canning, stains and discolorations, and other imperfections, including those which would impair painting. Clean and treat to accept paint.
2. Except as otherwise indicated, fabricate ductwork from galvanized sheet steel complying with ANSI/ASTM A 527, lockforming quality, with ANSI/ASTM A 525, G90 zinc coating; mill phosphatized for exposed locations.
3. Where indicated, provide stainless steel complying with ANSI/ASTM A 167; AISI type 302/304/316 with No. 4 directional polish where exposed to view in occupied spaces. Protect finished surfaces with mill-applied adhesive protective paper, maintained through fabrication and installation.

B. Duct Sealer:

1. Hardcast 601, Foster 32-19, Childers CP-146, or United McGill Unimastic 181. Sealer shall be UL Listed.
2. Flame spread 25 or lower in dry state
3. Smoke development 50 or lower in dry state
4. Refer to TABLE 1-2, Standard Duct Sealing Requirements, of the Manual.
5. Ductwork shall be sealed to the following Class per the SMACNA Manual:

APPLICABLE DUCT PRESSURE CLASS	SEAL CLASS
2" W.G. AND BELOW	C

2.2 SHEET METAL DUCT SYSTEM

A. Sheet metal ductwork includes, but is not limited to:

1. Supply, exhaust, return, and outside air ducts.
2. Construct pressure duct system in accordance with SMACNA HVAC Duct Construction Standards, Metal and Flexible, (2005), hereinafter referred to as the "Manual".
3. Use the Manual Duct Construction Tables for metal gauge, reinforcing type, spacing, and method of fabrication. Indicate on shop drawings.
4. Seal all joints as per Table 1-2. All screw penetrations shall be sealed.
5. Runouts to diffusers may be flexible ducts where shown on the plans.
6. Ductwork shall be fabricated in accordance with Table I-15 duct pressure class ratings based upon duct operating pressure obtained on the Equipment Schedule.
7. Rectangular ducts shall be reinforced in accordance with Tables 1-3 through 1-13 of the Manual.

- B. Sheet metal ductwork shall be constructed to the following duct pressure class per the SMACNA Manual:

DUCT PRESSURE CLASS	OPERATING PRESSURE
2" W.G.	UP TO 2" W.G.

- C. Round and oval ductwork shall be constructed in accordance with the requirements of Chapter 3 of the Manual.

- D. Hangers and Supports:

1. Hangers and supports shall be provided in accordance with Chapter IV of the Manual.
2. Hanger attachment to structure shall be as shown by Fig. 4-1 through Fig. 4-4.
3. Hanger size and spacing shall be as shown by Tables 4-1 through 4-3.
4. No power driven anchors shall be used.

- E. Fittings and Other Construction:

1. Fittings and other construction shall be fabricated in accordance with Chapter 2 of the Manual.
2. Supply, return, and exhaust air ducts shall be installed with fittings, dampers, etc., as indicated on Figure 2-1.
3. Radius elbows shall be constructed with a centerline radius of 1.5 times the duct width. Where a smaller radius or square elbows are used, provide turning vanes to produce a pressure drop less than that of an elbow with 1.5 radius.
4. Transitions shall be constructed with no side at a greater angle than 30 degrees from duct center line on contracting flow, and 22.5 degrees maximum diverging flow. See Fig. 2-7 of the Manual.
5. Connections to diffusers and registers shall be made with collars secured to duct and air devices. Branch ducts shall be fabricated in accordance with Table 2-15 of the Manual.
6. Volume dampers shall be installed on all branch lines. Dampers shall be fabricated as shown by Figures 2-12 and 2-13 of the Manual.
7. Branch connections shall be constructed as shown by Fig. 2-6. "Spin-In" connections shall be sealed.

- F. Turning and Splitter Vanes:

1. Turning vanes shall be provided in all square elbows. Splitter vanes shall be provided in all duct offsets larger than 15 degrees and radius elbows.
2. Turning vanes shall be constructed as shown by Figures 2-3 and 2-4 of the Manual.
3. Vanes shall be double thickness "airfoil" design, except in ducts 10 " or less in depth where single thickness vanes with trailing edges may be used.

- G. Kitchen hood exhaust ductwork shall be fabricated stainless steel not less than .043 in. (18 gage). All seams, joints and penetrations shall have liquid tight continuous external weld, except where the duct stub collar of the hood is connected to the exhaust duct.

This connection shall be continuous liquid-tight external weld. Provide openings for cleaning the interior of the ducts with covers constructed of the same materials and thickness of the ducts and shall not permit the passage of grease under any circumstances. Fabricate as required by NFPA 96, Chapter 3. Exhaust duct(s) shall be insulated with a UL labeled fire blanket specifically fabricated for such use. Blanket shall be as manufactured by Fire Master or Premier.

- H. Flexible Connections: Provide flexible duct connections wherever ductwork connects to vibration isolated equipment. Construct flexible connections of neoprene-coated flameproof fabric crimped into duct flanges for attachment to duct and equipment. Make airtight joint. Provide adequate joint flexibility to allow for thermal, axial, transverse, and torsional movement, and also capable of absorbing vibrations of connected equipment.

2.3 FACTORY-FABRICATED DUCTWORK

- A. At installer's option, provide factory-fabricated duct and fittings, in lieu of shop-fabricated duct and fittings.
- B. Galvanized sheet steel complying with ANSI/ASTM A527, lockforming quality, with ANSI/ASTM A525, G90 zinc coating, mill phosphatized.
- C. Gage: 28 ga. Minimum for round and oval ducts and fittings, 4" through 24" diameter.
- D. Elbows: One piece construction for 90 degree and 45 degree elbows 14" and smaller. Provide multiple core construction for larger diameters with standing seam circumferential joint.
- E. Divided Flow Fittings: 90 degree tees, constructed with saddle tap spot welded and bonded to duct fitting body.
- F. Available Manufacturers: Subject to compliance with requirements, manufacturers offering factory-fabricated ductwork which may be incorporated in the work include, but not limited to, the following: United Sheet Metal Div., United McGill Corp., Semco Manufacturing, Inc., Sheet Metal Products Co.

2.4 ACCESS DOORS

- A. In ductwork use the largest door size that can be installed, up to size 24" x 24" maximum, to permit easy inspection and servicing of duct mounted devices. Doors shall be as per Figures 2-10 and 2-11 of the Manual. Minimum size shall be 12" x 12". Access doors 6" and 8" in width shall be not less than 12" long.
- B. Insulated doors shall be hollow metal type with insulation of same thickness as for adjacent ductwork.
- C. Since the purpose of the access doors/panels is to facilitate access to concealed equipment and other devices, the size of each door/panel shall be determined in the field prior to ordering them.

- D. All doors/panels shall be of the hinged type with easily opened locking devices, unless safety or fire rated considerations require otherwise.
- E. Doors/panels that are found by the Architect or Owner to be of inadequate size to allow proper access to equipment and other concealed devices shall be promptly replaced at no cost to the contract.
- F. Doors/panels that are found by the Architect or Owner to be improperly located, with relation to the equipment or concealed devices they serve, shall be relocated at no cost to the contract.

2.5 DAMPERS AND DAMPER OPERATORS

- A. Manual Dampers: Provide dampers of single or multi-blade type, constructed in accordance with SMACNA manual.
- B. Single blade manual volume damper operators shall be equal to Ruskin, Ventfabrics, Durodyne or as approved, quadrant regulator with damper position indicator level and locking device.
- C. Multi-leaves volume dampers operators shall be equal to Ruskin, Ventfabrics, Durodyne, or as approved, selflocking regulator with damper position indicator. Motorized dampers shall be of the low leakage design.

2.6 FLEXIBLE DUCTS

- A. Flexible ducts shall be provided where indicated on drawings. Ducts must comply with the latest NFPA Bulletin 90A and be listed as Class I Air Duct, Standard 18 1.
- B. Liner shall be a trilaminate of aluminum foil, fiberglass, and aluminized polyester, all mechanically locked without adhesives.
- C. Ducts shall be factory insulated with glass fiber insulation having a "C" value of 0.23; vinyl vapor barrier jacket; a flame spread rating of 25, and smoke density factor of 50.
- D. Ducts shall be rated for 2 inch water gauge static pressure applications.
- E. The maximum length of flexible ducts to air devices shall be limited to six feet (6').
- F. The duct shall have an inside bending radius of its inside diameter.
- G. All flexible duct terminations to be secured with galvanized metal bolted draw band. Secure with a minimum of three sheet metal screws after band is tight. Seal cut ends of insulation with approved tape.
- H. Flexible duct shall be Thermaflex, Genflex, or Flexmaster.

2.7 SPIN IN FITTINGS

- A. Spin-in fittings shall be provided at the point of connection of flexible ducts to metal ducts, where indicated on drawings, and as herein specified. Fittings shall be specifically manufactured for sheet as applicable.
- B. Fittings shall be conical bellmouth type of galvanized steel, welded or riveted construction to meet system pressures. Fittings shall have integral dampers with handle indicating position at damper quadrant.
- C. The adjustable damper components shall be factory assembled using spring loaded, retraceable bearing, and positive locking regulator damper hardware.
- D. When fitting diameter equals or exceeds available duct dimensions, proceed as follows:

For rectangular ducts, use Flexmaster Type STO, Sheet Metal Connectors, Inc. Series H.E.T., or Crown Series 3300, with a volume damper.
- E. Acceptable manufacturer for galvanized sheet metal is Flexmaster 300OS-CB-D, Crown Series 3200.

2.8 REGISTERS, GRILLES AND CEILING DIFFUSERS

- A. By "register" is meant a face together with the box and dampers. By "grille" is meant the face only. All dampers in supply air registers shall be opposed blade type.
- B. All air distribution devices shall be the product of the same manufacturer, unless otherwise noted.
- C. Maximum permissible sound level of all air supply devices shall not be more than NC-25. Lower where indicated.
- D. Ceiling supply diffusers shall have dampers, distribution grids and, where necessary, approved type baffles.
- E. The size and capacities of all diffusers, registers, and grilles are indicated on the drawings.
- F. Select each air handling device to meet the indicated sound level criteria, air velocities and distribution pattern for every area.
- G. Provide frames as required for the installation of the air devices on the ceiling or wall construction indicated on the architectural plans.

Air devices connected to flexible ducts shall not be supported by ceiling tiles. Provide additional supports attached directly to the ceiling grid.

- H. At the contractor's option, all air devices may be provided with factory insulation in lieu of field applied insulation. If factory option is utilized, the back of all ceiling diffusers shall have factory applied foil faced, R-6 insulation formed to fit the contour of the diffuser back. Insulation shall be continuously glued and sealed around the outer perimeter of the outer cone to form a continuous vapor seal. The contractor shall seal the insulation

on the supply duct at the connection to the diffuser to form a continuous vapor seal at the duct connection. Approved duct sealant or foil faced duct tape may be used.

- I. Acceptable manufacturers are Titus, Carnes, Metalaire, Price, and Nailor.

2.9 FIRE DAMPERS

- A. Provide factory fabricated dampers constructed in accordance with SMACNA "Fire Damper and Heat Stop Guide". All dampers shall be of the dynamic type, capable of closing when the HVAC system is still running, and rated for closure to 2000 FPM and 4 inches W.G. static pressure.
- B. Provide fire dampers, of types and sizes indicated. Construct casings of 11 gauge galvanized steel. Provide fusible link rated at 160-165°F (71-74°C) unless otherwise indicated. Provide damper with positive lock in closed position, and with the following additional features:
 1. Damper Blade Assembly: Multi-blade type.
 2. Blade Material: Steel, match casing.
- C. Available Manufacturers: Subject to compliance with requirements, manufacturers offering fire dampers which may be incorporated in the work include, but are not limited to, the following:

Ruskin Mfg. Co.
Air Balance, Inc.
Arrow Louver and Damper Corp.
Greenheck

2.10 SMOKE AND FIRE/SMOKE DAMPERS

- A. Smoke and combination Fire/Smoke dampers shall be provided with an actuator tested and installed in accordance with UL specific for this application, UL555S Listing for 350F (250F) and shall drive open in 15 seconds and spring closed in 15 seconds at elevated temperature. Belimo FSNF 120 Actuators are approved for use with Ruskin dampers. Alternate manufacturers shall submit UL approval with shop drawings for approval.
- B. Provide dampers, of types and sizes indicated.
- C. Available Manufacturers: Subject to compliance with requirements, manufacturers offering fire dampers which may be incorporated in the work include, but are not limited to, the following:

Ruskin Mfg. Co.
Air Balance, Inc.
Arrow Louver and Damper Corp.
Greenheck

PART 3 - EXECUTION

3.1 GENERAL

- A. Install all system components such as air devices, dampers, etc. is in accordance with manufacturer's installation instructions.
- B. Install duct mounted devices furnished by Owner and other trades, such as , control dampers, instrumentation, etc. Meet and comply with manufacturer's installation instructions.
- C. Ductwork, diffusers, registers, grilles and other items of the air handling system shall not be supported by the ceiling or ceiling suspension system.
- D. The weight of ductwork and accessories shall not be supported by the equipment. Provide additional supports to the floor and/or building structure as required to relieve such weight.
- E. Set all equipment properly leveled and aligned with associated ductwork. Do not use the flexible connectors as a method of correcting misalignments or support of any equipment of duct weight.
- F. Coordinate location of grilles, wallcaps, roofcaps, louvers, and diffusers with electrical, architectural, and plumbing work. The bottom elevation of exposed ducts shall be coordinated with the Architect.
- G. All damper motors or actuators shall be mounted to be fully accessible. Provide extension shafts, if required.
- H. The back side of all louvers which are not used for outside air intake or exhaust shall be blanked off with galvanized sheet metal and insulated with two inch thick rigid board insulation, installed in accordance with the manufacturer's installation instructions.

3.2 INSTALLATION OF DUCTWORK

- A. Install all ductwork is in accordance with applicable SMACNA Manual. Ductwork shall be installed and tested to less than 2% leakage. Duct leakage tests shall be conducted in accordance with ASHRAE Standard 126-2008, Method of Testing HVAC Air Ducts.
- B. Provide hangers, reinforcing and supports is in accordance with applicable SMACNA Manual.
- C. Duct dimensions shown on drawings are clear inside dimensions.
- D. Duct dimensions may be changed to meet field conditions, as hereinbefore specified.
- E. Maintain full free interior duct areas and suitable shapes at all points.
- F. Conceal all ductwork is in finished spaces, unless otherwise indicated.
- G. Drawings do not show all transitions and offsets which may be required. Install all necessary transitions and offsets to complete system.

- H. Duct turns located near a fan discharge shall always be in the direction of fan rotation. Installer shall coordinate arrangement of fan section to assure this condition is met.
- I. Electrical Equipment Spaces: Do not run ductwork through transformer vaults and their electrical equipment spaces and enclosures.

3.3 FLEXIBLE DUCTS

- A. Flexible duct installation shall follow requirements shown on pages 3-13 through 3-20 and Figures 38, 3-9, and 3-10 of the Manual.
- B. Is in order not to exceed the maximum length of flexible duct allowed by these specifications, installer shall provide the necessary length of equivalent diameter sheet metal duct required for the installation.

3.4 SPIN-IN FITTING

- A. Install components in accordance with manufacturer's installation instructions.
- B. Provide a bead of duct sealer compound around duct opening before installation of fittings.
- C. Fittings shall not be installed back to back or adjacent to each other. Provide a minimum of four feet (4') between branch take-offs.

3.5 DUCT HANGERS AND SUPPORTS

- A. All ducts shall be properly hung and supported in accordance with Chapter 5 of the Manual. Spacing between hangers shall not exceed the maximum values shown on indicated tables of applicable Manual.
- B. Provide additional hangers as necessary for the proper support of control dampers and any related equipment.
- C. Installer shall be familiar with building structure and provide additional steel members when necessary for the proper support of equipment.
- D. No welding or cuffing of building structural members shall be permitted without the written approval of the Structural Engineer.
- E. All supports shall be from the building structure.
- F. Provide additional hangers on both sides of ducts penetrating fire rated walls. Hangers shall be located within 18" of wall. No ductwork shall be supported from any fire rated wall.
- G. On insulated ducts, hangers shall be attached directly to the ducts and be covered by insulation.

3.6 CLEANING

- A. As installation of ductwork progresses, remove temporary interior braces put in place during construction.
- B. All scraps of metal and insulation and other debris shall also be removed from interior of ducts.
- C. Clean ductwork internally, unit-by-unit as it is installed, of dust and debris. Clean external surfaces of foreign substances which might cause corrosive deterioration of metal or, where ductwork is to be painted, might interfere with painting or cause paint deterioration.
- D. Remove all grease and dust from exterior of ducts prior to installation of insulation.
- E. Paint inside of ducts visible through grilles and registers with one coat of dull black paint.
- F. At completion of work prior to final acceptance, clean interior of all work installed under this section.
- G. Strip protective paper from stainless steel ductwork surfaces, and repair finish wherever it has been damaged.
- H. Temporary Closure: At ends of ducts which are not connected to equipment or air distribution devices at time of ductwork installation, provide temporary closure of polyethylene film or other covering which will prevent entrance of dust and debris until time connections are to be completed.

3.7 START UP

- A. Refer to Division 23 section "Testing, Adjusting and Balancing" for air distribution balancing. Seal any leaks in ductwork that become apparent in balancing process.
- B. Replace all temporary filters used during construction with new, clean filters of the type specified for the project.

END OF SECTION 233000

SECTION 233400 – HVAC FANS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The Bidding Requirements and Contractual Conditions set forth in Division 01 apply to this section.
- B. Examine other sections of the Project Manual for requirements which affect work of this section whether or not such work is specifically mentioned in this section.
- C. The requirements of Section 230000 - HVAC apply to this section.

1.2 DESCRIPTION OF WORK

- A. Extent of power and gravity ventilator and exhaust fan work is shown on drawings and schedules, and by requirements of this section.
- B. Types of power and gravity ventilators and exhaust fans required for project include the following:
 - 1. Power Ventilators and Exhaust Fans:
Centrifugal roof ventilators and exhaust fans.
 - 2. Gravity ventilators:
Hooded gravity ventilators.
- C. Refer to Division 26 sections for electrical work required in conjunction with power ventilators and exhaust fans.

1.3 QUALITY ASSURANCE

- A. Firms regularly engaged in the manufacture of power and gravity ventilators and exhaust fans, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Provide power roof ventilators and exhaust fans bearing the Air Movement and Control Association, Inc. (AMCA) Certified Ratings Seal.
- C. Provide power roof ventilator and exhaust fans electrical components which have been listed and labeled by Underwriters Laboratories (UL).

1.4 SUBMITTALS

- A. Submit manufacturer's data for power and gravity ventilators and exhaust fans, including specifications, capacity ratings, dimensions, weights, materials, accessories furnished, and installation instructions.

- B. Submit maintenance instructions, including lubrication instructions, motor and drive replacement, and spare parts lists. Include this data in maintenance manuals.

PART 2 - PRODUCTS

2.1 POWER ROOF VENTILATORS

- A. General: Except as otherwise indicated, provide standard pre-fabricated power ventilator and exhaust fan units of type and size indicated, modified as necessary to comply with requirements, and as required for complete installation.
- B. Centrifugal Roof Ventilators and Exhaust Fans: Provide centrifugal roof type, curb mounted, power ventilators and exhaust fans of type, size, capacity, with options and accessories, as scheduled, and as specified herein.
 - 1. Type: Centrifugal fan, direct or belt driven, upblast or downblast, as scheduled. Provide aluminum weatherproof housings as scheduled. Provide square base. Provide permanent split-capacitor type motor for direct driven fans; capacitor-start, induction-run type motor for belt driven fans.
 - 2. Electrical: Provide thermal overload protection in fan motor. Provide conduit chase within unit for electrical connection. Provide disconnect switches, external type for the kitchen hood fan.
 - 3. Curbs: Provide insulated metal curbs with cants to fit base of roof ventilator, height as indicated (minimum 14 inches), and type to suit roof construction. Provide slanted roof curb for kitchen hood fan that meets NFPA codes. Kitchen exhaust air fans shall terminate a minimum 40 inches above the adjacent roof surface.
 - 4. Bird Screens: Provide removable bird screens, 1/2" mesh, 16 ga. aluminum or brass wire.
 - 5. Dampers: Provide gravity-actuated louvered dampers in curb bases except for kitchen hood exhaust fan.
 - 6. The kitchen hood exhaust fan shall be provided with an extended base and grease trough.
- C. Acceptable Manufacturers: Greenheck Fan Corp., Acme, Carnes Co., Cook (Loren) Co., Penn

2.2 CEILING EXHAUST AIR FANS

- A. Provide ceiling mounted exhaust fans of type, size and capacity as scheduled, and as specified herein.
 - 1. Provide insulated steel housing with baked enamel finish and adjustable mounting brackets. Provide centrifugal type blower with direct drive motor. Fan rpm, air delivery and sound shall be no greater than those listed for each model. Fans shall be UL approved and bear AMCA label for both air performance and sound. Motors shall be mounted with neoprene mounts to isolate vibration. Automatic backdraft damper shall be located within duct connector and have cushioned stops to prevent chatter.

2. Provide wall caps or louvers where shown and/or required as shown on the drawings.

B. Acceptable Manufacturers: Greenheck Fan Corp., Acme, Carnes Co., Cook (Loren) Co., Penn.

2.3 GRAVITY RELIEF AND INTAKES

A. Fresh Air Intakes: Provide aluminum low profile fresh air intakes of the throat size indicated in the schedule on the plans.

1. Provide aluminum coated curb, 14" high.

2. Provide insect screen around the perimeter of the hood.

PART 3 - EXECUTION

3.1 GENERAL

A. Examine areas and conditions under which power and gravity ventilators and exhaust fans are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF POWER AND GRAVITY VENTILATORS

A. General: Except as otherwise indicated or specified, install ventilators and exhaust fans in accordance with manufacturer's installation instructions and recognized industry practices to insure that ventilators serve their intended function.

B. Coordinate ventilator and exhaust fan work with work of roofing, walls, and ceilings, as necessary for proper interfacing.

C. Ensure that power ventilators and exhaust fans are wired properly, with correct motor rotation, and positive electrical motor grounding.

D. Remove shipping bolts and temporary supports within ventilators and exhaust fans. Adjust dampers for free operation.

3.3 TESTING

A. After installation of ventilators and exhaust fans has been completed, test each to demonstrate proper operation of units at performance requirements specified. When possible, field correct malfunctioning units, and then retest to demonstrate compliance. Replace units which cannot be satisfactorily corrected.

3.4 SPARE PARTS

A. General: Furnish to Owner, with receipt, one (1) spare set of belts for each belt drive power ventilator and exhaust fans.

END OF SECTION 233400

SECTION 237400 – AIR CONDITIONING UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The Bidding Requirements and Contractual Conditions set forth in Division 01 apply to this section.
- B. The requirements of Section 230000 - HVAC apply to this section.
- C. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 specification sections, apply to work of this section.

1.2 WORK INCLUDED

- A. Extent of unit work is indicated by drawings and schedules, and by requirements of this section. Each unit is defined to include (but not by way of limitation) fan and motor, filter section, cooling coil, drip pan, compressor section, thermal insulation; refer to plans for additional requirements.

- B. Types of packaged air handling units required for project include the following:

Packaged Rooftop Units
Ductless Wall Mounted Heat Pumps/Air Conditioners

- C. Refer to appropriate Division 26 sections for disconnects and power wiring.

1.3 QUALITY ASSURANCE

- A. Manufacturers: Firms regularly engaged in manufacture of packaged air handling units of types and capacities required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Comply with applicable provisions of ANSI/NFPA 90A, "Air-Conditioning and Ventilating Systems", pertaining to installation of electric heating coils.
- C. Comply with applicable provisions of ANSI/NFPA 70 "National Electric Code", pertaining to construction and installation of electrically operated components of packaged units.
- D. Except as otherwise indicated, provide unit thermal insulation with flame-spread index of 25 or less, fuel-contributed index of 50 or less, and smoke-developed index of 50 or less.
- E. Comply with Air Movement and Control Association (AMCA) standards as applicable to testing and rating fans, and testing louvers, dampers and shutters.
- F. Comply with Sheet Metal and Air-Conditioning Contractors National Association (SMACNA) ductwork construction standards as applicable to air handling units.
- G. Provide refrigerant coils complying with construction and testing standards of

ANSI/ASHRAE 15 "Safety Code for Mechanical Refrigeration".

- H. Except as otherwise indicated comply with ASHRAE recommendations pertaining to packaged air conditioning units.
- I. Provide electric components for air handling units which have been listed and labeled by Underwriters Laboratories.

1.4 SUBMITTALS

- A. Submit manufacturer's specifications for units showing dimensions, weights, capacities, ratings, fan performance with operating point clearly indicated, motor electrical characteristics, gages and finishes of materials, and installation instructions.
- B. Submit assembly-type shop drawings showing unit dimensions, construction details, and field connection details.
- C. Submit maintenance instructions, including lubrication instructions, filter replacement, motor and drive replacement, and spare parts lists. Include this data in maintenance manuals.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver units with factory-installed shipping skids and lifting lugs; pack components in factory-fabricated protective containers.
- B. Handle units carefully to avoid damage to components, enclosures, and finish. Do not install damaged components; replace and return damaged components to unit manufacturer.
- C. Store units in clean, dry place and protect from weather and construction traffic.

PART 2 - PRODUCTS

2.1 PACKAGED ROOFTOP UNITS

- A. Provide factory-built and factory-tested rooftop units as indicated, of sizes and capacities as scheduled, and as specified herein.
- B. Construct casings of 16 ga. minimum mill galvanized steel, designed to withstand specific operating pressures. Provide casing panels and/or access doors that are easily and quickly removable for inspection and access to internal parts. All components are to be weatherproof.
 - 1. Provide single zone unit consisting of fan section, coil section, adjustable fan motor mounting, compressor and condenser section and sloped stainless steel drain pan. Provide 24 inch high factory manufactured roof curb. For sloped roofs, coordinate the curb required with the Architectural drawings, so that the manufactured curb aligns with the roof, and the top of the curb is level, for a level rooftop installation.
 - 2. Provide reinforced points of support for setting units.

3. Provide slopped stainless steel or engineered plastic drain pan, located under cooling coil section, extensive enough to catch condensate leaving coil at highest catalogued face velocity.
 4. Provide motorized outside air damper, wired to close whenever air handler is de-energized.
- C. Provide cooling coils of scheduled capacity, mounted in unit in manner permitting removal.
1. Construct coils with copper tubing and aluminum fins bonded to tubes by method approved by specified manufacturer. Coils shall be ARI rated.
 2. Condenser coils shall be protected with air inlet grilles.
- D. Provide casing for cooling coils as required. Design internal structure of coil section to allow for removal of coils, and provide suitable baffles to assure no air bypass around coils. Provide condensate pans and drain connections to cooling coil sections of sufficient size to contain and remove coil condensate. Insulate coil section casings and drain pans as specified in "Insulation" paragraph.
- E. Provide forward curved fans specifically designed and suitable for class or service indicated. Provide adjustable motor base, adjusted with mounting bolts, to provide variation in center distance. Provide locking nuts, or similar devices; to secure base in proper position. Provide belt driven fans with adjustable pitch pulley permitting fan speed to be varied. Select pulley for mid-point of adjustable range. Design fan shafts so as not to pass through first critical speed when unit comes up to rated RPM. Provide grease lubricated fan bearings with externally accessible fittings for lubrication. Statically and dynamically balance the fan assemblies in the fan housing after final assembly. Refer to plans for additional requirements.
- F. Provide filter boxes with hinged access doors. Provide racks to receive filters in flat or pattern.
- G. Insulate unit casing from air entrance to coils, to air outlet from unit. Insulate framing angles exposed to air stream. Insulation is to be of sufficient thickness and density to prevent condensation from forming on unit casing.
- H. Provide insulation with fire-retarding characteristics, complying with ANSI/NFPA 90A. Insulate drain pans as required to prevent condensate formation on unit exterior at ambient conditions to be encountered.
- I. Provide filters as specified on the equipment schedule.
- J. Acceptable Manufacturers: Trane, Daikin, Johnson-York, Lennox, or Carrier.
- 2.2 DUCTLESS HEAT PUMPS / AIR CONDITIONERS
- A. Provide wall hung ductless or ceiling mounted air conditioning/heat pump unit(s) as shown on the plans.

- B. Wireless Remote Control With Large LCD Screen shall permit user to select all functions and the desired room temperature setting from anywhere in the room.
- C. Microcomputer-Controlled System shall constantly monitor time and temperature against pre-set conditions for maximum energy cost savings as well as to ensure correct indoor temperature at all times.
- D. Twenty-Four Hour (24) ON/OFF Program Timer shall allow user to set various time based functions.
- E. Electric Resistant Back Up Heater shall be provided where schedules are to allow supplementary heat automatically (except 09KHS21).
- F. Automatic Defrost Cycle shall prevent coil freeze up during heat pump operation.
- G. A full Width Centrifugal Blower shall distribute a quiet, even flow of conditioned air to the room from the indoor evaporator.
- H. Auto Louver Mechanism activated by the remote control shall, oscillate the unique air discharge vane up and down to ensure even distribution (Except 09KHS21 and 09KHS22).
- I. Heating/Cooling Automatic Changeover shall automatically switch the unit's operation from cooling to heating and vice versa.
- J. The Hot Start System shall ensure a comfortable warm airflow even at the beginning of the heating process or during defrost.
- K. The Self-Diagnostic Feature shall facilitate maintenance and quick repair by indicating on the PCB's LED where a malfunction or problem occurs.
- L. Provide Non Polar Wiring which simplifies installation as only two wires for the signal line are required to connect the indoor and outdoor units together.
- M. Provide Washable Filters, removable without tools.
- N. Unit(s) shall be ETL, ARI approved.
- O. Acceptable Manufacturers: LG, Hitachi, Daikin, Carrier, Lennox, Trane, Sanyo, and Mitsubishi.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine areas and conditions under which units are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF EQUIPMENT

- A. Install units where indicated, in accordance with equipment manufacturer's written instructions, and with recognized industry practices, to ensure that units comply with requirements and serve intended purposes.
- B. Coordinate with other work, including ductwork, floor construction, roof decking, and piping, as necessary to interface installation of air handling units with other work. Install units on vibration mounts as indicated, comply with manufacturer's indicated installation method, if any. Provide start up of equipment by the manufacturer's service technicians

3.3 INSTALLATION OF ROOFTOP UNITS

- A. Install units where indicated, in accordance with equipment manufacturer's written instructions, and with recognized industry practices, to ensure that units comply with requirements and serve intended purposes.
- B. Coordinate with other work, including ductwork, roof decking, as necessary to interface installation of rooftop units with other work.
- C. Install units on 24 inch high roof curb as indicated, comply with manufacturer's indicated installation method, if any. Curb shall be filled with six-inch batt insulation for sound attenuation purposes.
- D. Provide start-up of equipment by the manufacturer's factory certified service technicians.

3.4 GROUNDING

- A. Provide positive equipment ground for air handling unit components.

3.5 TESTING

- A. Upon completion of installation of units, start-up and operate equipment to demonstrate capability and compliance with requirements. Field correct malfunctioning units, then retest to demonstrate compliance.

3.6 TRAINING OF OWNER'S PERSONNEL

- A. Provide services of manufacturer's technical representative for 4-hours to instruct Owner's personnel in operation and maintenance of the equipment.
- B. Schedule training with Owner, provide at least 7-day notice to Contractor and Engineer of training date. Obtain receipt that training has been accomplished.

END OF SECTION 237400

260100- BASIC ELECTRICAL REQUIREMENTS

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.
- B. Coordination of work between mechanical and electrical trades is covered in Division-23 Section "GENERAL MECHANICAL PROVISIONS".

1.2 SUMMARY

- A. This Section specifies the basic requirements for electrical installations and includes requirements common to all sections of Division-26. It expands and supplements the requirements specified in sections of Division-01.

1.3 GENERAL REQUIREMENTS

- A. Provide all labor, materials, equipment, and incidentals required to make ready for use complete electrical systems as specified herein and shown on the drawings.
- B. Provide and Install: The word "provide" where used on the Drawings or in the Specifications shall mean "furnish, install, mount, connect, test, complete, and make ready for operation". The word "install" where used on the Drawings or in the Specifications shall mean "mount, connect, test, complete, and make ready for operation". Perform work required by, and in accordance with the Contract Documents.
- C. Installation: Provide and place in satisfactory condition, ready for proper operation, raceways, wires, cables, and other material needed for all complete electrical systems required by the Contract Documents. Additional raceways and wiring shall be provided to complete the installation of the specific equipment provided. Include auxiliaries and accessories for complete and properly operating systems. Provide electrical systems and accessories to comply with the NEC, state and local codes and ordinances. It is the intent of these Specifications that the electrical systems be suitable in every way for the use intended. Material and work which is incidental to the work of this Contract shall be provided at no additional cost to the Contract.
- D. Field Connections: Provide field connections to remote equipment and control panels provided under other Divisions of these Specifications. Provide raceway, wire, and interconnections between equipment, transmitters, local indicators, and receivers. Provide 120V and low voltage surge protection equipment in accordance with Section 16709 at equipment as required. Install field connections

to "packaged" equipment provided under other Divisions of these Specifications.

1.4 CODES AND STANDARDS

- A. Install all work in accordance with the applicable requirements of the latest edition of the following codes, as adopted by the local and state authorities:
1. Florida Building Code, 2020, 7th Edition.
 2. National Fire Protection Association (NFPA).
 3. National Electric Code (NFPA 70 - NEC), 2017 Edition.
 4. Life Safety Code (NFPA 101).
 5. National Electrical Safety Code (NESC)
 6. Florida Fire Prevention Code 2020, 7th Edition.
 7. Local, State, County and City Codes.
 8. American National Standards Institute (ANSI).
 9. Physically Handicapped (ANSI A117.1).
 10. Illuminating Engineering Society (IES).
 11. Institute of Electrical and Electronics Engineers (IEEE).
 12. National Electrical Manufacturer's Associations (NEMA).
 13. Occupational Safety and Health Act (OSHA).
 14. Underwriter's Laboratories, Inc. (UL).
- B. It is the intent of the Contract Documents to comply with the applicable codes, ordinances, regulations, and standards. Contractor shall be skilled and familiar with all codes listed in Paragraph "A". Contractor shall be familiar with the Construction Documents during the pricing and bidding process. Where discrepancies between code requirements and the Construction Documents occur, the most stringent requirements shall apply. The Contractor shall price and provide the item in question accordingly, and notify the Architect / Engineer in writing, through proper channels. If discrepancies occur between different codes, see Paragraph "F". Obvious code deficiencies (code items that do not require further calculations) shall be priced for installation in compliance with the code. It is the responsibility of the Contractor to provide working, and ready for use complete electrical system. Correct any installation that fails to comply with the applicable codes and standards at no additional cost to the Owner.
- C. All materials shall be new and free of defects, and shall be U.L. listed, bear the U.L. label or be labeled, or listed with an approved, nationally recognized Electrical Testing Agency. Where no labeling or listing service is available for certain types of equipment, test data shall be submitted to prove to the Engineer and Authority Having Jurisdiction (AHJ) that equipment meets or exceeds available standards.
- D. Comply with regulations and codes of suppliers of utilities.
- E. Where no specific method or form of construction is called for in Contract Documents, the Contractor shall comply with code requirement when carrying out such work.
- F. Where code conflict exists, generally the most stringent requirement applies.

1.5 PERMITS AND INSPECTIONS

- A. Contractor shall obtain and make all payments for permits and inspections required. At the completion of the project and before final acceptance of the electrical work, provide evidence of final inspection and approval by the authorities having jurisdiction.

1.6 RECORD DOCUMENTS

- A. Refer to the Division-01 Section: PROJECT CLOSEOUT or PROJECT RECORD DOCUMENTS for requirements. The following paragraphs supplement the requirements of Division-01.
- B. During the progress of the work the Contractor shall record on their field set of Drawings the corrections, variations, and deviations for systems which are not installed exactly as shown on the Contract Drawings. Mark Drawings to indicate revisions to conduit size and location both exterior and interior; actual equipment locations, distribution and branch electrical circuitry; fuse and circuit breaker size and arrangements; support and hanger details.
- C. Make entries within 24 hours upon receipt of information from field. Current set of marked Record Drawings shall be available to Architect or Engineer at all times.
- D. Mark Specifications to indicate approved substitutions, changes, actual equipment, and materials used.
- E. At the completion of all work, Contractor shall obtain the most current set of Construction Drawings in AutoCAD / Revit format, and transfer and update the drawings to match the exact installed conditions. Label each drawing "RECORD DRAWINGS" with date of final acceptance and completion. Obtain most current set of Specifications in word format and transfer and update Specifications. Label "Record Specifications on front cover and table of contents. Provide final Record Drawings in DWG and PDF format, and final Record Specifications in word and PDF format, and deliver in digital format on portable hard drive. Provide two hard drives to the Owner, and one hard drive to the Engineer.
- F. Contractor shall provide record drawings of the actual installation to the building owner, within 30 days after the date of system acceptance. Record drawings shall also include:
 - 1. A single-line diagram of the building electrical distribution system
 - 2. Floor plans indicating location and area served for all distribution

1.7 OPERATION AND MAINTENANCE DATA

- A. Refer to the Division-01 Section; PROJECT CLOSEOUT or OPERATION AND MAINTENANCE DATA for procedures and requirements for preparation and submittal of maintenance manuals.

- B. Contractor shall provide to the Owner or its representative thorough instructions and training for operation of all installed electrical systems. Coordinate arrangements, timing, and any specialty systems requirements with the Owner and the Engineer. For any training provided by the equipment factory representative, the contractor shall plan and price at least three days' worth of training, unless the current industry standard demands more time, or specifically coordinated with the Owner or the Engineer. Training sessions shall be recorded digitally with video camera. The intent of this paragraph is to provide the owner with satisfactory and complete training, and equipment documentation which allows the Owner to feel comfortable operating the equipment and able to perform maintenance and regular programming. After initial training is completed, the Contractor shall verify with the Engineer that the intent of this paragraph is satisfied. Depending on the quality and the duration of the initial training, and at Engineer's judgement, the Contractor may be directed to provide additional training sessions at no extra charge to the Owner.
- C. Provide manuals for all electrical systems. Provide one hard copy (sets bound in binders) and four digital copies (external hard drive) to the owner, and one digital copy to the Engineer. Manuals shall be neat, with sections, divided and indexed. Information shall include:
1. Purpose and detailed description of electrical system
 2. Detailed description of operation, including start-up, running, required action, programming (if applicable), shut-down procedures.
 3. Specifications sheets for all equipment pieces within the electrical system
 4. Submittal data stating equipment rating and selected options for each piece of equipment requiring maintenance
 5. Wiring diagrams
 6. Installation requirements
 7. Operation manuals and maintenance manuals for each piece of equipment requiring maintenance. Required routine maintenance actions shall be clearly identified
 8. Common care
 9. Instructions for ordering spare parts
 10. Names and addresses of at least one qualified service agency, within reasonable distance from the Owners site.
 11. Guarantees and factory Warranty

1.8 TEMPORARY POWER

- A. Provide and pay for all temporary electrical service as required for construction.
- B. Provide all temporary lighting and power distribution as required for construction. All temporary electrical work shall be in accordance with the N.E.C.

1.9 ELECTRONIC FILES

- A. AutoCAD / REVIT files will be available on a limited basis to qualified firms at the

Architects prerogative. The cost of the files will be \$100 per sheet. Recipients are cautioned that these files may not accurately show actual conditions as constructed. Users are responsible to verify actual field conditions. These files are not intended to be used as shop drawings.

- B. A request for CADD files should be delivered in writing along with payment for such files. Files will not be processed until payment is received.

PART 2 - PRODUCTS

2.1 QUALITY ASSURANCE

- A. **Manufacturers:** Firms regularly engaged in manufacture of electrical products specified, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. **Installer's Qualifications:** Firm with at least 5 years of successful installation experience on projects with electrical work similar to that required for this project.

2.2 Equipment and Materials:

- A. All materials shall be new and unused, Owner-supplied, or reused as shown on the Drawings, the best of their respective kinds, suitable for the conditions and duties imposed on them. The description, characteristics, and requirements of materials to be used shall be in accordance with qualifying conditions established in the following Sections.
- B. Equipment and materials furnished under this Division shall be the product of a manufacturer regularly engaged in the manufacture of such items for a period of three years. Where practical, all of the components shall be products of a single manufacturer in order to provide proper coordination and responsibility. Where required, Contractor shall furnish proof of installation of similar equipment or materials.
- C. Samples of specific products may be requested by the Owner or by the design team to verify that the item meets the requirements and the intent of the design, as well as aesthetic requirements. Provide samples of products as requested in the Construction Documents. Samples will also be required for product substitutions from basis of design .
- D. Each item of equipment shall bear a nameplate showing the manufacturer's name, trade name, model number, serial number, ratings and other information necessary to fully identify it. This plate shall be permanently mounted in a prominent location and shall not be concealed, insulated or painted.
- E. All materials shall be new and free of defects, and shall be U.L. listed, bear the U.L. label or be labeled, or listed with an approved, nationally recognized Electrical Testing

Agency. Where no labeling or listing service is available for certain types of equipment, test data shall be submitted to prove to the Engineer and Authority Having Jurisdiction (AHJ) that equipment meets or exceeds available standards.

- F. Materials and equipment are specified herein by a single or by multiple manufacturers to indicate quality, material and type of construction desired. Manufacturer's products shown on the Drawings have been used as basis for design; it shall be the Contractor's responsibility to ascertain that alternate manufacturer's products meet detailed specifications and that size and arrangement of equipment are suitable for installation.
- G. Model Numbers: Catalog numbers and model numbers indicated in the Drawings and Specifications are used as a guide in the selection of the equipment and are only listed for the Contractor's convenience. The Contractor shall determine the actual model numbers for ordering equipment and materials in accordance with the written description of each item and with the intent of the Drawings and Specifications.
- H. When two or more items of the same material or equipment are required they shall be of the same manufacturer, i.e., panelboards, motor starters, transformers, etc. Product manufacturer uniformity does not apply to raw materials, bulk materials, wire, conduit, fittings, sheet metal, steel bar stock, welding rods, solder, fasteners, motors for dissimilar equipment units, and similar items used in Work, except as otherwise indicated.
- I. When ordering products from different systems, but shown on drawings to interact, verify compatibility of products and systems prior to ordering the product.

2.3 PRODUCT OPTIONS AND SUBSTITUTIONS

- A. Refer to the Instructions to Bidders and the Division-01 for requirements in selecting products and requesting substitutions.
- B. Where several brand names, make or manufacturers are listed as acceptable each shall be regarded as equally acceptable, based on the design selection but each must meet all specification requirements. Where a manufacturer's model number is listed, this model shall set the standard of quality and performance required. Where no brand name is specified, the source and quality shall be subject to Engineer's review and acceptance. Where manufacturers are listed, one of the listed manufacturers shall be submitted for acceptance. No substitutions are permitted.
- C. Requests by Contractor for substitution will be considered only when reasonable, timely, fully documented, and qualifying under one or more of the following circumstances:
 - 1. Specified product cannot be supplied in time for compliance with Contract time requirements.
 - 2. Specified product is not acceptable to governing authority, or determined to be non-compatible, or cannot be properly coordinated, warranted or insured, or has other recognized disability as certified by Contractor.

3. Substantial cost advantage is offered to the Owner after deducting offsetting disadvantages including delays, additional compensation for redesign, investigation, evaluation of substitution product by an Engineer, and other necessary services and similar considerations
- D. Prior Approval: Where the term "or approved equal" is used in the Drawings or the Specifications, submit all requests for approval of the alternate manufacturer's products two weeks prior to bid opening. Approval will be in the form of an Addendum to the Specifications and Drawings. Clearly indicate all differences between the specified and proposed product following the guidelines for substitution herein. This requirement may be waived if, by the opinion of the Engineer, it is for the best interest of the Owner.

2.4 SHOP DRAWINGS:

- A. Before ordering any materials or equipment, the Contractor shall submit to the Engineer one complete schedule showing the make, type, manufacturer's name and trade designation of all equipment. Submit Specification Sheets, drawings, diagrams, dimensions, descriptive literature, rating, listing, material, finish, warranty, any special mounting accommodations, custom work, etc...for each electrical system. This is digital submittal through the channels to the Engineer.
- B. Properly coded stamp from the Engineer on returned submittal is required before ordering equipment. When approved, such schedule shall be an addition to these Specifications, and shall be of equal force in that no deviation will be permitted except with the approval of the Engineer.
- C. If shop drawings show variation from the requirements of the Contract Documents, the Contractor shall make specific mention of such variation in his letter of transmittal. If acceptable, Contractor will not be relieved of the responsibility for executing the work in accordance with the Contract.
- D. Review of shop drawings, descriptive literature, catalog data, or schedules by the Engineer shall not relieve the Contractor from responsibility for deviations from Contract Drawings or Specifications, unless he has in writing called to the attention of the Engineer such deviation at the time of submission, nor shall it relieve him from responsibility for errors of any sort in shop drawings, descriptive literature, catalog data, or schedules.
- E. Submittal of shop drawings, product data, and samples will be accepted only when submitted by the Contractor. Data submitted from subcontractors and material suppliers directly to the Architect/Engineer will not be processed.
- F. Coordinate with other division's supplying equipment prior to submitting shop drawings.
- G. Electrical Room Drawings: A detailed, 1/4"=1'-0" scaled plan view drawing shall be submitted for each electrical room to ensure that the equipment being supplied will fit properly. This drawing shall make specific mention of any NEC violation. All equipment within the electrical room shall be labeled and actual dimensions shown.

The drawings shall be submitted with the shop drawings and manufacturer's product sheets. Failure to supply scaled drawings shall be the basis of rejecting the entire submittal package.

PART 3 – EXECUTION

3.1 WORKMANSHIP

- A. All material, fixtures, and equipment shall be installed and completed in a first-class workmanlike manner and in accordance with the best modern methods and practice. Any materials installed which do not present an orderly and reasonably neat and/or workmanlike appearance, or do not allow adequate space for maintenance, shall be removed and replaced when so directed by the Engineer.

3.2 COORDINATION

- A. The Contractor shall be responsible for full coordination of the electrical systems with shop drawings of the building construction so the proper openings and sleeves or supports etc., are provided for conduit, devices, or other equipment passing through slabs or walls.
- B. Any additional steel supports required for the installation of any electrical equipment, etc., shall provided by the Contractor.
- C. It shall be the Contractor's responsibility to see that all equipment that may require maintenance and operation are made easily accessible, regardless of the diagrammatic location shown on the Drawings.
- D. All connections to fixtures and equipment shown on the Drawings shall be considered diagrammatic unless otherwise indicated by a specific detail on the Drawings. The actual connections shall be made to fully suit the requirements of each case and adequately provide for servicing. Field verify, and plan proper connections accordingly.
- E. The Contractor shall protect equipment and fixtures at all times during storage and construction. Contractor shall replace all equipment and fixtures, which are damaged as a result of inadequate protection.
- F. Prior to starting and during progress of work, examine work and materials installed by others as they apply to work in this division. Report conditions, which will prevent satisfactory installation.
- G. Start of work will be construed as acceptance of suitability of work of others.
- H. The Contractor shall review all equipment being supplied by other divisions prior to ordering electrical equipment. Any conflicts between equipment being supplied and the electronic requirements on the drawings shall be corrected and incorporated into the electrical submittals prior to ordering equipment. Installation of the electrical system

is the contractor's acceptance of equipment requirements. Any conflict with equipment's electrical requirements after electrical system has been installed shall be the responsibility of the contractor to make corrective action. Any corrective action shall be at the contractor's expense

3.3 IDENTIFICATION

- A. The following equipment shall be provided with nameplates: All motors, motor starters, motor-control centers, pushbutton stations, control panels, time switches, disconnect switches, panelboards, circuit breakers, contactors, lighting switches, power receptacles, existing equipment if being reconnected under this contract.
- B. Nameplates shall adequately describe the function of the particular equipment involved. Nameplates for panelboards and switchboards shall include the panel designation, branch (normal or emergency), voltage and phase of the supply. For example, "Panel A, Emergency Branch, 480Y/277V, 3-phase, 4-wire."
- C. See Section 260553, Identification for Electrical Systems, for additional requirements.

3.4 ROUGH-IN

- A. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected, and architectural room elevations.

3.5 ELECTRICAL INSTALLATIONS

- A. Coordinate electrical equipment and materials installation with other building components. Review and coordinate between all construction documents, and all project specifications.
- B. Verify all dimensions by field measurements.
- C. Arrange for chases, slots, and openings in other building components to allow for electrical installations.
- D. Coordinate the installation of required supporting devices and sleeves to be set in poured in place concrete and other structural components, as they are constructed.
- E. Sequence, coordinate, and integrate installations of electrical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing-in the building.
- F. Coordinate the cutting and patching of building components to accommodate the installation of electrical equipment and materials.
- G. Coordinate connection of electrical systems with local utility services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connections for each service.

- H. Branch Circuits: No more than 6 current carrying conductors (3 circuits) shall be installed in any one raceway. 6 current carrying conductors shall consist of 3 circuit conductors and 3 neutral conductors. Provide dedicated neutrals for multiwire branch circuits for compliance with NEC 210.4.
- I. Visit the site included in the scope of work to ascertain existing conditions. Verify all dimensions and locations before proceeding with work in the area and prior to purchasing equipment.
- J. Locate all underground utilities required by the Sunshine Law prior to proceeding with work.

3.6 CUTTING AND PATCHING

- A. This Article specifies the cutting and patching of electrical equipment, components, and materials to include removal and legal disposal of selected materials, components, and equipment.
- B. Do not endanger or damage installed Work through procedures and processes of cutting and patching.
- C. Arrange for repairs required to restore other work, because of damage caused as a result of electrical installations.
- D. No additional compensation will be authorized for cutting and patching work that is necessitated by ill-timed, defective, or non-conforming installations.
- E. Perform cutting, fitting, and patching of electrical equipment and materials required to:
 - 1. Uncover Work to provide for installation of ill-timed work;
 - 2. Remove and replace defective Work;
 - 3. Remove and replace Work not conforming to requirements of the Contract Documents;
 - 4. Remove samples of installed Work as specified for testing;
 - 5. Upon written instructions from the Architect/Engineer, uncover and restore Work to provide for Architect/Engineer observation of concealed Work.
 - 6. Install electrical work in existing facilities.

3.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to project properly identified with names, model numbers, types, grades, compliance labels, and similar information needed for distinct identifications; adequately packaged and protected to prevent damage during shipment, storage, and handling.
- B. Store equipment and materials at the site, unless off-site storage is authorized in writing. Protect stored equipment and materials from damage.

- C. Coordinate deliveries of electrical materials and equipment to minimize construction site congestion. Limit each shipment of materials and equipment to the items and quantities needed for the smooth and efficient flow of installations.
- D. Owner Furnished Equipment: Coordinate requirements and pricing for services with the owner.
 - 1. Contractor shall be responsible for receipt from the Owner, storage after receipt, and installation if required.
 - 2. Verify equipment connection requirements prior to rough-in and ordering materials.
 - 3. Install equipment in accordance with manufacturer instructions.
 - 4. Maintain equipment until project is turned over to the Owner at Substantial Completion.

3.8 CLEANING

- A. Refer to the Division-01 Section; PROJECT CLOSEOUT or FINAL CLEANING for general requirements for final cleaning.
- B. Clean all light fixtures and lenses prior to final acceptance. Replace all inoperative fixtures.

3.9 WARRANTIES

- A. Refer to individual equipment specifications for warranty requirements.
- B. Compile and assemble the warranties specified in Division-26, into a separate set of vinyl covered, three ring binders, tabulated and indexed for easy reference.
- C. Provide complete warranty information for each item to include product or equipment, date of beginning of warranty or bond; duration of warranty or bond; and names, addresses, and telephone numbers and procedures for filing a claim and obtaining warranty services.
- D. The Contractor shall guarantee labor, materials and equipment for a period of one (1) year from Substantial Completion, or from Owner's occupancy, whichever is earlier. Contractor shall make good any defects and shall include all necessary adjustments to and replacement of defective items without expense to the Owner.
- E. In addition to manufacturer's guarantee of each item, Contractor shall provide his standard guarantee after final acceptance and make good any defects of materials or workmanship occurring during this period without expense to the owner.
- F. Owner reserves the right to make emergency repairs as required to keep equipment in operation without voiding Contractor's Guarantee Bond nor relieving Contractor of his responsibilities during guarantee period.

3.10 ACCEPTANCE:

- A. Request inspections as required under the Supplementary or General Conditions. Conceal no work until inspected.
- B. Punch List: Submit written confirmation that all punch lists have been checked and the required work completed. The contractor at the Engineer's current billing rate shall pay for additional field time required by the Engineer to report or check on past punch list deficiencies.
- C. Instructions: At completion of the work, provide a competent and experienced person who is thoroughly familiar with the project, for a period deemed necessary by the Owner to instruct permanent operating personnel in the operation of equipment and control systems.
- D. Operation and Maintenance Manuals: Furnish as required in earlier sections.
- E. Control Diagrams: Frame under glass and mount on equipment room wall. See drawings for requirements.
- F. Test together and separately to determine that:
 - 1. System is free from short circuits and other faults.
 - 2. Motor starter overload devices are sized correctly.
 - 3. Motors rotate correctly.
 - 4. All equipment operates correctly and as specified.
- G. Warranties: Submit copies of all manufacturers' warranties.
- H. Record Drawings: Submit "Record Drawings".
- I. Install engraved metal or plastic nameplates or tags on controls, panels, switches, starters, timers, and similar operable equipment, keyed by number to operating instructions. Dymo type labels are not acceptable.
- J. Acceptance will be on the basis of tests and inspections of the work. A representative of the firm, which performed the testing, shall be in attendance to assist during inspection. Contractor shall furnish necessary electricians to operate system, make any necessary adjustments and assist with final inspection.

END OF SECTION 26 01 00

SECTION 26 05 19

LOW- VOLTAGE ELECTRICAL POWER CONDUCTORS

PART 1 – GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Building wires and cables rated 600 Volt and less.
 - 2. Connectors, splices, and terminations rated 600 Volt and less.

1.2 ACTION SUBMITTALS

- A. Product data for low voltage electrical power conductors and cables.
- B. Manufacturer's specification sheets inclusive of materials ratings and listings for intended applications and installation instructions,

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with most recently adopted NFPA 70.

PART 2 – PRODUCTS

2.1 CONDUCTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Alan Wire.
 - 2. Encore Wire Corporation.
 - 3. Okonite Company.
 - 4. Southwire Company.
- B. Conductors shall be Copper: Comply with NEMA WC 70.
- C. Conductor Insulation: Type THHN/THWN. Color coding shall be employed

LOW VOLTAGE ELECTRICAL POWER CONDUCTORS

throughout entire length of conductor for all conductor sizes. Phase taping is not allowed.

- D. An alternate has been accepted for the use of MC Cable, and is structured as follows:

1. Provide EMT conduits for power and lighting in all exposed, surface applications, including inside of all equipment rooms. Power and lighting within or running through ground level amenity or retail areas are to remain in EMT conduit. Change EMT conduit to MC Cable at all other interior locations where concealed and allowable by code. This alternate does not apply to Dining or Wellness.

2.2 CONNECTORS AND SPLICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Hubbell Power Systems, Inc.
 2. O-Z/Gedney; EGS Electrical Group LLC.
 3. Polaris Electrical Connectors.
 4. Ideal Wire Connectors.
 5. ILSCO
- B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.
- C. Connectors and splices in exterior in-ground handholes shall be Polaris Submersible (Blue) type ITW and IPLW suitable for the number of conductors (no substitutions). Ideal weatherproof connectors are acceptable for terminating single conductors, or for conductor sizes less than #6 AWG. Use Polaris Submersible type for two or more conductors larger than #8 AWG. Provide minimum three wraps of electrical tape around Polaris black caps.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger. Coordinate minimum allowable feeder size for the intended installation with contract documents.
- B. Branch Circuits: Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger. Minimum conductor size No. 12 AWG.

LOW VOLTAGE ELECTRICAL POWER CONDUCTORS

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Service Entrance: Type THHN-THWN, single conductors in raceway.
- B. Feeders: Type THHN-THWN, single conductors in raceway.
- C. Branch Circuits: Type THHN-THWN, single conductors in raceway.
- D. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh strain relief device at terminations to suit application.

3.3 INSTALLATION OF CONDUCTORS

- A. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- B. Use pulling means such as fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or raceway.
- C. Identify and color-code conductors and cables according to Division 26 Section "Identification for Electrical Systems".
- D. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- E. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors. Service entrance and panel feeders shall not be spliced.
- F. Wiring at Outlets: Install conductors at each outlet, with at least 6 inches of slack.
- G. Wiring in in-ground handholes: Loop all phase conductors, neutral conductors, and equipment grounds 360 degrees in handhole before terminating or before pulling to the next handhole.
- H. Wiring in light poles handholes: Provide at least 18" of slack at handhole.

3.5 BRANCH CIRCUIT REQUIREMENTS

- A. Do not use wire smaller than No. 12 AWG (unless otherwise noted) for branch circuit wiring, including motor circuits.

- B. Provide no. 10 wire in lieu of no. 12 wire for any branch circuit excess of 100 feet (120v) of circuit length to farthest device to prevent excessive voltage drop. Provide no. 8 wire in lieu of no. 10 wire for any branch circuit in excess of 160 feet (120v) of circuit length to farthest device to prevent excessive voltage drop.
- C. All 120 volt and 277 volt branch circuits shall have a dedicated neutral conductor for each circuit.
- E. Any branch circuit protected by a GFCI circuit breaker shall be provided with a dedicated neutral conductor.

END OF SECTION 26 05 19

SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes grounding and bonding systems and equipment.
- B. Section includes grounding and bonding systems and equipment, plus the following special applications:
 - 1. Underground distribution grounding.
 - 2. Ground bonding common with lightning protection system.
 - 3. Foundation steel electrodes.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
 - 1. General: Submit product data on ground rods, ground wire, ground connectors, ground bars, and data on exothermic welds.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Plans showing dimensioned locations of grounding features specified in "Field Quality Control" Article, including the following:
 - 1. Test wells.
 - 2. Ground rods.
 - 3. Ground rings.
 - 4. Grounding arrangements and connections for separately derived systems.
- B. Qualification Data: For testing agency and testing agency's field supervisor. (If engaged by the Contractor)
- C. Field quality-control reports.

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals.
 1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
 - a. Plans showing as-built, dimensioned locations of grounding features specified in "Field Quality Control" Article, including the following:
 - 1) Test wells.
 - 2) Ground rods.
 - 3) Ground rings.
 - 4) Grounding arrangements and connections for separately derived systems.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Certified by NETA.
 1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. General: Provide a grounding electrode system in compliance with NFPA 70 Article 250, as specified herein, and as shown on the Construction Drawings.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Comply with UL 467 for grounding and bonding materials and equipment.

2.2 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide or comparable product by one of the following:
1. Burndy; Part of Hubbell Electrical Systems.
 2. Dossert; AFL Telecommunications LLC.
 3. ERICO International Corporation.
 4. Fushi Copperweld Inc.
 5. Galvan Industries, Inc.; Electrical Products Division, LLC.
 6. Harger Lightning & Grounding.
 7. ILSCO.
 8. O-Z/Gedney; a brand of Emerson Industrial Automation.
 9. Robbins Lightning, Inc.
 10. Siemens Power Transmission & Distribution, Inc.
 11. Thomas & Betts Corporation, A Member of the ABB Group.
 12. Topaz Electric; a division of Topaz Lighting Corp. U

2.3 CONDUCTORS

- A. Size: Grounding electrode conductors shall be sized as specified herein and on the drawings, but in no case shall be smaller than required by NFPA 70.
- B. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- C. Bare Copper Conductors:
1. Solid Conductors: ASTM B 3.
 2. Stranded Conductors: ASTM B 8.
 3. Tinned Conductors: ASTM B 33.
 4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, **1/4 inch** in diameter.
 5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
 6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; **1-5/8 inches** wide and **1/16 inch** thick.
 7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; **1-5/8 inches** wide and **1/16 inch** thick.
- D. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 4 by 18 inches in cross section, with 9/32-inch holes spaced 1-1/8 inches apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V and shall be Lexan or PVC, impulse tested at 5000 V.

2.4 CONNECTORS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
- B. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
- C. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless exothermic-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.
- D. Beam Clamps: Mechanical type, terminal, ground wire access from four directions, with dual, tin-plated or silicon bronze bolts.
- E. Cable-to-Cable Connectors: Compression type, copper or copper alloy.
- F. Cable Tray Ground Clamp: Mechanical type, zinc-plated malleable iron.
- G. Conduit Hubs: Mechanical type, terminal with threaded hub.
- H. Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with socket set screw.
- I. Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with hex head bolt.
- J. Lay-in Lug Connector: Mechanical type, copper rated for direct burial terminal with set screw.
- K. Signal Reference Grid Clamp: Mechanical type, stamped-steel terminal with hex head screw.
- L. Straps: Solid copper, copper lugs. Rated for 600 A.
- M. Tower Ground Clamps: Mechanical type, copper or copper alloy, terminal one-piece clamp.
- N. U-Bolt Clamps: Mechanical type, copper or copper alloy, terminal listed for direct burial.
- O. Water Pipe Clamps:
 - 1. Mechanical type, two pieces with stainless-steel bolts.
 - a. Material: Die-cast zinc alloy.
 - b. Listed for direct burial.
 - 2. U-bolt type with malleable-iron clamp and copper ground connector rated for direct burial.

2.5 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel, sectional type; **3/4 inch by 10 feet.**
- B. Ground Plates: **1/4 inch**

2.6 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.
- B. Underground Grounding Conductors: (If Shown on Drawings)
Install bare tinned copper conductor, No. 2/0 AWG minimum.
 - 1. Bury at least 24 inches below grade.
- C. Isolated Grounding Conductors: (If Shown on Drawings)
Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.
- D. Grounding Bus: Install in electrical equipment rooms, in rooms housing service equipment, all electrical rooms with step down transformer, all communications and data rooms (MDF and IDF). Install elsewhere as indicated on drawings.
 - 1. Install bus horizontally, on insulated spacers **2 inches** minimum from wall, **6 inches** above finished floor unless otherwise indicated.
 - 2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.
 - 3. Provide connection from all busses to main service bus/bar via #4/0 copper grounding conductor.
 - 4. In addition to the main service ground, all ground bars shall be interconnected to each other via #4/0 insulated grounding conductor. Each ground bar shall also be bonded to local metallic water piping and building steel via #6 insulated grounding conductor.
- E. Conductor Terminations and Connections:
 - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
 - 2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
 - 3. Connections to Ground Rods at Test Wells: Bolted connectors.
 - 4. Connections to Structural Steel: Welded connectors.

2.7 GROUNDING ELECTRODE CONDUCTOR

- A. Grounding Electrode Conductor: A main grounding electrode conductor, bare copper, sized per NFPA 70, shall be run in PVC conduit from main service equipment ground bus to the main grounding electrodes. Main grounding electrodes are Ground Field, Main Metallic Water Pipe, Building Steel, and Rebar. The main grounding electrode conductor shall be exothermically welded to main grounding electrodes
- B. This conductor shall also be bonded to the following:
 - 1. Telecommunications service ground within 20' of the electrical service
 - 2. Lightning protection system.
 - 3. Gas and other interior metal piping.

2.8 GROUNDING AT THE SERVICE

- A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

2.9 GROUNDING SEPARATELY DERIVED SYSTEMS

- A. Description: Provide a separately derived grounding system where indicated herein and as required by the NFPA 70. Bond neutral and ground busses together.
- B. Services: Provide a separately derived grounding system for all building electrical services and stepdown transformers.
- C. Multiple Buildings: Multiple buildings fed from the same electrical service shall be provided with separate grounding electrode systems, as required by the NFPA 70 and specified herein.
- D. Emergency Generator: Provide a separately derived grounding system for the emergency system where 4-pole transfer switches are used (neutral and phase conductors are switched). Install grounding electrode(s) at the generator location. The electrode shall be connected to the equipment grounding conductor and to the frame of the generator.

2.10 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

- A. Comply with IEEE C2 grounding requirements.
- B. Pad-Mounted Transformers and Switches: Equipment is provided by local electrical utility company. Coordinate grounding requirements for concrete pads and equipment with the local electrical utility company.

2.11 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
 - 1. In general, all electrical equipment (metallic conduit, motor frames, panelboards, etc.) shall be bonded together with a green insulated copper system grounding conductor in accordance with specific rules of Article 250 of the NFPA 70 Equipment grounding conductors through the raceway system shall be continuous from main switch ground bus to panel ground bar of each panelboard, and from panel grounding bar of each panelboard to branch circuit equipment and devices

- B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
 - 1. All raceways shall have an insulated copper system ground conductor run throughout the entire length of circuit installed within conduit in strict accordance with NFPA 70. Grounding conductor shall be included in total conduit fill when determining conduit sizes, even though not included or shown on drawings.
 - 2. Feeders and branch circuits.
 - 3. Lighting circuits.
 - 4. Receptacle circuits.
 - 5. Single-phase motor and appliance branch circuits.
 - 6. Three-phase motor and appliance branch circuits.
 - 7. Flexible raceway runs.
 - 8. Armored and metal-clad cable runs.
 - 9. Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.
 - 10. X-Ray Equipment Circuits: Install insulated equipment grounding conductor in circuits supplying x-ray equipment.

- C. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

- D. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

- E. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.

- F. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure and install a separate insulated equipment grounding conductor. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.
- G. Poles Supporting Outdoor Luminaires: Install grounding electrode and a separate insulated equipment grounding conductor and bond to pole enclosure, in addition to grounding conductor installed with branch-circuit conductors.
- H. Metallic Fences: Comply with requirements of IEEE C2.
 - 1. Grounding Conductor: Bare, copper, not less than No. 8 AWG.
 - 2. Gates: Shall be bonded to the grounding conductor with a flexible bonding jumper.
 - 3. Barbed Wire: Strands shall be bonded to the grounding conductor.
- I. Exterior: All exterior grade mounded equipment will have their enclosures grounded directly to a separate driven ground rod at the equipment in addition to the building ground connection.

2.12 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Equipment Grounding:
 - 1. Where installed in metal conduit, both conductor and conduit shall be bonded at each end.
 - 2. Have connections accessible for inspection and made with approved solderless connectors brazed (or bolted) to the equipment or structure to be grounded.
 - 3. Shall in NO case be a current carrying conductor.
 - 4. Have green insulation, except that grounding electrode conductors may be bare.
- C. Bushings:
 - 1. Provide insulated grounding bushings on all metallic feeder conduits terminated within panelboards, switchboards or enclosed overcurrent devices. Provide insulated grounding bushings on all branch circuit conduits where concentric knockouts are used.
 - 2. Bond all grounding bushings to the equipment ground bus of the panel or switchboard, or overcurrent device in which it is located. Bond shall be made via an insulated bonding conductor of same size as equipment ground conductor run in the circuit.

- D. Underground: All connections and bonds made underground and to building steel shall be exothermic weld type-connections.
- E. Cable Tray: Provide a #10 bond from all metallic system conduits to the cable tray.
- F. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor and install in conduit.
- G. Ground Rods: Drive rods until tops are **2 inches** below finished floor or final grade unless otherwise indicated.
 - 1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
 - 2. The ground field shall consist of three 20 ft long vertically driven ground rods arranged in a triangular pattern spaced 20 feet apart. Additional ground rods shall be added as necessary to achieve the desired resistance.
- H. Test well shall be provided with circular, flush traffic rated, grade mounted, twist lock traffic cover with the word "ground" (or similar) on the cover. Test well shall allow clear access to the ground rod and exothermic weld connection of conductor to ground rod. Clearly mark all ground rod locations on the Record Drawings.
 - 1. Installation locations: Provide inspection wells for all ground rods covered by concrete, paving, or other permanent materials that prevent access to ground rods. Set top of test well flush with finished grade or floor
- I. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
 - 1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
 - 2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
 - 3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.
- J. Grounding and Bonding for Piping:
 - 1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end. The

building's main metallic underground water piping shall be utilized as a grounding electrode, provided the metal pipe is installed in direct contact with the earth for a minimum of 10 feet. Bond the main metallic water service within 5 ft. of the entrance of the water pipe into the building

2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
 3. Water Meter: Provide properly sized bonding shunt around water meter and/or dielectric unions in the water pipe.
 4. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.
- K. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install tinned -bonding jumper to bond across flexible duct connections to achieve continuity.
- L. Grounding for Steel Building Structure: The building steel shall be utilized as a grounding electrode, provided the steel is in direct contact with the earth or is otherwise effectively grounded. Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet apart.
- M. Ground Ring: Install a grounding conductor, electrically connected to each building structure ground rod and to each steel column, extending around the perimeter of building area
1. Install tinned-copper conductor not less than No. 2/0 AWG for ground ring and for taps to building steel.
 2. Bury ground ring not less than 24 inches from building's foundation.
- N. Concrete-Encased Grounding Electrode (Ufer Ground): Fabricate according to NFPA 70; use a minimum of 20 feet of bare copper conductor not smaller than No. 4 AWG.
1. If concrete foundation is less than 20 feet long, coil excess conductor within base of foundation.
 2. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building's grounding grid or to grounding electrode external to concrete.
- 2.13 FIELD QUALITY CONTROL
- A. Perform tests and inspections. Contractor may hire an independent and qualified testing agency to perform tests and inspections.
- B. Tests and Inspections:
1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.

2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
 3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground test wells, and at individual ground rods. Make tests at ground rods before any conductors are connected.
 - a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
 - b. Perform tests by fall-of-potential method according to IEEE 81.
 4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.
- C. Grounding system will be considered defective if it does not pass tests and inspections. Refer to Division 01, Section "Quality Requirements" for retesting and re-inspecting requirements and Division 01, Section "Execution" for requirements for correcting the work.
- D. Prepare test and inspection reports.
- E. Report measured ground resistances that exceed the following values as shown below in Items 1 through 7. Only perform testing on items that apply to the project.
1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
 2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.
 3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
 4. Power Distribution Units or Panelboards Serving Electronic Equipment: 1 ohm(s).
 5. Substations and Pad-Mounted Equipment: 5 ohms.
 6. Manhole Grounds: 10 ohms.
- F. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify the Electrical Engineer promptly and include recommendations to reduce ground resistance.

END OF SECTION 26 05 26

SECTION 26 05 29

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Hangers and supports for electrical equipment and systems.

1.2 PERFORMANCE REQUIREMENTS

- A. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.
- B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
- C. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Steel slotted support systems.
2. Raceway and cable support systems.
3. Mounting and support clamps.
4. Mounting and support through bolts and toggle bolts.
5. Mounting and support all thread hanger rods.

B. Shop Drawings: Show fabrication and installation details and include calculations for the following:

1. Trapeze hangers. Include Product Data for components.
2. Aluminum/Steel slotted channel systems. Include Product Data for components.
3. Equipment supports.

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.5 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Comply with NFPA 70.

PART 2 – PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allied Tube & Conduit.
 - b. Cooper B-Line, Inc.; a division of Cooper Industries.
 - c. ERICO International Corporation.
 - d. GS Metals Corp.
 - e. Thomas & Betts Corporation.
 - f. Unistrut; Tyco International, Ltd.
 - g. Wesanco, Inc.
 - h. Kindorf.
 - 2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
 - 3. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
 - 4. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
 - 5. Channel Dimensions: Selected for applicable load criteria.
 - 6. Exterior mounted channel: stainless steel or aluminum.
- B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
- C. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported. Exterior and wet locations shall be stainless steel or aluminum with stainless steel hardware.
- D. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

- E. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Hilti Inc.
 - 2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
 - 3) MKT Fastening, LLC.
 - 4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.
 2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated or stainless steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Cooper B-Line, Inc.; a division of Cooper Industries.
 - 2) Empire Tool and Manufacturing Co., Inc.
 - 3) Hilti Inc.
 - 4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
 - 5) MKT Fastening, LLC.
 3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
 4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
 5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
 6. Toggle Bolts: All-steel springhead type.
 7. Hanger Rods: Threaded steel.
 8. Mounting apparatus for exterior applications shall be stainless steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.
- B. Materials: Comply with requirements in Division 05 Section "Metal Fabrications"

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
- B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.
- C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
 - 1. Secure raceways and cables to these supports with two-bolt conduit clamps.
- D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
- B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.
- C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.
- D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
 - 1. To Wood: Fasten with lag screws or through bolts.
 - 2. To New Concrete: Bolt to concrete inserts.
 - 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 - 4. To Existing Concrete: Expansion anchor fasteners.

5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
 6. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
 7. To Light Steel: Sheet metal screws.
 8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.
- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.
- F. Supporting raceways via other raceways is not approved.
- G. Supporting raceways via cable trays and wireways or cable tray and wireway supports is not approved.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Comply with installation requirements in Division 05 Section "Metal Fabrications" for site-fabricated metal supports.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

- B. Touchup: Comply with requirements in Division 09 painting Section for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.
 - C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.
- 3.5 Exterior Supports for Electric Panels, Cabinets, and Equipment:
- A. Support post shall be concrete sized for the intended installation. Minimum size for mounting panels, disconnect switches, etc. shall be 6" x 6" x 10' (4' embedded).
 - B. Unistrut channel shall be stainless steel or aluminum.
 - C. Mounting hardware shall be stainless steel.

END OF SECTION 26 05 29

SECTION 26 05 33

RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal conduits, tubing, and fittings.
2. Nonmetal conduits, tubing, and fittings.
3. Metal wireways and auxiliary gutters.
4. Nonmetal wireways and auxiliary gutters.
5. Surface raceways.
6. Boxes, enclosures, and cabinets.
7. Handholes and boxes for exterior underground cabling.

1.2 ACTION SUBMITTALS

- A. Product Data: For raceways, fittings, outlet boxes, junction and pull boxes, floor boxes, hinged-cover enclosures, and cabinets.
- B. LEED Submittals:
 1. Product Data for LEED Credit: For solvent cements and adhesive primers, documentation including printed statement of VOC content.
- C. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

- A. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. RMC (Rigid Metallic Conduit)
 1. GRC (Galvanized Rigid Conduit): Comply with ANSI C80.1 and UL 6.
 2. RAC (Rigid Aluminum Conduit): Comply with ANSI C80.5 and UL 6A.

- C. IMC (Intermediate Metal Conduit): Comply with ANSI C80.6 and UL 1242.
- D. EMT (Electrical Metallic Conduit): Comply with ANSI C80.3 and UL 797.
- E. FMC (Flexible Metal Conduit): Comply with UL 1; zinc-coated steel or aluminum.
- F. LFMC (Liquidtight Flexible Metal Conduit): Flexible steel conduit with PVC jacket and complying with UL 360.
- G. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B, compatible with raceway and tubing materials.
 - 1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
 - 2. Fittings for EMT:
 - a. Material: Steel or die cast.
 - b. Type: Setscrew or compression.
 - c. Fittings shall be die cast compression type in damp locations.
 - 3. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
 - 4. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch, with overlapping sleeves protecting threaded joints.
- H. Joint Compound for IMC or GRC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

- A. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. ENT (Electrical Nonmetallic Conduit): Comply with NEMA TC 13 and UL 1653.
- C. RNC (Rigid Nonmetallic Conduit): Type EPC-40-PVC (PVC), complying with NEMA TC 2 and UL 651 unless otherwise indicated.
- D. Fittings for ENT: Comply with NEMA TC 3; match to conduit or tubing type and material.
- E. Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

- A. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1, Type 3R, Type 4, or Type 12 dictated by the application unless otherwise indicated, and sized according to NFPA 70.
 - 1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

2.4 SURFACE RACEWAYS

- A. Listing and Labeling: Surface raceways and tele-power poles shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Surface Metal Raceways: Galvanized steel with snap-on covers complying with UL 5.
- C. Surface Nonmetallic Raceways: Two or three-piece construction, complying with UL 5A, and manufactured of rigid PVC. Product shall comply with UL 94 V-0 requirements for self-extinguishing characteristics.

2.5 BOXES, ENCLOSURES, AND CABINETS

- A. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.
- B. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
- C. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, aluminum, Type FD, with gasketed cover.
- D. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.
- E. Metal Floor Boxes:
 - 1. Material: Cast metal.
 - 2. Type: Fully adjustable.
 - 3. Shape: Rectangular.

4. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- F. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb. Outlet boxes designed for attachment of luminaires weighing more than 50 lb shall be listed and marked for the maximum allowable weight.
 - G. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
 - H. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum with gasketed cover.
 - I. Box extensions used to accommodate new building finishes shall be of same material as recessed box.
 - J. Gangable boxes are prohibited.
 - K. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1, Type 3R, Type 4, or Type 12 required by the application with continuous-hinge cover. Interior hinged cover enclosures shall have flush latch. Exterior hinged cover enclosures shall be pad lockable with University of Tampa pad lock.
 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
 2. Nonmetallic Enclosures are not acceptable.
 3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.
 4. Hinged Cover Enclosures located in chiller plants, boiler plants, lift stations, irrigation wells shall be stainless steel.
 - L. Cabinets:
 1. NEMA 250, Type 1, Type 3R, or Type 12 required by the application galvanized- steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
 2. Hinged door in front cover with flush latch and concealed hinge. Exterior hinged door shall be pad lockable.
 3. Interior hinged door shall be key latch to match panelboards.
 4. Metal barriers to separate wiring of different systems and voltage.
 5. Accessory feet where required for freestanding equipment.
 6. Nonmetallic cabinets are not acceptable.
 7. Cabinets located in chiller plants, boiler plants, lift stations, irrigation wells shall be stainless steel.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
1. Exposed Conduit: GRC.
 2. Concealed Conduit, Aboveground: GRC, IMC, EMT, or Type EPC-40-PVC for the approved application.
 3. Underground Conduit: Type EPC-40-PVC. Minimum size shall be $\frac{3}{4}$ ".
 4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC or LFMC approved for the application.
 5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R. Provide stainless steel enclosures where required by code, in lift stations areas, chiller plants, boiler plants, and wells.
 6. Underground Raceways Warning Tapes – 6" wide by 0.004" thick polyethylene film with aluminum coil detectable tape with appropriate label:
 - a. Tape color red with label "Caution – Electrical Line Below"
 - b. Tape color yellow with label "Caution – Communications Line Below"
- B. Indoors: Apply raceway products as specified below unless otherwise indicated.
1. Exposed, Not Subject to Physical Damage: EMT.
 2. Exposed and Subject to Physical Damage: GRC. Raceway locations include the following:
 - a. Loading docks.
 - b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
 - c. Mechanical rooms.
 - d. Main and panels feeder raceways in main electrical rooms.
 - e. Lift station, chillers, and boilers areas.
 - f. Fire pump rooms.
 3. Concealed in Ceilings and Interior Walls and Partitions: EMT.
 4. Connection to Vibrating Equipment, including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment: FMC, except use LFMC in damp or wet locations.
 5. Wet Locations: GRC.
 6. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in kitchens areas, chiller areas, boiler areas, lift stations areas, wells areas.

- C. Minimum Raceway Size: 1/2-inch trade size. Minimum EPC-40 size is 3/4 inch.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.
 - 1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
 - 2. EMT: Use setscrew or compression fittings. Fittings in damp locations shall be die cast compression type. Comply with NEMA FB 2.10.
 - 3. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.
- E. Do not install aluminum conduits, boxes, or fittings in direct contact with concrete or earth.
- F. Install surface raceways only where indicated on Drawings.
- G. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.

3.2 INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
- B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot- water pipes. Install horizontal raceway runs above water and steam piping.
- C. Comply with requirements in Division 26 Section "Hangers and Supports for Electrical Systems" for hangers and supports.
- D. Arrange stub-ups so curved portions of bends are not visible above finished slab.
- E. Install no more than the equivalent of three 90-degree bends in any conduit. Support within 12 inches of changes in direction.
- F. Conceal conduit within finished walls, ceilings, and floors unless otherwise indicated.
- G. Install conduits (concealed or exposed) parallel or perpendicular to building lines or major structural elements.
- H. Support conduit within 12 inches of enclosures to which attached.

- I. Raceways Embedded in Slabs:
 - 1. Run conduits parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot intervals.
 - 2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
 - 3. Arrange raceways to keep a minimum of 2 inches of concrete cover in all directions.
 - 4. Do not embed threadless fittings in concrete.
 - 5. Transition from PVC to GRC before rising above floor.

- J. Stub-ups to Above Recessed Ceilings:
 - 1. Use EMT, IMC, or RMC for raceways.
 - 2. Use a conduit bushing or insulated fitting to terminate stub-ups.

- K. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

- L. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.

- M. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits $\frac{3}{4}$ to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts.

- N. Install bell ends on all PVC conduits entering medium voltage (campus primary) transformers and gear.

- O. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 24 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use. Label all spare conduits with origin.

- P. Surface Raceways:
 - 1. Install surface raceway with a minimum 2-inch radius control at bend points.
 - 2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.

- Q. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces.
- R. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:
1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 2. Where an underground service raceway enters a building or structure.
 3. Where otherwise required by NFPA 70.
- S. Expansion-Joint Fittings:
1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F and that has straight-run length that exceeds 25 feet.
 2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
 - a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
 - b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
 - c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
 - d. Attics: 135 deg F temperature change.
 3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per degree F of temperature change for PVC conduits.
 4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
 5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.
- T. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for recessed and semi-recessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
1. Use LFMC in damp or wet locations subject to severe physical damage.
 2. Use LFMC or LFNC in damp or wet locations not subject to severe

physical damage.

- U. Mount boxes at heights indicated on drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.
- V. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surface to provide a flat surface for a raintight connection between the box and cover plate or the supported equipment and box.
- W. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel and to maintain wall fire rating.
- X. Locate boxes so that cover or plate will not span different building finishes.
- Y. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.
- Z. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.
- AA. Set metal floor boxes level and flush with finished floor surface.
- BB. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.
- CC. Junction boxes, pull boxes, or other boxes (electrical and control) located in chiller plants, boiler plants, lift stations, and irrigation wells shall be stainless steel.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit.
2. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamped backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction.
3. Provide GRC conduit elbows at turn up to equipment and at building entrances through floor. Coat GRC below grade or slab with bitumastic.
4. Underground Warning Tape: Provide underground warning tape 24" above raceway, or 12" below grade if conduit is buried 24" below grade.
5. Electrical raceways shall have minimum of 24" cover (burial depth). Electrical feeders' raceways (service entrance and panel feeders) shall have minimum 36" cover (burial depth). Electrical raceways installed under concrete slabs shall have minimum 12" cover from slab bottom with electrical warning tap 6" above raceway. Electrical service entrance raceways installed under concrete slabs shall have minimum 24" cover from slab bottom with electric warning tap 6" above raceway.
6. Provide directional boring under all existing roadways and sidewalks.
7. Raceways for site lighting, including pedestrian, roadway and parking lot, shall be routed 12 to 18 inches within roadway curb or sidewalk and sweep to the in- ground handhole to allow future trees.

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

- A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.
- B. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch above finished grade.
- C. In-ground handholes and boxes in finish grade:
 1. In landscaped areas – Set top 1" above finish ground cover.
 2. In sodded areas – Set top 2" above grade before sod is laid. Once sod is laid, the top shall be no more than 1" above the sod.
 3. Handholes shall be set to follow slope of grade.

3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies meeting required UL fire ratings.

3.6 FIRESTOPPING

- A. Install firestopping at penetrations of fire-rated floor and wall assemblies meeting required UL fire ratings.

3.7 PROTECTION

- A. Protect coatings, finishes, and cabinets from damage and deterioration.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 2. Repair damage to paint finishes with matching touchup coating recommended by manufacturer.
 - 3. Provide bitumastic coating prior to installation to all RMC installed in grade.

3.8 RENOVATIONS AND DEMOLITION

- A. Remove abandoned outlets and raceways, including conductors, back to last device to remain in service or back to source panel. Where removed back to source panel, label circuit breaker(s) not re-used as spare and provide an updated typewritten panel directory.

END OF SECTION 26 05 33

SECTION 26 05 53

ELECTRICAL IDENTIFICATION

PART 1- GENERAL

1.1 RELATED DOCUMENTS

- A. General: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work specified in this section.

1.2 SUMMARY

- A. Extent: Electrical identification work as required by the Contract Documents or other specifications.
- B. Section Includes:
 - 1. Identification for raceways.
 - 2. Identification of power and control cables.
 - 3. Identification for conductors.
 - 4. Underground-line warning tape.
 - 5. Warning labels and signs.
 - 6. Instruction signs.
 - 7. Equipment identification labels.
 - 8. Miscellaneous identification products

1.2 SUBMITTALS

- A. Product Data: Submit shop drawings of all identification materials to be used for this project. Indicate equipment that will be identified with each individual submittal.

1.3 QUALITY ASSURANCE

- A. Comply with ANSI A13.1.
- B. Comply with NFPA 70.
- C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- D. Comply with ANSI Z535.4 for safety signs and labels.
- E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.
- F. ADA Compliance: All signage shall meet ADA standards. Identification for maintenance purposes shall be as specified herein

G. d

PART 2- PRODUCTS

1.4 RACEWAY SYSTEM IDENTIFICATION

- A. Color Coding: All electrical conduits shall be identified by color-coding. Apply color-coded identification on electrical conduit in a neat and workmanlike manner. Utilize a stencil for application of paint.
- B. Identification: Identify all raceways provided or utilized as part of this project as follows:

- 1. Apply bands 10 feet on center along the raceway system and at each side of walls or floors, and at branches from mains.
- 2. Identify the following services:

Service	Label
Low Voltage	120/208 Voltage
Low Voltage	120/240 Voltage
High Voltage	277/480 Voltage
Fire Alarm	Fire Alarm
Telephone	Telephone
Computer	Computer
Telephone/computer	Telephone/computer

- 3. Spot Painting on Rough-in:
 - a. Conduit, raceways, boxes, back boxes, panel boards, etc. shall be spot painted. Conduit shall be identified within 6 inches of the box or enclosure. The entire box and cover plate shall be painted.
 - b. Use following colors for color bands and for color coding:

System	Color
(1) Normal Power	Royal Blue
(2) Miscellaneous Communications	Brown
(3) Fire Alarm	Red
(4) Telephone\Computer	Black
(5) Life Safety	Yellow

1.5 CABLE/CONDUCTOR IDENTIFICATION

- A. General: Apply cable/conductor identification, including voltage, phase and feeder number, on each cable/conductor in each box/enclosure/cabinet where conductors of more than one circuit or communication (such as color coded conductors) is provided. Match identification with marking system used in panelboards, shop drawings, contract documents, and similar previously established identification for the project's electrical work.

- B. Color Coding: Color code all cables. Use wire colored by integral pigmentation, making the wire 100 percent colored. Tape color coding is not acceptable. Applies to feeders and branch circuit conductors of all sizes. Color coding shall be black, red, and blue (white neutral) for 120/208 volt 3-phase wiring, and brown, orange and yellow (grey neutral) for 277/480 volt 3-phase wiring. Ground conductors shall be green:
- C. Color-Coding for conductors shall be consistent throughout entire length. Phase tape color coding is not acceptable. Applies to feeders' conductors and branch circuit conductors. Color coding shall be as follows:

Voltage	Phase A	Phase B	Phase C	Neutral
277/480	Brown	Orange	Yellow	Gray
120/208	Black	Red	Blue	White
120/240	Black	Red	*****	White
120/240 (*)	Black	Orange	Blue	White

(*) Orange shall indicate high leg on three phase 240 Volt delta system.

- D. Color shall be factory applied.

1.6 FLOOR MARKING TAPE

- A. 2-inch- wide, 5-mil pressure-sensitive vinyl tape, with black and white stripes and clear vinyl overlay.

1.7 UNDERGROUND-LINE WARNING TAPE

- A. Tape:
 1. Provide warning tape to identify and locate underground electrical and communications utility lines.
 2. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
 3. Printing on tape shall be permanent and shall not be damaged by burial operations.
 4. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.
- B. Color and Printing:
 1. Comply with ANSI Z535.1 through ANSI Z535.5.
 2. Inscriptions for Red-Colored Tapes: ELECTRIC LINE, HIGH VOLTAGE.
 3. Inscriptions for Orange-Colored Tapes: TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE.

1.8 WARNING LABELS AND SIGNS

- A. Comply with NFPA 70 and 29 CFR 1910.145.

- B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.
- C. Metal-Backed, Butyrate Warning Signs:
 - 1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch galvanized-steel backing; and with colors, legend, and size required for application.
 - 2. 1/4-inch grommets in corners for mounting.
 - 3. Nominal size, 10 by 14 inches.
- D. Baked-Enamel Warning Signs
 - 1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
 - 2. 1/4-inch grommets in corners for mounting.
 - 3. Nominal size, 7 by 10 inches.
- E. Warning label and sign shall include, but are not limited to, the following legends:
 - 1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
 - 2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."

1.9 INSTRUCTION SIGNS

- A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. inches and 1/8 inch thick for larger sizes.
 - 1. Engraved legend with white letters on black face.
 - 2. Punched or drilled for mechanical fasteners.
 - 3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.
- B. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch.
- C. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch. Overlay shall provide a weatherproof and UV-resistant seal for label.

1.10 EQUIPMENT IDENTIFICATION LABELS

- A. Interiors - Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed and pop rivet to enclosure, with white letters on a dark-gray background. Minimum letter height shall be 1/2 inch.

- B. Outdoors - Stenciled Legend: In nonfading, waterproof. Adhesive backed and pop rivet to enclosure, seal penetrations with silicone. Minimum letter height shall be ½ inch.
- C. Identifications:
 - 1. 277/480 Volt – White background with black letters.
 - 2. 120/208 (120/240) Volt – Black background with white letters.
 - 3. 277/480 Volt Emergency Systems – Red background with white letters.
 - 4. 120/208 (120/240) Volt Emergency Systems – Red background with black letters.
 - 5. Letters shall be 1/2" high.
 - 6. Each panel shall be labeled with the panel designation, voltage and phase, and source feeding the panel including circuit numbers.
 - 7. Each transformer shall be labeled with the transformer designation and primary source and secondary fed equipment designation.
 - 8. Each safety switch, enclosed circuit breaker enclosure, etc. shall be labeled with the equipment designation, voltage and phase, and source feeding the equipment including circuit numbers.

1.11 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Paint: Comply with requirements in Division 09 painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).
- B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 2 - EXECUTION

2.1 INSTALLATION

- A. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- B. Apply identification devices to surfaces that require finish after completing finish work.
- C. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.
- D. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
- E. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.

- F. Painted Identification: Comply with requirements in Division 09 painting Sections for surface preparation and paint application.
- G. Label outlet boxes/junction boxes indicating circuits contained therein and source panel, neatly with black permanent marker.
- H. Provide labels on outlets cover plates indicating source panel and circuit number. Labels shall be machine type onto permanent tape.
- I. Label outlets boxes, inside (not cover plates), indicating circuit contained therein and source panel, neatly with black permanent marker.
- J. Paint fire alarm systems outlet boxes/junction boxes red. Spot paint fire alarm conduit red every 10' to within 12" of box or enclosure.
- K. Conductors to Be Extended in the Future: Attach write-on tags to conductors and list source.
- L. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
 - 1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
 - 2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
 - 3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.
- M. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.
- N. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.
- O. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum ½ inch high letters for emergency instructions at equipment used for power transfer.
- P. Each branch circuit conductor shall be labeled with the panel circuit designated 1" from termination to the circuit breaker with self-adhesive vinyl labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
- Q. Locations: In addition to installation of danger signs required by governing regulations and authorities, install appropriate danger signs at locations indicated and at locations subsequently identified as constituting dangers for persons in or about the project.

- R. Critical Switches/Controls: Install danger signs on switches and similar controls, regardless of whether concealed or locked up, where untimely or inadvertent operation (by anyone) could result in significant danger to persons, or damage to or loss of property.
- S. Electrical Equipment Rooms: Provide warning signage at the entrance to each such room; identify the hazard, and direct non-qualified personnel to stay away.
- T. Identification for power receptacles, lighting switches, and data cover plates: Install an engraved phenolic plastic laminate nameplate on each unit of electrical equipment in the building, including central or master unit of each electrical system unless unit is specified with its own self-explanatory identification or signal system. Except as otherwise indicated, provide single line of text. Provide text matching terminology and numbering of the contract documents and shop drawings.

2.2 IDENTIFICATION SCHEDULE

- A. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A, and 120 V to ground: Install labels at 20-foot maximum intervals.
- B. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:
 - 1. Emergency Power.
 - 2. Power.
 - 3. UPS.
- C. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.
- D. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.
 - 1. Install underground-line warning tape for both direct-buried cables and cables in raceway.
- E. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels.
 - 1. Comply with 29 CFR 1910.145.
 - 2. Identify system voltage with black letters on an orange background.
 - 3. Apply to exterior of door, cover, or other access.
 - 4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:
 - a. Power transfer switches.
 - b. Controls with external control power connections.

- F. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
1. Labeling Instructions:
 - a. Indoor Equipment: Self-adhesive, engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch- high letters on 1-1/2-inch- high label; where two lines of text are required, use labels 2 inches high.
 - b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
 - c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
 - d. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

END OF SECTION 26 05 53

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SECTION 26 09 23

LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Time switches.
2. Photoelectric switches.
3. Indoor occupancy sensors.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

PART 2 – PRODUCTS

2.1 TIME SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. SensorSwitch
2. Cooper Industries, Inc.
3. Intermatic, Inc.
4. Leviton Mfg. Company Inc.
5. NSi Industries LLC; TORK Products.
6. Watt Stopper

- B. Electronic Time Switches: Solid state, programmable, with alphanumeric display; complying with UL 917.
 - 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 - 2. Contact Configuration: SPST, DPST, DPDT as required for the desired control scheme.
 - 3. Contact Rating: 20-A ballast load, 120/240-V ac or 277 V ac.
 - 4. Programs: Two on-off set points on a 24-hour schedule, allowing different set points for each day of the week and an annual holiday schedule that overrides the weekly operation on holidays.
 - 5. Circuitry: Allow connection of a photoelectric relay as substitute for on-off function of a program.
 - 6. Astronomic Time: All channels.
 - 7. Automatic daylight savings time changeover.
 - 8. Battery Backup: Not less than seven days reserve, to maintain schedules and time clock.
- C. Electromechanical-Dial Time Switches are not approved.

2.2 OUTDOOR PHOTOELECTRIC SWITCHES

- A. Provide TORK 2007 A for all outdoor photoelectric switches.
- B. Description: Solid state, with SPST dry contacts rated for 1800 VA, to operate connected load, complying with ANSI C136.10 and EEI NEMA.
 - 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 - 2. Mounting: Twist lock complying with NEMA C136.10, with base.

2.3 INDOOR CEILING OCCUPANCY SENSORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Bryant Electric; a Hubbell company.
 - 2. Cooper Industries, Inc.
 - 3. Hubbell Building Automation, Inc.
 - 4. Leviton Mfg. Company Inc.
 - 5. Lithonia Lighting; Acuity Lighting Group, Inc.
 - 6. Lutron Electronics Co., Inc.
 - 7. Watt Stopper.

- B. General Requirements for Sensors: Ceiling-mounted, dual technology type indoor occupancy sensors.
1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 2. Operation: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn them off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 3 to 30 minutes.
 3. Provide manual toggle switch to allow manual means to turn load off. Provide dual switching in classrooms and computer labs, and research labs.
 4. Power Pack: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-tungsten at 120-V ac, and for 1 hp at 120-V ac. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70. Use when multiple sensors are required. Equal to DT-300 Series Dual Technology Ceiling Sensors.
 5. Use line voltage sensor equal to Watt Stopper DT-355 Dual Technology Line Voltage Ceiling Sensor when only one sensor is required.
 6. Automatic Light-Level Sensor: Adjustable from 10 to 300 fc; turn lights off when selected lighting level is present.
 7. LEDs to indicate occupancy detection.
 8. Provide five year warranty.

2.4 SWITCHBOX-MOUNTED OCCUPANCY SENSORS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
1. Bryant Electric; a Hubbell company.
 2. Cooper Industries, Inc.
 3. Hubbell Building Automation, Inc.
 4. Leviton Mfg. Company Inc.
 5. Lithonia Lighting; Acuity Lighting Group, Inc.
 6. Lutron Electronics Co., Inc.
 7. NSi Industries LLC; TORK Products.
 8. Watt Stopper.
- B. General Requirements for Sensors: Automatic-wall-switch occupancy sensor, suitable for mounting in a single gang switchbox.
1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 2. Operating Ambient Conditions: Dry interior conditions, 32 to 120 deg F.
 3. Switch Rating: Not less than 800-VA fluorescent at 120 V and 1200-VA fluorescent at 277 V.

C. Wall-Switch Sensor:

1. Standard Range: 180-degree field of view, field adjustable from 180 to 40 degrees; with a minimum coverage area of 900 sq. ft.
2. Sensing Technology: Dual technology - PIR and ultrasonic.
3. Switch Type: Provide with choice of Auto-On or Manual-On.
4. Provide means for manual-Off override via pushbutton.
5. Voltage: Dual voltage, 120 and 277 V; dual-technology type.
6. Ambient-Light Override: Concealed, field-adjustable, light-level sensor from 10 to 150 fc. The switch prevents the lights from turning on when the light level is higher than the set point of the sensor.
7. Concealed, field-adjustable, "off" time-delay selector at up to 30 minutes.
8. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and helps eliminate false "off" switching.

2.5 LIGHTING CONTACTORS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Allen-Bradley/Rockwell Automation.
2. ASCO Power Technologies, LP; a division of Emerson Electric Co.
3. Eaton Corporation.
4. General Electric Company; GE Consumer & Industrial - Electrical Distribution; Total Lighting Control.
5. Square D; a brand of Schneider Electric.

B. Description: Electrically operated and mechanically/electrically held (as required for the control type), complying with NEMA ICS 2 and UL 508.

1. Current Rating for Switching: Listing or rating consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast (ballast with 15 percent or less total harmonic distortion of normal load current).
2. Fault Current Withstand Rating: Equal to or exceeding the available fault current at the point of installation.
3. Enclosure: Comply with NEMA 250.

2.6 CONDUCTORS AND CABLES

- A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables".

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.
- B. Identify components and power and control wiring according to Division 26 Section "Identification for Electrical Systems".
- C. Circuit controlled by occupancy sensors shall not be routed through a relay control panel.
- D. Exterior lighting shall be controlled via photocell on/off and shall not be routed through a relay control panel.
- E. Provide Training for all lighting control devices.

3.2 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Lighting control devices will be considered defective if they do not pass tests and inspections.
- C. Prepare Test and Inspection reports.

END OF SECTION 26 09 23

SECTION 26 22 00

LOW-VOLTAGE TRANSFORMERS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following types of dry-type transformers rated 600 V and less, with capacities up to 1000 kVA:
 - 1. Distribution transformers.
 - 2. Buck-boost transformers.

1.2 ACTION SUBMITTALS

- A. Product Data: For each product indicated.
- B. Shop Drawings: Indicate dimensions and weights.
 - 1. Wiring Diagrams: Power, signal, and control wiring.

1.3 INFORMATIONAL SUBMITTALS

- A. Field quality-control test reports.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with IEEE C57.12.91, "Test Code for Dry-Type Distribution and Power Transformers."

LOW VOLTAGE TRANSFORMERS

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, provide products by the following:
1. ACME Electric Corporation; Power Distribution Products Division.
 2. Challenger Electrical Equipment Corp.; a division of Eaton Corp.
 3. Eaton Electrical Inc.; Cutler-Hammer Products.
 4. General Electric Company.
 5. Magnetek Power Electronics Group.
 6. Siemens Energy & Automation, Inc.
 7. Sola/Hevi-Duty.
 8. Square D; Schneider Electric.

2.2 GENERAL TRANSFORMER REQUIREMENTS

- A. Description: Factory-assembled and tested, air-cooled units for 60-Hz service.
- B. Cores: Grain-oriented, non-aging silicon steel.
- C. Coils: Continuous windings without splices except for taps.
1. Internal Coil Connections: Brazed or pressure type.
 2. Coil Material: Copper.

2.3 DISTRIBUTION TRANSFORMERS

- A. Comply with NEMA ST 20, and list and label as complying with UL 1561.
- B. Cores: One leg per phase.
- C. Indoor enclosure: Ventilated, NEMA 250, Type 2.
1. Core and coil shall be encapsulated within resin compound, sealing out moisture and air.
- D. Outdoor enclosure: Ventilated with weathersheild, Type 3R.

1. Core and coil shall be encapsulated within resin compound, sealing out moisture and air.
 - E. Taps for Transformers Smaller than 3 kVA: One 5 percent tap above normal full capacity.
 - F. Taps for Transformers 7.5 to 24 kVA: One 5 percent tap above and one 5 percent tap below normal full capacity.
 - G. Taps for Transformers 25 kVA and larger: Two 2.5 percent taps above and four 2.5 percent taps below normal full capacity.
 - H. Insulation Class: 220 deg C, UL-component-recognized insulation system with a maximum of 150 deg C rise above 40 deg C ambient temperature.
 - I. Energy Efficiency for Transformers Rated 15 kVA and Larger:
 1. Complying with NEMA TP 1, Class 1 efficiency levels.
 2. Tested according to NEMA TP 2.
 - J. K-Factor Rating where specified: 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.
 - K. Electrostatic Shielding: Each winding shall have an independent, single, full-width copper electrostatic shield arranged to minimize interwinding capacitance.
- 2.4 BUCK-BOOST TRANSFORMERS
- A. Description: Self-cooled, two-winding dry type, rated for continuous duty and with wiring terminals suitable for connection as autotransformer. Transformers shall comply with NEMA ST 1 and shall be listed and labeled as complying with UL 506 or UL 1561.
 - B. Enclosure: Ventilated, NEMA 250, Type 2.
 1. Finish Color: Gray.
- 2.5 IDENTIFICATION DEVICES
- A. Nameplates: Engraved, laminated-plastic. Nameplates are specified in Division 26

Section "Identification for Electrical Systems".

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Wall mounted transformers: Mount level and plumb with wall brackets fabricated by transformer manufacturer.
 - 1. Brace wall-mounting transformers in accordance with structural engineer direction.
- B. Floor mounted transformers - Construct 4" housing keeping concrete base and anchor floor-mounting transformers according to manufacturer's written instructions.
- C. Dry-type transformers installed indoors and rated 112 ½ KVA or less shall have a separation of at least 12 inches from combustible material, inclusive of drywall, unless separated from the combustible material by a fire resistant, heat-insulated barrier.
- D. Provide a non-fused disconnect switch at primary side of transformers located remote (not in site of) their primary overcurrent protection device.

3.2 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 - 1. Test secondary phase, neutral, and ground to ensure the transformer is connected properly (no floating neutral).

3.3 ADJUSTING

- A. Adjust transformer taps to provide optimum voltage conditions at secondary terminals. Optimum is defined as not exceeding nameplate voltage plus 10 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 written report recording output voltages and tap settings.

END OF SECTION 26 22 00

SECTION 26 24 16

PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Distribution panelboards.
 - 2. Lighting and appliance branch-circuit panelboards.
 - 3. Load centers.
 - 4. Electronic-grade panelboards.

1.3 DEFINITIONS

- A. GFCI: Ground-fault circuit interrupter.
- B. GFEP: Ground-fault equipment protection.
- C. HID: High-intensity discharge.
- D. MCCB: Molded-case circuit breaker.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of panelboard.
 - 1. Include materials, switching and overcurrent protective devices, accessories, and components indicated.
 - 2. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
- B. Shop Drawings: For each panelboard and related equipment.

PANELBOARDS

1. Include dimensioned plans, elevations, sections, and details.
2. Show tabulations of installed devices with nameplates, conductor termination sizes, equipment features, and ratings.
3. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.
4. Detail bus configuration, current, and voltage ratings.
5. Short-circuit current rating of panelboards and overcurrent protective devices.
6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
7. Include wiring diagrams for power, signal, and control wiring.
8. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device. Include an Internet link for electronic access to downloadable PDF of the coordination curves.
9. Provide 1/8" = 1'-0" scaled drawings with panelboard layouts in space of all electrical rooms and other areas where electrical panelboards are shown on the drawings. The Electrical Contractor shall be responsible for locating submitted equipment into allocated spaces as shown on the drawings. Provide a statement that final panelboard locations have been coordinated with Mechanical, Plumbing, and Fire Protection Contractors (as applicable), and that all requirements of working space and dedicated space, as described in NFPA 70, are met. Provide an official Request for Information if these requirements cannot be met.
10. Provide a statement that the Electrical Contractor has coordinated overcurrent device requirements with the other divisions which are supplying electrical equipment in this contract. Any changes shall be noted. Indicate that the wire and conduit sizes have been adjusted accordingly. Equipment shown in original Construction Documents is selected per basis of design equipment. Any changes shall be compensated by the division deviating from the base equipment. Coordinate overcurrent protection requirements with other divisions supplying the electrical equipment, prior to ordering final product.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency. See additional requirements in Division 01 Section "Quality Requirements".
- B. Field Quality-Control Reports:
 1. Test procedures used.
 2. Test results that comply with requirements.
 3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

PANELBOARDS

- C. Panelboard Schedules: For installation in panelboards.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
 - 1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
 - 2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents. Provide a written statement to indicate quantities of each product that will be delivered to the Owner, at the time of Substantial Completion.
 - 1. Keys: Two (2) spares for each type of panelboard cabinet lock.
 - 2. Circuit Breakers Including GFCI and GFEP Types: Two (2) spares for each panelboard.
 - 3. Fuses for Fused Switches: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
 - 4. Fuses for Fused Power-Circuit Devices: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications: ISO 9001 or 9002 certified.
- B. Testing Agency Qualifications: Member company of NETA or an NRTL.
 - 1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.
- C. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.
- D. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

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- E. 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.
- F. Comply with NEMA PB 1.
- G. Comply with NFPA 70.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.
- B. Handle and prepare panelboards for installation according to NEMA PB 1.

1.10 FIELD CONDITIONS

- A. Environmental Limitations:
 - 1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
 - 2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:
 - a. Ambient Temperature: Not exceeding 23 degrees F to 104 degrees F.
 - b. Altitude: Not exceeding 6600 feet.
 - c. For any panelboards installed at exterior locations: Coordinate ambient requirements (average) at location with the equipment manufacturer. Provide thermally compensated circuit breakers if required. Provide written statement explaining the action resulting from coordination event with the manufacturer.
- B. Service Conditions: NEMA PB 1, usual service conditions, as follows:
 - 1. Ambient temperatures within limits specified.
 - 2. Altitude not exceeding 6600 feet.
- C. Interruption of Existing Electric Service:
(Applicable to projects where the scope requires modifications to the existing electrical service)

Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1. Notify Architect, Construction Manager, and the Owner no fewer than ten (10) days in advance of proposed interruption of electric service.
2. The contractor shall comply with all phasing instructions, as required by the Construction Drawings and as interpreted by the Construction Manager. The contractor shall ensure that the manager of the existing facility (the Owner) is fully aware of general schedule of the project, and any specific event that may affect the facility operation. The contractor shall coordinate with the facility manager on demolition and the construction schedule and provide required notifications prior to any power shutdown or commencing work in each existing area of interest. The contractor shall ensure that the facility manager is fully aware of the entire sequence of operation at the time of power outage. For any power shut-down, the contractor is encouraged to create a sequence of operation in writing, indicating schedule and the required actions from all parties involved. Shut-down shall be kept to minimum time. The contractor may have to work during "off" hours, as required and agreed with facility manager. Temporary power shall be provided to all equipment that must remain in operation.
3. Do not proceed with interruption of electric service without the Owner's written permission.
4. Comply with NFPA 70E.

1.11 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace panelboards that fail in materials or workmanship within specified warranty period.
 1. Panelboard Warranty Period: Eighteen (18) months from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PANELBOARDS AND LOAD CENTERS COMMON REQUIREMENTS

- A. Enclosures: Flush- and Surface-mounted cabinets.
 1. Rated for environmental conditions at installed location.
 - a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
 - b. Outdoor Locations: NEMA 250, Type 3R.
 - c. Kitchen and Wash-Down Areas: NEMA 250, Type 4X, stainless steel.
 - d. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.

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2. Height: 78 inches maximum to manually operable parts of overcurrent protection devices.
3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims shall cover all live parts and shall have no exposed hardware.
4. Gutter Extension and Barrier: Same gage and finish as panelboard enclosure; integral with enclosure body. Arrange to isolate individual panel sections.
5. Finishes:
 - a. Panels and Trim: Steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
 - b. Back Boxes: Galvanized steel.
 - c. Fungus Proofing: Permanent fungicidal treatment for overcurrent protective devices and other components.
6. Directory Card: The directory shall be protected by a transparent protective covering inside of a metal frame attached to the inside the panelboard door. An adhesive plastic sleeve is not acceptable.

B. Incoming Mains:

1. Location: Top or Bottom.
2. Main Breaker: Main lug interiors up to 400 amperes shall be field convertible to main breaker.

C. Phase, Neutral, and Ground Buses:

1. Material: Hard-drawn copper, 98 percent conductivity.
 - a. Bus shall be fully rated the entire length.
2. Interiors shall be factory assembled into a unit. Replacing switching and protective devices shall not disturb adjacent units or require removing the main bus connectors.
3. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
4. Isolated Ground Bus: (If shown on drawings)
Adequate for branch-circuit isolated ground conductors; insulated from box.
5. Full-Sized Neutral: Equipped with full-capacity bonding strap for service entrance applications. Mount electrically isolated from enclosure. Do not mount neutral bus in gutter.
6. Extra-Capacity Neutral Bus: (If shown on Drawings)
Neutral bus rated 200 percent of phase bus and listed and labeled by an NRTL acceptable to authority having jurisdiction, as suitable for nonlinear loads in electronic-grade panelboards and others designated on Drawings. Connectors

shall be sized for double-sized or parallel conductors as indicated on Drawings. Do not mount neutral bus in gutter.

- D. Conductor Connectors: Suitable for use with conductor material and sizes.
1. Material: Hard-drawn copper, 98 percent conductivity.
 2. Terminations shall allow use of 75 degrees C rated conductors without derating.
 3. Size: Lugs suitable for indicated conductor sizes, with additional gutter space, if required, for larger conductors.
 4. Main and Neutral Lugs: Mechanical type, with a lug on the neutral bar for each pole in the panelboard.
 5. Ground Lugs and Bus-Configured Terminators: Mechanical type, with a lug on the bar for each pole in the panelboard.
 6. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
 7. Sub-feed (Double) Lugs: Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
 8. Gutter-Tap Lugs: Mechanical type suitable for use with conductor material and with matching insulating covers. Locate at same end of bus as incoming lugs or main device.
 9. Extra-Capacity Neutral Lugs: (If extra capacity Neutral bus)
Rated 200 percent of phase lugs mounted on extra-capacity neutral bus.
- E. NRTL Label: Panelboards or load centers shall be labeled by an NRTL acceptable to authority having jurisdiction for use as service equipment with one or more main service disconnecting and overcurrent protective devices. Panelboards or load centers shall have meter enclosures, wiring, connections, and other provisions for utility metering. Coordinate with utility company for exact requirements.
- F. Future Devices: Panelboards or load centers shall have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
1. Percentage of Future Space Capacity: Twenty (20) percent.
 2. Where "space" in Panelboard Schedule is followed by specific circuit breaker size, it indicates that provisions shall be made in panelboard to accommodate for future installation of breaker sized as shown.
- G. 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.
1. Panelboards and overcurrent protective devices rated 240 V or less shall have short-circuit ratings as shown on Drawings, but not less than 10,000 A rms symmetrical.

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2. Panelboards and overcurrent protective devices rated above 240 V and less than 600 V shall have short-circuit ratings as shown on Drawings, but not less than 14,000 A rms symmetrical.

2.2 POWER PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, provide comparable product by one of the following:
 1. General Electric Company
 2. Square D; a brand of Schneider Electric
 3. Cutler Hammer, Eaton Corporation
- B. Panelboards: NEMA PB 1, power and feeder distribution type.
- C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.
 1. For doors more than 36 inches high, provide two latches, keyed alike.
- D. Mains: As indicated on Drawings.
- E. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.
- F. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers, Plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, provide comparable product by one of the following:
 1. General Electric Company
 2. Square D; a brand of Schneider Electric
 3. Cutler Hammer, Eaton Corporation
- B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.
- C. Mains: Circuit breaker or lugs only.
- D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

- E. Doors: Door-in-door construction with concealed hinges; secured with multipoint latch with tumbler lock; keyed alike. Outer door shall permit full access to the panel interior. Inner door shall permit access to breaker operating handles and labeling, but current carrying terminals and bus shall remain concealed.
- F. Column-Type Panelboards: Single row of overcurrent devices with narrow gutter extension and overhead junction box equipped with ground and neutral terminal buses.
 - 1. Doors: Concealed hinges secured with multipoint latch with tumbler lock; keyed alike.

2.4 FUSED COORDINATION PANELBOARD

- A. Combination circuit breaker and fusible branch circuit panelboards shall be
- B. Mersen Fused Coordination Panelboard type MFCP or approved equal.
- C. Substitutions will be accepted only if the below requirements are met and written approval is provided from the engineer:

The electrical contractor supplies a written request to the engineer three weeks prior to the project bid date

The electrical contractor provides product documentation to prove complete compliance with specification and all pertinent codes and standards requirements as specified in this section.

D. PANELBOARD RATINGS

Panelboards shall be labeled with a short-circuit current rating (SCCR) equal to or greater than that indicated on the associated schedules or drawings.

Non-service and service entrance rated panelboards shall be UL listed.

Panelboards shall be rated 600Vac and have a current rating as indicated on the associated schedules or drawings.

Panelboard overcurrent protective device interrupting ratings shall be UL listed and rated for the maximum available fault current.

Current ratings, configuration of poles and number of circuits shall be indicated on associated schedules or drawings.

2.5 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. Manufacturers: Subject to compliance with requirements, provide comparable product by one of the following:
1. General Electric Company
 2. Square D; a brand of Schneider Electric
 3. Cutler Hammer, Eaton Corporation
- B. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.
1. Thermal-Magnetic Circuit Breakers:
 - a. Inverse time-current element for low-level overloads.
 - b. Instantaneous magnetic trip element for short circuits.
 - c. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
 2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
 3. Electronic Trip Circuit Breakers:
 - a. RMS sensing.
 - b. Field-replaceable rating plug or electronic trip.
 - c. Digital display of settings, trip targets, and indicated metering displays.
 - d. Multi-button keypad to access programmable functions and monitored data.
 - e. Ten-event, trip-history log. Each trip event shall be recorded with type, phase, and magnitude of fault that caused the trip.
 - f. Integral test jack for connection to portable test set or laptop computer.
 - g. Field-Adjustable Settings:
 - 1) Instantaneous trip.
 - 2) Long- and short-time pickup levels.
 - 3) Long and short time adjustments.
 - 4) Ground-fault pickup level, time delay, and I squared T response.
 4. Current-Limiting Circuit Breakers: (If shown on Drawings)
Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
 5. GFCI Circuit Breakers: (If shown on Drawings)
Single- and double-pole configurations with Class A ground-fault protection (6-mA trip).
 6. GFEP Circuit Breakers: (If shown on Drawings)
Class B ground-fault protection (30-mA trip).
 7. Arc-Fault Circuit Interrupter Circuit Breakers: (If shown on Drawings)
Comply with UL 1699; 120/240-V, single-pole configuration.

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8. Sub-feed Circuit Breakers: (If shown on Drawings)
Vertically mounted.
9. MCCB Features and Accessories:
 - a. Standard frame sizes, trip ratings, and number of poles.
 - b. Breaker handle indicates tripped status.
 - c. UL listed for reverse connection without restrictive line or load ratings.
 - d. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
 - e. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and HID lighting circuits.
 - f. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
 - g. Communication Capability: Universal-mounted communication module with functions and features compatible with power monitoring and control system specified in Section 260913 "Electrical Power Monitoring and Control."
 - h. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 75 percent of rated voltage.
 - i. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage with field-adjustable 0.1- to 0.6-second time delay.
 - j. Rating Plugs: Three-pole breakers with ampere ratings greater than 150 (One hundred and fifty) amperes shall have interchangeable rating plugs or electronic adjustable trip units.
 - k. Auxiliary Contacts: One, SPDT switch with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts and "b" contacts operate in reverse of circuit-breaker contacts.
 - l. Alarm Switch: Single-pole, normally open contact that actuates only when circuit breaker trips.
 - m. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
 - n. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function with other upstream or downstream devices.
 - o. Multipole units enclosed in a single housing with a single handle.
 - p. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in on or off position.
 - q. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.

2.6 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Division 26 Section "Identification for Electrical Systems."
- B. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles shall be located on the interior of the panelboard door.
- C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."
- D. Breaker Labels: Faceplate shall list current rating, UL and IEC certification standards, and AIC rating.
- E. Device Nameplates: Label each branch circuit device in distribution panelboards with a nameplate complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."
- F. Circuit Directory: Computer-generated circuit directory mounted in metal frame in door, with transparent plastic protective cover.
 - 1. Circuit directory shall identify specific purpose with detail sufficient to distinguish it from all other circuits.
 - 2. Create a directory to indicate installed circuit loads; incorporate Owner's final room designations.

2.7 ACCESSORY COMPONENTS AND FEATURES

- A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.
- B. Portable Test Set: For testing functions of solid-state trip devices without removing from panelboard. Include relay and meter test plugs suitable for testing panelboard meters and switchboard class relays.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify actual conditions with field measurements prior to ordering panelboards to verify that equipment fits in allocated space in, and comply with, minimum required clearances specified in NFPA 70.

PANELBOARDS

- B. Receive, inspect, handle, and store panelboards according to NEMA PB 1.1.
- C. Examine panelboards before installation. Reject panelboards that are damaged, rusted, or have been subjected to water saturation.
- D. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B. Comply with NECA 1.
- C. Install panelboards and accessories according to NEMA PB 1.1.
- D. Equipment Mounting:
 - 1. Install panelboards on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in Division 03 Cast-in-Place Concrete.
 - 2. Attach panelboard to the vertical finished or structural surface behind the panelboard.
- E. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.
- F. Mount top of trim 90 inches above finished floor unless otherwise indicated.
- G. Mount panelboard cabinet plumb and rigid without distortion of box.
- H. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
- I. Mount surface-mounted panelboards to steel slotted supports 5/8 inch in depth. Orient steel slotted supports vertically.
- J. Install overcurrent protective devices and controllers not already factory installed.
 - 1. Set field-adjustable, circuit-breaker trip ranges.

PANELBOARDS

2. Tighten bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver per manufacturer's written instructions.
- K. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.
- L. Install filler plates in unused spaces.
- M. Stub four 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch empty conduits into raised floor space or below slab not on grade.
- N. Wiring Gutters: Feeder and Branch circuit conductors are sized for circuit ampacity and anticipated voltage drop and may be larger than the allowable ampacities per NFPA 70 Table 310-15(B)(16). Contractor shall provide cabinets with gutters, sized as required to accommodate the conductors and connections being installed.
- O. Arrange conductors in gutters into groups and bundle and wrap with wire ties.
- P. Mount spare fuse cabinet in accessible location.
- Q. All panelboards shall be clean of dust and construction debris prior to substantial completion. Any bent or scratched covers shall be replaced with new factory equipment.

3.3 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems."
- B. Create a directory to indicate installed circuit loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside of a metal frame attached to the inside of the panelboard door.
- C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- D. Device Nameplates: Label each branch circuit device in power panelboards with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

- E. Install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems" identifying source of remote circuit.

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.
- B. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- C. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
 - 3. Perform the following infrared scan tests and inspections and prepare reports:
 - a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each panelboard. Remove front panels so joints and connections are accessible to portable scanner.
 - b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each panelboard 11 months after date of Substantial Completion.
 - c. Instruments and Equipment:
 - 1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
- D. Panelboards will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

- A. Adjust moving parts and operable components to function smoothly and lubricate as recommended by manufacturer.
- B. Set field-adjustable circuit-breaker trip ranges as indicated.

3.6 PROTECTION

- A. Temporary Heating: Prior to energizing panelboards, apply temporary heat to maintain temperature according to manufacturer's written instructions.

END OF SECTION 26 24 16

SECTION 26 27 26

WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Receptacles, receptacles with integral GFCI, and associated device plates.
2. Weather-resistant receptacles.
3. Snap switches and wall-box dimmers.
4. Solid-state fan speed controls.
5. Wall-switch and exterior occupancy sensors.
6. Communications outlets.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Receptacles for owner furnished equipment - match plug configurations.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: List of legends and description of materials and process used for marking wall plates.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

PART 2 - PRODUCTS

WIRING DEVICES

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products from one of the following:
1. Cooper Wiring Devices; Division of Cooper Industries, Inc. (Cooper).
 2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
 3. Leviton Mfg. Company Inc. (Leviton).
 4. Pass & Seymour/Legrand (Pass & Seymour).
- B. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 GENERAL WIRING-DEVICE REQUIREMENTS

- A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.

2.3 STRAIGHT-BLADE RECEPTACLES

- A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.
1. Products: Subject to compliance with requirements, provide products by one of the following:
 - a. Cooper; 5351 (single), CR5362 (duplex).
 - b. Hubbell; HBL5351 (single), HBL5352 (duplex).
 - c. Leviton; 5891 (single), 5352 (duplex).
 - d. Pass & Seymour; 5361 (single), 5362 (duplex).

2.4 GFCI RECEPTACLES

- A. General Description:
1. Straight blade, non-feed-through type.
 2. Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 943 Class A, and FS W-C-596.
 3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.

B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:

1. Products: Subject to compliance with requirements, provide products by one of the following:
 - a. Cooper.
 - b. Hubbell.
 - c. Pass & Seymour.
 - d. Leviton.

2.5 TOGGLE SWITCHES

A. Comply with NEMA WD 1, UL 20, and FS W-S-896.

B. Switches, 120/277 V, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Single Pole:
 - 1) Cooper; AH1221.
 - 2) Hubbell; hBL1221.
 - 3) Leviton; 1221-2.
 - 4) Pass & Seymour; CSB20AC1.
 - b. Two Pole:
 - 1) Cooper; AH1222.
 - 2) Hubbell; HBL1222.
 - 3) Leviton; 1222-2.
 - 4) Pass & Seymour; CSB20AC2.
 - c. Three Way:
 - 1) Cooper; AH1223.
 - 2) Hubbell; HBL1223.
 - 3) Leviton; 1223-2.
 - 4) Pass & Seymour; CSB20AC3.

- d. Four Way:
 - 1) Cooper; AH1224.
 - 2) Hubbell; HBL1224.
 - 3) Leviton; 1224-2.
 - 4) Pass & Seymour; CSB20AC4.

- C. Pilot-Light Switches, 20 A:
 - 1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; AH1221PL for 120 and 277 V.
 - b. Hubbell; HBL1201PL for 120 and 277 V.
 - c. Leviton; 1221-LH1.
 - d. Pass & Seymour; PS20AC1RPL for 120 V, PS20AC1RPL7 for 277 V.
 - 2. Description: Single pole, with neon-lighted handle, illuminated when switch is "off."

- D. Key-Operated Switches, 120/277 V, 20 A:
 - 1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; AH1221L.
 - b. Hubbell; HBL1221L.
 - c. Leviton; 1221-2L.
 - d. Pass & Seymour; PS20AC1-L.
 - 2. Description: Single pole, with factory-supplied key in lieu of switch handle.

2.6 DECORATOR-STYLE DEVICES

- A. Convenience Receptacles: Square face, 125 V, 15 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-15R, and UL 498.
 - 1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; 6252.
 - b. Hubbell; DR15.

WIRING DEVICES

- c. Leviton; 16252.
 - d. Pass & Seymour; 26252.
- B. GFCI, Non-Feed-Through Type, Convenience Receptacles: Square face, 125 V, 15 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-15R, UL 498, and UL 943 Class A.
- 1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; VGF15.
 - b. Hubbell; GF15LA.
 - c. Leviton; 8599.
 - d. Pass & Seymour; 1594.
- C. Toggle Switches, Square Face, 120/277 V, 15 A: Comply with NEMA WD 1, UL 20, and FS W-S-896.
- 1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; 7621 (single pole), 7623 (three way).
 - b. Hubbell; DS115 (single pole), DS315 (three way).
 - c. Leviton; 56291-2 (single pole), 5623-2 (three way).
 - d. Pass & Seymour; 2621 (single pole), 2623 (three way).
- D. Lighted Toggle Switches, Square Face, 120 V, 15 A: Comply with NEMA WD 1 and UL 20.
- 1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; 7631 (single pole), 7633 (three way).
 - b. Hubbell; DS120IL (single pole), DS320 (three way).
 - c. Leviton; 5631-2 (single pole), 5633-2 (three way).
 - d. Pass & Seymour; 2625 (single pole), 2626 (three way).
 - 2. Description: With neon-lighted handle, illuminated when switch is "off."

2.7 WALL-BOX DIMMERS

- A. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on-off switches, with audible frequency and EMI/RFI suppression filters.

- B. Control: Continuously adjustable slider toggle switch; with single-pole or three-way switching. Comply with UL 1472.
- C. Fluorescent Lamp Dimmer Switches: Modular; compatible with dimmer ballasts; trim potentiometer to adjust low-end dimming; dimmer-ballast combination capable of consistent dimming with low end not greater than 20 percent of full brightness.
- D. LED Dimmer Switches: Compatible with dimmer LED drivers, capable of consistent dimming with low end not greater than 10 percent of full brightness. In new construction, utilize LED dimmable fixtures with compatible LED dimmer.

2.8 WALL PLATES

- A. Single and combination types shall match corresponding wiring devices.
 - 1. Plate-Securing Screws: Metal with head color to match plate finish.
 - 2. Material for Finished Spaces: Coordinate with architect.
 - 3. Material for Unfinished Spaces: Galvanized steel.
 - 4. Material for Damp Locations: Cast aluminum while in use cover listed and labeled for use in wet and damp locations.
 - 5. Material for kitchens or food processing areas – stainless steel.
- B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum while in use cover.

2.9 FINISHES

- A. Device Color:
 - 1. Wiring Devices Connected to Normal Power System: Coordinate with architect.
 - 2. Wiring Devices Connected to Emergency Power System: Red.
 - 3. TVSS Devices: Blue.
- B. Wall Plate Color: Coordinate with architect.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:

1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
4. Existing Conductors:
 - a. Cut back and pigtail, or replace all damaged conductors.
 - b. Straighten conductors that remain and remove corrosion and foreign matter.
 - c. Pigtailing existing conductors is permitted, provided the outlet box is large enough, meets NEC.

D. Device Installation:

1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.

WIRING DEVICES

9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.
10. Do not install GFI type devices where readily inaccessible such as behind water fountain housings are where food prep equipment blocks access. In these instances, provide a GFI type circuit breaker protecting a standard device.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the right.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Dimmers:

1. Install dimmers within terms of their listing.
2. Verify that dimmers used for fan speed control are listed for that application.
3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.

H. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

I. Adjust locations of service poles to suit arrangement of partitions and furnishings.

3.2 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Test Instruments: Use instruments that comply with UL 1436.
2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

B. Tests for Convenience Receptacles:

1. Line Voltage: Acceptable range is 115 to 126 V.
2. Percent Voltage Drop under 15-A Load: A value of 5 percent or higher is unacceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.
6. Tests shall be diagnostic, indicating damaged conductors, high resistance at

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the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

- C. Wiring device will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

END OF SECTION 26 27 26

SECTION 26 28 16

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Fusible switches.
 - 2. Nonfusible switches.
 - 3. Shunt trip switches.
 - 4. Molded-case circuit breakers.
 - 5. Enclosures.

1.2 DEFINITIONS

- A. NC: Normally closed.
- B. NO: Normally open.
- C. SPDT: Single pole, double throw.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated.
- B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Wiring Diagrams: For power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

1.6 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.

PART 2 – PRODUCTS

2.1 FUSIBLE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 - 3. Siemens Energy & Automation, Inc.
 - 4. Square D; a brand of Schneider Electric.
- B. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A thru 400 A: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- C. Type HD, Heavy Duty, Single Throw, 600-V ac, 200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept one padlock, and interlocked with cover in closed position.
- D. Accessories:
 - 1. Equipment Ground Kit: Internally mounted and labeled for copper ground conductors.
 - 2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper neutral conductors.
 - 3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
 - 4. Lugs: Suitable for number, size, and conductor material.
 - 5. Service-Rated Switches: Labeled for use as service equipment.

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

2.2 NONFUSIBLE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 3. Siemens Energy & Automation, Inc.
 4. Square D; a brand of Schneider Electric.
- B. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A thru 400 A: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- C. Type HD, Heavy Duty, Single Throw, 600-V ac, 200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept one padlock, and interlocked with cover in closed position.
- D. Accessories:
1. Equipment Ground Kit: Internally mounted and labeled for copper ground conductors.
 2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper neutral conductors.
 3. Lugs: Suitable for number, size, and conductor material.

2.3 SHUNT TRIP SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Cooper Bussmann, Inc.
 2. Ferraz Shawmut, Inc.
 3. Littelfuse, Inc.
- B. General Requirements: Comply with ASME A17.1, UL 50, and UL 98, with 200-kA interrupting and short-circuit current rating when fitted with Class J fuses.
- C. Switches: Three-pole, horsepower rated, with integral shunt trip mechanism and Class J fuse block; lockable handle with capability to accept three padlocks; interlocked with cover in closed position.
- D. Accessories:
1. Oiltight key switch for key-to-test function.

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

2. Oiltight ON pilot light.
3. Isolated neutral lug.
4. Mechanically interlocked auxiliary contacts that change state when switch is opened and closed.
5. Form C alarm contacts that change state when switch is tripped.
6. Three-pole, double-throw, fire-safety and alarm relay; with appropriate coil voltage.
7. Three-pole, double-throw, fire-alarm voltage monitoring relay complying with NFPA 72.

2.4 MOLDED-CASE CIRCUIT BREAKERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 3. Siemens Energy & Automation, Inc.
 4. Square D; a brand of Schneider Electric.
- B. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.
- C. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
- D. Electronic Trip Circuit Breakers: Field-replaceable rating plug, rms sensing, with the following field-adjustable settings:
 1. Instantaneous trip.
 2. Long- and short-time pickup levels.
 3. Long- and short-time time adjustments.
 4. Ground-fault pickup level, time delay, and I^2t response.
- E. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.
- F. Features and Accessories:
 1. Standard frame sizes, trip ratings, and number of poles.
 2. Lugs: Suitable for number, size, trip ratings, and conductor material.
 3. Ground-Fault Protection: Comply with UL 1053; integrally mounted type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three- phase, zero-sequence current transformer/sensor.

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

4. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.
5. Auxiliary Contacts: Two SPDT switches with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
6. Alarm Switch: One NC contact that operates only when circuit breaker has tripped.

2.5 ENCLOSURES

- A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
 1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
 2. Outdoor Locations: NEMA 250, Type 3R.
 3. Wash-Down Areas: NEMA 250, Type 4X, stainless steel.
 4. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.
 5. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
- B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- C. Install fuses in fusible devices.
- D. Comply with NECA 1.

3.2 IDENTIFICATION

- A. Comply with requirements in Division 26 Section "Identification for Electrical Systems".
 1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
 2. Label each enclosure with engraved metal or laminated-plastic nameplate.
 3. Indicate manufacturer's name, amperage, voltage, phase, number of wires, short-circuit rating, ampacity interrupting capacity rating, and Arc Flash Warning label in accordance with NEC.

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections.

- B. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.

- C. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

- D. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

- E. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

END OF SECTION 26 28 16

SECTION 264313 - TRANSIENT-VOLTAGE SUPPRESSION FOR LOW-VOLTAGE
ELECTRICAL POWER CIRCUITS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes field-mounted TVSS for low-voltage (120 to 600 V) power distribution and control equipment.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include unit dimensions, rated capacities, operating weights, electrical characteristics, furnished specialties, and accessories.

1.3 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.
- B. Warranty information.
- C. Drawings: Provide shop drawings indicating mounting provisions, installation instructions, and wiring diagrams.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a testing agency, and marked for intended location and application.
- B. Comply with IEEE C62.41.2 and test devices according to IEEE C62.45.
- C. Comply with NEMA LS 1.
- D. Comply with UL 1283 and UL 1449.
- E. Comply with NFPA 70.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of surge suppressors that fail in materials or workmanship within specified warranty period.
1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SERVICE ENTRANCE SUPPRESSORS – Type 1

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Advanced Protection Technologies Inc. (APT).
 2. Current Technology Inc.; Danaher Power Solutions.
 3. LEA International.
 4. Leviton Mfg. Company Inc.
 5. PQ Protection.
- B. Surge Protection Devices:
1. LED indicator lights for power and protection status.
 2. Comply with UL 1449.
 3. Fabrication using bolted compression lugs for internal wiring.
 4. Integral disconnect switch when connected to line side of main service switch.
 5. Redundant suppression circuits.
 6. Arrangement with wire connections to phase buses, neutral bus, and ground bus.
 7. LED indicator lights for power and protection status.
- C. Peak Single-Impulse Surge Current Rating: 160 kA per mode/320 kA per phase.
- D. Protection modes and UL 1449 SVR for grounded wye circuits with 480Y/277 V or 208Y/120 V, 3-phase, 4-wire circuits shall be as follows:
1. Line to Neutral: 800 V for 480Y/277 V / 400 V for 208Y/120 V.
 2. Line to Ground: 800 V for 480Y/277 V / 400 V for 208Y/120 V.
 3. Neutral to Ground: 800 V for 480Y/277 V / 400 V for 208Y/120 V.
- E. Protection modes and UL 1449 SVR for 240/120 V, single-phase, 3-wire circuits shall be as follows:
1. Line to Neutral: 400 V.
 2. Line to Ground: 400 V.
 3. Neutral to Ground: 400 V.

- F. Protection modes and UL 1449 SVR for 240/120-V, 3-phase, 4-wire circuits with high leg shall be as follows:
1. Line to Neutral: 400 V, 800 V from high leg.
 2. Line to Ground: 400 V.
 3. Neutral to Ground: 400 V.
- G. Protection modes and UL 1449 SVR for 240 V, 480 V, or 600 V, 3-phase, 3-wire, delta circuits shall be as follows:
1. Line to Line: 2000 V for 480 V / 1000 V for 240 V.
 2. Line to Ground: 2000 V for 480 V / 1000 V for 240 V.
- H. Units integral with the switchboard are not allowed.
- 2.2 PANELBOARD SUPPRESSORS – Type 2.
- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Advanced Protection Technologies Inc. (APT).
 2. Current Technology Inc.; Danaher Power Solutions.
 3. LEA International.
 4. Leviton Mfg. Company Inc.
 5. PQ Protection.
- B. Surge Protection Devices:
1. LED indicator lights for power and protection status.
 2. Fabrication using bolted compression lugs for internal wiring.
 3. Redundant suppression circuits.
 4. Arrangement with wire connections to phase buses, neutral bus, and ground bus via panel mounted 30 Amp, 3 Pole, circuit breaker.
 5. LED indicator lights for power and protection status.
- C. Peak Single-Impulse Surge Current Rating: 80 kA per mode/160 kA per phase.
- D. Protection modes and UL 1449 SVR for grounded wye circuits with 480Y/277 V or 208Y/120 V, 3-phase, 4-wire circuits shall be as follows:
1. Line to Neutral: 800 V for 480Y/277 V / 400 V for 208Y/120 V.
 2. Line to Ground: 800 V for 480Y/277 V / 400 V for 208Y/120 V.
 3. Neutral to Ground: 800 V for 480Y/277 V / 400 V for 208Y/120 V.

- E. Protection modes and UL 1449 SVR for 240/120-V, single-phase, 3-wire circuits shall be as follows:
 - 1. Line to Neutral: 400 V.
 - 2. Line to Ground: 400 V.
 - 3. Neutral to Ground: 400 V.

- F. Protection modes and UL 1449 SVR for 240/120-V, 3-phase, 4-wire circuits with high leg shall be as follows:
 - 1. Line to Neutral: 400 V, 800 V from high leg.
 - 2. Line to Ground: 400 V.
 - 3. Neutral to Ground: 400 V.

- G. Protection modes and UL 1449 SVR for 240 V or 480 V, 3-phase, 3-wire, delta circuits shall be as follows:
 - 1. Line to Line: 2000 V for 480 V / 1000 V for 240 V.
 - 2. Line to Ground: 1500 V for 480 V / 800 V for 240 V.

- H. Units integral to panelboards are not allowed.

2.3 ENCLOSURES

- A. Indoor Enclosures: NEMA 250 Type 1.
- B. Outdoor Enclosures: NEMA 250 Type 3R.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Provide Type 1 TVSS devices at all service entrances on load side of main switch, with ground lead bonded to service entrance ground.

- B. Provide Type 2 TVSS devices for panelboards and auxiliary panels with conductors between suppressor and points of attachment as short and straight as possible. Do not exceed manufacturer's recommended lead length. Do not bond neutral and ground. Locations shall include all exterior panels, lab panels, panels serving exterior lighting and equipment loads, and process equipment panels. Coordinate with USF Project Manager for other panels requiring Type 2 connection prior to design.
 - 1. Provide multiple pole, 30-A circuit breaker as a dedicated disconnecting means for Type 2 TVSS unless otherwise indicated.

3.2 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- B. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection and electrical test stated in NETA ATS, "Surge Arresters, Low-Voltage Surge Protection Devices" Section. Certify compliance with test parameters.
 - 2. After installing TVSS devices but before electrical circuitry has been energized, test for compliance with requirements.
 - 3. Complete startup checks according to manufacturer's written instructions.
- C. TVSS device will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

3.3 STARTUP SERVICE

- A. Do not energize or connect service entrance equipment or panelboards to their sources until TVSS devices are installed and connected.
- B. Do not perform insulation resistance tests of the distribution wiring equipment with the TVSS installed. Disconnect before conducting insulation resistance tests, and reconnect immediately after the testing is over.

3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to train USF Physical Plant Department maintenance personnel to maintain TVSS devices.

END OF SECTION 264313

SECTION 26 51 19

INTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes the following types of LED luminaires:

1. Cylinder.
2. Downlight.
3. Highbay, linear.
4. Linear industrial.
5. Lowbay.
6. Parking garage.
7. Recessed linear.
8. Strip light.
9. Surface mount, linear.
10. Surface mount, nonlinear.
11. Suspended, linear.
12. Suspended, nonlinear.
13. Materials.
14. Finishes.
15. Luminaire support.

- B. Related Requirements:

1. Section 260923 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.
2. Section 260933 "Central Dimming Controls" for architectural dimming systems.

1.3 DEFINITIONS

- A. CCT: Correlated color temperature.
- B. CRI: Color Rendering Index.

- C. Fixture: See "Luminaire."
- D. IP: International Protection or Ingress Protection Rating.
- E. LED: Light-emitting diode.
- F. Lumen: Measured output of lamp and luminaire, or both.
- G. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Arrange in order of luminaire designation.
 - 2. Include data on features, accessories, and finishes.
 - 3. Finishes shall be coordinated with the Architect.
 - 4. Include physical description and dimensions of luminaires.
 - 5. Include emergency lighting units, including batteries and chargers.
 - 6. Include life, output (lumens, CCT, and CRI), and energy efficiency data.
 - 7. Photometric data and adjustment factors based on laboratory tests, complying with IES Lighting Measurements Testing and Calculation Guides, of each luminaire type. The adjustment factors shall be for lamps and accessories identical to those indicated for the luminaire as applied in this Project. Conform to IES LM-79 and IES LM-80.
 - a. Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
- B. Shop Drawings:
 - 1. Include plans, elevations, sections, and mounting and attachment details.
 - 2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 3. Include diagrams for power, signal, and control wiring.
- C. Samples for Substitutions:
 - 1. Include samples of luminaires for substituted luminaires whose model numbers and manufacturers are not specifically called on the drawings, or have not been prior approved during the bid or permit process.
- D. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing laboratory providing photometric data for luminaires.
- B. Product Certificates: For each type of luminaire.
- C. Product Test Reports: For each luminaire, for tests performed by manufacturer and witnessed by a qualified testing agency.
- D. Sample warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For luminaires and lighting systems to include in operation and maintenance manuals.
 - 1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Lamps: Ten for every 100 of each type and rating installed. Furnish at least one of each type.
 - 2. Diffusers and Lenses: One for every 100 of each type and rating installed. Furnish at least one of each type.
 - 3. Globes and Guards: One for every 20 of each type and rating installed. Furnish at least one of each type.

1.8 QUALITY ASSURANCE

- A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturer's laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.
- B. Provide luminaires from a single manufacturer for each luminaire type.
- C. All lighting fixtures shall be manufactured, furnished, and installed in compliance with all government agencies having jurisdiction. All fixtures shall bear the appropriate UL (or ETL) and IBEW identifications.
- D. Mockups (If specifically requested on Drawings): For interior luminaires in room or module mockups, complete with power and control connections.
 - 1. Obtain Architect's approval of luminaires in mockups before starting installations.

2. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.10 WARRANTY

- A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
- B. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 LUMINAIRE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Standards (As applicable for installation location):
 1. ENERGY STAR certified.
 2. NRTL Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by an NRTL.
 3. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.
 4. UL Listing: Listed for damp location.
 5. Recessed luminaires shall comply with NEMA LE 4.
 6. User Replaceable Lamps (if applicable):
 - a. Bulb shape complying with ANSI C78.79.
 - b. Lamp base complying with ANSI C81.61 or IEC 60061-1.
- C. See Luminaire Schedule on Drawings for specific requirements for each type of luminaires.
- D. Internal driver.

- E. Nominal Operating Voltage: As indicated on Luminaire Schedule.

2.2 MATERIALS

A. Metal Parts:

1. Free of burrs and sharp corners and edges.
2. Sheet metal components shall be steel unless otherwise indicated.
3. Form and support to prevent warping and sagging.

- B. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit re-lamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during re-lamping and when secured in operating position.

- C. Diffusers and Globes: See Luminaire Schedule.

- D. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Locate labels where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

1. Label shall include the following lamp characteristics:
 - a. "USE ONLY" and include specific lamp type.
 - b. Lamp diameter, shape, size, wattage, and coating.
 - c. CCT and CRI for all luminaires.

2.3 METAL FINISHES

- A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

2.4 LUMINAIRE SUPPORT

- A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.
- B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.
- C. Wires: ASTM A 641/A 641 M, Class 3, soft temper, zinc-coated steel, 12 gage.
- D. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.
- E. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.

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 luminaire to verify actual locations of luminaire and electrical connections before luminaire installation. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 TEMPORARY LIGHTING

- A. If approved by the Engineer, use selected permanent luminaires for temporary lighting. When construction is sufficiently complete, clean luminaires used for temporary lighting and install new lamps.

3.3 INSTALLATION

- A. Comply with NECA 1.
- B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.
- C. Install lamps in each luminaire (if applicable).
- D. Supports:
 - 1. Sized and rated for luminaire weight.
 - 2. Able to maintain luminaire position after cleaning and re-lamping.
 - 3. Provide support for luminaire without causing deflection of ceiling or wall.
 - 4. Luminaire mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and vertical force of 400 percent of luminaire weight.
- E. Flush-Mounted Luminaire Support:
 - 1. Secured to outlet box.
 - 2. Attached to ceiling structural members at four points equally spaced around circumference of luminaire.
 - 3. Trim ring flush with finished surface.
- F. Wall-Mounted Luminaire Support:
 - 1. Per industry standard. Coordinate with Structural Engineer.
 - 2. Do not attach luminaires directly to gypsum board.

G. Ceiling-Mounted Luminaire Support:

1. Ceiling mount with minimum of two 5/32-inch diameter aircraft cable supports adjustable to 120 inches in length.

H. Suspended Luminaire Support:

1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
2. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
3. Continuous Rows of Luminaires: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of luminaire chassis, including one at each end.
4. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.

I. Ceiling-Grid-Mounted Luminaires:

1. Secure to any required outlet box.
2. Secure luminaire to the luminaire opening using approved fasteners in a minimum of four locations, spaced near corners of luminaire.
3. Use approved devices and support components to connect luminaire to ceiling grid and building structure in a minimum of four locations, spaced near corners of luminaire.

J. Comply with requirements in Section 260519 "Conductors and Cables" for wiring connections.

3.4 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.

- B. Luminaire will be considered defective if it does not pass operation tests and inspections.

- C. Prepare test and inspection reports.

3.6 STARTUP SERVICE

- A. Comply with requirements for startup as indicated in Drawings.

3.7 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to two visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.
 - 1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.
 - 2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
 - 3. Adjust the aim of luminaires in the presence of the Architect.

END OF SECTION 26 51 19

SECTION 26 56 00

EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Exterior luminaires with lamps, LED drivers, and induction lamp generators.

1.2 ACTION SUBMITTALS

- A. Product Data: For each luminaire, arranged in order of lighting unit designation. Include data on features, accessories, and finishes.
- B. Submit photometric calculations superimposed onto the site plan or floor plan for all exterior lighting. The photometric levels shall be legible when plotted to scale. Provide separate photometric calculations for emergency egress lighting.
- C. Lighting fixture schedule indicating the fixture manufacturer, catalog number, voltage, input watts, lamp and color identification, mounting, and description shall be included on the electrical documents in a "Fixture Schedule".

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with IEEE C2, "National Electrical Safety Code".
- C. Comply with NFPA 70.

1.4 WARRANTY

- A. LED fixtures, lighting emitting diodes, and drivers: Manufacturer shall provide five year warranty against defects in materials and workmanship for all products. Project contractor shall replace defective fixtures and components during the first year of warranty without additional compensation.

EXTERIOR LIGHTING

B. Warranty period shall begin on date of substantial completion.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers and products are subject Owner review and approval.
1. Provide electronic (PDF format) cutsheets of proposed fixtures with reflected ceiling plan at design development.
 2. Provide electronic (PDF format) cutsheets of specified fixtures at 100% Construction Documents.

2.2 GENERAL REQUIREMENTS FOR LUMINAIRES

- A. Luminaires shall comply with UL 1598 and be listed and labeled for installation in wet locations by an NRTL acceptable to authorities having jurisdiction.
- B. All exterior light fixtures shall be full cutoff type, dark sky friendly, to reduce light pollution.
- C. Metal Parts: Free of burrs and sharp corners and edges.
- D. Sheet Metal Components: Corrosion-resistant aluminum unless otherwise indicated. Form and support to prevent warping and sagging.
- E. Housings: Rigidly formed, weather- and light-tight aluminum enclosures that will not warp, sag, or deform in use.
- F. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses.
- G. Exposed Hardware Material: Stainless steel.
- H. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
- I. Light Shields: Metal baffles, factory installed and field adjustable, arranged to block light distribution to indicated portion of normally illuminated area or field.

EXTERIOR LIGHTING

- J. Lenses and Refractors Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.
- K. Provide factory mounted in-line surge protector in all exterior roadway fixtures, parking lot fixtures, and pedestrian/sidewalk fixtures. Surge protector shall be equal to PQ Protection Series and shall meet Department of Transportation standards.
- L. All exterior fixtures shall be aluminum. Factory-applied finish for aluminum luminaires shall comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
 - 1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
 - 2. Natural Satin Finish: Provide fine, directional, medium satin polish (AA-M32); buff complying with AA-M20; and seal aluminum surfaces with clear, hard-coat wax.
- M. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps and ballasts, driver or generator. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

PART 3 - EXECUTION

3.1 LUMINAIRE INSTALLATION

- A. Install lamps in each luminaire.
- B. Provide final aiming and focusing of luminaires that require field adjustment or aiming under the direction of owner. Aiming and focusing luminaires shall be performed during non-daylight hours.
- C. Provide adjustment of photoelectric device to prevent false operation of relay by artificial light sources, favoring a north orientation.

END OF SECTION 26 56 00

EXTERIOR LIGHTING

SECTION 28 31 11 - FIRE ALARM SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 1. Manual fire-alarm boxes.
 2. System smoke detectors.
 3. Heat detectors.
 4. Notification appliances.
 5. Magnetic door holders.
 6. Addressable interface device.

1.3 DEFINITIONS

- A. LED: Light-emitting diode.
- B. NICET: National Institute for Certification in Engineering Technologies.

1.4 SYSTEM DESCRIPTION

- A. Noncoded, UL-certified addressable system, with multiplexed signal transmission, dedicated to fire-alarm service only.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For fire-alarm system. Include plans, elevations, sections, details, and attachments to other work.
 1. Comply with recommendations in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72.
 2. Include voltage drop calculations for notification appliance circuits.
 3. Include battery-size calculations.

4. Include performance parameters and installation details for each detector, verifying that each detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
5. Include plans, sections, and elevations of heating, ventilating, and air-conditioning ducts, drawn to scale and coordinating installation of duct smoke detectors and access to them. Show critical dimensions that relate to placement and support of sampling tubes, detector housing, and remote status and alarm indicators. Locate detectors according to manufacturer's written recommendations.
6. Include floor plans to indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits.

C. General Submittal Requirements:

1. Submittals shall be approved by authorities having jurisdiction prior to submitting them to Architect.
2. Shop Drawings shall be prepared by persons with the following qualifications:
 - a. Trained and certified by manufacturer in fire-alarm system design.
 - b. NICET-certified fire-alarm technician.
 - c. Licensed or certified by authorities having jurisdiction.

D. Delegated-Design Submittal: For smoke and heat detectors indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Drawings showing the location of each smoke and heat detector, ratings of each, and installation details as needed to comply with listing conditions of the detector.
2. Design Calculations: Calculate requirements for selecting the spacing and sensitivity of detection, complying with NFPA 72.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," deliver copies to authorities having jurisdiction and include the following:
 1. Comply with the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.

2. Provide "Record of Completion Documents" according to NFPA 72 article "Permanent Records" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter.
3. Record copy of site-specific software.
4. Provide "Maintenance, Inspection and Testing Records" according to NFPA 72 article of the same name and include the following:
 - a. Frequency of testing of installed components.
 - b. Frequency of inspection of installed components.
 - c. Requirements and recommendations related to results of maintenance.
 - d. Manufacturer's user training manuals.
5. Manufacturer's required maintenance related to system warranty requirements.
6. Abbreviated operating instructions for mounting at fire-alarm control unit.

B. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.
2. Program Software Backup: On magnetic media or compact disk, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.
- B. Installer Qualifications: Installation shall be by personnel certified by NICET as fire-alarm technician.
- C. Source Limitations for Fire-Alarm System and Components: Obtain fire-alarm system from single source from single manufacturer. Components shall be compatible with, and operate as, an extension of existing system.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.9 SOFTWARE SERVICE AGREEMENT

- A. Comply with UL 864.
- B. Technical Support: Beginning with Substantial Completion, provide software support for two years.
- C. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within two years from date of

Substantial Completion. Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of software.

1. Provide 30 days' notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment if necessary.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements:
1. Silent Knight; a Honeywell company.

2.2 SYSTEMS OPERATIONAL DESCRIPTION

- A. Fire-alarm signal initiation shall be by one or more of the following devices:
1. Manual stations.
 2. Heat detectors.
 3. Smoke detectors.
 4. Duct smoke detectors.
 5. Verified automatic alarm operation of smoke detectors.
 6. Automatic sprinkler system water flow.
 7. Fire-extinguishing system operation.
 8. Fire standpipe system.
- B. Fire-alarm signal shall initiate the following actions:
1. Continuously operate alarm notification appliances.
 2. Identify alarm at fire-alarm control unit and remote annunciators.
 3. Transmit an alarm signal to the remote alarm receiving station.
 4. Unlock electric door locks in designated egress paths.
 5. Release fire and smoke doors held open by magnetic door holders.
 6. Activate communication system.
 7. Switch heating, ventilating, and air-conditioning equipment controls to fire-alarm mode.
 8. Activate smoke-control system (smoke management) at firefighter smoke-control system panel.
 9. Close smoke dampers in air ducts of designated air-conditioning duct systems.
 10. Recall elevators to primary or alternate recall floors.
 11. Activate emergency lighting control.
 12. Activate emergency shutoffs for gas and fuel supplies.
 13. Record events in the system memory.
 14. Record events by the system printer.
- C. Supervisory signal initiation shall be by one or more of the following devices and actions:

1. Valve supervisory switch.
 2. Low-air-pressure switch of a dry-pipe sprinkler system.
 3. Elevator shunt-trip supervision.
- D. System trouble signal initiation shall be by one or more of the following devices and actions:
1. Open circuits, shorts, and grounds in designated circuits.
 2. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
 3. Loss of primary power at fire-alarm control unit.
 4. Ground or a single break in fire-alarm control unit internal circuits.
 5. Abnormal ac voltage at fire-alarm control unit.
 6. Break in standby battery circuitry.
 7. Failure of battery charging.
 8. Abnormal position of any switch at fire-alarm control unit or annunciator.
 9. Fire-pump power failure, including a dead-phase or phase-reversal condition.
 10. Low-air-pressure switch operation on a dry-pipe or preaction sprinkler system.
- E. System Trouble and Supervisory Signal Actions: Initiate notification appliance and annunciate at fire-alarm control unit and remote annunciators. Record the event on system printer.

2.3 MANUAL FIRE-ALARM BOXES

- A. General Requirements for Manual Fire-Alarm Boxes: Comply with UL 38. Boxes shall be finished in red with molded, raised-letter operating instructions in contrasting color; shall show visible indication of operation; and shall be mounted on recessed outlet box. If indicated as surface mounted, provide manufacturer's surface back box.
1. Indoor Protective Shield: Factory-fabricated clear plastic enclosure hinged at the top to permit lifting for access to initiate an alarm. Lifting the cover actuates an integral battery-powered audible horn intended to discourage false-alarm operation.
 2. Weatherproof Protective Shield: Factory-fabricated clear plastic enclosure hinged at the top to permit lifting for access to initiate an alarm.

2.4 SYSTEM SMOKE DETECTORS

- A. General Requirements for System Smoke Detectors:
1. Comply with UL 268; operating at 24-V dc, nominal.
 2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
 3. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.

4. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
 5. Remote Control: Unless otherwise indicated, detectors shall be analog-addressable type, individually monitored at fire-alarm control unit for calibration, sensitivity, and alarm condition and individually adjustable for sensitivity by fire-alarm control unit.
 - a. Rate-of-rise temperature characteristic shall be selectable at fire-alarm control unit for 15 or 20 deg F (8 or 11 deg C) per minute.
 - b. Fixed-temperature sensing shall be independent of rate-of-rise sensing and shall be settable at fire-alarm control unit to operate at 135 or 155 deg F (57 or 68 deg C).
 - c. Provide multiple levels of detection sensitivity for each sensor.
- B. Photoelectric Smoke Detectors:
1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
 2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
 - a. Primary status.
 - b. Device type.
 - c. Present average value.
 - d. Present sensitivity selected.
 - e. Sensor range (normal, dirty, etc.).
- C. Ionization Smoke Detector:
1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
 2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
 - a. Primary status.
 - b. Device type.
 - c. Present average value.
 - d. Present sensitivity selected.
 - e. Sensor range (normal, dirty, etc.).
- D. Duct Smoke Detectors: Photoelectric type complying with UL 268A.
1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
 2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
 - a. Primary status.
 - b. Device type.
 - c. Present average value.

- d. Present sensitivity selected.
 - e. Sensor range (normal, dirty, etc.).
3. Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X; NRTL listed for use with the supplied detector.
 4. Each sensor shall have multiple levels of detection sensitivity.
 5. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.
 6. Relay Fan Shutdown: Rated to interrupt fan motor-control circuit.
- E. Single-Station Duct Smoke Detectors:
1. Comply with UL 268A; operating at 120-V ac.
 2. Sensor: LED or infrared light source with matching silicon-cell receiver.
 - a. Detector Sensitivity: Smoke obscuration between 2.5 and 3.5 percent/foot (0.008 and 0.011 percent/mm) when tested according to UL 268A.
 3. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. The fixed base shall be designed for mounting directly to air duct. Provide terminals in the fixed base for connection to building wiring.
 - a. Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X; NRTL listed for use with the supplied detector.
 4. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.
 5. Relay Fan Shutdown: Rated to interrupt fan motor-control circuit.

2.5 HEAT DETECTORS

- A. General Requirements for Heat Detectors: Comply with UL 521.
- B. Heat Detector, Combination Type: Actuated by either a fixed temperature of 135 deg F (57 deg C) or a rate of rise that exceeds 15 deg F (8 deg C) per minute unless otherwise indicated.
1. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
- C. Heat Detector, Fixed-Temperature Type: Actuated by temperature that exceeds a fixed temperature of [190 deg F (88 deg C)].
1. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit. Detection system in paragraph below may be proprietary.

2.6 NOTIFICATION APPLIANCES

- A. General Requirements for Notification Appliances: Individually addressed, connected to a signaling line circuit, equipped for mounting as indicated and with screw terminals for system connections.
- B. General Requirements for Notification Appliances: Connected to notification appliance signal circuits, zoned as indicated, equipped for mounting as indicated and with screw terminals for system connections.
 - 1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly, equipped for mounting as indicated and with screw terminals for system connections.
- C. Chimes, Low-Level Output: Vibrating type, 75-dBA minimum rated output.
- D. Chimes, High-Level Output: Vibrating type, 81-dBA minimum rated output.
- E. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Comply with UL 464. Horns shall produce a sound-pressure level of 90 dBA, measured 10 feet (3 m) from the horn, using the coded signal prescribed in UL 464 test protocol.
- F. Visible Notification Appliances: Xenon strobe lights comply with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch- (25-mm-) high letters on the lens.
 - 1. Rated Light Output:
 - a. 15/30/75/110 cd, selectable in the field.
 - 2. Mounting: Wall mounted unless otherwise indicated.
 - 3. For units with guards to prevent physical damage, light output ratings shall be determined with guards in place.
 - 4. Flashing shall be in a temporal pattern, synchronized with other units.
 - 5. Strobe Leads: Factory connected to screw terminals.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

- A. Comply with NFPA 72 for installation of fire-alarm equipment.
- B. Install wall-mounted equipment, with tops of cabinets not more than 72 inches (1830 mm) above the finished floor.
- C. Smoke- or Heat-Detector Spacing:

1. Comply with NFPA 72, "Smoke-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for smoke-detector spacing.
 2. Comply with NFPA 72, "Heat-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for heat-detector spacing.
 3. Smooth ceiling spacing shall not exceed 30 feet (9 m)
 4. Spacing of detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas shall be determined according to Appendix A or Appendix B in NFPA 72.
 5. HVAC: Locate detectors not closer than 3 feet (1 m) 5 feet (1.5 m) from air-supply diffuser or return-air opening.
 6. Lighting Fixtures: Locate detectors not closer than 12 inches (300 mm) from any part of a lighting fixture.
- D. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of duct.
- E. Heat Detectors in Elevator Shafts: Coordinate temperature rating and location with sprinkler rating and location.
- F. Single-Station Smoke Detectors: Where more than one smoke alarm is installed within a dwelling or suite, they shall be connected so that the operation of any smoke alarm causes the alarm in all smoke alarms to sound.
- G. Remote Status and Alarm Indicators: Install near each smoke detector and each sprinkler water-flow switch and valve-tamper switch that is not readily visible from normal viewing position.
- H. Audible Alarm-Indicating Devices: Install not less than 6 inches (150 mm) below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille.
- I. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inches (150 mm) below the ceiling.
- J. Device Location-Indicating Lights: Locate in public space near the device they monitor.
- K. Fire-Alarm Control Unit: Surface mounted, with tops of cabinets not more than 72 inches (1830 mm) above the finished floor.
- L. Annunciator: Install with top of panel not more than 72 inches (1830 mm) above the finished floor.
- 3.2 CONNECTIONS
- A. For fire-protection systems related to doors in fire-rated walls and partitions and to doors in smoke partitions, comply with requirements in Division 08 Section "Door Hardware." Connect hardware and devices to fire-alarm system.

1. Verify that hardware and devices are NRTL listed for use with fire-alarm system in this Section before making connections.
- B. Make addressable connections with a supervised interface device to the following devices and systems. Install the interface device less than 3 feet (1 m) from the device controlled. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.
 1. Alarm-initiating connection to elevator recall system and components.
 2. Supervisory connections at valve supervisory switches.
 3. Supervisory connections at elevator shunt trip breaker.

3.3 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."
- B. Install framed instructions in a location visible from fire-alarm control unit.

3.4 GROUNDING

- A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.

3.5 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- B. Perform tests and inspections.
 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- C. Tests and Inspections:
 1. Visual Inspection: Conduct visual inspection prior to testing.
 - a. Inspection shall be based on completed Record Drawings and system documentation that is required by NFPA 72 in its "Completion Documents, Preparation" Table in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter.
 - b. Comply with "Visual Inspection Frequencies" Table in the "Inspection" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.

2. System Testing: Comply with "Test Methods" Table in the "Testing" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
 3. Test audible appliances for the public operating mode according to manufacturer's written instructions. Perform the test using a portable sound-level meter complying with Type 2 requirements in ANSI S1.4.
 4. Test audible appliances for the private operating mode according to manufacturer's written instructions.
 5. Test visible appliances for the public operating mode according to manufacturer's written instructions.
 6. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
- D. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.
- E. Fire-alarm system will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.
- G. Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.
- H. Annual Test and Inspection: One year after date of Substantial Completion, test fire-alarm system complying with visual and testing inspection requirements in NFPA 72. Use forms developed for initial tests and inspections.
- 3.6 DEMONSTRATION
- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain fire-alarm system.

END OF SECTION 283111