

PROJECT MANUAL



ROOFING SYSTEM AND HVAC EQUIPMENT REPLACEMENT FOR: DAISY ELEMENTARY SCHOOL

PMH No. 21043



PIKE ■ McFARLAND ■ HALL
ASSOCIATES, INC.
ARCHITECTS & PLANNERS
MYRTLE BEACH, SC



HORRY COUNTY SCHOOLS
335 FOUR MILE ROAD
CONWAY, SC

DECEMBER 2021

SET # _____

DOCUMENT 00011 - LIST OF DRAWING SHEETS AND TECHNICAL SPECIFICATIONS

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END OF DOCUMENT 00011



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General Conditions of the Contract for Construction

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

– Roofing System and HVAC
Equipment Replacement for:
Daisy Elementary School
2801 Red Bluff Road
Loris, SC 29569

THE OWNER:
(Name, legal status and address)

Horry County Schools
335 Four Mile Road
Conway, SC 29526

THE ARCHITECT:
(Name, legal status and address)

Pike – McFarland – Hall Associates, Inc.
1300 Professional Drive, Suite 201
Myrtle Beach, SC 29577

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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.

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

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ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

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

§ 1.1.2 The Contract

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

§ 1.1.3 The Work

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

§ 1.1.4 The Project

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

§ 1.1.5 The Drawings

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

§ 1.1.6 The Specifications

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

§ 1.1.7 Instruments of Service

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

§ 1.1.8 Initial Decision Maker

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

§ 1.2 Correlation and Intent of the Contract Documents

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

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

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

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

§ 1.3 Capitalization

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

§ 1.4 Interpretation

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

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

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

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

§ 1.6 Notice

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

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

§ 1.7 Digital Data Use and Transmission

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

§ 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set forth in AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document

G202™-2013, Project Building Information Modeling Protocol Form, shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

ARTICLE 2 OWNER

§ 2.1 General

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

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

§ 2.2 Evidence of the Owner's Financial Arrangements

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

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

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

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

§ 2.3 Information and Services Required of the Owner

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

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

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

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

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

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

§ 2.4 Owner's Right to Stop the Work

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

§ 2.5 Owner's Right to Carry Out the Work

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

ARTICLE 3 CONTRACTOR

§ 3.1 General

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

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

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

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

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

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.4, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

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

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

§ 3.3 Supervision and Construction Procedures

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

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

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

§ 3.4 Labor and Materials

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

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

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

§ 3.5 Warranty

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

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

§ 3.6 Taxes

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

§ 3.7 Permits, Fees, Notices and Compliance with Laws

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

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

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

§ 3.7.4 Concealed or Unknown Conditions

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

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

§ 3.8 Allowances

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

§ 3.8.2 Unless otherwise provided in the Contract Documents,

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

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

§ 3.9 Superintendent

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

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

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

§ 3.10 Contractor's Construction and Submittal Schedules

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

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

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

§ 3.11 Documents and Samples at the Site

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

delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.12 Shop Drawings, Product Data and Samples

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

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

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

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

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

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

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

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

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

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

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will

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

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

§ 3.13 Use of Site

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

§ 3.14 Cutting and Patching

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

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

§ 3.15 Cleaning Up

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

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

§ 3.16 Access to Work

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

§ 3.17 Royalties, Patents and Copyrights

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

§ 3.18 Indemnification

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

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

ARTICLE 4 ARCHITECT

§ 4.1 General

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

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

§ 4.2 Administration of the Contract

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

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

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

§ 4.2.4 Communications

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

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

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

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

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

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

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

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

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

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

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

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

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

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

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

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

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

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

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

§ 5.3 Subcontractual Relations

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

§ 5.4 Contingent Assignment of Subcontracts

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

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

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

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

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

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

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

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

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

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

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

§ 6.2 Mutual Responsibility

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

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

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

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

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

§ 6.3 Owner's Right to Clean Up

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

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

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

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

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

§ 7.2 Change Orders

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

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

§ 7.3 Construction Change Directives

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

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

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

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

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

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

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

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

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

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

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

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

§ 7.4 Minor Changes in the Work

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

ARTICLE 8 TIME

§ 8.1 Definitions

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

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

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

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

§ 8.2 Progress and Completion

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

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

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

§ 8.3 Delays and Extensions of Time

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

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

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

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

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

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

§ 9.2 Schedule of Values

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

§ 9.3 Applications for Payment

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

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

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

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

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

§ 9.4 Certificates for Payment

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1.

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

§ 9.5 Decisions to Withhold Certification

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

- .1 defective Work not remedied;
- .2 third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;
- .3 failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;

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- .4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- .5 damage to the Owner or a Separate Contractor;
- .6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
- .7 repeated failure to carry out the Work in accordance with the Contract Documents.

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

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

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

§ 9.6 Progress Payments

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

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

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

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

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

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

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

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

§ 9.7 Failure of Payment

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

§ 9.8 Substantial Completion

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

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

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

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

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

§ 9.9 Partial Occupancy or Use

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

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

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

§ 9.10 Final Completion and Final Payment

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

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

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

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

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

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

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

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

§ 10.2 Safety of Persons and Property

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

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

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

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

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

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

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

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

§ 10.2.8 Injury or Damage to Person or Property

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

§ 10.3 Hazardous Materials and Substances

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

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor and the Architect will

promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

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

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

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

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

§ 10.4 Emergencies

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

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

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

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

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

§ 11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act

or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Insurance

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

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

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

§ 11.3 Waivers of Subrogation

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

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

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

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

§11.5 Adjustment and Settlement of Insured Loss

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

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

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

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

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

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

§ 12.2.2 After Substantial Completion

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

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

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

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

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

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

§ 12.3 Acceptance of Nonconforming Work

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

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

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

§ 13.2 Successors and Assigns

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

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

§ 13.3 Rights and Remedies

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

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

§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and

approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

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

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

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

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

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

§ 13.5 Interest

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

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

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

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

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

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

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

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

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

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

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

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

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

§ 14.3 Suspension by the Owner for Convenience

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

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

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

§ 14.4 Termination by the Owner for Convenience

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

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

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

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

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

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

§ 15.1.2 Time Limits on Claims

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

§ 15.1.3 Notice of Claims

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

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

§ 15.1.4 Continuing Contract Performance

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

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

§ 15.1.5 Claims for Additional Cost

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

§ 15.1.6 Claims for Additional Time

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

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

§ 15.1.7 Waiver of Claims for Consequential Damages

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

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

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

§ 15.2 Initial Decision

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

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

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

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

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

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

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

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

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

§ 15.3 Mediation

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

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

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

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

§ 15.4 Arbitration

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

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

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

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

§ 15.4.4 Consolidation or Joinder

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

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

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



SECTION 00800 – SUPPLEMENTARY CONDITIONS

GENERAL CONDITIONS

The "General Conditions of the Contract for Construction", AIA Document A201, Sixteenth Edition, 2017, Articles 1 through 15 inclusive, is part of this contract.

SUPPLEMENTS

The following supplements modify, delete and/or add to the General Conditions. Where any article, paragraph or subparagraph in the General Conditions is supplemented by one of the following paragraphs, the provisions of such article, paragraph, or subparagraph shall remain in effect and the supplemental provisions shall be considered as added thereto. Where any article, paragraph or subparagraph in the General Conditions is amended, voided, or superseded by any of the following paragraphs, the provisions of such article, paragraph or subparagraph not so amended, voided, or superseded shall remain in effect.

GENERAL

Wherever the word "Architect" appears in the General Conditions substitute therefor: "Architect/Engineer".

ARTICLE 1 - GENERAL PROVISIONS

Add the following:

- 1.1.1.1 The Contractor's Bid shall be part of the Contract Documents.
- 1.1.2.1 Form of Agreement shall be Standard Form of Agreement Between Owner and Contractor, AIA Document Number A101, Current Edition.
- 1.2.1.2 In the event of conflict between the specifications and drawings, the provisions of the specifications shall govern.

ARTICLE 2 - OWNER

Modify as follows:

- 2.1.1 Last line delete "authorized" and substitute therefor "designated".

Add the following:

- 2.3.4.1 The Owner shall pay any building permit (refer to Section 01020-Allowances), sewer and water impact and tap fees directly to such agencies. Contractor shall notify Owner sufficiently in advance of installation schedule for these items to insure payment of such fees is processed promptly.
- 2.3.6 Delete in its entirety and substitute therefor the following:
- 2.3.6 The Contractor will be furnished, free of charge, fifteen (15) copies of the Drawings and Specifications and will be furnished, at actual cost of reproduction, as many additional copies as he may require.

ARTICLE 3 - CONTRACTOR

Add the following:

- 3.2.1.1 The following principles shall govern the settlement of disputes which may arise over discrepancies in the contract documents: (a) as between figures given on drawings and the

scaled measurements, the figures shall govern - no measurements should be taken by scale as working dimensions except on large-scale drawings not dimensioned in detail; (b) as between large-scale drawings and small-scale drawings, the larger scale shall govern; (c) as between drawings and specifications, requirements of the specifications shall govern; and (d) as between the Form of Agreement and the Specifications, requirements of the Form of Agreement shall govern. The principles set forth herein shall not alter provisions of Article I, paragraph 1.2.

- 3.6.1 Contractor shall hold Owner and his agents harmless against any claim or liability from pertinent clauses of State Law.
- 3.6.2 The Contractor's attention is directed to Title 12, Chapter 9, Code of laws of South Carolina 1976 as amended concerning withholding tax for non-residents, employees, contractors and subcontractors.
- 3.7.1.1 In order that the inspection services of municipal or county building departments might be made available for plumbing, heating, air conditioning, and electrical work the Contractor shall require that each subcontractor for these specialty contracts apply for, obtain, and pay the cost of a permit and inspection fees for that specialty for which he is a subcontractor; provided that this project is to be constructed within a municipality or county offering such services.
- 3.9.2 Delete in its entirety and substitute therefor the following:
- 3.9.2 The General Contractor shall provide a designated Project Superintendent and submit the Superintendent's resume for approval by the Architect and Owner. The Superintendent must have a minimum of 10 years experience in the same or higher position on projects similar to this project in scope and size, and must be familiar with all aspects of: on-site project coordination, scheduling, safety, submittal review and coordination, and Quality Control as specified in the Contract Documents. All Project Meetings will be conducted by the Project Superintendent, who will be responsible for recording and distributing minutes of the Project Meetings. Changes to the designated Project Superintendent must be approved by the Architect and Owner.

Add the following:

- 3.9.4 Major Subcontractors (Mechanical, Electrical, Plumbing, Fire Sprinkler, Sitework, Concrete, Masonry, Steel Framing, Metal Framing, Roofing, Ceiling, Drywall, and Painting) shall provide a designated Superintendent with 5 years experience in that trade, and the Superintendent must be familiar with project coordination, scheduling, safety, and the Quality Control procedures specified in the Contract Documents. This designated Subcontractor Superintendent must be on-site during all associated subcontractor activities, and must attend all Project Meetings associated with that Subcontractor's scope of work.
- 3.10.1.1 This schedule shall indicate the dates for the starting and completion of various stages of construction and shall be revised monthly as required by the conditions of the work.
- 3.14.3 It is Contractor's duty to coordinate with his subcontractors in advance so that pipe holes, sleeves, inserts, etc., can be installed as work progresses.
- 3.18.3 The Contractor shall not allow the use of asbestos containing products, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work, even if the products are nonfraible and/or contain minimal amounts of asbestos, and even though such products may still be legally installed.
- 3.18.4 The Contractor shall not allow the use of lead materials in public water applications. "Lead

Free" solder, flux and pipe must be used in all public drinking water applications as outlined in the 1986 Amendments to the Safe Drinking Water Act. "Lead Free" solder and flux are defined as containing less than 0.2% lead, while valves, pipes and appurtenances must contain less than 8.0% lead.

ARTICLE 4 - ARCHITECT

Add the following:

- 4.2.1.1 In the Specifications or on the Drawings, where the words "as directed", "as required", "as approved", "as permitted" or words of like effect are used, Contractor shall understand that direction, requirement, approval or permission of Architect/Engineer is intended. Similar words "approved", "acceptable", "satisfactory", or words of like importance mean approved by, acceptable to or satisfactory to Architect/Engineer.

Modify as follows:

- 4.2.1 First line following "-----provide", add "general".
- 4.2.10 Delete in its entirety and substitute therefor the following:
- 4.2.10 If a Project Representative is provided, his duties, responsibilities and limitations of authority shall be as set forth in STANDARD FORM OF ARCHITECT'S SERVICES: ON-SITE PROJECT REPRESENTATION, AIA DOCUMENT B207 – 2017 or latest edition, copy of which will be provided to Owner, Contractor and Project Representative.

ARTICLE 5 - SUBCONTRACTORS

Add the following:

- 5.3.1 The Contractor shall assure the Owner, by affidavit or in such other manner as the Owner may approve, that all agreements between the Contractor and his Subcontractors incorporate the provisions of subparagraph 5.3 as necessary to preserve and protect the rights of the Owner and the Architect/Engineer under the Contract Documents with respect to the work to be performed by Subcontractors so that the subcontracting thereof will not prejudice such rights.

ARTICLE 7 - CHANGES IN THE WORK

Add the following:

- 7.1.1.1 Change Orders are effective only after approval by the Owner and the Architect.
- 7.1.4 In determining the cost or credit to the Owner resulting from a change in the work, the allowances for overhead and profit combined, included in the total cost to the Owner, shall not exceed the percentages herein scheduled, as follows:
1. For work performed by the Contractor's own forces, a maximum of ten percent (10%) of the allowable direct costs or the unit pricing negotiated at the time of award.
 2. For work performed by a subcontractor's own forces, a maximum of ten percent (10%) of the allowable direct costs.
 3. For work performed by a subcontractor, overhead and profit of a maximum of five percent (5%) is allowable by the Contractor for administration of the sub-contract.
- 7.3.7.1 The "cost" as used herein may include all items of labor or materials, the use of power tools and power equipment and all such items of cost as public liability, workmen's compensation insurance, pro rata charges for additional time of foreman, social security, and old age and

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unemployment insurance other than that mentioned above, supervision, travel, superintendence, timekeepers, clerks, watchmen, small tools, incidental job burdens and general office expense, and all other items not included in the cost as defined above.

ARTICLE 8 - TIME

Modify as follows:

8.3 Delete in its entirety and substitute therefor the following:

8.3 Delay and Extension of Time

8.3.1 Completion time stipulated under other sections of the Contract Documents may be extended by Change Order to provide one additional work day for each full work day that the Contractor is prevented from working by reason of one or more of the following causes:

1. Unforeseeable causes beyond the control and without the fault or negligence of the Contractor, including but not limited to, catastrophes and/or acts of God, acts of another Contractor in the performance of a separate Contract with the Owner, epidemics, quarantine restrictions, strikes or freight embargoes;
2. An unusual amount of severe weather to such an extent as to be definitely abnormal and beyond conditions that may be reasonably anticipated. For the purpose of this contract, a total of three (3) working days per calendar month shall be anticipated as "normally bad or severe weather", and such time will not be considered justification for an extension of time.
3. Stoppage of work ordered by Owner or Architect/Engineer for reasons over which Contractor has no control.

The Contractor shall, within ten (10) days after the beginning of such delay notify the Owner and Architect/Engineer in writing of the cause of the delay. The contractor shall include with time extension request just cause indicating how delay has affected critical path sequence of construction activities. The Architect/Engineer will then ascertain the facts and extent of delay, and notify the Contractor within (10) days of the Owner's decision in the matter. Notice of delay and requests for extension of time shall set forth the cause and number of additional working days contractor desires contract extended.

8.3.2 No claims for extension of time will be considered when based on delays caused by conditions existing at the time bids were received, and of which the contractor might be reasonably expected to have full knowledge at the time of bidding, or upon delays caused by failure on the part of the contractor to anticipate properly the requirements of the work contracted for as to materials, labor and equipment. All claims for extension of time shall be made in writing to the Architect/Engineer with the next application for payment; otherwise they shall be waived.

8.3.3 Completion date stipulated under other sections of the Contract Documents may be extended by Change Order to compensate for additional work that may be ordered by Owner, provided such work is over and beyond scope of work covered by original contract and is of such nature as to materially affect date of completion.

ARTICLE 9 - PAYMENT AND COMPLETION

Modify as follows:

9.3.1 Third line following "notarized", delete "if required".

Add the following:

9.3.1.3 The Architect/Engineer will authorize, as provided in Paragraphs 9.4 and 9.5, monthly

payments equal to ninety (90%) percent of the portion of the contract sum properly allocable to labor, material and equipment incorporated in the work, and allocable to material and equipment suitably stored.

- 9.3.1.4 Contractor's Application for Payment, required for each project separately of a multi-project contract, shall be on Forms furnished by Architect/Engineer which shall include the following statement:

Undersigned Contractor certifies by this Application for Payment has been completed in accordance with Contract Documents, that all amounts have been paid by him for Work for which previous Certificates for Payment were issued and payments received from Owner, and that current payment shown herein is now due.

Contractor:

By: _____ Date: _____

Subscribed and sworn to before me this:

Notary Public:

My Commission Expires: _____ Date: _____

Add the following:

- 9.3.2.1 Rental equipment such as, but not limited to, mobile equipment, pans, forms, scaffolding, compressors, etc., shall not be considered material stored.
- 9.6.2.1 The Contractor's attention is directed to Title 29, Chapter 7, Code of Laws of South Carolina, 1976, as amended, concerning labors' liens.
- 9.6.2.2 Release of retained funds: When the work to be performed on a state construction contract is to be performed by multiple prime contractors or by a prime contractor and multiple subcontractors, the work contracted to be done by each individual contractor or subcontractor will be considered a separate division of the contract for the purpose of retention. As each such division of the contract is certified as having been completed, that portion of the retained funds which is allocable to the completed division of the contract shall be released forthwith to the prime contractor, who shall, within ten days of its receipt, release to the subcontractor responsible for the complete work the full amount of any retention previously withheld from him by the prime contractor.
- 9.7.1 Nonresident contractor's attention is directed to Title 12, Chapter 9, Code of Laws of South Carolina 1976, as amended, concerning withholding tax on nonresident employees, contractors and subcontractors.

Add the following:

- 9.10.1.1 When the contractor is ready for final inspection, he shall give notice to the Architect/Engineer with a copy to the Owner in the following words:

The work on the contract for (show name of improvement or project as it appears in the Form of Agreement), having been fully completed, except as stipulated herein below, it is requested that a final inspection be made promptly by the Architect. The following work is incomplete through no fault or negligence of the Contractor: (List any work the contractor regards as exceptionable and after each item substantiate why its incompleteness is not due to his fault or negligence).

No final inspection shall be made until such time as the Architect/Engineer and the Owner have received a letter in exact form indicated above.

- 9.10.2.1 Contractor shall submit to Architect/Engineer Contractor's Affidavit of Payment of Debts and Claims on AIA Document G706, latest edition, together with all supporting documents as called for thereon, including (as applicable):
1. Consent of Surety to Final Payment on AIA document G707, latest edition.
 2. Contractor's Release or Waiver of Liens, conditional upon receipt of final payment. Submit in letter form under Contractor's letterhead.
 3. Separate Releases or Waivers of Liens from all Subcontractors and Materials and
 4. Equipment Suppliers on reproduction of form supplied by Architect/Engineer in contract documents. Accompany with a list thereof.
 5. Contractor's Affidavit of Release of Liens on AIA Document G706A, latest edition.
- 9.10.3.1 The balance payable under conditions stated shall reflect retainage for thrice the value of uncompleted work, as determined by the Architect/Engineer, but not more than 10% of the contract amount.

ARTICLE 11 - INSURANCE AND BONDS

Delete Article in its entirety and substitute therefor the following:

ARTICLE 11 - INSURANCE

11.1 CONTRACTOR'S LIABILITY INSURANCE

- 11.1.1 The Contractor shall purchase and maintain in a company or companies acceptable to the Owner such insurance as will protect him from claims set forth below which may arise out of or result from the Contractor's operations under the Contract, whether such operations be by himself or by any Subcontractor or by anyone directly or indirectly employed by any of them or by anyone for whose acts any of them may be liable.
1. Claims under workers' or workmen's compensation, disability benefit and other similar employee benefit acts;
 2. Claims for damages because of bodily injury, occupational sickness or disease, or death of his employees;
 3. Claims for damages because of bodily injury, sickness or disease, or death of any person other than his employees;
 4. Claims for damages insured by usual personal injury liability coverage which are sustained (1) by any person as a result of an offense directly or indirectly related to the employment of such person by the Contractor, or (2) by any other person;
 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; and
 6. Claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle.
- 11.1.2 The insurance required by Subparagraph 11.1.1 shall be written for not less than any limits of liability specified in the contract documents, or required by law, whichever is greater.
- 11.1.2.1 Minimum limits of liability for following types of insurance are required (B.I.= Bodily Injury; P.D.= Property Damage; Limits are shown in thousands of dollars).
1. Workmen's Compensation, including:

- a. Workmen's Compensation Insurance-Statutory
 - b. Employers' Liability -100 each occurrence form
2. Comprehensive General Liability, including:
- a. Premises and Operations, 1000 B.I.; 250 P.D.
 - b. Contractual/Owner's Liability, 1000 B.I.; 250 P.D.
 - c. Contractor's Protective Liability, 1000 B.I.; 250 P.D.
 - d. Products Liability, including Completed Operations Coverage, 1000 B.I.; 250 P.D.
3. Comprehensive Automobile Liability, including:
- a. All owned Automobiles, 1000 B.I.; 250 P.D.
 - b. Non-owned Automobiles, 1000 B.I.; 250 P.D.
 - c. Hired Car Coverage, 1000 B.I.; 250 P.D.
- 11.1.2.2 In addition to Contractual Liability including indemnification provision Bodily Injury and Property Damage coverage under both Comprehensive General and Comprehensive Automobile forms shall include "occurrence" basis wording, which means an event, or continuous or repeated exposure to conditions which unexpectedly causes injury or damage during policy period.
- 11.1.2.3 Contractor shall either (a) require each of his Subcontractors to procure and maintain during the life of his contract, Subcontractors Comprehensive General Liability Insurance, Automobile Liability, and Property Damage Liability Insurance of the type and in the same amounts as specified in this Subparagraph, or (b) insure the activities of his Subcontractors in his own policy.
- 11.1.3 The insurance required by Subparagraph 11.1.1 shall include contractual liability insurance applicable to the Contractor's obligations under Paragraph 4.18.
- 11.1.3.1 CERTIFICATE OF INSURANCE MUST BE FILED THROUGH ARCHITECT/ENGINEER ON AIA DOCUMENT G715 – 2017 or LATEST EDITION, by an insurer authorized to do business in South Carolina by South Carolina State Insurance Commission. All blanks and questions on Certificate must be filled out completely. Incomplete or inadequate certificate will be returned to Contractor as unsatisfactory and commencement of his work will be delayed until satisfactory certificate is submitted. Such delay will not warrant extension of contract time.
- 11.1.4 Certificates of Insurance acceptable to Owner shall be filed with the Owner prior to commencement of the work. These certificates shall contain a provision that coverage afforded under the policies will not be canceled until at least thirty days prior written notice has been given to the Owner.
- 11.2 OWNER'S LIABILITY INSURANCE
- 11.2.1 The Contractor shall be responsible for purchasing and maintaining complete Owner's Protective Liability Insurance covering claims which may arise from operations under the Contract. The Contractor shall file a copy of all Owner's protective liability insurance policies with the Owner before any exposure to loss may occur. Limits shall be the same as specified for general liability and property damage insurance.
- 11.3 PROPERTY INSURANCE
- 11.3.1 Unless otherwise provided, the Owner shall purchase and maintain property insurance upon

the entire work at the site to the full insurable value thereof. This insurance shall include the interests of the Owner, the Contractor, Subcontractors, Sub-subcontractors in the work and shall insure against the perils of fire, extended coverage, vandalism, glass breakage and malicious mischief. A deductible of \$100.00 shall apply to each loss resulting from vandalism, glass breakage and malicious mischief. The deductible shall be borne by the Contractor. This insurance does not cover any tools owned by mechanics, any tools, equipment, scaffolding, staging towers and forms owned or rented by the Contractor which are not intended to become part of the project. This insurance shall also not cover any loss by theft or burglary, or damage to the building or contents as a result of said theft or burglary. The interest of the Owner, the Contractor, Subcontractors, Sub-subcontractors in this insurance shall only be effective during the construction of the project and all rights and interest of the Contractor, Subcontractors in this insurance shall only be effective during the construction of the project and all rights and interest of the Contractor, Subcontractor, and Sub-subcontractors in this insurance shall end upon the acceptance of the project by the Owner.

- 11.3.2 The Owner shall purchase and maintain such boiler and machinery insurance as may be required by the Contract Documents or by Law. This insurance shall include the interest of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the work. The interest of the Contractor, Subcontractors and Sub-subcontractors in this insurance shall only be during the time of the construction of the project and all rights and interest in this insurance shall end upon acceptance of the project by the Owner.
- 11.3.3 Any insured loss is to be adjusted with the Owner and made payable to the Owner as trustee for the insured, as their interests may appear, subject to the requirements of any applicable mortgage clause.
- 11.3.4 The Owner shall file a certificate of all policies with the Contractor before an exposure to loss may occur. If the Owner does not intend to purchase such insurance, he shall inform the Contractor in writing prior to commencement of the work. The Contractor then shall effect insurance which shall protect the interest of himself, his subcontractors and the 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 of the Owner to purchase or maintain such insurance and so notifies the Owner, then the Owner shall bear all reasonable cost appropriately attributable thereto.
- 11.3.5 If the Contractor requests in writing that insurance for special hazards be included in the Property Insurance Clause, the Owner shall, if possible, include such insurance, and the cost thereof shall be charged to the Contractor by appropriate Change Order.
- 11.3.6 The Owner and Contractor waive all rights against each other for damages caused by fire and other perils to the extent covered by insurance provided under Paragraph 11.3 except such rights as they may have to the proceeds of such insurance held by the Owner as trustee. The Contractor shall require similar waivers by Subcontractors and Sub-subcontractors in accordance with clause 5.3.1.1. This waiver does not apply to any defects due to faulty material or workmanship by the Contractor. The Subcontractors or Sub-subcontractors and the Contractor shall remedy any defects due to such faulty materials or workmanship and pay for any damage to other work resulting therefrom, which shall appear within a period of one year from the date of acceptance as defined in the general conditions and in accordance with the terms of any special guarantees provided in the contract. The Owner shall give notice of observed defect within ninety days of the time they were observed or should have been observed.
- 11.3.7 If required in writing by any party in interest, the Owner as trustee shall, upon the occurrence of an insured loss, deposit in a separate account any money received for such loss, and he shall

distribute it in accordance with such agreement as the parties in interest may reach. If after such loss no other special agreement is made, replacement of damaged work shall be covered by an appropriate Change Order.

- 11.3.8 The Owner as trustee shall have the power to adjust and settle with the insurers.
- 11.3.9 If the Owner finds it necessary to occupy or use a portion or portions of the work prior to substantial completion thereof, such occupancy shall not commence prior to a time mutually agreed to by the Owner and Contractor and to which the insurance company or companies providing the property insurance shall not be canceled or lapsed on account of such partial occupancy. Consent of the Contractor and of the insurance company or companies to such occupancy or use shall not be unreasonably withheld.
- 11.3.10 Any wall or steel construction during this period of coverage must be properly braced, regardless of plans or specifications otherwise, to prevent damage from wind. Any alleged damage must be inspected by a Representative of the Fund, prior to any cleaning or repair. Liability will not be accepted by the Fund if provisions of this Endorsement are not complied with.
- 11.4.1 Delete in its entirety and substitute therefor the following:
- 11.4.1 A Performance Bond and Labor and Material Payment Bond are required. The Contractor shall obtain a Performance Bond and Labor and Material Payment Bond, acceptable to the Owner in a surety company authorized to do business in the state in which the Project is constructed. The Performance Bond shall be in an amount equal to One Hundred Percent (100%) of the full amount of the Contract Sum as security for the faithful performance of the Contract Documents, and the Labor and Material Payment Bond shall be in an amount equal to One Hundred Percent (100%) of the full amount of the Contract Sum as security for the payment of all persons performing labor and furnishing materials in connection with the Contract Documents. Such bonds shall be on forms approved by the Owner and shall name the Owner as a primary co-obligee. The bonds shall guarantee the Contractor's faithful performance of the Contract and the payment of all obligations arising thereunder. The bonds shall remain in force until (1) the Project has been completed and accepted by the Owner, (2) the provisions of all guarantees required by these Contract Documents have been fulfilled, and the time limitation for all guarantees has expired, or (3) until the time for the filing of all mechanic's liens has expired, whichever is longer, after which it shall become void. The Contractor shall pay all changes in connection with these bonds as a part of the Contract. One executed copy of the bonds shall be attached to each copy of the Contract before they are returned to the Architect for the Owner's signature. These bonds shall be written on AIA Document A312, latest edition. A current Power of Attorney shall be attached to each bond.

ARTICLE 13 - MISCELLANEOUS PROVISIONS

Add the following:

- 13.1.1 By executing a contract for the Project the Contractor agrees to submit itself to the jurisdiction of the courts of the State of South Carolina for all matters arising or to arise hereunder, including but not limited to performance of said contract and payment of all licenses and taxes of whatever nature applicable thereto.
- 13.4.2.1 Materials subject to test shall be inspected by a testing agency selected by the Architect/Engineer and satisfactory to the Owner. The Contractor shall defray the cost of tests conducted pursuant to laws, ordinances, rules, regulations or orders of any public authority having jurisdiction; the cost of test conducted for his own information and in his own interest;

and the cost of tests which are named in the Technical Sections of the Specifications as tests to be paid for by the Contractor.

13.6 REGULATORY REQUIREMENTS

- 13.6.1 Compliance with EEOC and other State and Federal Laws: To the extent set forth in the respective statutes, Provider shall comply with the provisions of:
- 13.6.2 Title VII of the Civil Rights Act of 1964;
- 13.6.3 Age Discrimination in Employment Act of 1967;
- 13.6.4 Title I of the Americans with Disabilities Act of 1990;
- 13.6.5 Equal Pay Act of 1963;
- 13.6.6 Fair Labor Standards Act of 1938;
- 13.6.7 Immigration Reform and Control Act of 1986; and
- 13.6.8 South Carolina Wages Act, S.C. Code § 37-10-10 *et seq.*.
- 13.6.9 South Carolina Worker's Compensation Act, S.C. Code § 42-1-10 *et seq.*
- 13.6.10 South Carolina Illegal Immigration Reform Act, including without limitation Chapters 14 & 29, Title 8, and Chapter 8, Title 41, S.C. Code of Laws.
- 13.6.11 Part 681, Title 16 of the Code of Federal Regulations, Sections 114 and 315 of the Fair and Accurate Credit Transactions Act (FACTA) of 2003; the South Carolina Act 190 of 2008; Financial and Identity Theft Protection Act; and the Kershaw County Privacy / Identity Theft Policy.

ARTICLE 14 - TERMINATION OR SUSPENSION OF THE CONTRACT

Add the following:

- 14.3.2.3 that extended overhead exceeds five working days when the Owner in writing stops work for his convenience or a natural disaster. Extended overhead is denied for change orders, change directives, and other delays.

ARTICLE 15 – CLAIMS AND DISPUTES

Add the following:

- 15.2.9 Any controversy or claim arising out of or related to the Contract or the breach thereof will be settled in accordance with the laws of the State of South Carolina.
- 15.3 Delete in its entirety and substitute therefor the following:
- 15.4 Delete in its entirety and substitute therefor the following:

Article 15.3 Mediation/Arbitration

- 15.3.1 Disputes Resolutions: All claims, disputes, and other matters in questions between the parties to this Agreement, arising out of or relating to this Agreement of the breach thereof, shall be tried before a Circuit Judge or Master in Equity of Kershaw County without a jury. The

contractor hereby waives its right to a jury trial and agrees that the venue of the action will be in Kershaw County, South Carolina. Any legal proceedings arising out of or relating to this Agreement shall include, by consolidation, joinder or joint filing, any additional person or entity not a party to this agreement to the extent necessary to the final resolution of the matter in controversy. Owner shall include the same disputes resolution and consolidation provisions in the owner's contractor (or construction manager) agreement and shall provide that similar provisions be included in contractor or subcontractor agreements.

END OF SUPPLEMENTARY CONDITIONS 00800

SECTION 01010 – SUMMARY OF WORK

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract include but are not necessarily limited to: Special Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Project consists of the construction of Renovations to Daisy Elementary School in Loris, South Carolina, for the Horry County Schools.
- B. Project locations as described in Contract Documents.
- C. Contract Documents, dated December 2021 were prepared for the Project by PIKE - McFARLAND - HALL Associates, Inc., 1300 Professional Drive, Suite 201, Myrtle Beach, SC 29577.
- D. The Work consists of:
 - 1. The Roofing scope of work generally consists of the complete removal and disposal of the existing: aggregate surfaced Built-Up Roofing assembly down to the surface of the existing roof decks (RAs 1, 3, 4, 5, 6 & 7 cementitious wood fiber; RA 2 lightweight gypsum; RAs 8 & 9 metal), metal and bituminous flashings, metal through wall scupper liners, conductor heads and downspouts, metal gutter and downspouts, coping cap, expansion joint flashings, overflow scupper liners and abandoned equipment curbs.
 - 2. The Mechanical and Electrical scope of work includes removing and replacing in-kind all existing rooftop heat pumps, wall hung heat pumps, thru wall heat pumps, split system heat pumps, mini-split packaged VAV units, packaged ventilation air units and fan powered VAV boxes and upgrade control temperature sensors throughout. New electrical disconnects will be provided for each piece of mechanical equipment.

1.3 SAFETY COMPLIANCE

- A. In addition to any detailed requirements of these specifications, the contractors shall meet the requirements of federal and state safety standards, whichever is more restrictive. Matters of interpretation of these standards shall be submitted by all Civil, General, Plumbing, Mechanical and Electrical Contractors to the respective administration agency for resolution before starting work.

1.4 OCCUPANCY REQUIREMENTS

- A. Partial Owner Occupancy: The Owner reserves the right to occupy and to place and install equipment in completed areas of the building prior to Substantial Completion, provided such occupancy does not interfere with completion of the Work. Such placing of equipment and partial occupancy shall not constitute acceptance of the total Work.
 - 1. Obtain a Certificate of Occupancy from local building officials prior to Owner occupancy.
 - 2. Prior to partial Owner occupancy, mechanical and electrical systems shall be fully operational. Required inspections and tests shall have been successfully completed. Upon occupancy, the Owner will operate and maintain mechanical and electrical systems serving occupied portions of the building.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION (Not Applicable)

END OF SECTION 01010

SECTION 011000 – SUMMARY

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Contract description.
2. Work by Owner or other Work at the Site.
3. Owner-furnished products.
4. Contractor's use of Site and premises.
5. Future work.
6. Work sequence.
7. Owner occupancy.
8. Permits.

1.2 CONTRACT DESCRIPTION

- A. Work of the Project includes construction or alteration per the project drawings.
- B. Contract with Owner according to Conditions of Contract.
- C. Horry County Schools will contract with ALL third party inspectors etc. to include Testing and Balancing.

1.3 WORK BY OWNER OR OTHERS

- A. If Owner-awarded contracts interfere with each other due to work being performed at the same time or at the same Site, Owner will determine the sequence of work under all contracts according to "Work Sequence" and "Contractor's Use of Site and Premises" Articles in this Section.
- B. Coordinate Work with utilities of Owner and public or private agencies.
- C. Work under this Contract includes:
1. Work as indicated on Drawings.
- D. Items noted NIC (Not in Contract) will be furnished and installed by Owner.

1.4 OWNER-FURNISHED PRODUCTS

A. Owner's Responsibilities:

1. Arrange for and deliver Owner-reviewed Shop Drawings, Product Data, and Samples to Contractor.
2. Arrange and pay for delivery to Site.
3. Upon delivery, inspect products jointly with Contractor.
4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
5. Arrange for manufacturers' warranties, inspections, and service.

B. Contractor's Responsibilities:

1. Review Owner-reviewed Shop Drawings, Product Data, and Samples.
2. Receive and unload products at Site; inspect for completeness or damage jointly with Owner.
3. Handle, store, install, and finish products.
4. Repair or replace items damaged after receipt.

1.5 CONTRACTOR'S USE OF SITE AND PREMISES

A. Limit use of Site and premises to allow:

1. Owner occupancy.
2. Work by Owner.

B. Construction Operations: Limited to areas indicated on Drawings.

1. Noisy and Disruptive Operations (such as Use of Jack Hammers and Other Noisy Equipment): Not allowed in close proximity to existing building during regular hours of operation. Coordinate and schedule such operations with Owner to minimize disruptions.

C. Utility Outages and Shutdown:

1. Coordinate and schedule electrical and other utility outages with Owner.
2. Outages: Allowed only at previously agreed upon times. In general, schedule outages at times when facility is not being used.

D. Construction Plan: Before start of construction, submit three copies of construction plan regarding access to Work, use of Site, and utility outages for acceptance by Owner. After acceptance of plan, construction operations shall comply with accepted plan unless deviations are accepted by Owner in writing.

1.6 PERMITS

- A. These Specifications are written in imperative mood and streamlined form. This imperative language is directed to Contractor unless specifically noted otherwise. The words "shall be" are included by inference where a colon (:) is used within sentences or phrases.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION 011000

SECTION 01030 – ALTERNATES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
- B. The Bid Documents show the cost quoted by Contractors for each alternate. The Owner-Contractor Agreement lists the alternates accepted by the Owner for incorporation into the work.
- C. The Owner reserves the right to accept alternates in any order or combination. Where an alternate requires more than one Contractor to complete a portion of the work, alternates will be accepted from all Contractors necessary to complete the portion of the work being considered.

1.2 Related work described elsewhere:

- A. Pertinent sections of the Specifications describe the materials and methods required under the various alternatives.
- B. The method for stating the proposed Contract Sum is described on the Bid Form as submitted by the Contractor.
- C. The general provisions of the Contract, including General and Supplemental Conditions and Division One specifications, apply to the work of this Section.

- 1.3 The drawings generally indicate the work that will be included if the alternate bids are accepted. Include as part of each alternate, miscellaneous devices, accessory objects and items incidental to or required for a complete installation, whether or not mentioned as a part of the alternate.

PART 2 – ALTERNATE DESCRIPTION

2.1 CONTRACT ALTERNATES

A. DEDUCT ALTERNATE NO. 1 (TPO MEMBRANE)

1. Contractor shall state price, which would represent all labor and materials to provide a 60 mil TPO membrane, in lieu of the specified roof covering.

B. DEDUCT ALTERNATE NO. 2 (GREENHECK/DAIKIN VENTILATION AIR UNIT MANUFACTURER)

1. Contractor shall state price, which would represent all labor and materials, to provide an alternate to Greenheck/Daikin Ventilation Air Unit.

C. DEDUCT ALTERNATE NO. 3 (DAIKIN AIR CONDITIONING/HEAT PUMPS, AND PACKAGED VAV UNITS)

1. Contractor shall state price, which would represent all labor and materials to provide an alternate to Daikin Air Conditioning/Heat Pumps, and Packaged VAV Units.

END OF SECTION 01030

SECTION 01040 – COORDINATION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and supervisory requirements necessary for coordinating construction operations including, but not necessarily limited to, the following:
 - 1. General project coordination procedures.
 - 2. Conservation.
 - 3. Coordination Drawings.
 - 4. Administrative and supervisory personnel.
 - 5. Cleaning and protection.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 1 Section "Project Management and Coordination" for progress meetings, coordination meetings, and preinstallation conferences.
 - 2. Division 1 Section "Submittals" for preparing and submitting the Contractor's Construction Schedule.
 - 3. Division 1 Section "Materials and Equipment" for coordinating general installation.
 - 4. Division 1 Section "Contract Closeout" for coordinating contract closeout.

1.3 COORDINATION

- A. Coordinate construction operations included in various Sections of these Specifications to assure efficient and orderly installation of each part of the Work. Coordinate construction operations included under different Sections that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in the sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components to assure maximum accessibility for required maintenance, service, and repair.
 - 3. Make provisions to accommodate items scheduled for later installation.
- B. Where necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.
 - 1. Prepare similar memoranda for the Owner and separate contractors where coordination of their work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and assure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of schedules.
2. Installation and removal of temporary facilities.
3. Delivery and processing of submittals.
4. Progress meetings.
5. Project closeout activities.

1.4 SUBMITTALS

- A. Coordination Drawings: Prepare coordination drawings where careful coordination is needed for installation of products and materials fabricated by separate entities. Prepare coordination drawings where limited space availability necessitates maximum utilization of space for efficient installation of different components.
1. Show the relationship of components shown on separate Shop Drawings.
 2. Indicate required installation sequences.
 3. Comply with requirements contained in Section "Submittals."
- B. Staff Names: Within 15 days of commencement of construction operations, submit a list of the Contractor's principal staff assignments, including the superintendent and other personnel in attendance at the Project Site. Identify individuals and their duties and responsibilities. List their addresses and telephone numbers.
1. Post copies of the list in the Project meeting room, the temporary field office, and each temporary telephone.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION

3.1 GENERAL COORDINATION PROVISIONS

- A. Inspection of Conditions: Require the Installer of each major component to inspect both the substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.
- B. Coordinate temporary enclosures with required inspections and tests to minimize the necessity of uncovering completed construction for that purpose.

3.2 CLEANING AND PROTECTION

- A. Clean and protect construction in progress and adjoining materials in place, during handling and installation. Apply protective covering where required to assure protection from damage or deterioration at Substantial Completion.
- B. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to assure operability without damaging effects.
- C. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period. Where applicable, such exposures include, but are not limited to, the following:

1. Excessive static or dynamic loading.
2. Excessive internal or external pressures.
3. Excessively high or low temperatures.
4. Thermal shock.
5. Excessively high or low humidity.
6. Air contamination or pollution.
7. Water or ice.
8. Solvents.
9. Chemicals.
10. Light.
11. Radiation.
12. Puncture.
13. Abrasion.
14. Heavy traffic.
15. Soiling, staining, and corrosion.
16. Bacteria.
17. Rodent and insect infestation.
18. Combustion.
19. Electrical current.
20. High-speed operation.
21. Improper lubrication.
22. Unusual wear or other misuse.
23. Contact between incompatible materials.
24. Destructive testing.
25. Misalignment.
26. Excessive weathering.
27. Unprotected storage.
28. Improper shipping or handling.
29. Theft.
30. Vandalism.

END OF SECTION 01040

SECTION 01045 – CUTTING AND PATCHING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for cutting and patching.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Divisions 2 through 11 including site work, concrete and masonry, steel and architectural work.
 - 2. Refer to other Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.
 - a. Requirements of this Section apply to mechanical and electrical installations. Refer to Divisions 16 through 28 Sections for other requirements and limitations applicable to cutting and patching mechanical and electrical installations.

1.3 SUBMITTALS

- A. Cutting and Patching Proposal: Submit a proposal describing procedures well in advance of the time cutting and patching will be performed if the Owner requires approval of these procedures before proceeding. Request approval to proceed. Include the following information, as applicable, in the proposal:
 - 1. Describe the extent of cutting and patching required. Show how it will be performed and indicate why it cannot be avoided.
 - 2. Describe anticipated results in terms of changes to existing construction. Include changes to structural elements and operating components as well as changes in the building's appearance and other significant visual elements.
 - 3. List products to be used and firms or entities that will perform Work.
 - 4. Indicate dates when cutting and patching will be performed.
 - 5. Utilities: List utilities that cutting and patching procedures will disturb or affect. List utilities that will be relocated and those that will be temporarily out-of-service. Indicate how long service will be disrupted.
 - 6. Where cutting and patching involves adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with the original structure.
 - 7. Approval by the Architect / Owner to proceed with cutting and patching does not waive the Architect's / Owner's right to later require complete removal and replacement of unsatisfactory work.

1.4 QUALITY ASSURANCE

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

1. Obtain approval of the cutting and patching proposal before cutting and patching the following structural elements:
 - a. Foundation construction.
 - b. Bearing and retaining walls.
 - c. Structural concrete.
 - d. Structural steel.
 - e. Lintels.
 - f. Timber and primary wood framing.
 - g. Structural decking.
 - h. Stair systems.
 - i. Miscellaneous structural metals.
 - j. Exterior curtain-wall construction.
 - k. Equipment supports.
 - l. Piping, ductwork, vessels, and equipment.

- B. Operational Limitations: Do not cut and patch operating elements or related components in a manner that would result in reducing their capacity to perform as intended. Do not cut and patch operating elements or related components in a manner that would result in increased maintenance or decreased operational life or safety.
 1. Obtain approval of the cutting and patching proposal before cutting and patching the following operating elements or safety related systems:
 - a. Primary operational systems and equipment.
 - b. Air or smoke barriers.
 - c. Water, moisture, or vapor barriers.
 - d. Membranes and flashings.
 - e. Fire protection systems.
 - f. Noise and vibration control elements and systems.
 - g. Control systems.
 - h. Communication systems.
 - i. Conveying systems.
 - j. Electrical wiring systems.
 - k. Operating systems of special construction in Division 13 Sections.

- C. Visual Requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in the Architect's / Owner's opinion, reduce the building's aesthetic qualities. Do not cut and patch construction in a manner that would result in visual evidence of cutting and patching. Remove and replace construction cut and patched in a visually unsatisfactory manner.
 1. If possible retain the original Installer or fabricator to cut and patch the exposed Work listed below. If it is impossible to engage the original Installer or fabricator, engage another recognized experienced and specialized firm.
 - a. Processed concrete finishes.
 - b. Stonework and stone masonry.
 - c. Ornamental metal.
 - d. Matched-veneer woodwork.
 - e. Preformed metal panels.
 - f. Firestopping.
 - g. Window wall system.
 - h. Stucco and ornamental plaster.
 - i. Acoustical ceilings.

- j. Terrazzo.
- k. Finished wood flooring.
- l. Fluid-applied flooring.
- m. Carpeting.
- n. Aggregate wall coating.
- o. Wall covering.
- p. Swimming pool finishes.
- q. HVAC enclosures, cabinets, or covers.

1.5 WARRANTY

- A. Existing Warranties: Replace, patch, and repair material and surfaces cut or damaged by methods and with materials in such a manner as not to void any warranties required or existing.

PART 2 – PRODUCTS

2.1 MATERIALS, GENERAL

- A. Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible if identical materials are unavailable or cannot be used. Use materials whose installed performance will equal or surpass that of existing materials.

PART 3 – EXECUTION

3.1 INSPECTION

- A. Examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed before cutting. If unsafe or unsatisfactory conditions are encountered, take corrective action before proceeding.

3.2 PREPARATION

- A. Temporary Support: Provide temporary support of work to be cut.
- B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the Project that might be exposed during cutting and patching operations.
- C. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- D. Avoid cutting existing pipe, conduit, or ductwork serving the building but scheduled to be removed or relocated until provisions have been made to bypass them.

3.3 PERFORMANCE

- A. General: Employ skilled workmen to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay.
 - 1. Cut existing construction to provide for installation of other components or performance of other construction activities and the subsequent fitting and patching required to restore surfaces to their original condition.

- B. Cutting: Cut existing construction using methods least likely to damage elements retained or adjoining construction. Where possible, review proposed procedures with the original Installer; comply with the original Installer's recommendations.
1. In general, where cutting, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 2. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.
 3. Cut through concrete and masonry using a cutting machine, such as a Carborundum saw or a diamond-core drill.
 4. Comply with requirements of applicable Division 2 Sections where cutting and patching requires excavating and backfilling.
 5. Where services are required to be removed, relocated, or abandoned, by-pass utility services, such as pipe or conduit, before cutting. Cut-off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal the remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after bypassing and cutting.
- C. Patching: Patch with durable seams that are as invisible as possible. Comply with specified tolerances.
1. Where feasible, inspect and test patched areas to demonstrate integrity of the installation.
 2. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
 3. Where removing walls or partitions extends one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform color and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - a. Where patching occurs in a smooth painted surface, extend final paint coat over entire unbroken surface containing the patch after the area has received primer and second coat.
 4. Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.

3.4 CLEANING

- A. Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar items. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged pipe covering to its original condition.

END OF SECTION 01045

SECTION 01060 – REGULATORY REQUIREMENTS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. The following requirements of Regulatory Agencies having an interest in this project are hereby made a part of this Contract.
- B. The construction of the project, including the letting of contracts in connection herewith, shall conform to the applicable requirements of State, territorial, and local laws and ordinances to the extent that such requirements do not conflict with Federal laws and this subchapter.
- C. South Carolina Sales Tax: All applicable South Carolina sales tax shall be to the account of the Contractor.
- D. Use of Chemicals: All chemicals used during the project construction or furnished for project operation, whether herbicide, pesticide, disinfectant, polymer, reactant or of other classification, must show approval of EPA or USDA. Use of all such chemicals and disposal of residues shall be in strict conformance with instructions.
- E. Safety and Health Regulations: The Contractor shall comply with the Department of Labor and Safety and Health Regulations for construction promulgated under the Occupational Safety and Health Act of 1970 (PL-91-596) and under Section 107 of the Contract Work Hours and Safety Standards Act (PL-91-54).
- F. Inspection by Agencies: The representatives of the South Carolina Department of Health and Environmental Control, Horry County and Department of Highways and Public Transportation and where applicable, municipalities in which a project is located, shall have access to the work wherever it is, in preparation or in progress, and the Contractor shall provide proper facilities for such access and inspection.
- G. Withholding for Non-Residents shall comply with the following:
 - 1. Attention of non-resident contractors is invited to Part Two, Act No. 855. Acts of the General Assembly of South Carolina 1958.
 - 2. If a non-resident contractor is the successful bidder on this project, he shall be required to post surety bond, or deposit cash or securities with the South Carolina Tax Commission in compliance with the Act. Proof of such coverage shall be filed with the Engineer before work is started.
 - 3. If the Contractor fails to comply with the regulations of the South Carolina Tax Commission, two percent (2%) of each and every payment made to the Contractor shall be retained by the Owner to satisfy such requirements.
- H. The Owner shall provide and maintain competent and adequate observation of construction as required by 40 CFR 35.2214.

END OF SECTION 01060

SECTION 01061 – PERMITS AND RIGHTS-OF-WAY

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DESCRIPTION

- A. Work included: This section establishes requirements pertaining to the securement and payment for licenses, building permits, rights-of-way, etc. necessary for the construction of the project.
- B. Work not included: The Owner will obtain and provide to the Contractor, as required, copies of:
 - Encroachment permits, State Highway Department.
 - Encroachment permits, Public Utility.
 - Easements obtained to cross private property.
 - S.C. Department of Health and Environmental Control Permit to Construct.
- C. Related Work:
 - 1. Documents affecting work of this section include, but are not necessarily limited to, General Conditions, Supplementary Conditions and Sections in Division 1 of these specifications.

1.3 SUBMITTALS

- A. Submit to Architect satisfactory evidence that all necessary licenses, building permits, etc. have been secured prior to commencing the work.

PART 2 – PRODUCTS (Not required)

PART 3 – EXECUTION

3.1 BUSINESS LICENSE

- A. Determine licenses required to perform the work at project location.
- B. Obtain all necessary licenses at no additional cost to the Owner.

3.2 BUILDING PERMITS

- A. Building permit is not required for this project.
- B. All other required permits shall be paid for and obtained by the Contractor.

3.3 RIGHTS-OF-WAYS, UTILITY LINES

- A. Owner will provide necessary right-of-way or easements for construction of utility lines, whether on privately or publicly owned property.

3.4 NPDES PERMIT FOR CONSTRUCTION ACTIVITY

- A. The Contractor is responsible for filing a “Notice of Intent” with the South Carolina Department of Health and Environmental Control (SCDHEC) for a National Pollutant Discharge Elimination system (NPDES) Permit under 40 CFR Part 122.
- B. Permit application must be filed thirty (30) days prior to commencing construction activity.
- C. The Contractor shall use Best Management Practices (BMP) to control sediment runoff from construction areas.

3.5 LAND

- A. The necessary land for construction of the project will be provided by the Owner.

END OF SECTION 01061

SECTION 01210 – ALLOWANCES PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

- A. Allowances indicated in the Bid Proposal Form to be included in Contract Amount.
 - 1. Selected materials and equipment, and in some cases, their installation, are shown and specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when additional information is available for evaluation. Additional requirements, if necessary, will be issued by change order.
 - 2. Allowances may be used in lieu of metering for temporary construction site utility services or to reimburse project related work performed by University forces, for example, keying.

1.3 RELATED SECTIONS

- A. Refer to product Specifications Sections identified in Allowance description.

1.4 GENERAL REQUIREMENTS FOR ALLOWANCES

- A. Contractor shall submit cost data and other descriptive data to establish basis used by Contractor for determining costs in Contract Amount attributable to each Allowance.
- B. Any amount not fully consumed shall be adjusted by change order.
 - 1. The Contractor will be credited for his actual cost of labor, materials, and other actual costs WITHOUT mark-up.
 - 2. Any unused allowances shall be returned to the Owner using a credit change order for the full amount of the value unused.
 - 3. Should the Contractor's actual costs exceed the specified allowance, the Contractor's Contract Amount will be adjusted by change order in accordance with Contract.

PART 2 - PRODUCTS

2.1 LUMP SUM ALLOWANCES

CONTINGENCY:

- a. The Contractor shall include a contract allowance of \$50,000.00 in their proposal for the purpose of Contingency for unforeseen conditions. Allowance does not include overhead and profit to General Contractor and/or attic stock (if required).

- b. Removal and disposal of the existing acoustical ceiling, lighting fixtures and etc. will be thru the General Contractor and will not be a part of this allowance.

PART 3 - EXECUTION

3.1 SELECTION OF PRODUCTS

A. Owner's Representative and Architect will:

1. Consult with Contractor for considerations to be given in selection of products, suppliers and qualified installers.
2. Make selection in consultation with HCS Facility staff. Obtain written direction by HCS's Representative designating:
 - a. Product, color, design and finish.
 - b. Accessories and attachments.
 - c. Suppliers and qualified installers, as applicable.
 - d. Allowance amount to be included in Contract Amount.
 - e. Construction Contract warranty and manufacturer's guarantee provisions.

B. Contractor shall:

1. Assist HCS Facility staff's Representative and Architect in determining qualified suppliers or installers.
2. Obtain proposals from suppliers and installers.
3. Make cost and constructability recommendations to Owner's Representative and Architect for consideration in product, supplier and qualified installer selections.
4. Notify Owner's Representative and Architect promptly of:
 - a. Reasonable objections Contractor may have against any supplier or party under consideration for installation.
 - b. Effects on Construction Schedule anticipated by selections under consideration.

3.2 CONTRACTOR'S RESPONSIBILITIES

- A. Upon notification of selection, Contractor shall execute purchase agreement with designated supplier and enter into contract with designated qualified installer, as applicable.
- B. Contractor shall make all arrangements for and submit shop drawings, product data and samples as required.
- C. Contractor shall make all arrangements for pick-up, delivery, handling and storage of products.
- D. Upon delivery, Contractor shall promptly inspect products for damage or defects. Should damage or defects be found, Contractor shall effect return, replacement or repair of products, as appropriate, and process claims for transportation damage.
- E. Contractor shall apply, install and finish products in compliance with requirements of applicable Sections of Specifications.

3.3 ADJUSTMENT COSTS

- A. Should the net cost of the Allowance be more or less than the amount included in the Contract Amount, the Contract Amount shall be adjusted in accordance with provisions of the Contract General Conditions and a Change Order shall be executed.
- B. Adjustment shall be made only for:
 - 1. Increase or decrease in handling costs at site, labor, installation costs, overhead, profit, and other expenses resulting from final selection under Allowance.
 - 2. Increase or decrease in product cost resulting from final selection under Allowance.
 - 3. Increase or decrease in product, application, installation and finishing costs resulting from change in quantity stated in Allowance.

END OF SECTION

SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 DEFINITIONS

- A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if the Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
 - 1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
 - 2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternates into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

- A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
 - 1. Include, as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation, whether or not indicated as part of alternate.
 - 2. Include, as part of the Base Bid and as part of the Alternative Bid the Owners Contingency allowance of \$ 50,000.00
- B. Execute accepted alternates under the same conditions as other Work of the Contract.
- C. Schedule: A Part 3 "Schedule of Alternates" Article is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

- A. Base Bid: The project involves the complete removal and disposal of the existing: aggregate surfaced Built-Up Roofing assembly down to the surface of the existing roof decks (RAs 1, 3, 4, 5, 6 & 7 cementitious wood fiber; RA 2 lightweight gypsum; RAs 8 & 9 metal), metal and bituminous flashings, metal through wall scupper liners, conductor heads and downspouts, metal gutter and downspouts, coping cap, expansion joint flashings, overflow scupper liners and abandoned equipment curbs.
The Mechanical and Electrical scope of work includes removing and replacing in-kind an existing rooftop heat pumps, wall hung heat pumps, thru wall heat pumps, split system heat pumps, mini-split packaged VAV units, packaged ventilation air units and fan powered VAV boxes and upgrade control temperature sensors throughout. New electrical disconnects will be provided for each piece of mechanical equipment.
- B. **Alternate #1:** State the amount to DEDUCT from the base bid price to provide all Work as described in the Drawings and Specifications to provide a 60 mil TPO membrane, in lieu of the specified roof covering.
- C. **Alternate #2:** State the amount to DEDUCT from the base bid to provide all Work as described in the Drawings and Specifications to provide an alternate to Greenheck-RVE Ventilation Air units.
- D. **Alternate #3:** State the amount to Deduct from the base bid to provide all Work as described in the Drawings and Specifications to provide an alternate to Trane Air Conditioning/Heat Pumps and Packaged VAV Units.
- E. **Alternate #4:** State the amount to ADD to the base bid price to provide factory training on all HVAC units and components. For the purposes of pricing, training shall consist of a one-day session, 8 hours long and shall include all necessary training materials.

END OF SECTION 012300

SECTION 01270 – UNIT PRICES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for unit prices.

1.2 DEFINITIONS

- A. Unit price is an amount proposed by bidders, stated on the Bid Form, as a price per unit of measurement for materials or services added to or deducted from the Contract Sum by appropriate modification, if estimated quantities of Work required by the Contract Documents are increased or decreased.

1.3 PROCEDURES

- A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.
- B. Measurement and Payment: Refer to individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.
- C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.
- D. List of Unit Prices: A list of unit prices is included at the end of this Section. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 LIST OF UNIT PRICES

- A. Unit Prices are indicated on the "Official Bid Form."

END OF SECTION 01270

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 CONTRACT DOCUMENT

- A. The **Contract Agreement** with referenced attachments, technical specifications and drawings including all project addenda constitute the Scope of the Work.
- B. Specific project requirements are included in the Contract Agreement and contain, but may include more than the following:
 - 1. Pre-Construction Meeting
 - 2. Construction Management
 - 3. Conformance to applicable Codes and Laws
 - 4. Project Schedule
 - 5. SLED Background checks
 - 6. Submittals
 - 7. Record Drawings
 - 8. Quality Control
 - 9. Cut and Patching
 - 10. Jobsite Supervision
 - 11. Work site control and clean-up.
 - 12. Material testing and Inspections
 - 13. Warranties and Guarantees
 - 14. Traffic Control and Safety
- C. **Important safety and specific Horry County School requirements are contained in the Contract Agreement and specifically Section 83 “ Mandatory Safety and Conduct Requirements.”**

1.2 SUMMARY

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Requirements:
 - 1. Those work restrictions and limitations listed on the **Scope of Work (Exhibit A)** and the **Contract Agreement**.

1.3 UTILITY USE AND CHARGES

- A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless specifically noted otherwise within the Scope of Work (Exhibit A) to the Contract Agreement. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, testing agencies, and authorities having jurisdiction.
- B. Requirement for temporary utilities if paid for by the Contractor:
 - 1. Sewer Service: **Pay** sewer-service use charges for sewer usage by all entities for construction operations.

2. Water Service: **Pay** water-service use charges for water used by all entities for construction operations.
3. Electric Power Service: **Pay** electric-power-service use charges for electricity used by all entities for construction operations.

C. Requirement for temporary utilities if paid for by the Owner:

1. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations at no cost to the Owner.
2. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations at no cost to the Owner.
 - a. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
 - b. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.4 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.5 PROJECT CONDITIONS

- A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

DEFINITIONS

- A. Included within the **Contract agreement** and within each specific specification section.

PART 2 - PRODUCTS

2.1 TEMPORARY FENCING

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

2.2 TEMPORARY FACILITIES

- A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.
- B. Common-Use Field Office: Of sufficient size to accommodate needs of Owner, Architect, and construction personnel office activities and to accommodate Project meetings specified in **Contract agreement**. Keep office clean and orderly.
- C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
 - 1. Store combustible materials apart from building.

2.3 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
 - 1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
 - 2. Heating Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.
 - 3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return-air grille in system and remove at end of construction and clean HVAC system as required in Section 017700 "Closeout Procedures".

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

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

3.2 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
 - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Water Service: Connect to Owner's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.

- C. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
- D. Heating: Provide temporary heating required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
- E. Electric Power Service: Connect to Owner's existing electric power service. Maintain equipment in a condition acceptable to Owner.
- F. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
 - 1. Install electric power service overhead unless otherwise indicated.
 - 2. Connect temporary service to Owner's existing power source, as directed by Owner.
- G. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
 - 1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
 - 2. Install lighting for Project identification sign.
- H. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel
 - 1. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.

3.3 SUPPORT FACILITIES INSTALLATION

- A. General: Comply with the following:
- B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas within construction limits indicated on Drawings.
 - 1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.
- C. Traffic Controls: Comply with requirements of authorities having jurisdiction.
 - 1. Protect existing site improvements to remain including curbs, pavement, and utilities.
 - 2. Maintain access for fire-fighting equipment and access to fire hydrants.
- D. Parking: Provide temporary parking areas for construction personnel.
- E. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
 - 1. Identification Signs: Provide Project identification signs as indicated on Drawings.
 - 2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.

- a. Provide temporary, directional signs for construction personnel and visitors.
3. Maintain and touchup signs so they are legible at all times.
- F. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction.

3.3 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
- B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
- C. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- D. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.
- E. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using environmentally safe materials.
- F. Site Enclosure Fence: Prior to commencing earthwork, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.
1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations and / or as indicated on Drawings.
 2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner.
- G. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each work day.
- H. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- I. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.
- J. Covered Walkway: Erect protective, covered walkway for passage of individuals through or adjacent to Project site. Coordinate with entrance gates, other facilities, and obstructions. Comply with regulations of authorities having jurisdiction and requirements indicated on Drawings.
1. Construct covered walkways using scaffold or shoring framing.

2. Provide overhead decking, protective enclosure walls, handrails, barricades, warning signs, exit signs, lights, safe and well-drained walkways, and similar provisions for protection and safe passage.
 3. Paint and maintain appearance of walkway for duration of the Work.
- K. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.
- L. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner from fumes and noise.
1. Construct dustproof partitions with gypsum wallboard with joints taped on occupied side, and fire-retardant-treated plywood on construction operations side.
 2. Construct dustproof partitions with two layers of 6-mil polyethylene sheet on each side. Cover floor with two layers of 6-mil polyethylene sheet, extending sheets 18 inches up the sidewalls. Overlap and tape full length of joints. Cover floor with fire-retardant-treated plywood.
 - a. Construct vestibule and airlock at each entrance through temporary partition with not less than 48 inches between doors. Maintain water-dampened foot mats in vestibule.
 3. Where fire-resistance-rated temporary partitions are indicated or are required by authorities having jurisdiction, construct partitions according to the rated assemblies.
 4. Insulate partitions to control noise transmission to occupied areas.
 5. Seal joints and perimeter. Equip partitions with gasketed dustproof doors and security locks where openings are required.
 6. Protect air-handling equipment.
 7. Provide walk-off mats at each entrance through temporary partition.

3.3 OPERATION, TERMINATION, AND REMOVAL

- A. "Supervision" Paragraph below is important if allowances for metered use of temporary facilities have been established.
- B. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- C. Maintenance: Maintain facilities in good operating condition until removal.
 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- D. Operate Project-identification-sign lighting daily from dusk until 12:00 midnight.
- E. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- F. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been

delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION 013100

SECTION 01303 – SUBMITTALS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for submittals required for performance of the Work, including the following:

1. Contractor's construction schedule.
2. Submittal schedule.
3. Daily construction reports.
4. Shop Drawings.
5. Product Data.
6. Samples.
7. Quality assurance submittals.

- B. Administrative Submittals: Refer to other Division 1 Sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to, the following:

1. Permits.
2. Schedule of Values
3. Applications for Payment.
4. Performance and payment bonds.
5. Insurance certificates.
6. List of subcontractors.

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

1. Division 1 Section 01040 "Coordination" specifies requirements governing preparation and submittal of required Coordination Drawings.
2. Division 1 Section 01401 "Quality Control and Special Inspections" specifies requirements for submittal of inspection and test reports.
3. Division 1 Section 01770 "Closeout Procedures" specifies requirements for submittal of Project Record Documents and warranties at project closeout.

1.3 DEFINITIONS

- A. Coordination Drawings show the relationship and integration of different construction elements that require careful coordination during fabrication or installation to fit in the space provided or to function as intended.

1. Preparation of Coordination Drawings is specified in Division 1 Section 01040 "Coordination" and may include components previously shown in detail on Shop Drawings or Product Data.

- B. Field samples are full-size physical examples erected on-site to illustrate finishes, coatings, or finish materials. Field samples are used to establish the standard by which the Work will be judged.

1.4 SUBMITTAL PROCEDURES

- A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.
1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 2. Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals concurrently for coordination.
 - a. The Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until all related submittals are received.
 3. 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.
 - a. Allow 2 weeks for initial review. Allow additional time if the Architect must delay processing to permit coordination with subsequent submittals.
 - b. If an intermediate submittal is necessary, process the same as the initial submittal.
 - c. Allow 2 weeks for reprocessing each submittal.
 - d. No extension of Contract Time will be authorized because of failure to transmit submittals to the Architect sufficiently in advance of the Work to permit processing.
- B. Submittal Preparation: Place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block.
1. Provide a space approximately 4 by 5 inches on the label or beside the title block on Shop Drawings to record the Contractor's review and approval markings and the action taken.
 2. Include the following information on the label for processing and recording action taken.
 - a. Project name.
 - b. Date.
 - c. Name and address of the Architect.
 - d. Name and address of the Contractor.
 - e. Name and address of the subcontractor.
 - f. Name and address of the supplier.
 - g. Name of the manufacturer.
 - h. Number and title of appropriate Specification Section.
 - i. Drawing number and detail references, as appropriate.
 3. Electronic Submittals: Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number.
- C. Submittal Transmittal: Package each submittal appropriately for transmittal and handling. Transmit each submittal from the Contractor to the Architect using a transmittal form. The Architect will not accept submittals received from sources other than the Contractor.
1. On the transmittal, record relevant information and requests for data. On the form, or separate sheet, record deviations from Contract Document requirements, including variations and limitations. Include Contractor's certification that information complies with Contract Document requirements.
- D. General Contractor (or Construction Manager) shall submit one copy of all submittals (including shop drawings) to Owner's Project Supervisor at the same time they are submitted to Architect.

1.5 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Bar-Chart Schedule: Prepare a fully developed, horizontal bar-chart-type, contractor's construction schedule. Submit within 30 days after the date established for "Commencement of the Work."
1. Provide a separate time bar for each significant construction activity. Provide a continuous vertical line to identify the first working day of each week. Use the same breakdown of units of the Work as indicated in the "Schedule of Values."
 2. Within each time bar, indicate estimated completion percentage in 10 percent increments. As Work progresses, place a contrasting mark in each bar to indicate Actual Completion.
 3. Prepare the schedule on a sheet, or series of sheets, of stable transparency, or other reproducible media, of sufficient width to show data for the entire construction period.
 4. Secure time commitments for performing critical elements of the Work from parties involved. Coordinate each element on the schedule with other construction activities; include minor elements involved in the sequence of the Work. Show each activity in proper sequence. Indicate graphically the sequences necessary for completion of related portions of the Work.
 5. Coordinate the Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittal Schedule, progress reports, payment requests, and other schedules.
 6. Indicate completion in advance of the date established for Substantial Completion. Indicate Substantial Completion on the schedule to allow time for the Architect's procedures necessary for certification of Substantial Completion.
- B. Work Stages: Indicate important stages of construction for each major portion of the Work, including submittal review, testing, and installation.
- C. Distribution: Following response to the initial submittal, print and distribute copies to the Architect, Owner, subcontractors, and other parties required to comply with scheduled dates. Post copies in the Project meeting room and temporary field office.
1. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.
- D. 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. A current approved construction schedule shall be submitted with each application for payment.

1.6 SUBMITTAL SCHEDULE

- A. After development and acceptance of the Contractor's Construction Schedule, prepare a complete schedule of submittals. Submit the schedule within 10 days of the date required for submittal of the Contractor's Construction Schedule.
1. Coordinate Submittal Schedule with the list of subcontracts, Schedule of Values, and the list of products as well as the Contractor's Construction Schedule.
 2. Prepare the schedule in chronological order. Provide the following information:
 - a. Scheduled date for the first submittal.
 - b. Related Section number.
 - c. Submittal category (Shop Drawings, Product Data, or Samples).
 - d. Name of the subcontractor.
 - e. Description of the part of the Work covered.
 - f. Scheduled date for resubmittal.

- g. Scheduled date for the Architect's final release or approval.
- B. Distribution: Following response to the initial submittal, print and distribute copies to the Architect, Owner, subcontractors, and other parties required to comply with submittal dates indicated. Post copies in the Project meeting room and field office.
 - 1. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.
- C. Schedule Updating: Revise the schedule after each meeting or activity where revisions have been recognized or made. Issue the updated schedule concurrently with the report of each meeting.

1.7 DAILY CONSTRUCTION REPORTS

- A. Prepare a daily construction report recording the following information concerning events at the site, and submit duplicate copies to the Architect at weekly intervals:
 - 1. List of subcontractors at the site.
 - 2. Approximate count of personnel at the site.
 - 3. High and low temperatures, general weather conditions.
 - 4. Accidents and unusual events.
 - 5. Meetings and significant decisions.
 - 6. Stoppages, delays, shortages, and losses.
 - 7. Meter readings and similar recordings.
 - 8. Emergency procedures.
 - 9. Orders and requests of governing authorities.
 - 10. Change Orders received, implemented.
 - 11. Services connected, disconnected.
 - 12. Equipment or system tests and startups.
 - 13. Partial Completions, occupancies.
 - 14. Substantial Completions authorized.

1.8 SHOP DRAWINGS

- A. Submit newly prepared information drawn accurately to scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not a Shop Drawing.
- B. Shop Drawings include fabrication and installation Drawings, setting diagrams, schedules, patterns, templates and similar Drawings. Include the following information:
 - 1. Dimensions.
 - 2. Identification of products and materials included by sheet and detail number.
 - 3. Compliance with specified standards.
 - 4. Notation of coordination requirements.
 - 5. Notation of dimensions established by field measurement.
 - 6. Sheet Size: Except for templates, patterns and similar full-size Drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 36 by 48 inches.
 - 7. Submittal: If paper submittals are required, submit 6 blue- or black-line prints and 2 additional prints where required for maintenance manuals. The Architect will retain 2 prints and return the remainder.
 - a. One of the prints returned shall be marked up and maintained as a "Record Document."

8. Do not use Shop Drawings without an appropriate final stamp indicating action taken.

1.9 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 dimensions verified by field measurement.
 - f. Notation of coordination requirements.
 2. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.
 3. Submittals: If paper submittals are required, submit 6 copies of each required submittal. The Architect will retain one and will return the other marked with action taken and corrections or modifications required.
 - a. Unless noncompliance with Contract Document provisions is observed, the submittal may serve as the final submittal.
 4. Distribution: Furnish copies (paper or electronic) 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.

1.10 SAMPLES

- A. Submit full-size, fully 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 or display Samples in the manner to facilitate review of qualities indicated. Prepare Samples to match the Architect's sample. 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. Samples not incorporated into the Work, or otherwise designated as the Owner's property, are the property of the Contractor and shall be removed from the site prior to Substantial Completion.
 3. Preliminary Submittals: Submit a full set of choices where Samples are submitted for selection of color, pattern, texture, or similar characteristics from a range of standard choices.
 - a. The Architect will review and return preliminary submittals with the Architect's notation, indicating selection and other action.
 4. Submittals: Except for Samples illustrating assembly details, workmanship, fabrication techniques, connections, operation, and similar characteristics, submit 3 sets. The Architect will return one set marked with the action taken.
 5. Maintain sets of Samples, as returned, at the Project Site, for quality comparisons throughout the course of construction.
 - a. Unless noncompliance with Contract Document provisions is observed, the submittal may serve as the final submittal.
 - b. Sample sets may be used to obtain final acceptance of the construction associated with each set.
- B. Distribution of Samples: Prepare and distribute additional sets to subcontractors, manufacturers, fabricators, suppliers, installers, and others as required for performance of the Work. Show distribution on transmittal forms.
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.

1.11 QUALITY ASSURANCE SUBMITTALS

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

1.12 ARCHITECT'S ACTION

- A. Except for submittals for the record or information, where action and return is required, the Architect 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 Architect will stamp each submittal with a uniform, action stamp. The Architect will mark the stamp appropriately to indicate the action taken, as follows:
 - 1. Final Unrestricted Release: When the Architect marks a submittal "Reviewed," the Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents. Final payment depends on that compliance.
 - 2. Final-But-Restricted Release: When the Architect marks a submittal "Furnish as Corrected," the Work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents. Final payment depends on that compliance.
 - 3. Returned for Resubmittal: When the Architect marks a submittal "Rejected or Revise and Resubmit," do not proceed with Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal according to the notations; resubmit without delay. Repeat if necessary to obtain different action mark.
 - a. Do not use, or allow others to use, submittals marked "Not Approved, Revise and Resubmit" at the Project Site or elsewhere where Work is in progress.
- C. Unsolicited Submittals: The Architect will return unsolicited submittals to the sender without action.
- D. Review of submittals and subsequent marking of a submittal as "Reviewed", "Furnish as Corrected" or "Revise and Resubmit" by the Architect or consulting engineers does not relieve the Contractor of responsibility or liability for the product, material or system not complying with the contract documents.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION (Not Applicable)

END OF SECTION 01303

SECTION 01322 – PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for the following:
 - 1. Pre-construction photographs.
 - 2. Periodic construction photographs.
 - 3. Final Completion construction photographs.
- B. Related Sections include the following:
 - 1. Division 1 Section "Submittals" for submitting construction photographs.
 - 2. Division 1 Section "Contract Closeout" for submitting digital photographs as Project Record Documents at Project closeout.

1.3 COST

- A. Costs: Contractor to include all costs associated with construction photographs in base bid price as required below.
- B. Construction Photographs: Submit digital copies of each photograph to Architect once a month.
 - 1. Format: 12 mega pixel (minimum) jpg. digital files.
 - 2. Submit digital files on appropriate storage media for transfer to Architect.
 - 3. Identification: Provide label on face of each disc with the following information:
 - a. Name of Project.
 - b. Name and address of photographer.
 - c. Name of Architect.
 - d. Name of Contractor.
 - e. Dates photograph were taken.
 - f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.

PART 2 - PRODUCTS

2.1 PHOTOGRAPHIC MEDIA

- A. Format: 12 mega pixel digital jpg. file.
- B. Contractor to provide storage media for transfer of all files to Architect.

PART 3 - EXECUTION

3.1 EXECUTION

- A. Pre-construction Photographs: Before starting construction, take a minimum of 15 photographs of Project site and surrounding properties from different vantage points and 1 aerial exposure.
1. Provide at least one picture of the entire site from each corner of the site prior to start of any construction work, (I.E.: rectangular lot shape, from each corner, etc.). Capture the entire width of the site from each angle. Pictures to also include adjacent properties abutting each property line of project site.
Contractor to provide 1 aerial exposure of the entire site prior to construction.
- B. Periodic Construction Photographs: Take photographs of the following (angle of exposures to include permanent identifiable fixed reference points, objects, etc., in frame of picture):
1. All under slab and site subsurface utility systems prior to covering by other work or cover by rough and finish grading, landscaping, sod, etc. Also include 4 aerial exposures front, rear and sides.
 2. Completed, installed concrete slabs of all building wings. Also include 4 aerial exposures front, rear and sides after installation of all slabs.
 3. All CMU exterior walls prior to covering of exterior veneer. Also include 4 aerial exposures front, rear and sides.
 4. Roof framing and metal roof decking prior to covering of interior finish materials and roof coverings. Also include 4 aerial exposures front, rear and sides.
 5. All asphalt and concrete paving sub base prior to installation of finish paving materials. Also include 2 aerial exposures one at each parking area.
 6. Provide bi-monthly general pictures of progress work of entire site (beginning to end of construction.)
 7. Provide daily general pictures of construction progress of all areas.
 8. Provide 4 aerial exposures, one of each side of building-site at the completion of the project.
- C. Final Completion Construction Photographs: Provide at least 20 digital photographs after date of Substantial Completion of all areas and angles as instructed by Architect. Provide final pictures by a professional photographic service paid for by the contractor. Include one 5"x7" printout of each picture along with the digital copies on appropriate transfer media as described above.

END OF SECTION 01322

SECTION 01401 – QUALITY CONTROL AND SPECIAL INSPECTIONS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
- B. Office of School Facilities (OSF) Requirements – Memorandums (2) dated March 29, 2005 relating to Chapters 1 and 17, apply to this Section.

1.2 SUMMARY

- A. All existing ductwork will remain to be reused so the special inspections will be limited in nature and based on the requirements of the contract documents.
- B. This Section includes administrative and procedural requirements for quality-control services and special inspections.
- C. Quality-control services include inspections, tests, and related actions, including reports performed by Contractor, by independent agencies, and by governing authorities. They do not include contract enforcement activities performed by Architect.
- D. Inspection and testing services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with Contract Document requirements.
- E. Requirements of this Section relate to customized fabrication and installation procedures, not production of standard products.
 - 1. Specific quality-control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
 - 2. Specified inspections, tests, and related actions do not limit Contractor's quality-control procedures that facilitate compliance with Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
- F. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 1 Section 01045 "Cutting and Patching" specifies requirements for repair and restoration of construction disturbed by inspection and testing activities.

1.3 RESPONSIBILITIES

- A. Contractor Responsibilities: Unless otherwise indicated as the responsibility of another identified entity, Contractor shall provide inspections, tests, and other quality-control services specified elsewhere in the Contract Documents and required by authorities having jurisdiction. Costs for these services are included in the Contract Sum.
 - 1. Where individual Sections specifically indicate that certain inspections, tests, and other quality-control services are the Contractor's responsibility, the Contractor shall employ and pay a qualified independent testing agency to perform quality-control services. Costs for these services are included in the Contract Sum.

2. Contractor's responsibilities include providing of certifications and tests of fabricators required by Article 1704.2, Chapter 17 of the International Building Code.
 3. Contractor's responsibilities relative to the "Special Inspector" are indicated further in this Section.
- B. Owners Responsibilities: Where indicated, the Owner shall provide inspections, test and other quality-control services specified herein and required by authorities having jurisdiction. Cost of the services will be paid by the Owner.
1. Owner will provide inspection and testing services, performed by a "Special Inspector", as indicated in "SPECIAL INSPECTION REQUIREMENTS" Table included at the end of this Section and on drawings.
 2. Special Inspector will perform inspections in accordance with Tables 1704.3 and 1704.4 and other relevant articles of Chapter 17 of the IBC.
 - a. A pre-construction meeting shall be held for the purpose of reviewing the special inspection requirements of the project. Required attendees include the Owner, Architect, General Contractor and the Special Inspector.
 - b. A Special Inspections Project Manual will be developed by the Special Inspector and be distributed to all parties in attendance at the pre-construction meeting. The Special Inspection Project Manual will identify the specific special inspection requirements of the project.
 3. General Contractor's responsibilities relative to the Special Inspector include the following:
 - a. The General Contractor shall ensure that copies of approved plans, specifications and shop drawings are provided to the Special Inspector prior to the start of the affected work.
 - b. The Contractor is responsible for notifying the Special Inspector when the work is ready for inspection. A minimum of 24-hours' notice shall be provided so the Special Inspector has time to inspect the work prior to concealment. The Contractor shall provide access to and means for safe and proper inspection of the work.
 - c. The General Contractor shall create a file (three-ring binder) for the Special Inspector's daily reports. This file shall be located in a conspicuous place in the project trailer/office to allow review by the Building Department Inspectors. No Certificate of Occupancy will be issued until the Special Inspector's completion report has been reviewed and approved the Building Department.
 - d. When the work requiring special inspections is completed and all nonconforming items have been resolved, the General Contractor shall notify the Special Inspector to submit a Completion Report (included at the end of this Section) to the Building Department, AOR/EOR, and General Contractor. A Certificate of Occupancy will not be issued until the final report has been reviewed and approved by the Building Department.
 4. Special Inspector's responsibilities include the following:
 - a. It is the Special Inspector's responsibility to thoroughly review the approved plans in advance of construction to establish that adequate information is available to conduct the required inspections and tests. All errors and/or omissions in the reviewed plans that create any form of uncertainty or ambiguity shall be resolved through the AOR or EOR.
 - b. An approved Special Inspector shall perform inspections and/or tests of the work for conformance with the approved plans, specifications, shop drawings and applicable provisions of the International Building Code. It is the Special Inspector's responsibility to verify that all work requiring special inspections is inspected and/or tested prior to concealment.
 - c. After each inspection, the Special Inspector shall complete a Special Inspection Daily Report (included at the end of this Section) and give it to the Contractor. Any

nonconforming items shall be brought to the immediate attention of the General Contractor and noted on the Daily Report form.

- d. The Special Inspector of record shall submit a Special Inspection Weekly Report (included at the end of this Section) to the Building Department and AOR/EOR weekly until all work requiring special inspections is complete. Weekly report shall include the following:
 - 1.) A brief summary of the work performed during the reporting time frame.
 - 2.) Changes and/or discrepancies with the approved drawings or specifications that were observed during the reporting period.
 - 3.) Discrepancies that were resolved or corrected.
 - 4.) A list of nonconforming items requiring resolution.
 - 5.) All applicable test results.
- C. Retesting: The Contractor is responsible for retesting where results of inspections, tests, or other quality-control services prove unsatisfactory and indicate noncompliance with Contract Document requirements, regardless of whether the original test was Contractor's responsibility.
 1. The cost of retesting construction, revised or replaced by the Contractor, is the Contractor's responsibility where required tests performed on original construction indicated noncompliance with Contract Document requirements.
- D. Associated Services: Cooperate with agencies performing required inspections, tests, and similar services, and provide reasonable auxiliary services as requested. Notify the agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include, but are not limited to, the following:
 1. Provide access to the Work.
 2. Furnish incidental labor and facilities necessary to facilitate inspections and tests.
 3. Take adequate quantities of representative samples of materials that require testing or assist the agency in taking samples.
 4. Provide facilities for storage and curing of test samples.
 5. Deliver samples to testing laboratories.
 6. Provide the agency with a preliminary design mix proposed for use for materials mixes that require control by the testing agency.
 7. Provide security and protection of samples and test equipment at the Project Site.
- E. Duties of the Testing Agency: The independent agency engaged to perform inspections, sampling, and testing of materials and construction specified in individual Sections shall cooperate with the Architect and the Contractor in performance of the agency's duties. The testing agency shall provide qualified personnel to perform required inspections and tests.
 1. The agency shall notify the Architect and the Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 2. The agency is not authorized to release, revoke, alter, or enlarge requirements of the Contract Documents or approve or accept any portion of the Work.
 3. The agency shall not perform any duties of the Contractor.
- F. Coordination: Coordinate the sequence of activities to accommodate required services with a minimum of delay. Coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.
 1. The Contractor is responsible for scheduling times for inspections, tests, taking samples, and similar activities.

1.4 SUBMITTALS

- A. Unless the Contractor is responsible for this service, the independent testing agency shall submit a certified written report, in duplicate, of each inspection, test, or similar service to the Architect. If the Contractor is responsible for the service, submit a certified written report, in duplicate, of each inspection, test, or similar service through the Contractor.
1. Submit additional copies of each written report directly to the governing authority, when the authority so directs – see Chapter 17 of the latest adopted Code of the International Building Code (IBC) and having jurisdiction over the project location.
 2. Report Data: Written reports of each inspection, test, or similar service include, but are not limited to, the following:
 - a. Date of issue.
 - b. Project title and number.
 - c. Name, address, and telephone number of testing agency.
 - d. Dates and locations of samples and tests or inspections.
 - e. Names of individuals making the inspection or test.
 - f. Designation of the Work and test method.
 - g. Identification of product and Specification Section.
 - h. Complete inspection or test data.
 - i. Test results and an interpretation of test results.
 - j. Ambient conditions at the time of sample taking and testing.
 - k. Comments or professional opinion on whether inspected or tested Work complies with Contract Document requirements.
 - l. Name and signature of laboratory inspector.
 - m. Recommendations on retesting.

1.5 QUALITY ASSURANCE

- A. Qualifications for Service Agencies: Engage inspection and testing service agencies, including independent testing laboratories, that are pre-qualified as complying with the American Council of Independent Laboratories' "Recommended Requirements for Independent Laboratory Qualification" and that specialize in the types of inspections and tests to be performed.
1. Each independent inspection and testing agency engaged on the Project shall be authorized by authorities having jurisdiction to operate in the state where the Project is located.

PART 2 – PRODUCTS (Not Applicable)

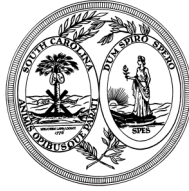
PART 3 – EXECUTION

3.1 REPAIR AND PROTECTION

- A. General: Upon completion of inspection, testing, sample taking and similar services, repair damaged construction and restore substrates and finishes. Comply with Contract Document requirements for Division 1 Section "Cutting and Patching."
- B. Protect construction exposed by or for quality control service activities, and protect repaired construction.
- C. Repair and protection is Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing, or similar services.

END OF SECTION 01401

See following pages for: Correspondence from OSF dated 03/29/05 re Inspections, Chapter 1 IBC
Correspondence from OSF dated 03/29/05 re Inspections, Chapter 17, IBC
Latest edition of IBC Chapter 1 Inspections



STATE OF SOUTH CAROLINA
DEPARTMENT OF EDUCATION

OFFICE OF SCHOOL FACILITIES

INEZ MOORE TENENBAUM
STATE SUPERINTENDENT OF EDUCATION

MEMORANDUM

TO: Architects/Engineers
Construction Managers
School District Facility Managers

FROM: Alex James, Director
Office of School Facilities (OSF)

RE: Inspections, Chapter 1 IBC

DATE: March 29, 2005

On March 15, 2004, OSF began enforcing inspections required in *the 2004 South Carolina School Facilities Planning and Construction Guide*. At that time, plans submitted for their initial code review were required to adhere to the following:

SECTION 903 INSPECTION REQUIRED BY CODE

903.1 *Except for inspections required herein and provided by OSF, it will be the responsibility of the owner to contract for all code required inspection services. These required inspections shall be carried out by an agency approved by OSF. The entity shall be responsible for approved construction document compliance only. All code compliance shall be determined by OSF.*

The Owner or his agent shall identify in the construction documents the inspections required by code in Chapter 1. No more than two weeks after the opening of the bids or before the constructions starts (whichever comes first) the identity of the entities to provide the inspections with means of contacting these entities (telephone numbers) shall be provided to OSF.

Chapter 1 Inspections include but are not limited to the following:

- 109.3.1 Footing or foundation inspection.
- 109.3.2 Concrete slab or under-floor inspection.
- 109.3.3 Lowest floor elevation.
- 109.3.4 Frame inspection.
- 109.3.5 Lath or gypsum board inspection.

- 109.3.6 Fire-resistant penetrations
- 109.3.7 Energy efficiency inspections
- 909.3 Special inspection and test requirements. (smoke control systems)
- S406.6.6 Inspection of fill. Placement of the fill material shall be inspected by the code official.
- RR109.1.1 Foundation inspection. Inspection of the foundation shall be made after poles or piers or trenches or basement areas are excavated and any required forms erected and any required reinforcing steel is in place prior to the placing of concrete. The foundation inspection shall include excavations for thickened slabs intended for the support of bearing walls, partitions, structural supports, or equipment.
- RR109.1.2 Plumbing, mechanical, gas and electrical systems inspection. Rough inspection of plumbing, appliances are set or installed, and prior to framing inspection.

Mechanical Code: M107.1 Required Inspections

1. Underground inspection shall be made after trenches or ditches are excavated and bedded, piping installed, and before backfill is put in place.
2. Rough-in inspection shall be made after the roof, framing, fireblocking and bracing are in place and all ducting and other components to be concealed are complete, and prior to the installation of wall or ceiling membranes.

Plumbing Code: P107.1 Required inspections and testing.

1. Underground inspection shall be made after trenches or ditches are excavated and bedded, piping installed, and before any backfill is put in place.
2. Rough-in inspection shall be made after the roof, framing, fireblocking, firestopping, draftstopping and bracing is in place and all sanitary, storm and water distribution piping is roughed-in and prior to the installation of wall or ceiling membranes.

Electrical Code:

1. Underground inspection shall be made after trenches or ditches are excavated and bedded, conduit installed, and before backfill is placed.
2. Rough-in inspection shall be made after the roof, framing, fireblocking and bracing are in place and other components to be concealed are complete, and prior to the installation of concealing construction.

All persons defined by code as a building official (A101.1), a chief inspector (A101.2), or an inspector (A101.3) are eligible to provide these Chapter 1 inspections. Architects and engineers are also eligible. Construction Managers can provide the inspections w/qualified personnel, provided they are not under a CM at Risk contract. *(Per the Due Diligence Memorandum of April 18, 2005, individuals retained by the owner or his agent and determined to be qualified and approved by OSF are also eligible.)* Contractors cannot perform code inspections – they are still to provide testing as required by specifications.



STATE OF SOUTH CAROLINA
DEPARTMENT OF EDUCATION

OFFICE OF SCHOOL FACILITIES

INEZ MOORE TENENBAUM
STATE SUPERINTENDENT OF EDUCATION

MEMORANDUM

**TO: Architects/Engineers
Construction Managers
School District Facility Managers**

FROM: Alex James, Director
Office of School Facilities (OSF)

**RE: Inspection Reports
Special Inspections, Chapter 17, 2003 IBC**

DATE: March 29, 2005

On March 9, 2005 the OSF began enforcing *the 2005 South Carolina School Facilities Planning and Construction Guide*. All plans submitted to OSF on or after this date for their initial code review are required to provide inspection reports per the following (*in italics*) addition to the previous guide:

SECTION 903 INSPECTION REQUIRED BY CODE

903.1 Except for inspections required herein and provided by OSF, it will be the responsibility of the owner. *Copies of these inspection reports shall be provided to the owner's representative, design professional, and OSF within five (5) business days.*

In lieu of the five (5) day limit of providing inspection reports, the Owner or his agent may choose to hold the inspection reports (Chapter 1 and Chapter 17, Special) for OSF. These reports may be presented to OSF at the "above ceiling" or final inspection. All reports shall be provided to OSF or held at a designated location for review by OSF before a certificate of occupancy can be issued.

The inspection/testing firm shall immediately notify the Owner and design professional of all failed inspections/tests.

On January 1, 2005, OSF began enforcing the 2003 IBC. All plans submitted on or after this date for their initial code analysis shall be required to adhere to this code. Included in the 2003 IBC is Chapter 17, Structural Tests and Special Inspections.

Special Inspections – Chapter 17

Special Inspections of Chapter 17 include but are not limited to the following:

1704.2	Inspection of Fabrication
1704.3	Steel Construction
1704.4	Concrete Construction
1704.5	Masonry Construction
1704.7	Soils
1704.8	Piles
1704.9	Pier Foundations
1704.10	Wall Panels / Veneers
1704.11	Sprayed Fire Resistant Materials
1704.12	EIFS
1704.13	Special Cases
1704.14	Smoke Control

Seismic Resistance

Wind Resistance

The Owner or his agent shall identify those entities he/she judges is qualified to perform the **Special Inspections of Chapter 17**. *OSF must approve the credentials of the entity(s) to perform the special inspections before the construction documents can be approved.* OSF recommends that these entities be recognized by a professional association, but does not intend to eliminate those individuals who exhibit knowledge that the Owner or his agent deems appropriate.

All inspection fees must be paid directly by the Owner. They shall be a separate budget item for the Owner and not included as an allowance in the Contractor's cost.

In all cases, these are inspection services only. They are not building permits. OSF will continue to provide plan approval, code compliance, and certification of occupancy. The traditional services of "above ceiling" and final inspections will remain as a part of OSF service.

LATEST VERSION OF IBC CHAPTER 1 INSPECTIONS

CODE SECTION	DESCRIPTION OF INSPECTION	INSPECTION FIRM	CONTACT	TELEPHONE
109.3.1	Footing and foundation inspection	N/A		
109.3.2	Concrete slab or under-floor inspection	N/A		
109.3.3	Lowest floor inspection	N/A		
109.3.4	Frame inspection	N/A		
109.3.5	Lath or gypsum board inspection	N/A		
109.3.6	Fire-resistant penetrations	N/A		
109.3.7	Energy efficient inspections	N/A		
S406.6.6	Inspection of fill	N/A		
RR109.1.1	Foundation inspection. After steel is placed and prior to placement of concrete. Includes inspection for thickened slabs intended for the support of bearing walls and supports.	N/A		
RR109.1.2	Mechanical, plumbing & electrical inspection. Rough inspection of plumbing, mechanical, gas and electrical systems shall be made prior to covering or concealment, before fixtures or appliances are set or installed, and prior to framing inspection.	TBD		

SECTION 01421 – REFERENCE STANDARDS AND DEFINITIONS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DEFINITIONS

- A. General: Basic contract definitions are included in the Conditions of the Contract.
- B. "Indicated": The term "indicated" refers to graphic representations, notes, or schedules on the Drawings; or to other paragraphs or schedules in the Specifications and similar requirements in the Contract Documents. Terms such as "shown," "noted," "scheduled," and "specified" are used to help the user locate the reference. Location is not limited.
- C. "Directed": Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted" mean directed by the Architect, requested by the Architect, and similar phrases.
- D. "Approved": The term "approved," when used in conjunction with the Architect's action on the Contractor's submittals, applications, and requests, is limited to the Architect's duties and responsibilities as stated in the Conditions of the Contract.
- E. "Regulations": The term "regulations" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": The term "furnish" means to supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": The term "install" describes operations at the Project site including the actual unloading, temporary storage, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- H. "Provide": The term "provide" means to furnish and install, complete and ready for the intended use.
- I. "Installer": An installer is the Contractor or another entity engaged by the Contractor, either as an employee, subcontractor, or contractor of lower tier, to perform a particular construction activity, including installation, erection, application, or similar operations. Installers are required to be experienced in the operations they are engaged to perform.
 - 1. The term "experienced," when used with the term "installer," means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with the special requirements indicated; and having complied with requirements of authorities having jurisdiction.
 - 2. Trades: Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespersons of the corresponding generic name.

3. Assigning Specialists: Certain Sections of the Specifications require that specific construction activities shall be performed by specialists who are recognized experts in those operations. The specialists must be engaged for those activities, and their assignments are requirements over which the Contractor has no option. However, the ultimate responsibility for fulfilling contract requirements remains with the Contractor.
 - a. This requirement shall not be interpreted to conflict with enforcing building codes and similar regulations governing the Work. It is also not intended to interfere with local trade-union jurisdictional settlements and similar conventions.
- J. "Project site" is the space available to the Contractor for performing construction activities, either exclusively or in conjunction with others performing other work as part of the Project. The extent of the Project site is shown on the Drawings and may or may not be identical with the description of the land on which the Project is to be built.
- K. "Testing Agencies": A testing agency is an independent entity engaged to perform specific inspections or tests, either at the Project site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

1.3 SPECIFICATION FORMAT AND CONTENT EXPLANATION

- A. Specification Format: These Specifications are organized into Divisions and Sections based on the 16-division format and CSI/CSC's "MasterFormat" numbering system.
- B. Specification Content: These Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
 1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be interpolated as the sense requires. Singular words shall be interpreted as plural and plural words interpreted as singular where applicable as the context of the Contract Documents indicates.
 2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by the Contractor. At certain locations in the Section Text, subjective language is used for clarity to describe responsibilities that must be fulfilled indirectly by the Contractor or by others when so noted.
 - a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

1.4 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with standards in effect as of the date of the Contract Documents.
- C. Conflicting Requirements: Where compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to the Architect for a decision before proceeding.

1. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of the requirements. Refer uncertainties to the Architect for a decision before proceeding.
- D. Copies of Standards: Each entity engaged in construction on the Project must be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
1. Where copies of standards are needed to perform a required construction activity, the Contractor shall obtain copies directly from the publication source and make them available on request.
- E. Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. Where abbreviations and acronyms are used in the Specifications or other Contract Documents, they mean the recognized name of the trade association, standards-producing organization, authorities having jurisdiction, or other entity applicable to the context of the text provision. Refer to Gale Research's "Encyclopedia of Associations" or Columbia Books' "National Trade & Professional Associations of the U.S.," which are available in most libraries.

END OF SECTION 01421

SECTION 01500 – CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes requirements for construction facilities and temporary controls, including temporary utilities, support facilities, and security and protection.
- B. Temporary utilities include, but are not limited to, the following:
 - 1. Water service and distribution.
 - 2. Temporary electric power and light.
 - 3. Temporary heat.
 - 4. Ventilation.
 - 5. Telephone service.
 - 6. Sanitary facilities, including drinking water.
 - 7. Storm and sanitary sewer.
- C. Support facilities include, but are not limited to, the following:
 - 1. Field offices and storage sheds.
 - 2. Temporary roads and paving.
 - 3. Dewatering facilities and drains.
 - 4. Temporary enclosures.
 - 5. Hoists and temporary elevator use.
 - 6. Temporary project identification signs and bulletin boards.
 - 7. Waste disposal services.
 - 8. Rodent and pest control.
 - 9. Construction aids and miscellaneous services and facilities.
- D. Security and protection facilities include, but are not limited to, the following:
 - 1. Temporary fire protection where required by code.
 - 2. Barricades, warning signs, and lights.
 - 3. Sidewalk bridge or enclosure fence for the site where required.
 - 4. Environmental protection.
- E. Contract Management/Contract Administration:
 - 1. Provide space, equipment and support as described in the Special Conditions section of the specifications.
- F. Project Site Cleanup and Maintenance:
 - 1. Contractor shall maintain a clean and safe construction site throughout the construction period until final turnover to the Owner at completion of the project.

- a. Project site shall be kept clean of trash and debris on a daily basis to prevent trash and debris from blowing across the Owner's property line onto adjacent properties.
- b. The storm protection devices and fencing shall be checked on a daily basis and all damage or missing sections shall be repaired and/or replaced immediately. Coordinate with the "Storm/OSRM" permit requirements.
- c. The building interior shall be cleaned on a daily basis. All trash shall be properly disposed of in appropriate containers. Unused excess construction materials and supplies left over from installations, etc...shall be removed from the site on a daily basis.
- d. Clean up and proper maintenance of the project site shall be reviewed and discussed at the Pre-Construction conference and at every project meeting.

1.3 SUBMITTALS

- A. Temporary Utilities: Submit reports of tests, inspections, meter readings, and similar procedures performed on temporary utilities.

1.4 QUALITY ASSURANCE

- A. Regulations: Comply with industry standards and applicable laws and regulations of authorities having jurisdiction including, but not limited to, the following:
 1. Building code requirements.
 2. Health and safety regulations.
 3. Utility company regulations.
 4. Police, fire department, and rescue squad rules.
 5. Environmental protection regulations.
- B. Standards: Comply with NFPA 241 "Standard for Safeguarding Construction, Alterations, and Demolition Operations," ANSI A10 Series standards for "Safety Requirements for Construction and Demolition," and NECA Electrical Design Library "Temporary Electrical Facilities."
 1. Electrical Service: Comply with NEMA, NECA, and UL standards and regulations for temporary electric service. Install service in compliance with NFPA 70 "National Electric Code."
- C. Inspections: Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.

1.5 PROJECT CONDITIONS

- A. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Relocate temporary services and facilities as the Work progresses. Do not overload facilities or permit them to interfere with progress. Take necessary fire-prevention measures. Do not allow hazardous, dangerous, or unsanitary conditions, or public nuisances to develop or persist on-site. The jobsite shall be kept clean and orderly at all times for safety concerns, both interior and exterior.
- B. Refer and coordinate jobsite condition during construction period with the General Conditions.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. General: Provide new materials. If acceptable to the Architect, the Contractor may use undamaged, previously used materials in serviceable condition. Provide materials suitable for use intended.
- B. Tarpaulins: Provide waterproof, fire-resistant, UL-labeled tarpaulins with flame-spread rating of 15 or less. For temporary enclosures, provide translucent, nylon-reinforced, laminated polyethylene or polyvinyl chloride, fire-retardant tarpaulins.
- C. Water: Provide potable water approved by local health authorities.
- D. Open-Mesh Fencing: Provide 0.120-inch thick, galvanized 2-inch chainlink fabric fencing 6 feet high with galvanized barbed-wire top strand and galvanized steel pipe posts, 1-1/2 inches I.D. for line posts and 2-1/2 inches I.D. for corner posts.

2.2 EQUIPMENT

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

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

PART 3 – EXECUTION

3.1 INSTALLATION

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

3.2 TEMPORARY UTILITY INSTALLATION

- A. General: Engage the appropriate local utility company to install temporary service or connect to existing service. Where company provides only part of the service, provide the remainder with matching, compatible materials and equipment. Comply with company recommendations.
 1. Arrange with company and existing users if applicable for a time when service can be interrupted, if necessary, to make connections for temporary services.
 2. Provide adequate capacity at each stage of construction. Prior to temporary utility availability, provide trucked-in services.
 3. Obtain easements to bring temporary utilities to the site where the Owner's easements cannot be used for that purpose.
 4. Use Charges: Cost or use charges for temporary facilities are not chargeable to the Owner or Architect. Neither the Owner nor Architect will accept cost or use charges as a basis of claims for Change Orders.
 5. Permanent power and water can be turned on in the School District's name. The Contractor is responsible for the bill until the District has a Certificate of Occupancy and has accepted the building. Please notify Owner two weeks before water and power are needed.
- B. Water Service: Install water service and distribution piping of sizes and pressures adequate for construction until permanent water service is in use.
 1. Sterilization: Sterilize temporary water piping prior to use.
- C. Temporary Electric Power Service: Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period. Include meters, transformers, overload-protected disconnects, automatic ground-fault interrupters, and main distribution switchgear.
 1. Install electric power service underground, except where overhead service must be used.
 2. Power Distribution System: Install wiring overhead and rise vertically where least exposed to damage. Where permitted, wiring circuits not exceeding 125 Volts, ac 20 Ampere rating, and lighting circuits may be nonmetallic-sheathed cable where overhead and exposed for surveillance.
- D. Temporary Lighting: When overhead floor or roof deck has been installed, provide temporary lighting with local switching.

1. Install and operate temporary lighting that will fulfill security and protection requirements without operating the entire system. Provide temporary lighting that will provide adequate illumination for construction operations and traffic conditions.
- E. Temporary Heat: Provide temporary heat required by construction activities for curing or drying of completed installations or for protection of installed construction from adverse effects of low temperatures or high humidity. Select safe equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce the ambient condition required and minimize consumption of energy.
- F. Temporary Telephones: Provide temporary telephone service throughout the construction period for all personnel engaged in construction activities. Install telephone on a separate line for each temporary office and first-aid station.
 1. Separate Telephone Lines: Provide additional telephone lines for the following:
 - a. Where an office has more than 2 occupants, install a telephone for each additional occupant or pair of occupants.
 2. At each telephone, post a list of important telephone numbers.
 - G. Sanitary facilities include temporary toilets, wash facilities, and drinking-water fixtures. Comply with regulations and health codes for the type, number, location, operation, and maintenance of fixtures and facilities. Install where facilities will best serve the Project's needs.
 1. Provide toilet tissue, paper towels, paper cups, and similar disposable materials for each facility. Provide covered waste containers for used material.
 - H. Toilets: Install self-contained toilet units. Shield toilets to ensure privacy.
 - I. Drinking-Water Facilities: Provide containerized, tap-dispenser, bottled-water drinking-water units, including paper supply.

3.3 SUPPORT FACILITIES INSTALLATION

- A. Locate field offices, storage sheds, and other temporary construction and support facilities for easy access.
 1. Maintain support facilities until near Substantial Completion. Remove prior to Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to the Owner.
- B. Provide incombustible construction for offices, shops, and sheds located within the construction area or within 30 feet of building lines. Comply with requirements of NFPA 241.
- C. Field Offices: Provide insulated, weathertight temporary offices of sufficient size to accommodate required office personnel at the Project Site. Keep the office clean and orderly for use for small progress meetings. Furnish and equip offices as follows:
 1. Furnish with a desk and chairs, a 4-drawer file cabinet, plan table, plan rack, and a 6-shelf bookcase.
- D. Storage and Fabrication Sheds: Install storage and fabrication sheds sized, furnished, and equipped to accommodate materials and equipment involved, including temporary utility service. Sheds may be open shelters or fully enclosed spaces within the building or elsewhere on-site.

- E. Dewatering Facilities and Drains: For temporary drainage and dewatering facilities and operations not directly associated with construction activities included under individual Sections, comply with dewatering requirements of applicable Division 2 Sections. Where feasible, utilize the same facilities. Maintain the site, excavations, and construction free of water.
- F. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities.
 - 1. Where heat is needed and the permanent building enclosure is not complete, provide temporary enclosures where there is no other provision for containment of heat. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.
 - 2. Install tarpaulins securely, with incombustible wood framing and other materials. Close openings of 25 sq. ft. or less with plywood or similar materials.
 - 3. Close openings through floor or roof decks and horizontal surfaces with load-bearing, wood-framed construction.
- G. Project Identification and Temporary Signs: Prepare project identification and other signs of size indicated. Install signs where indicated to inform the public and persons seeking entrance to the Project. Support on posts or framing of preservative-treated wood or steel. Do not permit installation of unauthorized signs.
 - 1. Project Identification Signs: Engage an experienced sign painter to apply graphics. Comply with details indicated.
 - 2. Temporary Signs: Prepare signs to provide directional information to construction personnel and visitors.
- H. Collection and Disposal of Waste: Collect waste from construction areas and elsewhere daily. Comply with requirements of NFPA 241 for removal of combustible waste material and debris. Enforce requirements strictly. Do not hold materials more than 7 days during normal weather or 3 days when the temperature is expected to rise above 80 deg F. Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material lawfully.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Temporary Fire Protection: Until fire-protection needs are supplied by permanent facilities, install and maintain temporary fire-protection facilities of the types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 10 "Standard for Portable Fire Extinguishers" and NFPA 241 "Standard for Safeguarding Construction, Alterations, and Demolition Operations."
 - 1. Locate fire extinguishers where convenient and effective for their intended purpose, but not less than one extinguisher on each floor at or near each usable stairwell.
 - 2. Store combustible materials in containers in fire-safe locations.
 - 3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire-protection facilities, stairways, and other access routes for fighting fires. Prohibit smoking in hazardous fire-exposure areas.
 - 4. Provide supervision of welding operations, combustion-type temporary heating units, and similar sources of fire ignition.
- B. Permanent Fire Protection: At the earliest feasible date in each area of the Project, complete installation of the permanent fire-protection facility, including connected services, and place into operation and use. Instruct key personnel on use of facilities.

- C. Barricades, Warning Signs, and Lights: Comply with standards and code requirements for erection of structurally adequate barricades. Paint with appropriate colors, graphics, and warning signs to inform personnel and the public of the hazard being protected against. Where appropriate and needed, provide lighting, including flashing red or amber lights.
- D. Enclosure Fence: Before excavation begins, install an enclosure fence with lockable entrance gates. Locate where indicated, or that portion of the site determined sufficient to accommodate construction operations. Install in a manner that will prevent people, dogs, and other animals from easily entering the site, except by the entrance gates. Modify enclosure fence as required for the various stages of construction and demolition.
 - 1. Provide open-mesh, chainlink fencing with posts set in a compacted mixture of gravel and earth.
- E. Security Enclosure and Lockup: Install substantial temporary enclosure of partially completed areas of construction. Provide locking entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.
 - 1. Storage: Where materials and equipment must be stored, and are of value or attractive for theft, provide a secure lockup. Enforce discipline in connection with the installation and release of material to minimize the opportunity for theft and vandalism.
- F. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations, and minimize the possibility that air, waterways, and subsoil might be contaminated or polluted or that other undesirable effects might result. Avoid use of tools and equipment that produce harmful noise. Restrict use of noise-making tools and equipment to hours that will minimize complaints from persons or firms near the site.

3.5 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.
- B. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage by freezing temperatures and similar elements.
 - 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
 - 2. Protection: Prevent water-filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.
- C. Termination and Removal: Unless the Architect requests that it be maintained longer, remove each temporary facility when the need has ended, when replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with the temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
 - 1. Materials and facilities that constitute temporary facilities are the Contractor's property. The Owner reserves the right to take possession of project identification signs.
 - 2. At Substantial Completion, clean and renovate permanent facilities used during the construction period including, but not limited to, the following:

- a. Replace air filters and clean inside of ductwork and housings.
- b. Replace significantly worn parts and parts subject to unusual operating conditions.
- c. Replace lamps burned out or noticeably dimmed by hours of use.

END OF SECTION 01500

SECTION 01600 – MATERIALS AND EQUIPMENT

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements governing the Contractor's selection of products for use in the Project.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 1 Section 01421 "Reference Standards and Definitions" specifies the applicability of industry standards to products specified.
 - 2. Division 1 Section 01303 "Submittals" specifies requirements for submittal of the Contractor's Construction Schedule and the Submittal Schedule.
 - 3. Division 1 Section 01631 "Substitutions" specifies administrative procedures for handling requests for substitutions made after award of the Contract.

1.3 DEFINITIONS

- A. Definitions used in this Article are not intended to change the meaning of other terms used in the Contract Documents, such as "specialties," "systems," "structure," "finishes," "accessories," and similar terms. Such terms are self-explanatory and have well-recognized meanings in the construction industry.
 - 1. "Products" are items purchased for incorporation in the Work, whether purchased for the Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - a. "Named Products" are items identified by the manufacturer's product name, including make or model number or other designation, shown or listed in the manufacturer's published product literature, that is current as of the date of the Contract Documents.
 - 2. "Materials" are products substantially shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form a part of the Work.
 - 3. "Equipment" is a product with operational parts, whether motorized or manually operated, that requires service connections, such as wiring or piping.

1.4 SUBMITTALS

- A. Product List: Prepare a list showing products specified in tabular form acceptable to the Architect. Include generic names of products required. Include the manufacturer's name and proprietary product names for each item listed.
 - 1. Coordinate product list with the Contractor's Construction Schedule and the Schedule of Submittals.
 - 2. Form: Prepare product list with information on each item tabulated under the following column headings:

- a. Related Specification Section number.
- b. Generic name used in Contract Documents.
- c. Proprietary name, model number, and similar designations.
- d. Manufacturer's name and address.
- e. Supplier's name and address.
- f. Installer's name and address.
- g. Projected delivery date or time span of delivery period.

1.5 QUALITY ASSURANCE

- A. Source Limitations: To the fullest extent possible, provide products of the same kind from a single source.
 1. When specified products are available only from sources that do not, or cannot, produce a quantity adequate to complete project requirements in a timely manner, consult with the Architect to determine the most important product qualities before proceeding. Qualities may include attributes, such as visual appearance, strength, durability, or compatibility. When a determination has been made, select products from sources producing products that possess these qualities, to the fullest extent possible.
- B. Compatibility of Options: When the Contractor is given the option of selecting between 2 or more products for use on the Project, the product selected shall be compatible with products previously selected, even if previously selected products were also options.
- C. Nameplates: Except for required labels and operating data, do not attach or imprint manufacturer's or producer's nameplates or trademarks on exposed surfaces of products that will be exposed to view in occupied spaces or on the exterior.
 1. Labels: Locate required product labels and stamps on concealed surfaces or, where required for observation after installation, on accessible surfaces that are not conspicuous.
 2. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on an easily accessible surface that is inconspicuous in occupied spaces. The nameplate shall contain the following information and other essential operating data:
 - a. Name of product and manufacturer.
 - b. Model and serial number.
 - c. Capacity.
 - d. Speed.
 - e. Ratings.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

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

5. Store products at the site in a manner that will facilitate inspection and measurement of quantity or counting of units.
6. Store heavy materials away from the Project structure in a manner that will not endanger the supporting construction.
7. Store products subject to damage by the elements above ground, under cover in a weathertight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instructions.

PART 2 – PRODUCTS

2.1 PRODUCT SELECTION

- A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, new at the time of installation.
 1. Provide products complete with accessories, trim, finish, safety guards, and other devices and details needed for a complete installation and the intended use and effect.
 2. Standard Products: Where available, provide standard products of types that have been produced and used successfully in similar situations on other projects.
- B. Product Selection Procedures: The Contract Documents and governing regulations govern product selection. Procedures governing product selection include the following:
 1. Proprietary Specification Requirements: Where Specifications name only a single product or manufacturer, provide the product indicated. No substitutions will be permitted.
 2. Semiproprietary Specification Requirements: Where Specifications name 2 or more products or manufacturers, provide 1 of the products indicated. No substitutions will be permitted.
 - a. Where Specifications specify products or manufacturers by name, accompanied by the term "or equal" or "or approved equal," comply with the Contract Document provisions concerning "substitutions" to obtain approval for use of an unnamed product.
 3. Nonproprietary Specifications: When Specifications list products or manufacturers that are available and may be incorporated in the Work, but do not restrict the Contractor to use of these products only, the Contractor may propose any available product that complies with Contract requirements. Comply with Contract Document provisions concerning "substitutions" to obtain approval for use of an unnamed product.
 4. Descriptive Specification Requirements: Where Specifications describe a product or assembly, listing exact characteristics required, with or without use of a brand or trade name, provide a product or assembly that provides the characteristics and otherwise complies with Contract requirements.
 5. Performance Specification Requirements: Where Specifications require compliance with performance requirements, provide products that comply with these requirements and are recommended by the manufacturer for the application indicated.
 - a. Manufacturer's recommendations may be contained in published product literature or by the manufacturer's certification of performance.
 6. Compliance with Standards, Codes, and Regulations: Where Specifications only require compliance with an imposed code, standard, or regulation, select a product that complies with the standards, codes, or regulations specified.
 7. Visual Matching: Where Specifications require matching an established Sample, the Architect's decision will be final on whether a proposed product matches satisfactorily.

- a. Where no product available within the specified category matches satisfactorily and complies with other specified requirements, comply with provisions of the Contract Documents concerning "substitutions" for selection of a matching product in another product category.
8. Visual Selection: Where specified product requirements include the phrase "... as selected from manufacturer's standard colors, patterns, textures ..." or a similar phrase, select a product and manufacturer that complies with other specified requirements. The Architect will select the color, pattern, and texture from the product line selected.
9. Allowances: Refer to individual Specification Sections and "Allowances" provisions in Division 1 for allowances that control product selection and for procedures required for processing such selections.

PART 3 – EXECUTION

3.1 INSTALLATION OF PRODUCTS

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

END OF SECTION 01600

SECTION 01631 – SUBSTITUTIONS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for handling requests for substitutions made after award of the Contract.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 1 Section 01421 "Reference Standards and Definitions" specifies the applicability of industry standards to products specified.
 - 2. Division 1 Section 01303 "Submittals" specifies requirements for submitting the Contractor's Construction Schedule and the Submittal Schedule.
 - 3. Division 1 Section 01600 "Materials and Equipment" specifies requirements governing the Contractor's selection of products and product options.

1.3 DEFINITIONS

- A. Definitions in this Article do not change or modify the meaning of other terms used in the Contract Documents.
- B. Substitutions: Changes in products, materials, equipment, and methods of construction required by the Contract Documents proposed by the Contractor after award of the Contract are considered to be requests for substitutions. The following are not considered to be requests for substitutions:
 - 1. Revisions to the Contract Documents requested by the Owner or Architect.
 - 2. Specified options of products and construction methods included in the Contract Documents.
 - 3. The Contractor's determination of and compliance with governing regulations and orders issued by governing authorities.

1.4 SUBMITTALS

- A. Substitution request shall include the following information:
 - 1. Submit one copy of each request for substitution for consideration. Submit requests in the form and according to procedures required for change order proposals.
 - 2. Identify the product or the fabrication or installation method to be replaced in each request. Include related Specification Section and Drawing numbers.
 - 3. Provide complete documentation showing compliance with the requirements for substitutions, and the following information, as appropriate:
 - a. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by the Owner and separate contractors that will be necessary to accommodate the proposed substitution.
 - b. A detailed comparison of significant qualities of the proposed substitution with those of the Work specified. Significant qualities may include elements, such as performance, weight, size, durability, and visual effect.

- c. Product data, including drawings and descriptions of products and fabrication and installation procedures.
 - d. Samples, where applicable or requested.
 - e. A statement indicating the substitution's effect on the Contractor's Construction Schedule compared to the schedule without approval of the substitution. Indicate the effect of the proposed substitution on overall contract time.
 - f. Cost information, including a proposal of the net change, if any in the contract sum.
 - g. The Contractor's certification that the proposed substitution conforms to requirements in the Contract Documents in every respect and is appropriate for the applications indicated.
 - h. The Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of the failure of the substitution to perform adequately.
4. Architect's Action: If necessary, the Architect will request additional information or documentation for evaluation of a request for substitution. The Architect will notify the parties requesting substitution of acceptance or rejection of the substitution after receipt of the request, or after receipt of requested additional information or documentation, whichever is later. Architect will not be responsible for rejection of a substitution request due to negligence of the parties requesting substitution to submit all data required to determine equivalent evaluation of a substitution. Acceptance will be in the form of a change order.
- a. Use the product specified if the Architect cannot make a decision on the use of a proposed substitute request.

PART 2 – PRODUCTS

2.1 SUBSTITUTIONS

- A. Conditions: The Architect will receive and consider the Contractor's request for substitution when one or more of the following conditions are satisfied, as determined by the Architect. If the following conditions are not satisfied, the Architect will return the requests without action except to record noncompliance with these requirements.
1. Extensive revisions to the Contract Documents are not required.
 2. Proposed changes are in keeping with the general intent of the Contract Documents.
 3. The request is timely, fully documented, and properly submitted.
 4. The specified product or method of construction cannot be provided within the contract time. The Architect will not consider the request if the product or method cannot be provided as a result of failure to pursue the work promptly or coordinate activities properly.
 5. The request is directly related to an "or equivalent" clause or similar language in the Contract Documents.
 6. The requested substitution offers the Owner a substantial advantage, in cost, time, energy conservation, or other considerations, after deducting additional responsibilities the Owner must assume. The Owner's additional responsibilities may include compensation to the Architect for redesign and evaluation services, increased cost of other construction by the Owner, and similar considerations.
 7. The specified product or method of construction cannot receive necessary approval by a governing authority, and the requested substitution can be approved.
 8. The specified product or method of construction cannot be provided in a manner that is compatible with other materials and where the Contractor certifies that the substitution will overcome the incompatibility.
 9. The specified product or method of construction cannot be coordinated with other materials and where the Contractor certifies that the proposed substitution can be coordinated.

10. The specified product or method of construction cannot provide a warranty required by the Contract Documents and where the Contractor certifies that the proposed substitution provides the required warranty.
- B. The Contractor's submittal and the Architect's acceptance of Shop Drawings, Product Data, or Samples for construction activities not complying with the Contract Documents do not constitute an acceptable or valid request for substitution, nor do they constitute approval.
 - C. Architect's Action: If necessary, the Architect will request additional information or documentation for evaluation within one week of receipt of a request for substitution. The Architect will notify the Contractor of acceptance or rejection of the substitution within two weeks of receipt of the request, or one week of receipt of additional information or documentation, whichever is later. Acceptance will be in the form of a change order.
 1. Use the product specified if the Architect cannot make a decision on the use of a proposed substitute within the time allocated.

PART 3 – EXECUTION (Not Applicable)

END OF SECTION 01631

SECTION 01710 – FINAL CLEANING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for final cleaning at Substantial Completion.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 1 Section 01500 "Construction Facilities and Temporary Controls" specifies general cleanup and waste-removal requirements.
 - 2. Division 1 Section 01750 "Contract Closeout" specifies general contract closeout requirements.
 - 3. Special cleaning requirements for specific construction elements are included in appropriate Sections of Divisions 2 through 16.
- C. Environmental Requirements: Conduct cleaning and waste-disposal operations in compliance with local laws and ordinances. Comply fully with federal and local environmental and antipollution regulations.
 - 1. Do not dispose of volatile wastes, such as mineral spirits, oil, or paint thinner, in storm or sanitary drains.
 - 2. Burning or burying of debris, rubbish, or other waste material on the premises is not permitted.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by the manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.
- B. Cleaning in all areas must be very detailed and performed by a professional cleaning crew and also must be coordinated with furniture deliveries and installations.

PART 3 – EXECUTION

3.1 FINAL CLEANING

- A. General: Provide final-cleaning operations when indicated. Employ professional cleaners for final cleaning. Clean each surface or unit of Work to the condition expected from a commercial building cleaning and maintenance program. Comply with manufacturer's instructions.
- B. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for the entire Project or a portion of the Project.

1. Clean the Project Site, yard and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and foreign substances.
 2. Sweep paved areas broom clean. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 3. Remove petrochemical spills, stains, and other foreign deposits.
 4. Remove tools, construction equipment, machinery, and surplus material from the site.
 5. Remove snow and ice to provide safe access to the building.
 6. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 7. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 8. Broom clean concrete floors in unoccupied spaces.
 9. Vacuum clean carpet (no wet cleaning, shampooing, etc...) and similar soft surfaces, removing debris and excess nap.
 10. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other substances that are noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
 11. Remove labels that are not permanent labels.
 12. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
 - a. Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
 13. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 14. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 15. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 16. Clean ducts, blowers, and coils if units were operated without filters during construction.
 17. Clean food-service equipment to a sanitary condition, ready and acceptable for its intended use.
 18. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs and defective and noisy starters in fluorescent and mercury vapor fixtures.
 19. Clean and polish no wax vinyl tile flooring materials. Clean/Finish other hard surface materials as specified and as recommended by the manufacturer/installer.
 - a. After thorough cleaning and preparation of VCT, provide three (3) heavy coats of wax in all areas where VCT is specified. Apply per manufacturer's recommendations.
 20. Clean and buff Solid Vinyl No-Wax flooring material.
 - a. Refer to flooring manufacturer's instructions and recommendations for proper procedures and cleaning materials.
 21. Leave the Project clean and ready for occupancy.
- C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid the Project of rodents, insects, and other pests. Comply with regulations of local authorities.

- D. Removal of Protection: Remove temporary protection and facilities installed during construction to protect previously completed installations during the remainder of the construction period.
- E. Compliances: Comply with governing regulations and safety standards for cleaning operations. Remove waste materials from the site and dispose of lawfully.
 - 1. Where extra materials of value remain after completion of associated Work, they become the Owner's property. Dispose of these materials as directed by the Owner.
- F. Coordinate all final cleaning operations with Owner's delivery and installation of facility furniture and accessories.

END OF SECTION 01710

SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 SUMMARY

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

1.2 QUALITY ASSURANCE

- A. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety
- B. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- C. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
 - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

- A. Existing Utility Information: Furnish information to **local utility and to Owner** that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Owner.

3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Engineer **and Owner** promptly.

3.4 FIELD ENGINEERING

- A. Identification: Owner will identify existing benchmarks, control points, and property corners.
- B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
 - 1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect **or Owner**. Report lost or destroyed permanent benchmarks or control points promptly.
 - 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

3.5 PROTECTION OF INSTALLED CONSTRUCTION

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

END OF SECTION 017300

SECTION 01740 – WARRANTIES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for warranties required by the Contract Documents, including manufacturers standard warranties on products and special warranties.
 - 1. Refer to the General Conditions for terms of the Contractor's period for correction of the Work.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 1 Section 01303 "Submittals" specifies procedures for submitting warranties.
 - 2. Division 1 Section 01750 "Contract Closeout" specifies contract closeout procedures.
 - 3. Divisions 2 through 16 Sections for specific requirements for warranties on products and installations specified to be warranted.
 - 4. Certifications and other commitments and agreements for continuing services to Owner are specified elsewhere in the Contract Documents.
- C. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products. Manufacturer's disclaimers and limitations on product warranties do not relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

1.3 WARRANTY REQUIREMENTS

- A. The Contract for Construction requires a one-year labor and materials warranty on all work. In addition to warranties required in Sections 2 through 16, the following warranties are required:

1. Roof System (materials and labor)	5 years (watertight)
2. Roof System (materials, NDL)	20 years with watertight warranty
3. HVAC Compressors (parts only)	5 years
4. HVAC	1 year on all maintenance for HVAC systems is included in service.
- B. Related Damages and Losses: When correcting failed or damaged warranted construction, remove and replace construction that has been damaged as a result of such failure or must be removed and replaced to provide access for correction of warranted construction.
- C. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
- D. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of the Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work

regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.

- E. Owner's Recourse: Expressed warranties made to the Owner are in addition to implied warranties and shall not limit the duties, obligations, rights, and remedies otherwise available under the law. Expressed warranty periods shall not be interpreted as limitations on the time in which the Owner can enforce such other duties, obligations, rights, or remedies.
 - 1. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
- F. Where the Contract Documents require a special warranty, or similar commitment on the Work or part of the Work, the Owner reserves the right to refuse to accept the Work, until the Contractor presents evidence that entities required to countersign such commitments are willing to do so.

1.4 SUBMITTALS

- A. Submit written warranties to the Architect prior to the date certified for Substantial Completion. If the Architect's Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of the Architect.
 - 1. When a designated portion of the Work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Architect within 15 days of completion of that designated portion of the Work.
- B. When the Contract Documents require the Contractor, or the Contractor and a subcontractor, supplier or manufacturer to execute a special warranty, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner, through the Architect, for approval prior to final execution.
- C. Bind warranties and bonds in heavy-duty, commercial-quality, durable 3-ring, vinyl-covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper (also electronically on thumb drive).
 - 1. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address, and telephone number of the Installer.
 - 2. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project title or name, and name of the Contractor.
 - 3. When warranted construction requires operation and maintenance manuals, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION (Not Applicable)

END OF SECTION 01740

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Substantial Completion procedures.
 - 2. Final completion procedures.
 - 3. Warranties.
 - 4. Final cleaning.
 - 5. Repair of the Work.

1.2 ACTION SUBMITTALS

- A. Product Data: For cleaning agents.
- B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.3 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From all authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.
- C. Field Report: For pest control inspection.

1.4 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.
- B. Submittals Prior to Substantial Completion: Complete the following a minimum of 5 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - 1. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
 - 2. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 3. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

- C. Procedures Prior to Substantial Completion: Complete the following a minimum of **5** days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 2. Complete final cleaning requirements, including touchup painting.
 3. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of **5** days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect, Engineer and Owner will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect and Engineer will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by the Architect and Engineer, that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected. Contractor shall compensate Architect and Engineer at the firm's standard billing rates for additional reinspections beyond the first.
 2. Results of completed inspection will form the basis of requirements for final completion.

1.5 FINAL COMPLETION PROCEDURES

- A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:
1. Submit a final Application for Payment according to Section 012900 "Payment Procedures."
 2. Certified List of Incomplete Items: .
 3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
- B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 5 days prior to date the work will be completed and ready for final inspection and tests. Engineer will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected. Contractor shall compensate Architect and Engineer at the firm's standard billing rates for additional reinspections beyond the first. .

1.6 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit warranties electronically on request of Owner for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.

PART 2 - PRODUCTS

2.1 MATERIALS

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

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. General: Perform 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: Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
- C. Construction Waste Disposal: Comply with waste disposal requirements specified.

3.2 REPAIR OF THE WORK

- A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.
- B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.

END OF SECTION 017700

SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 CLOSEOUT SUBMITTALS

- A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
 - 1. Architect **and Commissioning Authority** will determine whether content of operations and maintenance submittals are acceptable.
 - 2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- B. Format: Submit operations and maintenance manuals in the following format:
 - 1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Architect.
 - a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
 - b. Enable inserted reviewer comments on draft submittals.
- C. Initial Manual Submittal: Submit draft copy of each manual at least **30** days before commencing demonstration and training. Architect **and Commissioning Authority** will determine whether general scope and content of manual are acceptable.
- D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least **15** days before commencing demonstration and training. Architect **and Commissioning Authority** will return copy with comments.
 - 1. Correct or revise each manual to comply with Architect's **and Commissioning Authority's** comments. Submit copies of each corrected manual within **15** days of receipt of Architect's **and Commissioning Authority's** comments and prior to commencing demonstration and training.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

- A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information. Include a section in the directory for each of the following:
 - 1. List of documents.
 - 2. List of systems.
 - 3. List of equipment.
 - 4. Table of contents.
- B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
- C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
- D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.2 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

- A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
 - 1. Title page.
 - 2. Table of contents.
 - 3. Manual contents.
- B. Title Page: Include the following information:
 - 1. Subject matter included in manual.
 - 2. Name and address of Project.
 - 3. Name and address of Owner.
 - 4. Date of submittal.
 - 5. Name and contact information for Contractor.
 - 6. Name and contact information for Construction Manager.
 - 7. Name and contact information for Architect.
 - 8. Name and contact information for Commissioning Authority.
 - 9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
 - 10. Cross-reference to related systems in other operation and maintenance manuals.

- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
 - 1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
- E. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
 - 1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
 - 2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

2.3 OPERATIONS MANUALS

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

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

2.3 PRODUCT MAINTENANCE MANUALS

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

2.4 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

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

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

- A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.
- B. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.
- C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
 - 1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
 - 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
 - 1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
- F. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
 - 1. Do not use original project record documents as part of operation and maintenance manuals.
 - 2. Comply with requirements of newly prepared record Drawings in Section 017839 "Project Record Documents."
- G. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 017823

SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

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

1.2 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following. Site civil drawings for the final submittal shall be signed and sealed by the land surveyor registered in the state of South Carolina employed by the contractor.:
1. Number of Copies: Submit **one** set(s) of marked-up record prints.
 2. Number of Copies: Submit copies of record Drawings as follows:
 - a. Submittal:
 - 1) Submit PDF electronic files of scanned record prints.
- B. Record Specifications: Submit a **PDF electronic file copy** of Project's Specifications, including addenda and contract modifications.
- C. Record Product Data: Submit **annotated PDF electronic files and directories** of each submittal.
1. Where record Product Data are required as part of operation and maintenance manuals, submit PDF electronic files of duplicate marked-up Product Data as a component of manual.
- D. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit **annotated PDF electronic files** of each submittal.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

- A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.
1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.

- a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Accurately record information in an acceptable drawing technique.
 - c. Record data as soon as possible after obtaining it.
 - d. Record and check the markup before enclosing concealed installations.
2. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
 3. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
 4. Mark important additional information that was either shown schematically or omitted from original Drawings.
 5. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

2.2 RECORD SPECIFICATIONS

- A. This article contains typical recording procedures regardless of requirements for final output. If necessary, these procedures could be revised to more elaborate requirements.
- B. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
 3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
 4. For each principal product, indicate whether record Product Data has been submitted in operation and maintenance manuals instead of submitted as record Product Data.
 5. Note related Change Orders, **record Product Data**, and record Drawings where applicable.
- C. Format: Submit record Specifications as **scanned PDF electronic file(s) of marked-up paper copy of Specifications**.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

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

END OF SECTION 017839

SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
 - 1. Demonstration of operation of systems, subsystems, and equipment.
 - 2. Training in operation and maintenance of systems, subsystems, and equipment.
 - 3. Demonstration and training video recordings.

1.3 INFORMATIONAL SUBMITTALS

- A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
 - 1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.
- B. Attendance Record: For each training module, submit list of participants and length of instruction time.
- C. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

1.4 CLOSEOUT SUBMITTALS

- A. Demonstration and Training Video Recordings: Submit **two** copies within **seven** days of end of each training module.
 - 1. Identification: On each copy, provide an applied label with the following information:
 - a. Name of Project.
 - b. Name and address of videographer.
 - c. Name of Architect.
 - d. Name of Contractor.
 - e. Date of video recording.
 - 2. At completion of training, submit complete training manual(s) for Owner's use **in PDF electronic file format on compact disc**.

1.5 COORDINATION

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.
- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
- C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.
- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:
 - 1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
 - a. System, subsystem, and equipment descriptions.
 - b. Performance and design criteria if Contractor is delegated design responsibility.
 - c. Operating standards.
 - d. Regulatory requirements.
 - e. Equipment function.
 - f. Operating characteristics.
 - g. Limiting conditions.
 - h. Performance curves.
 - 2. Documentation: Review the following items in detail:
 - a. Operations manuals.
 - b. Maintenance manuals.
 - c. Project record documents.
 - d. Identification systems.
 - e. Warranties and bonds.
 - f. Maintenance service agreements and similar continuing commitments.
 - 3. Emergencies: Include the following, as applicable:
 - a. Instructions on meaning of warnings, trouble indications, and error messages.
 - b. Instructions on stopping.
 - c. Shutdown instructions for each type of emergency.
 - d. Operating instructions for conditions outside of normal operating limits.
 - e. Sequences for electric or electronic systems.
 - f. Special operating instructions and procedures.

4. Operations: Include the following, as applicable:
 - a. Startup procedures.
 - b. Equipment or system break-in procedures.
 - c. Routine and normal operating instructions.
 - d. Regulation and control procedures.
 - e. Control sequences.
 - f. Safety procedures.
 - g. Instructions on stopping.
 - h. Normal shutdown instructions.
 - i. Operating procedures for emergencies.
 - j. Operating procedures for system, subsystem, or equipment failure.
 - k. Seasonal and weekend operating instructions.
 - l. Required sequences for electric or electronic systems.
 - m. Special operating instructions and procedures.
5. Adjustments: Include the following:
 - a. Alignments.
 - b. Checking adjustments.
 - c. Noise and vibration adjustments.
 - d. Economy and efficiency adjustments.
6. Troubleshooting: Include the following:
 - a. Diagnostic instructions.
 - b. Test and inspection procedures.
7. Maintenance: Include the following:
 - a. Inspection procedures.
 - b. Types of cleaning agents to be used and methods of cleaning.
 - c. List of cleaning agents and methods of cleaning detrimental to product.
 - d. Procedures for routine cleaning
 - e. Procedures for preventive maintenance.
 - f. Procedures for routine maintenance.
 - g. Instruction on use of special tools.
8. Repairs: Include the following:
 - a. Diagnosis instructions.
 - b. Repair instructions.
 - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - d. Instructions for identifying parts and components.
 - e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 017823 "Operation and Maintenance Data."

- B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

- A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.
- B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
 - 1. Architect will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
 - 2. Owner will furnish an instructor to describe Owner's operational philosophy.
 - 3. Owner will furnish Contractor with names and positions of participants.
- C. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.

3.3 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

- A. General: Engage a qualified commercial videographer to record demonstration and training video recordings. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.
 - 1. At beginning of each training module, record each chart containing learning objective and lesson outline.
- B. Video: Provide minimum 640 x 480 video resolution converted to **format file type acceptable to Owner**, on electronic media.
 - 1. Electronic Media: Read-only format compact disc acceptable to Owner, with commercial-grade graphic label.
 - 2. File Names: Utilize file names based upon name of equipment generally described in video segment, as identified in Project specifications.
 - 3. Contractor and Installer Contact File: Using appropriate software, create a file for inclusion on the Equipment Demonstration and Training DVD that describes the following for each Contractor involved on the Project, arranged according to Project table of contents:
 - a. Name of Contractor/Installer.
 - b. Business address.
 - c. Business phone number.
 - d. Point of contact.
 - e. E-mail address.
- C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to adequately cover area of demonstration and training. Display continuous running time.
 - 1. Film training session(s) in segments not to exceed 15 minutes.
 - a. Produce segments to present a single significant piece of equipment per segment.
 - b. Organize segments with multiple pieces of equipment to follow order of Project Manual table of contents.

- c. Where a training session on a particular piece of equipment exceeds 15 minutes, stop filming and pause training session. Begin training session again upon commencement of new filming segment.
- D. Light Levels: Verify light levels are adequate to properly light equipment. Verify equipment markings are clearly visible prior to recording.
 - 1. Furnish additional portable lighting as required.
- E. Preproduced Video Recordings: Provide video recordings used as a component of training modules in same format as recordings of live training.

END OF SECTION 017900

SECTION 024119 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

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

1.2 DEFINITIONS

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

1.3 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.

1.4 PREINSTALLATION MEETINGS

- A. Predemolition Conference: Conduct conference at Project site.
 1. Inspect and discuss condition of construction to be selectively demolished.
 2. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 3. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
 4. Review areas where existing construction is to remain and requires protection.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For refrigerant recovery technician.
- B. Proposed Protection Measures: Submit report, including drawings, that indicates the measures proposed for protecting individuals and property for dust control and, for noise control. Indicate proposed locations and construction of barriers.
- C. Schedule of Selective Demolition Activities: Indicate the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's building manager's on-site operations are uninterrupted.
 2. Interruption of utility services. Indicate how long utility services will be interrupted.
 3. Coordination for shutoff, capping, and continuation of utility services.
 4. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
- D. Inventory: Submit a list of items to be removed and salvaged and deliver to Owner prior to start of demolition.
- E. Predemolition Photographs or Video: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by demolition operations. Comply with Section 013233 "Photographic Documentation." Submit before Work begins.
- F. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.
- G. Warranties: Documentation indicated that existing warranties are still in effect after completion of selective demolition.
- 1.5 CLOSEOUT SUBMITTALS
- A. Inventory: Submit a list of items that have been removed and salvaged.
- 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. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- C. Notify Owner of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- D. 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.
- E. Storage or sale of removed items or materials on-site is not permitted.
- F. Utility Service: Maintain all existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
1. Maintain fire-protection facilities in service during selective demolition operations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

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

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
- B. Review record documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in record documents.
- C. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.
- E. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs.
 - 1. Comply with requirements specified in Section 013233 "Photographic Documentation."
 - 2. Inventory and record the condition of items to be removed and salvaged. Provide photographs of conditions that might be misconstrued as damage caused by salvage operations.
 - 3. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
- B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
 - 1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
 - 2. Arrange to shut off indicated utilities with utility companies.
 - 3. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
 - 4. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated to be removed.

- a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
 - b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
 - c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
 - d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
 - e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
 - f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
 - g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.
- C. Refrigerant: Remove refrigerant from mechanical equipment to be selectively demolished according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.2 PREPARATION

- A. Revise "Site Access and Temporary Controls" and "Temporary Facilities" paragraphs below to suit Project. Delete both if adequately covered in Section 015000 "Temporary Facilities and Controls."
- B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 1. Comply with requirements for access and protection specified in Section 013100 "Project management and Coordination."
- C. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
 2. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
- D. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
 1. Strengthen or add new supports when required during progress of selective demolition.

3.2 SELECTIVE DEMOLITION, GENERAL\

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
 1. Proceed with selective demolition systematically, from higher to lower level.

2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
5. Maintain adequate ventilation when using cutting torches.
6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
7. Dispose of demolished items and materials promptly.

B. Removed and Salvaged Items:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area off-site designated by Owner.
5. Protect items from damage during transport and storage.

C. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

- D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.3 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least **3/4 inch** at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.
- B. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, then remove concrete between saw cuts.
- C. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.
- D. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.

- E. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings." **Do not use methods requiring solvent-based adhesive strippers.**
- 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 weatherproof. See Appropriate Specification Section for new roofing requirements.
 - 1. Remove existing roof membrane, flashings, copings, and roof accessories.
 - 2. Remove existing roofing system down to substrate.

3.4 DISPOSAL OF DEMOLISHED MATERIALS

- A. Insert other specific disposal, cleanup, or removal requirements to suit Project.
- B. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an-approved landfill.
 - 1. Do not allow demolished materials to accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- C. Burning: Do not burn demolished materials.
- D. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.4 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 024119

SECTION 03511 - CEMENTITIOUS WOOD FIBER PLANK

PART 1 GENERAL

1.1 SCOPE

- A. The work consists of furnishing all labor, materials, accessories, and equipment necessary to cover all areas shown on the drawings and specified herein with Structural Cement Fiber Roof Deck tile including subpurlins, and grout.

1.2 QUALIFICATIONS

- A. Tectum I tile as manufactured by Armstrong Building Solutions, 877-276-7876, shall be considered the standard of quality and performance for products proposed for use in this section. Tectum shall be composed of extra long, fine wood fibers bonded with waterproof portland cement.
- B. **MOISTURE/WATER WARRANTY:** The manufacturer of the cement fiber roof deck shall provide a 15-year non-pro rata warranty against loss of flexural strength of the structural cement fiber panel (substrate) due to exposure to moisture or water. Said warranty to run from date of substantial completion of project, or occupation by Owner, whichever shall be later.
- C. **Substitutions:** Contractor is invited to submit on the substitution sheet, alternate deck systems based on a PORTLAND CEMENT BASED structural cement fiber product. Submittal shall be accompanied by evidence that the proposed substitution meets or exceeds the structural, fire resistive, and acoustical performance of the product named as a standard of quality.
- D. **Submittals:** Shop drawings, produced by the manufacturer of the decking, sufficiently detailed to show entire scope of work of this section. Manufacturer's technical literature sufficient to verify compliance with performance requirements.

1.3 DELIVERY AND STORAGE OF MATERIALS

- A. Protect material from exposure to the elements. Material on site should be stored under cover on blocking. Portland cement bound structural cement fiber products may stain when exposed to rain or melting snow. Stained plank may require additional painting. Protect panels from soiling or abrasion on surfaces which will be exposed to view in the final construction. Discard damaged plank.

1.4 PRODUCT PROPERTIES

- A. Structural cement fiber tile substrate shall be composed of extra long, fine wood fibers, and WATERPROOF PORTLAND CEMENT. Substrate shall be allowed by ICBO-ES for use where noncombustible materials are required by the U.B.C. Substrate shall be allowed by ICBO-ES, and SBCCI-PST & ESI, for use where fire retardant treated wood is required by the U.B.C. and Standard Building Code respectively. Substrate is also a 15-minute thermal barrier for foamed plastics in accordance with U.B.C. standard 17-3, and the Standard Building Code. Substrate shall be classified in accordance with Federal Specification SS-S-118a as type IX, class 25. Tile shall be two and one half (2 ½) inches thick.
- B. The roof deck will remain exposed in the finished building, and the Tectum roof deck shall be provided with a factory applied coat of primer paint. Light reflectance of mill primed deck shall not be less than 60%.

- C. The roof deck panels shall have been tested in accordance with ASTM E84 and found to have a flame spread of 25 or less.
- D. The roof deck panels shall have been tested in accordance with ASTM E119 and shall have been found to be a suitable 15-minute barrier for the protection of foamed plastic.

1.5 SYSTEM PERFORMANCE

- A. The roof deck system supplied shall be capable of supporting a uniformly distributed load of 30# / SF (min.) over spans shown with deflection not to exceed L/180.
- B. The roof deck system shall be capable of resisting 85# / SF wind uplift. In addition, the roof deck system as installed shall conform to a published U.L. Class 90 wind uplift design, specifically design # NM 508.

PART 2 PRODUCTS

2.1 TILE

- A. The roof deck panels shall have rabbetted sides for use with subpurlins, and tongue and groove-ends where standard length tile are used, and end joints do not land over supports. Where end joints must occur over supports, ends of panels shall be square. All panels shall be 32" wide.
- B. Bulb tee subpurlins shall be No. 218 as manufactured by Chicago Heights Steel and shall be mill primed red. Subpurlins shall have been selected to carry a uniformly distributed load of 95 p.s.f. when used on the longest span encountered on this project. Subpurlins shall be accurately spaced at least 32½" o.c. but not more than 33" o.c., with a deflection not to exceed (1/180) of the span.
- C. Grout shall be 500 p.s.i. premixed gypsum concrete. Never add anything but clean water to gypsum concrete.
- D. Install six (6) screws per tile. Screws shall be # 14 minimum, galvanized as protection against corrosion, or shall be sized as recommended by manufacturer to meet structural requirements. Screws shall be sized to penetrate and thread into steel. Washers for use with screws shall be 1.5" dia., min. 19ga., galvanized washers.
- E. Perimeter support including framing for openings, support for longitudinal and transverse edges of decking, as well as support at all hips, valleys, and ridges, or other major discontinuities in the surface of the deck is existing to the best of our knowledge and belief. Roofing Contractor shall review existing support and notify architect prior to bidding if he thinks additional steel is necessary for the installation of the new roof deck panels. Additional steel support shall be provided and installed at the expense of the roofing contractor.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION

- A. The roof deck installer shall inspect the structural support system before the start of this work. Any defects, deficiencies, or deviation from structural or approved fabricator's drawings, shall be corrected by the roofing contractor at this time.

- B. When laying out deck panels, walk directly over structural supports until the deck has been securely attached. Avoid any unnecessary traffic on the deck. Where heavy objects are placed upon or transported over the deck or where material is repeatedly landed on the deck, planking or plywood shall be used to distribute the loads.
- C. Roof deck panels shall be cut to fit neatly at walls or curbs and around openings as shown on approved shop drawings. Perimeter edges of roof deck, as well as cut edges, shall be supported by walls or other structural supports. Openings greater than 6" in any direction shall be framed by the steel erector or trade requiring the opening. Subpurlins should never be cut to make openings.

3.2 SYSTEM INSTALLATION

A. Installation of basic system.

1. Subpurlins:

- a. Subpurlins are existing and if not damaged during removals may be reused. Existing and new subpurlins shall be installed for entire roof area before tile is laid. Position new subpurlins at minimum 32 1/2" and maximum 33" OC. Weld on both sides at end bearing and on alternate sides at intermediate supports with 3/4" fillet welds.

2. Tile and Grout

- a. Evenly space tile between bulb tees with tongue and groove end joints tightly nested or square cut ends tightly butted over supports. Mix gypsum concrete grout to a pourable consistency per the instructions on the bag. Then fill entire void around subpurlins with grout to the top of the tile. Strike off any excess grout flush with the top of the tile.
- b. The deck shall be left ready for the roofer. Gypsum concrete grout should be used to feather out any irregularities.

END OF SECTION 03511

SECTION 03520 - GYPSUM CONCRETE ROOF DECK

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes cast-in-place lightweight concrete for roof decks at Daisy Elementary School.

1.2 SUBMITTALS

- A. Product Data: For each product indicated, include on the material and manufacturers list with appropriate minimum standards referenced.

1.3 PROJECT CONDITIONS

- A. Do not place lightweight concrete unless ambient temperature is 40 deg F and rising.
- B. Do not place lightweight concrete during rain or snow or on surfaces covered with standing water, snow, or ice.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Pre-mix gypsum concrete such as PYROFILL™ complying with ASA - A59.1- 1954 as mfg. by UNITED STATES GYPSUM, Chicago 6, IL, Structolite or Metro Mix.
- B. Water: Clean, potable.
- C. Wire mesh reinforcement: Welded wire fabric, ASTM A185, to match existing mesh reinforcement.

PART 3 EXECUTION

3.1 PREPARATION

- A. Carefully inspect the roof deck. If, in the Contractor's opinion, there are areas of decking which require repair or replacement, notify Owner and Architect. Do not proceed with repair or replacement until directed by Owner and Architect.
- B. Remove all existing gypsum concrete that is loose, damaged, or deteriorated and discard.
- C. At existing decking where base sheet has been removed, repair the holes in the existing gypsum concrete roof deck created by the base sheet fastener removal. Fill holes completely and finish to a level flush with the top of the adjacent gypsum deck surface.
- D. Remove and replace any damaged or deteriorated wire mesh reinforcement, gypsum board form.
- E. At new decking installation, install pre-mix gypsum concrete over new or existing form. Finish to a level flush with the top of the adjacent contiguous gypsum decking.

- F. If large areas of poured gypsum concrete are required, install new roof vent (1 for every 100 Sq. Ft.) in accordance with the requirements for roof vent installation.

3.2 MIXING AND PLACING

- A. Mix and place gypsum concrete per Manufacturer's written instructions, using equipment and procedures to avoid segregation of mix and loss of air content.
- B. Deposit and screed gypsum concrete in a continuous operation until an entire repair or section of roof area is completed. Do not vibrate or work mix except for screeding or floating. Place to depths and slopes to match existing.
- C. Retain board insulation below if applicable.
- D. Finish top surface smooth, free of ridges and depressions, and maintain surface in condition to receive subsequent roofing system.
- E. Begin curing operations immediately after placement, and air cure per manufacturer's written instructions.
- F. If ambient temperature falls below 32 deg F, protect gypsum concrete from freezing and maintain temperature recommended by manufacturer for 72 hours after placement.

3.3 TESTING

- A. Fastener pull-out test for roofing: Resists a minimum 40-pound pull-out when driven into cured lightweight concrete.
- B. Perform one roof fastener pull-out test in new or existing lightweight concrete for every 10 squares of roofing installed.
- C. Patch test pull-out areas after fastener is removed.

3.4 DEFECTIVE WORK

- A. Refinish, or remove and replace, gypsum concrete if surfaces are excessively scaled or too rough to receive roofing, according to roofing base sheet manufacturer's written requirements.
- B. Remove and replace gypsum concrete that fails to comply with compressive-strength requirements.

END OF SECTION 03520

SECTION 05310 - STEEL ROOF DECK

PART 1. GENERAL

1.1. SECTION INCLUDES:

- A. Steel roof deck and accessories

1.2. RELATED SECTIONS

- A. Section 01300 – Submittals
- B. Section 07591 – Roof Removal and Preparation

1.3. REFERENCE STANDARDS

- A. References in these specifications to standards, test methods and codes, are implied to mean the latest edition of each such standard adopted. The following is an abbreviated list of associations, institutions, and societies which may be used as references throughout these specifications.
 1. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 2. ASTM A 780 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
 3. ASTM A 924/A 924M - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
 4. ASTM A 1008/A 1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
 5. ASTM E 329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.
 6. AISI - North American Specification for the Design of Cold-Formed Steel Structural Members.
 7. AWS D1.3 - Structural Welding Code - Sheet Steel.
 8. Factory Mutual (FM) Guide Listing - FM Approval Guide, Building Materials
 9. Factory Mutual (FM) loss Prevention Data Sheet 1- 29
 10. SDI Code of Standard Practice - 2014
 11. SDI RD - Standard for Steel Roof Deck
 12. SDI RDDM - Roof Deck Design Manual
 13. SDI MOC2 - Manual of Construction with Steel Deck
 14. UL - Fire Resistance Directory.

1.4. DESIGN / PERFORMANCE REQUIREMENTS

- A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's North American Specification for the Design of Cold-Formed Steel Structural Members and SDI RDDM Roof Deck Design Manual.
- B. Roof Decking:
 1. Deck shall meet the minimum design gage and yield strength specified on the drawings, or meet minimum specified section properties at specified yield strength.
 2. Whenever possible, the deck shall be multi-span.

- C. Factory Mutual Guide Listing: Provide steel roof deck evaluated by FM and listed in its "Approval Guide, Building Materials" for Class 1 fire rating and Class 1-90 windstorm ratings.
- D. Fire-Test-Response Characteristics: Where indicated, provide steel deck units that are approved by UL, LLC and listed in the UL and ULC Fire Resistance Directories.

1.5. SUBMITTALS

- A. Refer to Section 01300 of these Specifications for a Listing of Other Submittals required for this Project.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Deck property information for the proposed deck units as outlined in section 5.6 of SDI COSP-2014.
 - 2. Preparation instructions and recommendations.
 - 3. Storage and handling requirements and recommendations.
 - 4. Erection instructions.
- C. Shop Drawings: Show location, connections, bearing on supports, methods of anchoring, attachment of accessories, adjusting plate details and the manufacturer's erection instructions and pertinent details.
- D. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within previous 12 months.
- E. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

1.6. QUALITY ASSURANCE

- A. Manufacturer Qualifications: Member in good standing of Steel Deck Institute (SDI).
- B. Testing Agency Qualifications: An independent agency qualified according to ASTM E 329 for testing indicated.
- C. Welding: Qualify procedures and personnel according to AWS D1.3, Structural Welding Code - Sheet Steel.

1.7. DELIVERY, STORAGE, AND HANDLING

- A. Store products in compliance with SDI MOC2
- B. Separate sheets and store on dry wood sleepers; slope for positive drainage. Cut plastic wrap to encourage ventilation. Protect with a waterproof covering and ventilate to avoid condensation.

1.8. SEQUENCING

- A. Ensure that locating templates and other information required for installation of products of this section are furnished to affected trades in time to prevent interruption of construction progress.

PART 2. PRODUCTS

2.1. MANUFACTURERS

- A. Subject to compliance with requirements, manufacturers whose products may be included in the Work include, but are not limited to, the following:

1. Consolidated Systems, Inc.
2. Epic Metals Corp.
3. United Steel Deck, Inc.
4. Vulcraft, Division of Nucor
5. Wheeling Corrugating Co.

2.2. ROOF DECK

- A. Steel Roof Deck - General: Fabricate deck to comply with SDI RD - Standard for Steel Roof Deck, with the minimum section properties indicated. Deck type and thickness shall be as indicated on the Drawings:

1. Type A nARROW Rib deck is 1-1/2 inches deep and 36 inches wide with nested side laps (RAs 8 & 9).

B. Deck Materials

1. Sheet steel for galvanized deck shall conform to ASTM A 653/A 653M Structural Steel, with a minimum yield strength of 33 ksi (230 MPa) or other galvanized structural sheet steels or high strength low alloy steels in accordance with AISI S100, Section A2.
2. Sheet steel for uncoated or phosphatized top/painted bottom deck shall conform to ASTM A 1008 / A 1008M with a minimum yield strength of 33 ksi (230 MPa) or other structural sheet steels or high strength low alloy steels in accordance with AISI S100, Section A2.
3. Sheet steel for accessories shall conform to ASTM A 653/A 653M, Structural Steel for structural accessories, ASTM A 653/A 653M Commercial Steel for non-structural accessories, or ASTM A 1008 / A 1008M for either structural or non-structural accessories. Other structural sheet steels or high strength low alloy steels shall be permitted in accordance with AISI S100, Section A2. All sheet steel for accessories shall have a minimum specified yield strength of 33 ksi (230 MPa).

C. Deck Finish

1. Galvanized coating shall comply with ASTM A 924/A 924M with zinc coating as follows:
 - a. G60
2. Primer-painted finish gray on both the top and bottom sides.

2.2. ACCESSORIES

- A. Column closures, end closures, side closures and cover plates shall be the standard type provided by the deck manufacturer unless indicated otherwise on the Drawings.
- B. Galvanizing Repair Paint for Roof Decks: High-zinc-dust content paint for re-galvanizing welds in galvanized steel conforming to ASTM A 780.
- C. Fasteners: As manufactured by Teks, Hilti, Buildex, Simpson Strong-Tie or approved equal.
1. Deck fasteners: #12 self-drilling screw.
 2. Side lap fasteners: #10 self-drilling screw.

- D. Flexible Closure Strips.

PART 3. EXECUTION

3.1. EXAMINATION

- A. Confirm that all items to be removed, have been, and that appropriate substrate has been installed and appropriately attached to structure for support of the new steel roof deck.
- B. Carefully inspect the roof deck. If, in the Contractor's opinion, there are areas of decking which require repair or replacement, notify Architect. Do not proceed with repair or replacement until directed by Architect. Correct all unsatisfactory substrate conditions prior to the application of new metal roof deck.
- C. Application of new materials constitutes approval by the installing roofing contractor that the substrate conditions are satisfactory.

3.2. PREPARATION

- A. Refer to Section 07591 for work required prior to installation of new roof assembly.
- B. Clean deck surfaces and ribs thoroughly prior to installation.
- C. Remove any existing deteriorated roof deck and replace with new decking to match existing profile and thickness. Maintain and submit daily log of deck replacement work.
- D. Locate deck bundles to prevent overloading of support members.

3.3. INSTALLATION – GENERAL

- A. Install deck panels and accessories in accordance with the Contract Documents approved installation drawings and requirements of this Section.
- B. Place deck panels on structural supports and adjust to final position with ends aligned. Attach firmly to the supports immediately after placement in order to form a safe working platform.
- C. Cut and neatly fit deck units and accessories around openings and other work projecting through or adjacent to the decking.

3.4. INSTALLATION – ROOF DECK

- A. Install and fasten deck and accessories in accordance with the Contract Documents, approved installation drawings and requirements of ANSI/SDI RD.
- B. Roof deck to be attached with 36/4 fastening pattern at interior supports of deck panel and at 6" O.C. around perimeter. Fastening to be made with #12 screws to supports with a minimum of (1) #10 sidelap fastener at 30" O.C., equally spaced between supports.
- C. All roof deck shall be placed to provide a minimum (2) span condition.
- D. End Bearing: Install deck ends over supports with a minimum end bearing of 1-1/2 inches (38 mm) unless otherwise shown on approved installation drawings.

- E. Side Closures: Fasten to supporting structure and deck in accordance with the Contract Documents, approved installation drawings and requirements of ANSI/SDI RD.
- F. Ridge and valley plates, flat plates at changes of deck direction and sump pans, shall be fastened to the deck in accordance with the Contract Documents, approved installation drawings and requirements of ANSI/SDI RD.

3.5. INSPECTION AND REPAIR

- A. Before installation of the new roof assembly, the deck shall be inspected for tears, dents, or other damage that may prevent the deck from acting as a tight and substantial form. Replace decking which has been damaged or permanently deflected.
- B. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint.
- C. Repair Painting: Apply repair paint, of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.

3.6. PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 05310

SECTION 05521 – PIPE AND TUBE RAILING SYSTEMS

PART 1. GENERAL

1.1. SECTION INCLUDES:

1.1.1. Permanent roof edge protection.

1.1.1.1. Ballasted Guardrails on RA 6.

1.2. RELATED SECTIONS

1.2.1. Section 01300 – Submittals

1.2.2. Section 07540 – Thermoplastic Membrane Roofing

1.2.3. Section 07550 – Modified Bitumen Membrane Roofing

1.2.4. Section 07591 – Roof Removal and Preparation

1.3. REFERENCES

1.3.1. American Society for Testing of Materials (ASTM):

1.3.1.1. ASTM A36 - Standard Specification for Carbon Structural Steel.

1.3.1.2. ASTM A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

1.3.1.3. ASTM A269 - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.

1.3.2. Occupational Safety and Health Administration (OSHA):

1.3.2.1. 29 CFR 1910.21 - Scope and Definitions

1.3.2.2. 29 CFR 1910.28 - Duty to Have Fall Protection

1.3.2.3. 29 CFR 1910.29 - Walking Working Surfaces

1.3.2.4. 29 CFR-1910.30 - Training Requirements

1.5. SUBMITTALS

1.5.1. Refer to Section 01300 of these Specifications for a Listing of Other Submittals required for this Project.

1.5.2. Product Data: Manufacturer's data sheets for products and assemblies specified.

1.5.2.1. Preparation instructions and recommendations.

1.5.2.2. Storage and handling requirements and recommendations.

1.5.2.3. Cleaning methods.

1.5.3. Shop Drawings:

1.5.3.1. Indicate profiles, sizes, connections, size and type of fasteners, accessories.

1.5.3.2. Show location of rails and guardrails including plans, details of components and anchor details.

1.5.3.3. Field Verified Measurements: Verify dimensions indicated on Drawings.

1.5.4. Verification Samples: For each finish specified, two samples representing actual colors specified.

1.6. DELIVERY, STORAGE, AND HANDLING

1.6.1. Deliver, store and handle materials and products in strict compliance with manufacturer's instructions and recommendations and industry standards.

1.6.2. Store materials in manufacturer's original sealed, labeled packaging until ready for installation and in accordance with manufacturer's instructions. Protect finishes on rails and uprights from damage.

1.7. PROJECT CONDITIONS

1.7.1. Maintain environmental conditions, temperature, humidity and ventilation, within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.7.2. Field Measurements: Where horizontal rails and uprights are indicated to fit to other construction, check actual dimensions or other construction by accurate field measurements prior to ordering and installation; show recorded measurements on final Shop Drawings.

1.8. SEQUENCING AND SCHEDULING

1.8.1. Coordinate fabrication and delivery schedule of handrails with construction progress and sequence to avoid delay of railing installation.

1.8.1.1. Where field measurements cannot be made without delaying the system fabrication and delivery, obtain guaranteed dimensions in writing by the Contractor and proceed with fabrication of products to not delay fabrication, delivery and installation.

1.9. WARRANTY

1.9.1. Warranty: Provide manufacturer's standard one year warranty against defects in materials and manufacturing.

PART 2. PRODUCTS

2.1. MANUFACTURERS

- 2.1.1. Acceptable Manufacturer: Leading Edge Safety, LLC, which is located at: 1345 Taney St.; North Kansas City, MO 64116; Toll Free Tel: 888-990-2990; Fax: 816-472-0822; Email: request info; Web: <https://leadingedgesafety.net>
- 2.1.2. Requests for substitutions will be considered in accordance with provisions of Section 01631 - Substitutions.

2.2. BALLASTED GUARDRAILS

- 2.2.1. Product: Ballasted Guardrail as manufactured by Leading Edge Safety.

- 2.2.1.1. Heavy weighted bases ensure stability and can be configured to meet almost any project condition. Meets and exceeds OSHA Standard CFR 29 1910.29 for guardrail systems.

- 2.2.2. Components:

- 2.2.2.1. Uprights: ASTM C1008/1010 steel tube, 1.625 dia x 0.065 inches. Length: 42 inches.

- 2.2.2.2. Bases: Class 35 gray iron; galvanized. 23 x 23 inches.

- 2.2.2.3. Adjustable Horizontal Sliding Rails: ASTM C1008/1010 steel tube, 1.625 inch dia x 0.065 inch wall and 1.375 inch dia x 0.065 inch wall.

- 2.2.2.3.1. Spacing: 8 ft on center.

- 2.2.2.4. Finish: Powder coat.

- 2.2.2.5. Colors: As determined by the Architect from manufacturer's range.

- 2.2.2.6. Hardware: 3/8-16 thread x 1 inch long zinc plated steel.

- 2.2.2.7. Labels: Applicable safety warnings and manufacturer's contact information.

- 2.2.2.8. Uprights:

- 2.2.2.8.1. Top Rail: 42 inches.

- 2.2.2.8.2. Mid Rail: 21 inches.

- 2.2.2.9. Weight:

- 2.2.2.9.1. Base: Approximately 99.6 lbs.

- 2.2.2.9.2. Post: Approximately 5 lbs.

2.2.2.9.3. Horizontal Rails: Approximately 1 lbs / lineal foot.

PART 3. EXECUTION

3.1. EXAMINATION AND PREPARATION

- 3.1.1. Inspect and prepare substrates and nailers using the methods recommended by the manufacturer for achieving best result for the substrates under project conditions. Verify that nailers and other structural components of the building are securely fastened and capable of withstanding loads applied by the guardrail system.
- 3.1.2. Do not proceed with installation until substrates and nailers have been prepared using the methods recommended by the manufacturer and deviations from manufacturer's recommended tolerances are corrected. Commencement of installation constitutes acceptance of conditions.
- 3.1.3. If preparation is the responsibility of another installer, notify Architect in writing of deviations from manufacturer's recommended installation tolerances and conditions.

3.2. INSTALLATION

- 3.2.1. Install in accordance with manufacturer's instructions including the following.
- 3.2.2. Permanent Roof Edge Protection:
 - 3.2.2.1. Set uprights, horizontal rails and corners accurately in location, alignment and elevation, measured from established lines and levels and per installation drawings.
 - 3.2.2.2. Install fasteners as recommended by manufacturer in holes provided on the upright bracket.
 - 3.2.2.3. Inspect final installation and test for capacity in accordance with manufacturer's recommendations.
- 3.2.3. Ballasted Guardrails: Weighted bases and uprights shall be placed around the perimeter of the roof as indicated at required distances or other areas for fall protection or controlled access. Horizontal railings attach to uprights using 7/32 inch hex key bolts.
 - 3.2.3.1. Extend ballasted guardrail a minimum of 30" beyond the length of the new HVAC unit on RA 6.

3.3. PROTECTION

- 3.3.1. Protect installed products until completion of project.
- 3.3.2. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 05521

SECTION 06100 - ROUGH CARPENTRY

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes but is not limited to the following:
 - 1. Wood blocking.
 - 2. Plywood blocking.
- B. Related Sections include the following:
 - 1. Division 7 Section 07540 "Thermoplastic Membrane Roofing".
 - 2. Division 7 Section 07550 "Modified Bitumen Membrane Roofing".
 - 3. Division 7 Section 07591 "Reroofing Removal & Preparation".

1.3 DEFINITIONS

- A. Lumber grading agencies, and the abbreviations used to reference them, include the following:
 - 1. NLGA - National Lumber Grades Authority.
 - 2. SPIB - Southern Pine Inspection Bureau.
 - 3. ALSCBR - American Lumber Standards Committee Board of Review

1.4 SUBMITTALS

- A. Material Certificates: Prior to start of work, submit manufacturer's Certificate of Compliance with the material specifications of this section, signed by a responsible officer of the manufacturing firm and notarized.
 - 1. Certify as to Treatment Process; Treatment Chemical; and Chemical Retention.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, with the experience and capability to conduct the testing indicated as documented.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Lumber:
 - a. Boise Cascade Corporation.

- b. Georgia-Pacific Corporation.
- c. Louisiana-Pacific Corporation.
- d. International Paper Corp.

2.2 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of lumber grading agencies certified by the American Lumber Standards Committee Board of Review.
 - 1. Factory mark each piece of lumber with grade stamp of grading agency.
 - 2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified.
 - 3. Provide dressed lumber, S4S, unless otherwise indicated.
 - 4. Provide dry lumber with 19 percent maximum moisture content at time of dressing for 2-inch nominal (38-mm actual) thickness or less, unless otherwise indicated.

2.3 MISCELLANEOUS LUMBER

- A. For concealed boards, provide lumber with 19 percent maximum moisture content and of the following species and grades:
 - 1. Mixed southern pine, No. 2 grade; SPIB.
- B. Do not use material that is warped or does not comply with requirements for untreated material.
- C. Application: Treat all rough carpentry for use “above grade” to include, but not limited to, the following:
 - 1. Nailers, curbs, blocking, stripping, and similar members in connection with roofing, flashing, and waterproofing.

2.4 WOOD-PRESERVATIVE-TREATED MATERIALS (In Contact with Concrete or Masonry)

- A. Preservative Treatment by Pressure Process: AWPA C-2 (Ground Contact lumber) and AWPA C9 (plywood).
- B. Preservative Chemicals: Acceptable to authorities having jurisdiction the following or approved equal:
 - 1. Alkaline Copper Quaternaries (ACQ-C or D).
 - 2. Copper Azole (CA-B)
- C. Kiln-dry material after treatment to maximum moisture content of 19 percent for lumber and for plywood. Do not use material that is warped or does not comply with requirements for untreated material.
- D. Retention of preservative shall be 0.40 pcf for ACQ Treatment or 0.21 pcf for CA Treatment.
- E. Mark each treated item with the treatment quality mark of an inspection agency approved by the American Lumber Standards Committee Board of Review.
- F. Application: Treat all rough carpentry for use “in ground contact” to include, but not limited to, the following:

1. Wood nailers, parapet furring, blocking, furring, stripping, and similar concealed members in direct contact with masonry or concrete.

2.5 PLYWOOD BACKING PANELS AND BLOCKING

- A. Miscellaneous Backing Panels: CDX, DOC PS 1, Exterior Exposure 1, C-D Plugged, 3/4-inch thickness indicated or, if not indicated, not less than 1/2 inch (12.7 mm) thick.
- B. Sheathing: CDX, DOC PS 1, Exterior Exposure 1, C-D Plugged, thickness indicated or, if not indicated, not less than 3/4 inch (12.7 mm) thick.
- C. Do not store sheathing outdoors or expose to moisture.

2.6 FASTENERS

- A. Reference Division 7 Section 07591 "Reroofing Removal & Preparation".
- B. All fasteners, connections, clips or strap anchors for wood and plywood shall be either hot-dipped zinc coated galvanized steel or stainless steel (Type 304 or 316 SS).

PART 3 EXECUTION

3.1 INSTALLATION, GENERAL

- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate blocking and similar supports to comply with requirements for attaching other construction.
- B. Separate any aluminum metal component from preservative treated lumber with minimum divorcing layer of 15 lb asphalt saturated building paper. Use appropriate ring-shank, stainless steel fasteners.
- C. Never use aluminum fasteners with preservative treated wood. Only use hot-dipped galvanized or stainless-steel fasteners with treated wood.
- D. All wood nailers shall be of sufficient thickness so as to finish flush with the adjacent insulation. Securely anchor wood blocking with appropriate fasteners a minimum of two (2) for every 16". Perimeter wood blocking and blocking at openings shall be a minimum nominal width of 6".
- E. Do not use materials with defects that impair quality of rough carpentry or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- F. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 1. Published requirements of metal framing anchor manufacturer.
 2. Table 2304.10.1, "Fastening Schedule," in the International Building Code.
- G. For wood to wood connections use ring shanked, hot dipped galvanized 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.

END OF SECTION 06100

SECTION 07540 - THERMOPLASTIC MEMBRANE ROOFING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:

1. Base Sheet Installation
2. Insulation and Coverboard Installation.
3. Fully Adhered Roofing Membrane Installation
4. Induction Welded Roofing Membrane Installation.

- B. Related Sections include the following:

1. Division 6 Section 06100 "Rough Carpentry".
2. Division 7 Section 07591 "Removals and Preparation".
3. Division 7 Section 07620 "Flashing and Sheet Metal".
4. Division 7 Section 07920 "Sealants and Caulking."

- C. Unit Prices: Refer to Division 1 Section 01010 "Summary of Work" for description of Work in this Section affected by unit prices.

1.3 DEFINITIONS

- A. Roofing Terminology: Refer to ASTM D1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definition of terms related to roofing work in this Section.
- B. Design Uplift Pressure: The uplift pressure, calculated according to procedures in SPRI's "Wind Load Design Guide for Fully Adhered and Mechanically Fastened Roofing Systems," before multiplication by a safety factor.
- C. Factored Design Uplift Pressure: The uplift pressure, calculated according to procedures in SPRI's "Wind Load Design Guide for Fully Adhered and Mechanically Fastened Roofing Systems," after multiplication by a safety factor.

1.4 PERFORMANCE REQUIREMENTS

- A. General: Provide installed roofing membrane and base flashings that remain watertight; do not permit the passage of water; and resist specified uplift pressures, thermally induced movement, and exposure to weather without failure.
- B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by roofing membrane manufacturer based on testing and field experience.
- C. Roofing System Design: Provide a membrane roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist the factored

design uplift pressures calculated according to SPRI's "Wind Load Design Guide for Fully Adhered and Mechanically Fastened Roofing Systems."

1. Roofing system design shall meet or exceed a FM 1-90 rated system.

1.5 SUPERVISION

- A. Contractor shall assign a full-time, English speaking, qualified Roofing Superintendent to the project to coordinate the various aspects of the work; to provide Quality Control Services for the project; and to serve as liaison with the Owner's representative.
- B. The roofing crew shall be supervised at all times by Contractor's full-time, English speaking Foreman.

1.6 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For roofing system. Include plans, sections, and details of attachments to other Work.
 1. Base flashings and membrane terminations.
 2. Tapered insulation, including slopes.
 3. Insulation fastening patterns.
 4. TPO Seam layout.
- C. Samples for Verification: For the following products:
 1. 12-by-12-inch (300-by-300-mm) square of sheet roofing, of color specified, including T-shaped side and end lap seam.
 2. 12-by-12-inch (300-by-300-mm) square of roof recover board
 3. 12-by-12-inch (300-by-300-mm) square of walkway pads or rolls.
 4. 12-inch (300-mm) length of metal termination bars.
 5. 12-inch (300-mm) length of battens.
 6. Four insulation and recover board fasteners of each type, length, and finish.
 7. Four roof membrane cover fasteners of each type, length, and finish.
- D. Installer Certificates: Signed by roofing system manufacturer certifying that Installer is approved, authorized, or licensed by manufacturer to install roofing system.
- E. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
 1. Submit evidence of meeting performance requirements.
- F. Qualification Data: For Installer and manufacturer.
- G. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for components of roofing system.
- H. Research/Evaluation Reports: For components of membrane roofing system.
- I. Maintenance Data: For roofing system to include in maintenance manuals.

- J. Warranties: Special warranties specified in this Section.
- K. Inspection Report: Copy of roofing system manufacturer's inspection report of completed roofing installation.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's warranty.
- B. Manufacturer Qualifications: A qualified manufacturer that has UL listing and FMG approval for membrane roofing system identical to that used for this Project.
- C. Source Limitations: Obtain components for membrane roofing system approved by roofing membrane manufacturer.
- D. Fire-Test-Response Characteristics: Provide membrane roofing materials with the fire-test-response characteristics indicated as determined by testing identical products per test method below by UL, FMG, or another testing and inspecting agency acceptable to authorities having jurisdiction. Materials shall be identified with appropriate markings of applicable testing and inspecting agency.
 - 1. Exterior Fire-Test Exposure: Class A; ASTM E108, for application and roof slopes indicated.
- E. Preinstallation Roofing Conference: Before starting removals and roof recover construction, conduct conference at Project site. Review methods and procedures related to reroof construction and roofing system including, but not limited to, the following:
 - 1. Meet with Owner, Architect, and roofing system manufacturer's representative.
 - 2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
 - 3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 4. Examine existing substrate conditions and finishes for compliance with requirements, including flatness and fastening.
 - 5. Review structural loading limitations of roof deck during and after roofing.
 - 6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
 - 7. Review governing regulations and requirements for insurance and certificates if applicable.
 - 8. Review temporary protection requirements for roofing system during and after installation.
 - 9. Review roof observation and repair procedures after roofing installation.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storing and mixing with other components.
- B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
 - 1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

- C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation. Storage exposed to weather in manufacturer's original packaging alone is not sufficient. Provide tarps and store above ground on pallets at a minimum.
- D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck. Do Not Stockpile equipment or materials on the roof.

1.9 PROJECT CONDITIONS

A. Requirements Prior to Job Start

1. Pre-Roofing Conference: Roofing Contractor shall schedule a pre-roofing construction conference to be conducted by the Project Architect or his Representative, and attended by the installing roofing contractor, the roofing system manufacturer, the Owner's representative and sub-contractors engaged in the work of this project.
2. Notification: Give a minimum of 5 days notice to the Owner, Project Architect, and Manufacturer prior to commencing any work and notify all parties on a daily basis of any change in work schedule.
3. Permits: Obtain all permits required by local agencies and pay all fees which may be required for the performance of the work.
4. Safety: Familiarize every member of the application crew with all fire and safety regulations recommended by OSHA, NRCA and other industry or local governmental groups.

B. Asbestos Products

1. No Asbestos Containing Materials are to be incorporated into the work as a part of this contract. No existing asbestos containing material is to be left or incorporated into the work of this contract. In the event the Contractor finds asbestos containing materials not previously identified, then Contractor shall stop all work in the affected area and notify the Owner and Architect. Contractor shall provide all materials necessary to temporarily dry-in the affected area in the Base Bid. Additional work caused by the discovery, if authorized by the Owner, will be handled as a Change Order to this Contract

- C. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

D. Protection Requirements

1. Membrane Protection: Provide protection against staining and mechanical damage to newly applied roofing and adjacent surfaces throughout this project.
2. Limited Access: Prevent access by the public to materials, tools and equipment during the course of the project.
3. Debris Removal: Remove all debris daily from the project site and take to a legal dumping area authorized to receive such materials.
4. Site Condition: Complete, to the Owner's satisfaction, all job site clean-up including building interior, exterior and landscaping where affected by the construction.
5. Facility Protection:
 - a. Limit size of work sections to safeguard adjacent materials, structures, etc., and to minimize dust and noise.

- b. Protect existing facilities from damage during work. Do not overload existing paving, curbs, sidewalks, etc. with vehicle traffic. Do not overload new or existing construction with demolition debris, equipment, new materials etc.
 - c. Protect existing facilities from fire. Contractor shall provide suitable and adequate fire extinguishers conveniently located on the premises at staging areas, storage areas and at areas of equipment. Competent operators shall be in attendance at all times and shall be properly trained or instructed in fire protection.
 - d. Plywood, minimum 3/4-inch-thick, or other suitable materials shall be used to protect roof areas from damage that may be caused by concentrated equipment loads and foot traffic.
 - e. Site and roof traffic shall be confined to work areas. Contractor shall be responsible for leaks that develop in traffic areas during and after Project completion.
 - f. Contractor shall protect interior operations from adverse weather during roofing operations. This requirement extends beyond the immediate project scope of work to adjacent contiguous roof areas.
 - g. The Contractor is responsible and shall be held liable for any damages to the adjacent roof assemblies, building, building contents, its occupancy, grounds or landscaping resulting from work under the Contract. In the event of damage, Contractor will restore property to a condition equivalent to that at the time the Project started. Restoration may be necessary to construction assemblies not specified in this project manual. In such cases, repair methods and materials are subject to approval by Owner.
6. The Contractor shall keep existing drainage facilities clear of debris during construction.

1.10 WARRANTY

- A. **Manufacturer's Warranty:** Manufacturer's standard form, without monetary limitation, in which manufacturer agrees to repair or replace components of membrane roofing system that fail in materials or workmanship within specified warranty period. Failure includes roof leaks. Reference WARRANTIES Section 01740.
 1. Manufacturer's warranty includes roofing membrane, base flashings, roofing membrane accessories, fasteners, cover boards, walkway products and other components of membrane recover roofing system.
 2. Warranty Period: 20 years from date of Substantial Completion.
- B. **Contractor's 2 Year Watertight Warranty:** Submit roofing Installer's watertight warranty, on warranty form provided in WARRANTIES Section 01740, signed by Installer, covering Work of this Section, including all components of membrane roofing system such as roofing membrane, base flashing, flexible sheet and metal flashings, roof recover board, fasteners, sheet metal components, metal siding and walkway products for the following warranty period:
 1. Warranty Period: Two years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:
 1. Products: Subject to compliance with requirements, provide one of the products specified.
 2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 THERMOPLASTIC POLYOLEFIN ROOFING MEMBRANE

- A. Fabric-Reinforced Thermoplastic Polyolefin Sheet: Uniform, flexible sheet formed from a thermoplastic polyolefin, internally fabric or scrim reinforced, and as follows:
1. Manufacturers:
 - a. Johns Manville International, Inc.
 - b. Carlisle SynTec Incorporated.
 - c. GAF.
 2. Thickness: 60 mils, nominal.
 3. Field Sheet Width: 10' max.
 4. Perimeter Half Sheet Width: Not Required.
 5. Exposed Face Color: White
 6. Physical Properties:
 - a. Breaking Strength: 225 lbf (1 kN); ASTM D751, grab method.
 - b. Elongation Ultimate: 500% ASTM D412.
 - c. Tearing Strength: 55 lbf (245 N) minimum; ASTM D751, Procedure B.
 - d. Brittleness Point: Pass at Minus 22 deg F (30 deg C).
 - e. Ozone Resistance: Pass ASTM D1149.
 - f. Resistance to Heat Aging: 90 percent minimum retention of breaking strength, elongation at break, and tearing strength after 166 hours at 240 deg F (116 deg C); ASTM D573.
 - g. Water Absorption: Less than 4 percent mass change after 166 hours' immersion at 158 deg F (70 deg C); ASTM D471.
 - h. Linear Dimension Change: Plus or minus 2 percent; ASTM D1204.

2.3 AUXILIARY MATERIALS

- A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with membrane roofing.
1. Liquid-type auxiliary materials shall meet VOC limits of authorities having jurisdiction.
- B. Cut Edge Sealant: A medium solids content, free-flowing, polymeric material designed to be used for sealing cut edges of TPO Reinforced Membrane.
- C. Sheet Flashing: Manufacturer's standard unreinforced thermoplastic polyolefin sheet flashing, 55 mils thick, minimum, of same color as sheet membrane.
- D. Bonding Adhesive: Manufacturer's standard solvent-based bonding adhesive for base flashings.
- E. Metal Battens: Manufacturer's standard aluminum-zinc-alloy-coated or zinc-coated steel sheet, approximately 1 inch (25 mm) wide by 0.05 inch (1.3 mm) thick, prepunched.
- F. Metal Termination Bars: Manufacturer's standard predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch (25 by 3 mm) thick; with anchors.
- G. Fasteners: Factory-coated white steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening membrane to substrate, and acceptable to membrane roofing system manufacturer.

- H. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, termination reglets, cover strips, and other accessories.

2.4 BASE SHEET

- A. Rosin Sized Sheathing Paper: High quality, single-ply sheathing paper made from 100% recycled fibers set in alum, such as Red Rosin Paper as manufactured by W.R. Meadows.
- B. SureMB Vented Base: A fiberglass reinforced, asphalt coated sheet venting base sheet, having a minimum weight of 86 lb/sq. The sheet shall conform to ASTM D 4897, Type II requirements (G: Liberty SBS Mechanically Attached Base Sheet; JM: Ventsulation Felt).

2.5 ROOF INSULATION

- A. General: Provide preformed roof insulation boards that comply with requirements and referenced standards, selected from manufacturer's standard sizes and of thicknesses indicated.
- B. Extruded Polystyrene Board Insulation: 1.5" thick XPS insulation such as Deckmate Plus as manufactured by DuPont, or equal. Maximum board size for adhesive attachment is 4' x 4' x 2".

1. Manufacturers:

- a. DuPont
 - b. Dow
- C. Polyisocyanurate Board Insulation: 1 ½" & 2" thicknesses, ASTM C 1289, Type II, Class 3, Grade 2 all glass facer on both major surfaces, such as ENERGY3 AGF. Maximum board size is 4ft. x 8ft. for mechanical attachment.

1. Manufacturers:

- a. Johns Manville International, Inc.
 - b. Carlisle SynTec Incorporated.
 - c. GAF Building Products Company.
 - d. Firestone Building Products Company.
- D. Tapered Polyisocyanurate Insulation: Provide factory-tapered polyisocyanurate roof insulation boards fabricated to 1/4" and 1/2" per foot slope, with 1/2" starting thickness, as indicated in Project Drawings. Use monolithic board only, factory laminated board is not acceptable.: ASTM C 1289, Type II, Class 3, Grade 2 all glass facer on both major surfaces such as ENERGY3 AGF. Maximum board size is 4ft. x 4ft.
 - E. Tapered Edge Strips: Wood fiber in full range as provided by Manufacturer from ½ inch to 2-inch at thick edge; Provide 0" – ½" x 6" tapered edge strip at leading edge of tapered insulation saddles.
 - F. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping around fixed equipment and to gutters. At cricket conditions, fabricate to slopes double the normal slope of the roof.
 - G. Gypsum Overlayment – Georgia Pacific DensDeck Prime: a minimum 1/4" thick glass mat faced gypsum board with non-asphaltic coating, specifically designed for use as an overlayment or

coverboard furnished by the manufacturer as part of the guaranteed roof system (USG Securock). Must meet or exceed a minimum compressive strength of 150 psi.

H. Cant Strips: Siplast: Mineral perlite board cut to fit at 45 degrees with 5" face.

2.6 INSULATION ACCESSORIES

A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatible with membrane roofing.

B. Mechanical Fasteners:

1. Drill•Tec™ XHD Screws: Heavy gauge alloy white steel fastener with CR-10 coating with a .275" diameter thread. Factory Mutual Standard 4470 Approved, #3 Phillips truss head for use on heavy steel decks
2. Drill•Tec™ RhinoBond® Insulation Plates: Galvalume, 3" diameter, specially coated for use in RhinoBond® attachment systems.
3. Base Sheet Fasteners: 1.4" Twin Loc-Nail fastener as manufactured by ES Products or Ultralok™ Locking Impact Fastener as manufactured by Johns Manville.

C. Insulation Adhesive

1. Dow Instastik QS

2.7 PMMA LIQUID PENETRATION FLASHING SYSTEMS

A. LIQUISEAL CST-8844 PMMA Liquid Flashing Resin by Carlisle Syntec Systems with primer, 2-Part Resin Mixture, Polyester Flashing Fleece reinforcing, and accessories recommended by system manufacturer (Sika-Sarnifil Liquid Flashing SW or WW Liquid Flashing System; Soprema Alsan RS230 Liquid Flashing System; GAF Liquid Flashing System.)

2.8 ROBOTIC SEAM WELDING EQUIPMENT

- A. Robotic hot air welder (e.g., Leister)
- B. 10,000-watt minimum continuous power output generator.
- C. 100' max length, 10-gauge, 3 conductor electrical cords.
- D. Roof probe
- E. Lumber crayon

2.9 WALKWAYS

A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, solid-rubber, slip-resisting, surface-textured walkway pads or rolls, approximately 3/16 inch (5 mm) thick, and acceptable to membrane roofing system manufacturer.

2.10 ROOF ACCESSORIES

A. Fasteners

1. Base Sheet Fasteners: Base sheet fasteners shall be approved by the manufacturer of the primary roofing products. Acceptable base sheet fasteners for specific substrate types are listed below.
 - a. NVS Base Sheet Fasteners having a 2.7 inch diameter rib reinforced cap and 1 inch long rectangular legs by Siplast; Irving, TX
 - b. CWF Tube base sheet fasteners with plate, such as Twin-loc by Trufast.
2. Capped Nails: Hot-dip galvanized ring shank or Stainless Steel ring shank nail as manufactured by Maze Nails or Simplex.
3. Fasteners for miscellaneous attachments not specified: Hot-dipped galvanized Ring Shank or Stainless Steel Roofing Nails as mfg. by Maze Nails. Only stainless steel nails may be used in conjunction with aluminum sheet and aluminium fabrications.
4. Masonry Expansion Fasteners: Rawl Zamac Nailin® drive anchor w/ Type 304 stainless steel nail 1/4" x 1 1/4".

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions for compliance with the following requirements and other conditions affecting performance of roofing system:
 1. Verify that roof openings and penetrations are in place and set and braced.
 2. Verify that abandoned roof openings have been appropriately covered and attached to existing or new structural members.
 3. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
 4. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Reference Section 07591 Removals and Preparation for work required prior to installation of new insulation and TPO membrane.
- B. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.
- C. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.
- D. Remove existing abandoned curbs and discard. Replace steel decking and stitch to adjacent steel deck with fasteners at 6" O.C.

3.3 BASE SHEET INSTALLATION (RAs 1, 2, 3, 4, 5, 6, & 7)

- A. Install vented base sheet at cement fiber roof deck according to roofing system manufacturer's written instructions and applicable recommendations of ARMA/NRCA's "Quality Control Guidelines for the Application of Built-up Roofing."

- B. Substrate-Joint Penetrations: Prevent roofing asphalt from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction.
- C. Install one lapped course of red rosin sized sheathing paper and base sheet, extending sheet to and up vertical walls behind cants and terminating at the underside of copings and control joint covers. At all roof openings, extend base sheet to and up vertical curbs and terminate at top of curb.
- D. Mechanically fasten to substrate with specified fasteners to meet a minimum FM Class 1-90 rating, as follows:
 - 1. At Roof Field: 7" O.C. at laps & in two intermediate rows, 11" apart, fasten at 13" O.C. staggered.
 - 2. At Roof Perimeter (9'): 5" O.C. at laps & in two intermediate rows, 11" apart, fasten at 11" O.C. staggered.
 - 3. At Roof Corners (9'x9'): 4" O.C. at laps & in three intermediate rows, 8.5" apart, fasten at 6" O.C. staggered.
- E. Form an envelope fold in the base sheet at roof area terminations, including parapet walls, eaves, rakes, ridges, equipment curbs, etc.

3.4. GENERAL INSULATION INSTALLATION

- A. Minimum required roof insulation 4 feet from roof drain valley or building perimeter shall be R-21, as required by ASHRAE 90.1-2007 and current building code. In no case shall the minimum R-Value be less than that stated on Form F-3 on the Key Plan for each construction type.
- B. Edges of adjacent insulation boards shall be in moderate contact, without forcing.
- C. Gaps in insulation joints over ¼" wide shall be filled.
- D. Broken corners and edges of any insulation board shall be cut out and repaired with square-cut pieces of insulation no less than 8" x 8" in size.
- E. Insulation boards shall be cut neatly to fit tight against vertical surfaces.
- F. Insulation surface shall present a smooth surface to receive the roof membrane.
- G. All joints of insulation board layer above base layer insulation shall be offset 24" from joints in base layer or fill insulation, below.
- H. All joints in insulation overlay shall be offset 24" from joints of flat and tapered insulation, below.

3.5. INSULATION ADHERED TO BASE SHEET OVER CEMENTITIOUS WOOD FIBER DECK (RAS 1, 3, 4, 5, 6 & 7)

- A. After the installation of red rosin paper and base sheet, adhere in a low-rise foam adhesive two 1.5" layers of polyisocyanurate insulation. Apply insulation with end joints staggered approximately one-half the length of the units between rows and layers.
- B. Adhere each insulation board, approved and furnished by manufacturer of selected roof system, in ribbons of foamed, insulation adhesive, spaced at 12" centers.

1. At perimeters, decrease adhesive spacing to 6" centers. At corners, decrease adhesive spacing to 4" centers.
 - C. Size adhesive ribbons in accordance with manufacturer's instructions.
 - D. Space ribbons approx. 3" in from sides of insulation and overlay boards and extend ribbons to within 3" of board ends
 - E. Lay boards onto adhesive ribbons, without sliding across roof surface to position in final location.
 - F. Walk all boards down immediately after installation before adhesive has set.
 - G. Completely remove excess adhesive from surface of overlay boards to provide a plane surface for additional layers of insulation, coverboard, or membrane above.
 - H. Form crickets along the upslope side of all curb mounted equipment with base widths exceeding 18" using factory tapered expanded polystyrene insulation (1/2":12"), fill units and tapered edge strips. Adhere in low-rise foam adhesive to substrate insulation. Crickets, saddles and tapered edge strips must be installed before application of insulation overlayment.
- 3.6 INSULATION INSTALLATION OVER LIGHTWEIGHT CONCRETE ROOF DECK (RA 2)
- A. After the installation of red rosin paper and base sheet, adhere in a low-rise foam adhesive one 2" layer of polyisocyanurate insulation. Apply insulation with end joints staggered approximately one-half the length of the units between rows and layers.
 - B. Adhere each insulation board, approved and furnished by manufacturer of selected roof system, in ribbons of foamed, insulation adhesive, spaced at 12" centers.
 1. At perimeters, decrease adhesive spacing to 6" centers. At corners, decrease adhesive spacing to 4" centers.
 - C. Size adhesive ribbons in accordance with manufacturer's instructions.
 - D. Space ribbons approx. 3" in from sides of insulation and overlay boards and extend ribbons to within 3" of board ends
 - E. Lay boards onto adhesive ribbons, without sliding across roof surface to position in final location.
- 3.7 INSULATION ATTACHMENT TO METAL DECKS (RAs 8 & 9)
- A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.
 - B. Comply with roofing system manufacturer's written instructions for installing roof insulation.
 - C. Apply insulation with end joints staggered approximately one-half the length of the units.
 - D. Apply insulation with long dimension of units across deck ribs. On open rib steel decks, ends of units must bear on deck surface.
 - E. Loose lay one layer of 2" extruded polystyrene insulation, offsetting joints of adjacent insulation boards, between rows and layers, a minimum of 12". Loose lay a second layer of 2" extruded

polystyrene insulation, offsetting joints of adjacent insulation boards, between rows and layers, a minimum of 12". Loose lay 1/2" tapered polyisocyanurate insulation over the base insulation.

- F. The drain valley total thickness without saddles or crickets is 2" and 4' away is 4".
- G. Mechanically gang fasten through both base layer and tapered layers of insulation to metal deck substrate with specified fasteners using pattern as found in FM Property Loss Prevention Data Sheets 1-29.
 - 1. At Roof Field: 12 fasteners per 4' x 8' insulation board.
 - 2. At Roof Perimeter (8'): 16 fasteners per 4' x 8' insulation board.
 - 3. At Roof Corners (8' x 8'): 24 fasteners per 4' x 8' insulation board.
- H. Partial insulation units less than 2 square feet in area must be fastened with a minimum of two fasteners.
- I. Form saddles in between roof drains and crickets along the upslope side of all curb mounted equipment with base widths exceeding 18" using factory tapered polyisocyanurate insulation (1/2":12"), fill units and tapered edge strips.
 - 1. Adhere tapered insulation in ribbons of foamed, insulation adhesive, spaced at 12" centers in the field and 6" O.C. at perimeter and corner conditions.
 - 2. Crickets, saddles and tapered edge strips must be installed before application of insulation overlayment.

3.8 INSTALLATION OF INSULATION OVERLAYMENT

- A. Adhere each overlayment board, approved and furnished by manufacturer of selected roof system, in ribbons of foamed, insulation adhesive, spaced at 12" centers.
 - 1. At perimeter and corner conditions (8' wide), decrease adhesive spacing to 6" centers.
- B. Size adhesive ribbons in accordance with manufacturer's instructions.
- C. Space ribbons approx. 3" in from sides of insulation and overlay boards and extend ribbons to within 3" of board ends.
- D. Lay boards onto adhesive ribbons, without sliding across roof surface to position in final location.
- E. Walk all boards down immediately after installation before adhesive has set.
- F. Completely remove excess adhesive from surface of overlay boards to provide a plane surface for membrane above.
- G. Offset insulation and overlayment joints a minimum of 12", in both directions, in each layer and between layers.

3.7 FULLY ADHERED ROOFING MEMBRANE INSTALLATION

- A. Install roofing membrane over area to receive roofing according to roofing system manufacturer's written instructions. Unroll roofing membrane and allow to relax before installing.
- B. Start installation of roofing membrane in presence of roofing system manufacturer's technical personnel.

- C. Accurately align roofing membranes and maintain uniform side and end laps of minimum dimensions required by manufacturer to meet the design pressures specified in this section.
- D. Install field membrane and adhere to substrates according to membrane roofing system manufacturer's written instructions.
- E. Apply roofing membrane with side laps shingled with slope of roof insulation where possible.
- F. All exposed sheet corners shall be rounded a minimum of 1".
- G. All cut edges of reinforced TPO membrane must be sealed with TPO Cut Edge Sealant.
- H. Use full width rolls in the field and perimeter region of roof.
- I. Fully adhere membrane sheets to the substrate with TPO membrane adhesive
- J. Prevent seam contamination by keeping the adhesive application a few inches back from the seam area.
- K. Adhere approximately one half of the membrane sheet at a time. One half of the sheet's length shall be folded back in turn to allow for asphalt application. Lay membrane into adhesive after it has been allowed to flash off.
- L. Roll membrane with a weighted roller to ensure complete bonding between asphalt and membrane.
- M. Seams: Clean seam areas, overlap roofing membrane, and hot-air weld side and end laps of roofing membrane with 2" machine welds or 1.5" field welds, or according to manufacturer's written instructions to ensure a watertight seam installation.
 - 1. Perform test welds a minimum of two times each workday if welding is done before and after lunch. Perform a test weld if weather changes significantly during the day.
 - 2. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roofing membrane.
 - 3. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
 - 4. Repair tears, voids, and lapped seams in roofing membrane that does not meet requirements.
- N. Supplemental membrane attachment is required at the base of all walls and curbs, and where the angle of the substrate changes by more than five (5) degrees (1" in 12"). Roofing membrane shall be turned up the vertical plane a minimum of 3" (76 mm) and secured with screws and termination bar. Fastener spacing is the same as is used for in-lap attachment. The termination bar must be installed within 1-1/2" to 2" of the plane of the roof membrane, with a minimum of 1" of membrane extending above the termination bar.
- O. In-Splice Attachment: Secure one edge of roofing membrane using fastening plates or metal battens centered within membrane splice and mechanically fasten roofing membrane to roof deck. Field-splice seam.
- P. Install roofing membrane and auxiliary materials to tie into existing conditions.

3.8 INDUCTION WELDING ROOFING MEMBRANE INSTALLATION

- A. Install roofing membrane over area to receive roofing according to roofing system manufacturer's written instructions. Unroll roofing membrane and allow to relax before installing.
- B. Start installation of roofing membrane in presence of roofing system manufacturer's technical personnel.
- C. Equipment Settings
 - 1. As with any electrical tool, it is imperative that the tool receive the recommended amount of current for its proper operation. Damage could result from overload (surge) as well as a low voltage situation. No other electrical devices shall be run at the same time as the RhinoBond® Portable Bonding Machines.
 - 2. The RhinoBond® tool must be adjusted to achieve the maximum bond strength with most roofing membranes between 0° and 120° F.
- D. Calibration of the Machine
 - 1. The user must adjust the RhinoBond® tool to achieve maximum bond strength with TPO roofing membranes from 0° to 120° F ambient temperatures. The tool leaves the factory set to deliver an optimal weld with most membranes at 70°F when set to an energy level of "0". The energy level must be adjusted up (+1, +2, etc.) when temperatures are below 70°F, and down (-1, -2 etc.) when temperatures are above 70°F. These adjustments can be made by using the up/down arrow keys next to the display window on the machine.
 - 2. In an area adjacent to the day's work, lay out 5 RhinoBond® Plates 10" apart and cover them with a fresh piece of field membrane approximately 18" x 5'.
 - 3. Locate the plates under the membrane by dragging your foot across the surface of the membrane. After locating the RhinoBond® Plate, center the machine's red location circle directly over the plate.
 - 4. Determine an initial setting based on the ambient temperature. Remember that 70°F is a "0" energy setting on the display. On a 110° F day in Phoenix, AZ your initial energy setting may be "2" or "3".
 - 5. Weld the first plate at your initial energy setting and immediately place the cooling clamp onto the plate and mark the setting with the lumber crayon. Increase the energy setting using the "up" arrow on the machine by a unit of 1. Weld the second plate to the right of the first plate; mark the setting in crayon and put the second cooling clamp on the plate. Increase by another unit of 1 and weld the third plate. Repeat this process for the next two plates – installing them to the left of your first weld – except reduce the energy setting by a unit of 1 from your original setting each time. From left to right, your set of plates will be marked as follows (on a 70-degree F day): -2, -1, 0, 1, 2.
 - 6. Let the membrane over the plates cool to ambient temperature and fold the membrane over exposing the RhinoBond® Plates. Standing on the membrane, use your pliers to grip the plate and pull the plate from the test material, delaminating the plate from the membrane in the process.
 - 7. Three distinct types of bonds are probable, and are as follows: Full bond, an even and consistent weld of the membrane to the plate. The plate will also leave an impression in the membrane. This is a spec installation. Uneven/incomplete weld of the plate to the membrane. Cause of failure may be energy source set too low, machine not centered over the plate completely, or the plate may be over-driven. This would be a complete or partial hit of the plate. Remember, a full concentration of heat applied to the plate is needed to achieve a spec weld.

- E. Accurately align roofing membranes and maintain uniform side and end laps of minimum dimensions required by manufacturer to meet the design pressures specified in this section. Stagger end laps at a minimum by the width of the membrane roll.
- F. Full-width rolls shall be installed in the field and perimeter regions of the roof.
- G. Overlap full roof membrane sheets a minimum of 3" for side and end laps.
- H. Install membrane so that the lap runs across the roof slope and lapped toward the drainage points, if possible.
- I. All exposed sheet corners shall be rounded a minimum of 1".
- J. All cut edges of reinforced TPO membrane must be sealed with TPO Cut Edge Sealant.
- K. Weld TPO to RhinoBond® Plates with RhinoBond® Portable Bonding Tool. Weighted cooling magnets are placed over the bonded membrane/plates for a minimum of 45 seconds.
- L. Seams: Clean seam areas, overlap roofing membrane, and hot-air weld side and end laps of roofing membrane with 2" machine welds or 1.5" field welds, or according to manufacturer's written instructions to ensure a watertight seam installation.
 - 1. Perform test welds a minimum of two times each work day if welding is done before and after lunch. Perform a test weld if weather changes significantly during the day.
 - 2. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roofing membrane.
 - 3. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
 - 4. Repair tears, voids, and lapped seams in roofing membrane that does not meet requirements.
- M. In-Splice Attachment: Secure one edge of roofing membrane using fastening plates or metal battens centered within membrane splice and mechanically fasten roofing membrane to roof deck. Field-splice seam.
- N. Install roofing membrane and auxiliary materials to tie into existing conditions.

3.9 BASE FLASHING INSTALLATION

- A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.
- B. Apply solvent-based bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply bonding adhesive to seam area of flashing.
- C. Flash penetrations and field-formed inside and outside corners with sheet flashing.
- D. Clean seam areas and overlap and firmly roll sheet flashings into the adhesive. Weld side and end laps to ensure a watertight seam installation.
- E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars or piping clamps.

3.10 LIQUID APPLIED FLASHING APPLICATION

- A. Install the liquid-applied primer and flashing system in accordance with the system manufacturer's printed installer's guidelines. Observe all other applicable written recommendations as provided by the manufacturer.
- B. Remove all bitumen, debris, rust, scale and other foreign matter from surfaces receiving catalyzed flashing system, prior to installation. Use scrapers, wire brush and/or grinders, as necessary.
- C. Treat cleaned membrane receiving liquid applied flashing with appropriate primer and allow to flash off. Apply appropriate primer to all other surfaces to which flashing will be applied.
- D. Cut and prepare all reinforcing fleece before mixing resin.
- E. Mix the two components of the liquid applied flashing system using the manufacturer's written instructions.
- F. Using a nap roller or brush, apply two-thirds of the resin evenly onto the substrate using even strokes.
- G. Roll the polyester fleece directly into the resin, ensuring that the smooth side is facing up (natural unrolling procedure) and avoiding folds, wrinkles, and air pockets.
- H. Apply the remaining one-third of the resin and use the roller or brush to work the resin into the fleece, saturating from the bottom up. All areas of the fleece should be completely saturated with resin.

3.11 WALKWAY INSTALLATION

- A. Flexible Walkways: Install walkway products in front of all access locations to all roof mounted equipment. Minimum 22" X 48". Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

3.12 FIELD QUALITY CONTROL

- A. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion and submit report to Architect.
 - 1. Notify Architect or Owner 48 hours in advance of date and time of inspection.
- B. Repair or remove and replace components of membrane roofing system where test results or inspections indicate that they do not comply with specified requirements.
- C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.13 PROTECTING AND CLEANING

- A. Protect membrane roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner

- B. Correct deficiencies in or remove membrane roofing system that does not comply with requirements, repair substrates, and repair or reinstall membrane roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
- C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

3.14 ROOFING INSTALLER'S WARRANTY

- A. Reference Section 01740 "Warranties" for a copy of the Contractor's Two-Year Watertight Warranty.

END OF SECTION 07540

SECTION 07550 - MODIFIED BITUMEN MEMBRANE ROOFING

PART 1. GENERAL

1.1. SECTION INCLUDES:

- A. Base Sheet Application
- B. Insulation and Coverboard Installation
- C. Two Ply Roof Membrane Application
- D. Incorporation of Sheet Metal Flashing Components and Roofing Accessories into the Roof System

1.2. RELATED SECTIONS

- A. Section 01300 – Submittals
- B. Section 03521 – Cellular Lightweight Insulating Concrete
- C. Section 06100 – Rough Carpentry
- D. Section 07620 – Sheet Metal Flashing and Trim
- E. Section 07591 – Removals and Preparation

1.3. REFERENCE STANDARDS

- A. References in these specifications to standards, test methods and codes, are implied to mean the latest edition of each such standard adopted. The following is an abbreviated list of associations, institutions, and societies which may be used as references throughout these specifications.
 - 1. ASTM American Society for Testing and Materials, Philadelphia, PA
 - 2. FM Factory Mutual Engineering and Research, Norwood, MA
 - 3. NRCA National Roofing Contractors Association, Rosemont, IL
 - 4. OSHA Occupational Safety and Health Administration, Washington, DC
 - 5. SMACNA Sheet Metal and Air Conditioning Contractors National Association, Chantilly, VA
 - 6. UL Underwriters Laboratories, Northbrook, IL

1.4. DESCRIPTION OF WORK

- A. Description of Work: Work required in this specification is referenced below and is based on Siplast Roofing Systems Products and Specifications. A SBS modified bitumen roof system from Johns Mansville (JM) or Soprema (S) installed in accordance with the requirements and procedures listed in this Specification will be accepted. Acceptable JM and Soprema products are listed in parentheses following listed Siplast products in Part 2 of this Spec Section.

- 1. Roof System:
 - a. Hot/Cold Applied Modified Bitumen such as:
 - 1) Siplast Paradiene 20/30 IH-A

- 2) Johns Manville 2CID-CA
- 3) Soprema IS-25/41 SG

1.5. SUPERVISION

- A. Contractor shall assign a full-time, English speaking, qualified Roofing Sup't. to the project to coordinate the various aspects of the work; to provide Quality Control Services for the project; and to serve as liason with the Owner's representative.
- B. The roofing crew shall be supervised at all times by Contractor's full-time, English speaking Foreman.

1.6. SUBMITTALS

- A. Refer to Section 01300 of these Specifications for a Listing of Submittals required for this Project.

1.7. QUALITY ASSURANCE

- A. Acceptable Products: Primary roofing products, including each type of sheet, all manufactured in the United States, shall be supplied by a single manufacturer which has been successfully producing the specified types of primary products for not less than 10 years. The primary roofing products shall have maintained a consistent composition for a minimum of five years.
- B. Product Quality Assurance Program: Primary roofing materials shall be manufactured under a quality management system that is monitored regularly by a third party auditor under the ISO 9001:2000 audit process. A certificate of analysis for reporting/confirming the tested values of the actual material being supplied for the project will be required prior to project close-out.
- C. Roof System Manufacturer Quality Control Inspections: Provide as a part of the Contractor's Base Bid price the following level of roofing system inspections by the roofing system manufacturer during the installation of the new roofing system:
 1. Attend the Pre-Roofing Conference with Owner's Agent, Architect, Installing Roofing Contractor, Manufacturer's Representative and General Contractor.
 2. Manufacturer's Inspector shall be present along with Architect at initial project startup, 50% and 100% inspections.
 3. Manufacturer's Inspector shall notify the Architect prior to performing field inspections and provide copies of the Inspector's field report to the Architect after each site visit.
- D. Work found in violation of the Specifications, or not in conformance with acceptable workmanship practices/standards, shall be subject to rejection including complete removal and replacement with new materials at Contractor's expense.
- E. Failure of Owner or Architect to discover or reject defective work, or work not in accordance with the Contract, shall not be deemed an acceptance thereof, or a waiver of Owner's rights to Contractor's compliance with the Contract or performance of the work, or any part thereof. No partial or final payment, or partial or entire occupancy, by Owner shall be deemed to be an acceptance of work or of material which is not strictly in accordance with the Contract, nor shall it be deemed a waiver by Owner or any of Owner's rights pursuant to this Contract or otherwise.
- F. Contractor may be made to uncover work in-place to determine the quantity and quality of material and workmanship. Contractor photographs may or may not be accepted to validate fasteners, fastener frequency, unit price work and other elements of the work concealed by project finishes.

- G. Owner Responsibilities: Owner will provide inspections during the work. Such inspections may be daily or periodic.
- H. Contractor Responsibilities: Unless otherwise indicated, provide quality-control inspections with Contractor's own work force. Repair or replace nonconforming work.
1. Associated Services: Cooperate with agencies performing inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Provide the following:
 - a. Access to the Work.
 - b. Incidental labor and materials necessary to facilitate inspections.
 2. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate inspections.
 3. Agency Approvals: The proposed roof system shall conform to the following requirements. No other testing agency approvals will be accepted. Underwriters Laboratories Class A acceptance of the proposed roofing system, including cold adhesive, without additional requirements for gravel or coatings.
 4. Acceptable Contractor: Contractor shall have a minimum of 4 years experience in successfully installing the same or similar roofing materials and be certified in writing by the roofing materials manufacturer to install the primary roofing products.
 5. Scope of Work: The work to be performed under this specification shall include but is not limited to the following: Attend necessary job meetings and furnish competent and full time supervision, experienced roof mechanics, all materials, tools, and equipment necessary to complete, in an acceptable manner, the roof installation in accordance with this specification. Comply with the latest written application instructions of the manufacturer of the primary roofing products. In addition, application practice shall comply with requirements and recommendations contained in the latest edition of the Handbook of Accepted Roofing Knowledge (HARK) as published by the National Roofing Contractor's Association, amended to include the acceptance of a phased roof system installation.
 6. Local Regulations: Conform to regulations of public agencies, including any specific requirements of the city and/or state of jurisdiction, including, but not limited to, permitting of work and licensing of contractors performing the work
 7. Manufacturer Requirements: Ensure that the primary roofing materials manufacturer provides direct trained company personnel to attend necessary job meetings, perform periodic inspections as necessary, and conducts a final inspection upon successful completion of the project.

1.8. PRODUCT DELIVERY STORAGE AND HANDLING

- A. Delivery: Deliver materials in the manufacturer's original sealed and labeled containers and in quantities required to allow continuity of application.
- B. Storage: Store materials out of direct exposure to the elements. Store roll-goods on a clean, flat and dry surface. All material stored on the roof overnight shall be stored on pallets. Rolls of roofing must be stored on ends. Store materials on the roof in a manner so as to preclude overloading of deck and building structure. Store materials such as solvents, adhesives and asphalt cutback products away from open flames, sparks or excessive heat. Cover all material using a breathable cover such as a canvas. Polyethylene or other non-breathable plastic coverings are not acceptable.

- C. Handling: Handle all materials in such a manner as to preclude damage and contamination with moisture or foreign matter. Handle rolled goods to prevent damage to edges or ends.
- D. Damaged Material: Any materials that are found to be damaged or stored in any manner other than stated above will be automatically rejected, removed and replaced at the Contractor's expense.

1.9. PROJECT/SITE CONDITIONS

A. Requirements Prior to Job Start

1. Pre-Roofing Conference: Roofing Contractor shall schedule a pre-roofing construction conference to be conducted by the Project Architect or his Representative, and attended by the installing roofing contractor, the roofing system manufacturer, the Owner's representative and sub-contractors engaged in the work of this project.
2. Notification: Give a minimum of 5 days notice to the Owner, Project Architect, and Manufacturer prior to commencing any work and notify all parties on a daily basis of any change in work schedule.
3. Permits: Obtain all permits required by local agencies and pay all fees which may be required for the performance of the work.
4. Safety: Familiarize every member of the application crew with all fire and safety regulations recommended by OSHA, NRCA and other industry or local governmental groups.

B. Asbestos Products

1. No products containing asbestos fibers are present in the work covered in the Base Bid at Daisy Elementary School.
2. No Asbestos Containing Materials are to be incorporated into the work as a part of this contract. No existing asbestos containing material is to be left or incorporated into the work of this contract.
3. In the event the Contractor finds asbestos containing materials not previously identified, then Contractor shall stop all work in the affected area and notify the Owner and Architect. Contractor shall provide all materials necessary to temporarily dry-in the affected area in the Base Bid. Additional work caused by the discovery, if authorized by the Owner, will be handled as a Change Order to this Contract.

C. Environmental Requirements

1. Precipitation: Do not apply roofing materials during precipitation or in the event there is a probability of precipitation during application. Take adequate precautions to ensure that materials, applied roofing, and building interiors are protected from possible moisture damage or contamination.
2. Temperature Restrictions - cold adhesive: At low temperatures, the specified cold adhesive becomes more viscous, making even distribution more difficult. The optimal temperature of the adhesive at point of application is 70°F (21°C). To facilitate application when ambient temperatures are below 50°F (10°C), store the adhesive and roll goods in a warm place immediately prior to use. Suspend application in situations where the adhesive cannot be kept at temperatures allowing for even distribution. Roll or broom base ply and finish ply sheets across their full width to ensure contact with the underlying adhesive.

D. Protection Requirements

1. Membrane Protection: Provide protection against staining and mechanical damage to newly applied roofing and adjacent surfaces throughout this project.

2. Limited Access: Prevent access by the public to materials, tools and equipment during the course of the project.
3. Debris Removal: Remove all debris daily from the project site and take to a legal dumping area authorized to receive such materials.
4. Site Condition: Complete, to the Owner's satisfaction, all job site clean-up including building interior, exterior and landscaping where affected by the construction.
5. Facility Protection:
 - a. Limit size of work sections to safeguard adjacent materials, structures, etc., and to minimize dust and noise.
 - b. Protect existing facilities from damage during work. Do not overload existing paving, curbs, sidewalks, etc. with vehicle traffic. Do not overload new or existing construction with demolition debris, equipment, new materials etc.
 - c. Protect existing facilities from fire. Contractor shall provide suitable and adequate fire extinguishers conveniently located on the premises at staging areas, storage areas and at areas of equipment. Competent operators shall be in attendance at all times and shall be properly trained or instructed in fire protection.
 - d. Plywood, minimum 3/4 inch thick, or other suitable materials shall be used to protect roof areas from damage that may be caused by concentrated equipment loads and foot traffic.
 - e. Site and roof traffic shall be confined to work areas. Contractor shall be responsible for leaks that develop in traffic areas during and after Project completion.
 - f. Contractor shall protect interior operations from adverse weather during roofing operations. This requirement extends beyond the immediate project scope of work to adjacent contiguous roof areas.
 - g. The Contractor is responsible and shall be held liable for any damages to the adjacent roof assemblies, building, building contents, its occupancy, grounds or landscaping resulting from work under the Contract. In the event of damage, Contractor will restore property to a condition equivalent to that at the time the Project started. Restoration may be necessary to construction assemblies not specified in this project manual. In such cases, repair methods and materials are subject to approval by Owner.
6. The Contractor shall keep existing drainage facilities clear of debris during construction.

1.10. CONTRACTOR'S TWO YEAR WARRANTY

- A. All new materials and workmanship covering work provided under this section of the specifications shall be guaranteed in writing by the contractor to maintain in a watertight condition without cost to the Owner for a period of two (2) years after date of substantial completion.

1.11. MANUFACTURER'S 20 YEAR GUARANTEE/WARRANTY

- A. Roof System Guarantee: Upon successful completion of the project, and after all post installation procedures have been completed, furnish the Owner with the roof system manufacturer's 20 year, No Dollar Limit, Labor and Materials Total Roof System Guarantee. The roof system guarantee shall include both the modified bitumen roofing, surfacing, and flashing membranes, catalyzed resin flashing system, roof insulation, insulation overlay, insulation adhesives, insulation fasteners, flashing adhesives, and accessory roofing materials.
- B. All repair or replacement costs covered under the guarantee shall be borne by the roofing membrane manufacturer. The guarantee shall be a term type, without deductibles or limitations on coverage amount, and be issued at no additional cost to the Owner.

PART 2. PRODUCTS

2.1. BASE SHEET

- A. Rosin Sized Sheathing Paper: High quality, single-ply sheathing paper made from 100% recycled fibers set in alum, such as Red Rosin Paper as manufactured by W.R. Meadows.
- B. Siplast Parabase FS: A fiberglass reinforced, asphalt coated sheet with a polyolefin film backing, having a minimum weight of 20 lb/sq. The sheet shall conform to ASTM D 4601, Type II requirements (JM: Ventsulation Felt; S: Vented Base).

2.2. ROOF INSULATION

- A. General: Provide preformed roof insulation boards that comply with requirements and referenced standards, selected from manufacturer's standard sizes and of thicknesses indicated.
- B. Extruded Polystyrene Board Insulation: 1.5" thick XPS insulation such as Deckmate Plus as manufactured by DuPont, or equal. Maximum board size for adhesive attachment is 4' x 4' x 2".
 - 1. Manufacturers:
 - a. DuPont
 - b. Dow
- C. Polyisocyanurate Board Insulation: 1 ½" & 2" thicknesses, ASTM C 1289, Type II, Class 3, Grade 2 all glass facer on both major surfaces, such as ENERGY3 AGF. Maximum board size is 4ft. x 8ft. for mechanical attachment.
 - 1. Manufacturers:
 - a. Johns Manville International, Inc.
 - b. Carlisle SynTec Incorporated.
 - c. GAF Building Products Company.
 - d. Firestone Building Products Company.
- D. Tapered Polyisocyanurate Insulation: Provide factory-tapered polyisocyanurate roof insulation boards fabricated to 1/4" and 1/2" per foot slope, with 1/2" starting thickness, as indicated in Project Drawings. Use monolithic board only, factory laminated board is not acceptable.: ASTM C 1289, Type II, Class 3, Grade 2 all glass facer on both major surfaces such as ENERGY3 AGF. Maximum board size is 4ft. x 4ft.
- E. Tapered Edge Strips: Wood fiber in full range as provided by Manufacturer from ½ inch to 2-inch at thick edge; Provide 0" – ½" x 6" tapered edge strip at leading edge of tapered insulation saddles.
- F. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping around fixed equipment and to gutters. At cricket conditions, fabricate to slopes double the normal slope of the roof.
- G. Gypsum Overlayment – Georgia Pacific DensDeck Prime: a minimum 1/4" thick glass mat faced gypsum board with non-asphaltic coating, specifically designed for use as an overlayment or coverboard furnished by the manufacturer as part of the guaranteed roof system (USG Securock). Must meet or exceed a minimum compressive strength of 150 psi.

H. Cant Strips: Siplast: Mineral perlite board cut to fit at 45 degrees with 5" face.

2.3. INSULATION ACCESSORIES

A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatible with membrane roofing.

B. Mechanical Fasteners:

1. Drill•Tec™ XHD Screws: Heavy gauge alloy white steel fastener with CR-10 coating with a .275" diameter thread. Factory Mutual Standard 4470 Approved, #3 Phillips truss head for use on heavy steel decks
2. Base Sheet Fasteners: 1.4" Twin Loc-Nail fastener as manufactured by ES Products or Ultralok™ Locking Impact Fastener as manufactured by Johns Manville.

C. Insulation Adhesive

1. Dow Instastik QS

2.4. BASE PLY

A. Siplast Paradiene 20: 62# / 100 sq. ft. minimum weight, applied to base sheet (JM: DynaBase; S: Elastophene Sanded).

2.5. FINISH PLY

A. Siplast Paradiene 30 FR CR, white: 75# / 100 sq. ft. minimum weight, applied to Base Ply (JM: DynaGlas FR CR; S: Elastophene LS FR GR SG).

2.6. FLASHING MEMBRANE

A. Siplast Veral Aluminum: aluminum clad asphalt elastomer sheet: 96# / 100 sq. ft. minimum weight, applied with solvent-free adhesive (JM: DynaClad; S: Sopralast 50 TV ALU sanded).

2.7. FLUID APPLIED FLASHING SYSTEMS

A. Siplast Parapro 123 Flashing System: A Catalyzed Acrylic Resin Flashing System: A specialty flashing system consisting of a liquid-applied, fully reinforced, multi-component acrylic membrane installed over a prepared or primed substrate. The flashing system consists of a catalyzed acrylic resin primer, basecoat and topcoat, combined with a non-woven polyester fleece. The resin and catalyst are pre-mixed immediately prior to installation. The use of the specialty flashing system shall be specifically approved in advance by the membrane manufacturer for each application. (JM: PMMA Flashing; S: Alsan RS 230 Flashing).

2.8. ASPHALT MATERIALS

A. Asphalt Primer: ASTM D41.

B. Roofing Asphalts: ASTM D312, Type III: Steep Grade;
 ASTM D312, Type IV: Extra Steep Grade.

2.9. AUXILIARY ROOFING MATERIALS

A. Adhesives

1. Adhesive for Membrane Plies: Siplast PA-311 M Adhesive. (JM: MBR Cold Application Adhesive; S: Colply Adhesive VOC).
2. Adhesive for Membrane Plies at Pipe Penetrations Receiving Catalyzed Resin Flashing System: Siplast Solvent Free Adhesive. (JM: MBR Cold Application Adhesive; S: Colply Adhesive VOC).

B. Bituminous Cutback Materials

1. Mastic: Siplast PA-1021 Plastic Cement (JM: MBR Utility Cement; S: FM Adhesive (VOC) Trowel Grade)

C. Sealant at Membrane/metal junctions:

1. Siplast PS-304 Elastomeric Sealant

D. Reflective Coating for Liquid Applied Membrane and Adhesive Overruns:

1. Siplast #11 Roofing Granules (JM: Mineral Granules white; S: SG Granules).

2.10. WALK PAD

A. At locations designated on Roof Plan:

1. Industrial Anti Fatigue Mat, Wet Areas, Size 38 x 64 In, Color Black, Orange Border, 7/8 In Thick Rubber
Item #4YJ18 as distributed by Grainger
2. At HVAC units, gas pipe supports and condensate drain supports:
 - a. Siplast Paradiene 40 FR, white: 99# / 100 sq. ft. minimum weight, applied to Cap Sheet with cold adhesive and heat welded laps (JM: DynaKap FR; S: Elastophene LS FR GR SG).

B. Condensate Drain Support:

1. A pipe support with "strut" used to support roof-mounted electrical conduit, solar piping, gas pipes, and other mechanical piping, such as MIRO Model 1.5 supports as manufactured by MIRO Industries, Sandy, Utah, 800-768-6978.

C. Gas Pipe Supports:

1. A "roller-bearing", "clevis hanger", or "band hanger" pipe support, used to support roof-mounted gas pipes, such as MIRO 3-RAH-12 supports as manufactured by MIRO Industries, Sandy, Utah, 800-768-6978.

2.11. ROOF ACCESSORIES

A. Fasteners

1. Base Sheet Fasteners: Base sheet fasteners shall be approved by the manufacturer of the primary roofing products. Acceptable base sheet fasteners for specific substrate types are listed below.
 - a. NVS Base Sheet Fasteners having a 2.7 inch diameter rib reinforced cap and 1 inch long rectangular legs by Siplast; Irving, TX

- b. CWF Tube base sheet fasteners with plate, such as Twin-loc by Trufast.
- 2. Capped Nails: Hot-dip galvanized ring shank or Stainless Steel ring shank nail as manufactured by Maze Nails or Simplex.
- 3. Fasteners for miscellaneous attachments not specified: Hot-dipped galvanized Ring Shank or Stainless Steel Roofing Nails as mfg. by Maze Nails. Only stainless steel nails may be used in conjunction with aluminum sheet and aluminium fabrications.
- 4. Masonry Expansion Fasteners: Rawl Zamac Nailin® drive anchor w/ Type 304 stainless steel nail 1/4" x 1 1/4".

PART 3. EXECUTION

3.1. PREPARATION

- A. Refer to Section 07591 for work required prior to removal of existing roof system, and preparations required to receive new roofing.
- B. General: After removal of existing roof system and deck preparation is complete, remove all dirt, dust, debris and foreign substances from roof deck and ribs of roof deck, prior to commencement of roofing.
- C. Where exposed, examine roof deck to verify deck is in sound condition without visible damage or rust. Repair or replace existing roof deck as specified in Section 07591 of these specifications.
- D. Examine any exposed metal roof deck at roof perimeter to confirm edge of roof deck is fastened to structure at maximum 6" centers. Install missing fasteners and replace damaged fasteners at the perimeter of all roof areas as specified in Section 07591 of these specifications.

3.2. BASE SHEET ATTACHMENT

- A. Install built-up roofing vented base sheet according to roofing system manufacturer's written instructions and applicable recommendations of ARMA/NRCA's "Quality Control Guidelines for the Application of Built-up Roofing."
- B. Substrate-Joint Penetrations: Prevent roofing asphalt from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction.
- C. Install one lapped course of base sheet over rosin sized sheathing paper, extending sheet to and up vertical walls behind cants and terminating at the underside of copings and control joint covers. At all roof openings extend base sheet to and up vertical curbs and terminate at top of curb.
 - 1. Mechanically fasten to substrate with specified fasteners.
 - At Roof Field: 7" O.C. at laps & in two intermediate rows, 11" apart, fasten at 10" O.C. staggered
 - At Roof Perimeter (6'): 5" O.C. at laps & in three intermediate rows, 9" apart, fasten at 8" O.C. staggered
 - At Roof Corners (6'x6'): 5" O.C. at laps & in four intermediate rows, 8" apart, fasten at 6" O.C. staggered
- D. Form an envelope fold in the base sheet at roof area terminations, including parapet walls, eaves, rakes, ridges, equipment curbs, etc.

- E. In locations where existing curbs were removed and deck filled in, attach the base sheet through the gypsum board and into the metal deck using insulation fasteners with 3" plates. Use nine fasteners per area of filled in deck using pattern as found in FM Property Loss Prevention Data Sheets 1-29.

3.3. GENERAL INSULATION INSTALLATION

- A. Minimum required roof insulation 4 feet from roof drain valley or building perimeter shall be R-21, as required by ASHRAE 90.1-2007 and current building code. In no case shall the minimum R-Value be less than that stated on Form F-3 on the Key Plan for each construction type.
- B. Edges of adjacent insulation boards shall be in moderate contact, without forcing.
- C. Gaps in insulation joints over ¼" wide shall be filled.
- D. Broken corners and edges of any insulation board shall be cut out and repaired with square-cut pieces of insulation no less than 8" x 8" in size.
- E. Insulation boards shall be cut neatly to fit tight against vertical surfaces.
- F. Insulation surface shall present a smooth surface to receive the roof membrane.
- G. All joints of insulation board layer above base layer insulation shall be offset 24" from joints in base layer or fill insulation, below.
- H. All joints in insulation overlay shall be offset 24" from joints of flat and tapered insulation, below.

3.4. INSULATION ADHERED TO BASE SHEET OVER CEMENTITIOUS WOOD FIBER DECK (RAs 1, 3, 4, 5, 6 & 7)

- A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.
- B. Comply with roofing system manufacturer's written instructions for installing roof insulation.
- C. After the installation of red rosin paper and base sheet, adhere in a full mopping of hot Type III asphalt one base insulation layer of 1.5" polyisocyanurate and a second fully adhered layer of 1.5" polyisocyanurate insulation. Apply insulation with end joints staggered approximately one-half the length of the units between rows and layers.
- D. Form crickets along the upslope side of all curb mounted equipment with base widths exceeding 18" using factory tapered polyisocyanurate insulation (1/2":12"), fill units and tapered edge strips.
 - 1. Crickets, saddles and tapered edge strips must be installed before application of insulation overlayment.

3.5. INSULATION INSTALLATION OVER LIGHTWEIGHT CONCRETE ROOF DECK (RA 2)

- A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.
- B. Comply with roofing system manufacturer's written instructions for installing roof insulation.

- C. Form 4' insulation sumps with tapered polyisocyanurate insulation at main roof drains as shown on Project Drawings.
- D. After the installation of red rosin paper and base sheet, adhere in a full mopping of hot Type III asphalt one base insulation layer of 2" polyisocyanurate. Apply insulation with end joints staggered approximately one-half the length of the units between rows and layers.
- E. Form crickets along the upslope side of all curb mounted equipment with base widths exceeding 18" using factory tapered polyisocyanurate insulation (1/2":12"), fill units and tapered edge strips.
 - 1. Crickets, saddles and tapered edge strips must be installed before application of insulation overlayment.

3.6. INSULATION ATTACHMENT TO METAL DECKS (RAs 8 & 9)

- A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.
- B. Comply with roofing system manufacturer's written instructions for installing roof insulation.
- C. Apply insulation with end joints staggered approximately one-half the length of the units.
- D. Apply insulation with long dimension of units across deck ribs. On open rib steel decks, ends of units must bear on deck surface.
- E. Loose lay one layer of 2" extruded polystyrene insulation, offsetting joints of adjacent insulation boards, between rows and layers, a minimum of 12". Loose lay a second layer of 2" extruded polystyrene insulation, offsetting joints of adjacent insulation boards, between rows and layers, a minimum of 12". Loose lay 1/2" tapered polyisocyanurate insulation over the base insulation.
- F. The drain valley total thickness without saddles or crickets is 2" and 4' away is 4".
- G. Mechanically gang fasten through both base layer and tapered layers of insulation to metal deck substrate with specified fasteners using pattern as found in FM Property Loss Prevention Data Sheets 1-29.
 - 1. At Roof Field: 12 fasteners per 4' x 8' insulation board.
 - 2. At Roof Perimeter (8'): 16 fasteners per 4' x 8' insulation board.
 - 3. At Roof Corners (8' x 8'): 24 fasteners per 4' x 8' insulation board.
- H. Partial insulation units less than 2 square feet in area must be fastened with a minimum of two fasteners.
- I. Form saddles in between roof drains and crickets along the upslope side of all curb mounted equipment with base widths exceeding 18" using factory tapered polyisocyanurate insulation (1/2":12"), fill units and tapered edge strips.
 - 1. Adhere tapered insulation in ribbons of foamed, insulation adhesive, spaced at 12" centers in the field and 6" O.C. at perimeter and corner conditions.
 - 2. Crickets, saddles and tapered edge strips must be installed before application of insulation overlayment.

3.7. INSTALLATION OF INSULATION OVERLAYMENT

- A. Adhere each overlayment board, approved and furnished by manufacturer of selected roof system, in ribbons of foamed, insulation adhesive, spaced at 12" centers.
 - 1. At perimeter and corner conditions (8' wide), decrease adhesive spacing to 6" centers.
- B. Size adhesive ribbons in accordance with manufacturer's instructions.
- C. Space ribbons approx. 3" in from sides of insulation and overlay boards and extend ribbons to within 3" of board ends.
- D. Lay boards onto adhesive ribbons, without sliding across roof surface to position in final location.
- E. Walk all boards down immediately after installation, before adhesive has set.
- F. Completely remove excess adhesive from surface of overlay boards to provide a plane surface for membrane above.
- G. Offset insulation and overlayment joints a minimum of 12", in both directions, in each layer and between layers.

3.8. GENERAL ASPHALT APPLICATION

- A. Do not apply materials when surfaces are wet or damp, over dust, dirt, or any other foreign matter. Foaming of hot bitumen at the point of application is evidence that the substrate is too wet for the proper application of materials.
- B. Do not apply bituminous materials when the ambient air temperature is below 40°F unless equipment can be operated and materials maintained within the specified temperature ranges and without damage to materials, and then only with the approval of the Architect. Follow manufacturer's cold weather application requirements.
- C. Perform only such amount of reroofing work that can be completed by the end of each workday.
- D. Protect edges and incomplete flashings against water infiltration with night seals and other temporary measures. Remove end of day cut-offs and temporary measures prior to resuming roofing application. Step insulation at night seals.
- E. Maintain the following temperature ranges at kettles and handling equipment at all times during the application of bitumen:

<u>Bitumen</u>	<u>Kettle Temperature °F</u>	<u>Handling Equip. Temperature °F</u>
Type III Asphalt	500 Maximum	400 to 425
Type IV Asphalt	500 Maximum	400 to 475

Kettles must be equipped with working thermometers or provide hand held thermometer for use by kettle operator. Hand held readings shall be taken from opposite side furthest from the burner stacks or at the draw-off spigot.

Kettle temperature shall be maintained below asphalt flash point (FP).

At no time shall kettle temperature meet or exceed FBT for more than two hours.

- F. Prime (1 gal. / 100 SF) all concrete, masonry and wood surfaces that are to receive hot asphalt or bituminous cements and allow to dry thoroughly before application of bitumen.

- G. Prior to application of new bituminous materials, prime with asphalt primer and allow to thoroughly dry all metal surfaces that receive hot asphalt or bituminous cements.
- H. Provide additional quantities of asphalt as may be required by the roofing system manufacturer in excess of those specified herein in order to comply with manufacturer's warranted systems at no additional cost to the Owner.
- I. Asphalts shall be certified in writing from the roofing system manufacturer that they are approved for use in the manufacturer's roofing system.
- J. Thoroughly hand broom all plies to eliminate voids underneath the membrane ply and so that all edges are tightly adhered to asphalt.

3.9. ROOF MEMBRANE INSTALLATION

- A. Membrane Application: Apply roofing in accordance with roofing system manufacturer's current instructions and the following requirements. Application of roofing membrane components shall immediately follow application of insulation overlay, as a continuous operation.
- B. Aesthetic Considerations: An aesthetically pleasing overall appearance of the finished roof application is a standard requirement for this project. Make necessary preparations, utilize recommended application techniques to apply the specified materials, and exercise care in ensuring that the finished application is acceptable to the Owner.
- C. Priming: Prime metal, concrete, and masonry surfaces, and both sides of metal flashings, in contact with bituminous products, with a uniform coating of the specified asphalt primer.
- D. Membrane Adhesive Application: Membrane adhesive can be applied by roller, squeegee or spray unit, as recommended by manufacturer of roofing system. Apply cold adhesive in a smooth, even, continuous layer without breaks or voids. Utilize an application rate of 1 1/2 to 2 gal/sq for interply applications. Utilize an application rate of 2 to 2 1/2 gal/sq over irregular or porous substrates.
- E. Adhesive and Primer Consistency: Thinning or alterations of adhesives, primer, and sealants will not be permitted.
- F. Roof Membrane Application: Apply all layers of roofing free of wrinkles, creases or fishmouths. Exert sufficient pressure on the roll during application to ensure prevention of air pockets. Broom base ply and top ply across their full width and along its full length.
 - 1. Apply all layers of roofing perpendicular to the slope of the roof, starting installation at eaves and working upslope. Extend all layers of roof membrane across hips of tapered insulation system. Offset base ply and finish ply end laps at hips.
 - 2. Apply all layers of the roof membrane without backwater or side-hill laps.
 - 3. "Mop and flop" installation of roof membrane will not be permitted.
- G. Base Ply Application (Hot Asphalt):
 - 1. Adhere cant strips in hot asphalt or roof cement to surface of base sheet and to vertical face of parapets and curbs.
 - 2. Fully bond the base ply to the surface of the mechanically attached base sheet. Install with minimum 3 inch side laps and 6" end laps. Apply each sheet directly behind the hot asphalt applicator.

- a. Embed each ply sheet in a solid mopping of hot Type III asphalt with 25lbs/100 sq. ft.
 3. Cut a dog ear angle at the end laps of the base ply, on overlapping selvage edges. Using a clean trowel, apply top pressure to seal T-laps immediately following sheet application. Stagger end laps a minimum of 3 feet.
 4. Extend the base ply, dry, across the face of all cant strips, and cut off at top of cant strips.
 5. Use a broom or weighted roller to apply light, even pressure to the top of the base ply membrane after it is rolled into the asphalt to promote proper adhesion.
- H. Base Ply Application (Cold Adhesive):
1. Adhere cant strips to surface of base sheet and to vertical face of parapets and curbs.
 2. Membrane adhesive can be applied by roller, squeegee or spray unit, as recommended by manufacturer of roofing system. Apply cold adhesive in a smooth, even, continuous layer without breaks or voids. Utilize an application rate of 1 1/2 to 2 gal/sq for interply applications. Utilize an application rate of 2 to 2 1/2 gal/sq over irregular or porous substrates.
 3. Fully bond the base ply to the surface of the mechanically attached base sheet. Install with minimum 3 inch side laps and 6" end laps. Apply each sheet directly behind the cold adhesive applicator.
 4. Cut a dog ear angle at the end laps of the base ply, on overlapping selvage edges. Using a clean trowel, apply top pressure to seal T-laps immediately following sheet application. Stagger end laps a minimum of 3 feet.
 5. Extend the base ply, dry, across the face of all cant strips, and cut off at top of cant strips.
 6. Use a broom or weighted roller to apply light, even pressure to the top of the base ply membrane after it is rolled into the cold adhesive to promote proper adhesion.
- I. Finish Ply Application:
1. Before installation of the finish ply begins, install an additional, fully adhered layer of base ply, as reinforcing sheet, across the cant strip, using specified flashing cement, extending 3" above the cant strip and 3" onto the horizontal surface of the previously installed base ply, in accordance with system manufacturer's instructions.
 2. At wood substrates, extend the backer ply, dry, above the cant strip, to the height of the finished base flashing and fasten to the substrate at 6" centers, in both directions, using specified, capped nails.
 3. Before installation of finish ply begins, install all flanged flashings over base ply as outlined in Paragraph 3.5 Roof System Interface with Related Components, below.
 4. Fully bond the finish ply to the base ply, utilizing minimum 3 inch side and 6" end laps. Apply each sheet directly behind the cold adhesive applicator. Stagger end laps of the finish ply a minimum 3 feet.
 5. Cut a dog ear angle, at the end laps of the finish ply, on overlapping selvage edges. Using a clean trowel, apply top pressure to top seal T-laps immediately following sheet application.
 6. Offset side laps of the finish ply 18 inches from side laps in the underlying base ply. Stagger end laps of the finish ply a minimum 3 feet from end laps in the underlying base ply and from the adjacent sheets of finish ply.
 7. Use a broom or weighted roller to apply light, even pressure to the top of the finish ply membrane after it is rolled into the cold adhesive to promote proper adhesion.
- J. Adhesive and Cement Overruns: Cover all adhesive and flashing cement overruns on the base flashing or finish ply surface with specified reflective coating while the adhesive or cement is still soft to ensure a monolithic surface color.
- K. Base Flashing Application: Flash walls and curbs using the reinforcing sheet and the aluminum clad flashing sheet, applied in specified flashing cement.

1. Except as noted above for wood substrates, fully adhere the reinforcing sheet to the base ply and other substrates using specified flashing cement, prior to installation of the finish ply. Incorporate minimum 3 inch side laps; extending the sheets a minimum of 3 inches onto the base ply surface and 3 inches up the wall or curb, above the cant, unless otherwise required by roof system manufacturer.
 2. Terminate the finish ply at the top of the cant. Cut the specified surface flashing sheet across the width of each roll, maintaining the selvage edge along one side of the cut flashing sheet.
 3. Apply a uniform coat of the specified flashing cement to the area to receive flashing coverage and to the backside of the precut section of base flashing. Set the flashing in place while exerting pressure on the flashing sheet to ensure complete contact with the wall/roof surfaces and to prevent air pockets. Check and seal all loose laps and edges.
 4. Fasten the top edge of the flashing sheet to wood blocking or to wood substrates using 1-1/4", stainless steel, capped, ring shank nails spaced at 4" centers.
 5. Secure top edge of the flashing sheet to masonry blocking with a termination bar fastened with drive pins at 6" O.C. through pre-punched holes.
- L. Catalyzed Acrylic Resin Flashing System (Interply Application Required): Install the liquid-applied primer and flashing system in accordance with the system manufacturer's printed installer's guidelines for an interply application. Observe all other applicable written recommendations as provided by the manufacturer.
1. Remove all bitumen, debris, rust, scale and other foreign matter from surfaces receiving catalyzed flashing system, prior to installation. Use scrapers, wire brush and/or grinders, as necessary.
 2. Treat cleaned areas receiving ParaPro Flashing with Siplast Pro-Prep and allow to dry.
 3. Apply Siplast ParaPro ProFleece to prepared surface of roof and penetrations thru roof in strict accordance with manufacturer's written instructions, including pre-saturation of ProFleece laps with the Catalyzed Acrylic Resin.
 4. Apply base coat and top coat of catalyzed resin to ParaPro fleece. Allow manufacturer's instructions regarding drying and curing time between coats.
- M. Water Cut-Offs: At end of each day's work, or when precipitation is imminent, construct water cut-offs at all open edges. Cut-offs can be built using asphalt or plastic cement and roofing felts, and shall be constructed so as to withstand protracted periods of service. Cut-offs must be completely removed prior to the resumption of roofing.
- N. Walk pads: Install specified walk pads over finish ply, at designated locations, using specified flashing adhesive.
- 3.10. ROOF SYSTEM INTERFACE WITH RELATED COMPONENTS
- A. Roof Drain Insert
1. Coat both top and bottom surfaces of drain insert flanged flashing with asphalt primer and allow to dry. When dry, set primed flange over field membrane plies in solid bed of black plastic roof cement.
 2. Secure flange of the drain insert to previously installed wood blocking with a minimum of six (6) fasteners evenly spaced around the drain insert flange.
 3. Seal flange with one base ply to field membrane ply. Fit stripping ply snugly to drain insert opening. Extend stripping ply at least six inches beyond the flange.
- B. Walk Pad: Adhere the walk pad to the finish ply using the specified plastic cement. Apply the specified cement in a 3/8 inch thickness to the back of the product in 5 inch by 5 inch spots in accordance with the pattern as supplied by the walk pad manufacturer. Walk-in each sheet after

application to ensure proper adhesion. Use a minimum spacing of 2 inches between sheets to allow for proper drainage.

- C. Sealant: Apply a smooth continuous bead of the specified sealant at the exposed edges of the finish ply at the transition to all metal flashings incorporated into the roof system.
- D. Gas Piping: Support gas piping at 9' O.C. with specified gas pipe stands. Set gas pipe stand in a bed of utility cement on a sacrificial cap sheet membrane, which extends a minimum of 4" beyond the gas pipe support base in all directions. Sacrificial cap sheet membrane shall be spot adhered to the cap sheet surfacing.
- E. Condensate Drain Piping: Support PVC piping at 5' O.C. with specified condensate pipe stands. Set pipe stand in a bed of utility cement on a sacrificial cap sheet membrane, which extends a minimum of 4" beyond the pipe support base in all directions. Sacrificial cap sheet membrane shall be spot adhered to the cap sheet surfacing.
- F. Miscellaneous Flanged Flashings
 - 1. Coat both top and bottom surfaces of miscellaneous flanged flashing with asphalt primer and allow to dry. When dry, set primed flange over field membrane plies in solid bed of black plastic roof cement.
 - 2. If flange width exceeds 12 inches, secure it to previously installed wood blocking with suitable fasteners placed near each corner and at the center of each side.
 - 3. Seal flange with one base ply to field membrane ply. Fit stripping ply snugly to vertical flanges. Extend stripping ply at least six inches beyond the flange.
 - 4. Extend flashing sleeves a minimum height of 8" above the roof surface.

3.11. FIELD QUALITY CONTROL AND INSPECTIONS

- A. Site Condition: Leave all areas around job site free of debris, roofing materials, equipment and related items after completion of job.
- B. Schedule required manufacturer's progress inspections at specified intervals. Notify Project Architect of scheduled inspection dates. Provide Project Architect with copies of manufacturer's inspection reports in a timely fashion. Provide pertinent information regarding proposed and completed repairs required by the manufacturer.
- C. Notification of Completion: Notify the manufacturer by means of manufacturer's printed Notification of Completion form of job completion in order to schedule a final inspection date.
- D. Final Inspection
 - 1. Notify Project Architect of scheduled time and date of manufacturer's final inspection.
 - 2. Post-Installation Meeting: Hold a meeting at the completion of the project, attended by all parties that were present at the pre-job conference. A punch list of items required for completion shall be compiled by the Contractor and the manufacturer's representative. Complete, sign, and mail the punch list form to the manufacturer's headquarters and to the Project Architect.
- E. Issuance of The Guarantee: Complete all post installation procedures and meet the manufacturer's final endorsement for issuance of the specified guarantee.

END OF SECTION 07550

SECTION 07591 - REROOFING REMOVALS & PREPARATION

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Existing Roof System Assembly Removals
2. Preparing the Existing Substrate Decking for New Roof Construction
3. Installation of New Wood Blocking at Parapet Walls
4. Installation of New Wood Blocking at Eaves
5. Installation of New Wood Blocking at Expansion Joints
6. Installation of New Drain Inserts at Existing Main Drains
7. New Overflow Scupper Construction
8. Existing Abandoned Equipment Curb Removals
9. Existing Roofing System Assemblies Disposal

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Unit Prices: Refer to Division 1 Section 01025 "Measurement and Payment" for description of Work in this Section affected by unit prices.
- B. Cementitious Wood Fiber Plank: Refer to Division 3 Section 03511 "Cementitious Wood Fiber Plank" for description of Work in this Section affected by cementitious wood fiber plank replacement.
- C. Gypsum Concrete Decking: Refer to Division 3 Section 03520 "Gypsum Concrete Roof Deck" for description of Work in this Section affected by gypsum deck replacement.
- D. Steel Roof Deck: Refer to Division 5 Section 05310 "Steel Roof Deck" for description of Work in this Section affected by steel roof deck replacement.
- E. Wood Blocking: Refer to Division 6 Section 06100 "Rough Carpentry" for description of Work in this Section affected by wood blocking installation.

1.3 SUBMITTALS

- A. Product Data: Reference Section 01300 "Submittals."
- B. Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including exterior and interior finish surfaces that might be misconstrued as having been damaged by reroofing operations. Submit before Work begins.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Reference Section 01400 "Quality Control."
- B. Pre-roofing Conference: Prior to the work beginning, conduct a pre-construction conference with the Owner and Architect at St. James Middle School with the Contractor's project foreman and project manager in attendance.

1.5 PROJECT CONDITIONS

- A. Owner will occupy portions of building immediately below reroofing area. Conduct reroofing so Owner's operations will not be disrupted. Provide Owner with not less than 72 hours' notice of activities that may affect Owner's operations.
- B. Coordinate work activities daily with Owner so Contractor can place protective dust or water leakage covers over sensitive equipment or furnishings, shut down HVAC and fire-alarm or detection equipment if needed, and evacuate occupants from below the work area if desired.
- C. Before working over structurally impaired areas of deck, notify Owner to evacuate occupants from below the affected area. Verify that occupants below the work area have been evacuated prior to proceeding with work over the impaired deck area.
- D. Protect building to be reroofed, building interiors, adjacent buildings, walkways, site improvements, exterior plantings, and landscaping from damage or soiling from reroofing operations. Repair affected areas to original existing condition previous to reroofing project.
- E. Protect occupants and property below roofing activity at all times until work overhead is complete to the point that protection is no longer required.
- F. Maintain access to existing walkways, corridors and other occupied or used facilities.
 - 1. Do not close or obstruct walkways, corridors and other occupied or used facilities without written permission from authorities having jurisdiction.
- G. Limit construction loads on roof to 20 lbs/SF for uniformly distributed loads which includes rooftop equipment wheel loads.
- H. Weather Limitations: Proceed with reroofing preparation only when existing and forecasted weather conditions permit Work to proceed without water entering into existing roofing system or building.

PART 2 PRODUCTS

2.1 AUXILIARY REROOFING MATERIALS

- A. General: Auxiliary reroofing preparation materials recommended by roofing system manufacturer for intended use and compatible with components of new roofing systems.
- B. Wood blocking to wood substrate: Stormguard® hot dipped galvanized ring shanked or spiral decking nails with minimum 3/8" head as manufactured by Maze Nails.
- C. Wood to Wood Screws: Shall be ITW Buildex DEC-KING™ Climacoat™ bugle head, size for length required 6x1- 1/4" (part No. 2176500) for sheathing to sheathing application.
- D. Wood blocking to structural steel: Corrosion resistant, self tapping, self-drilling screw with low profile head such as TRAXX™ 4.5 by ITW Buildex where length will allow; and where greater length is required countersink head and utilize TRAXX™ 5 by ITW Buildex. Acceptable equal alternates as manufactured by Construction Fasteners, Rawl, Olympic and Tru-Fast must be submitted for approval.

- E. Wood to Metal Screws: Shall be ITW Buildex TRAXX™ Climacoat™ flat head 12-24X2 ½" (part No. 1094000).
- F. Wood blocking to gypsum or lightweight insulating concrete decking: Corrosion resistant toggle bolt with low profile head such as RAWL Speed-Lock R Toggle.
- G. Wood blocking to masonry wall: hot dipped, galvanized 3/8" diameter threaded rod embedded a minimum of 4" into the masonry and set in fast curing epoxy.
- H. Fast Curing Epoxy: ASTM C881-90, Type IV, Grade 3, Class A, B and C, two-part, fast curing epoxy such as C6 Fast Curing Epoxy, as manufactured by Epcon.
- I. One-Piece, Vibration Resistant Masonry Anchor: Shall be Powers SPIKE® ¼ inch diameter manufactured from high grade carbon steel (ASTM B 633) with mushroom head at one end and a specially designed "S" shaped expansion mechanism on the working end. Perma-Seal Fluoropolymer Coating. Pre-drill hole 1/2-inch depth greater than SPIKE length. Johns Manville CD-10 Fastener w/ CR-10 coating approved equal.
- J. Metal Primer: High performance, corrosion resistant and fast drying metal primer such as Interior/Exterior Flat Rusty Metal Primer Paint and Primer in One, as manufactured by Rust-Oleum.

2.2 ROOF DRAIN INSERT

- A. 11 gage spun aluminum drain body with watertight mechanical seal, including cast aluminum clamping ring and strainer dome, such as Hercules Retro Drain as manufactured by OMG Roofing Products.

2.1 DECKING FOR INFILL AT ABANDONED CURBS

- A. 1/8" thick steel plate.
- B. ¼"x2"x2" and ¼"x3"x3" miscellaneous steel angle.
- C. 22 gage steel metal "B" deck: 1 ½" deep, intermediate rib, structural roof deck unit that provides a support surface for various types of roofing materials.
 - 1. Profile to match existing metal deck.
- D. Gypsum Insulation Overlayment: Georgia Pacific DensDeck Prime; ¼" x 4' x 4'; furnished by manufacturer as part of the guaranteed roof system (USG Securock; ¼" x 4' x 4') (Invinsa ® JM ¼"x4x4) (Soprema Sopraboard 1/8" x 4' x 4').

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

- A. Protect existing roofing systems that are indicated not to be reroofed.
- B. Coordinate with Owner to shut down air intake equipment in the vicinity of the Work. Cover air intake louvers before proceeding with reroofing work that could affect indoor air quality or activate smoke detectors in the ductwork.

1. Contractor is responsible for disconnection of existing roof mounted equipment and electrical wiring, as well as all reconnections and testing.
- C. Check all internal roof drains for clear passage of storm water. Report any clogged drains to OWNER prior to the start of reroofing work. Contractor's start of work is regarded as Contractor's acceptance of clear drainage. Contractor will be responsible for all work required to clear drainage path after work under this contract has begun.
1. Replace any plastic, damaged or missing drain strainer baskets with new cast iron strainer baskets.
 2. Replace any damaged or broken drain clamping rings or bolt fasteners.
- D. Raise mechanical equipment and curbs as necessary to maintain minimum 8" base flashing height.
1. Extend sanitary vents as necessary to a minimum height of 8" above the finished roof surface.
- E. Maintain roof drainage path in functioning condition to ensure roof drainage at end of each workday. Prevent debris from entering or blocking roof drainage path and conductors. For internal drainage systems, use roof-drain plugs specifically designed for this purpose. Remove roof-drain plugs at end of each workday, when no work is taking place, or when rain is forecast.
- F. It is not anticipated that hazardous materials will be encountered in the work of this project. There are no existing products containing asbestos fibers. Reference Section 01010 Summary of Work.
1. If encountered materials are suspected of containing hazardous materials, do not disturb; immediately notify Architect and Owner. Hazardous materials not currently identified in the contract documents will be removed by Owner as a Change Order to the Contract or under separate contract with separate specialty contractor.
- G. Storage or sale of removed items or materials on-site will not be permitted.
- H. Utility Service: Maintain existing utilities in service and protect them against damage during the selective demolition operations.
1. Maintain security and fire protection facilities in service during selective demolition operations.
 2. 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 in writing a report to the Architect.
 3. Verify that rooftop utilities and service piping have been shut off before commencing work which may not be safe if service is left on.
 4. Coordinate shutdown or disconnect of rooftop utilities or service piping with Owner, no less than 72 hours before shutdown or disconnect are scheduled.
- I. Site Access and Temporary Controls: Conduct removals, preparations and roofing installation operations to ensure minimum interference with roads, streets, walks, walkways and other adjacent occupied and used facilities.
1. Do not close or obstruct roads, streets, walks, walkways and other adjacent occupied and used facilities without written permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.

2. Erect temporary protection where required by authorities having jurisdiction.
- J. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 1. Provide Temporary toilet facilities on site in location to be determined by Owner and Architect.
 2. Provide chain link fencing for kettle with temporary standards. Do not penetrate existing pavement to support fencing or temporary barricades.
- K. Examination of Roof Drains
 1. Remove all asphalt or misc. sealant accumulations from interior of all drain and overflow drain bowls prior to start of roof removals. Water test all prepared drain bowls and overflow drain bowls to locate any existing defects in drain casting.
 2. Verify integrity of anchor lugs or threaded attachment points for drain clamping rings.
 3. Advise Project Architect of any defect found in drain assemblies prior to start of roof removal. Contractor is responsible for all drains once new roof assembly is applied.

3.2 EXISTING ROOF SYSTEM ASSEMBLY REMOVALS:

- A. General: Notify Owner each day of extent of removals or roof tear-off proposed and obtain authorization to proceed from Owner's point of contact.
- B. RAs 1, 3, 4, 5, 6 & 7:
 1. Remove existing aggregate surfaced, Built-Up Roof system assembly, metal and bituminous flashings and other roofing system components, down to the cementitious wood fiber plank deck, and discard in accordance with SCDHEC regulations.
 2. Remove and discard existing metal coping cap.
 3. Remove and discard existing metal through wall scupper liners, conductor heads and downspouts at RAs 1, 3 & 7.
 4. Remove and discard existing metal edge trim at RAs 4, 5 & 6.
 5. Remove and discard existing metal gutter and downspouts at RAs 4, 5 & 6.
 6. Remove and discard existing wooden cant at the perimeter of RAs 1, 3 & 7.
 1. Remove and discard existing metal expansion joint flashings.
 2. Remove, discard and repair remaining substrate surface at any obstruction which may interfere with the proper application of new materials.
- C. RA 2:
 1. Remove existing aggregate surfaced, Built-Up Roof system assembly, metal and bituminous flashings and other roofing system components, down to the gypsum concrete roof deck, and discard in accordance with SCDHEC regulations.
 2. Remove and discard existing metal edge trim.
 1. Remove and discard existing metal gutter and downspouts.
 2. Remove and discard existing metal expansion joint flashings.
 3. Remove and discard all abandoned equipment curbs.
 4. Remove, discard and repair remaining substrate surface at any obstruction which may interfere with the proper application of new materials.
- D. RAs 8 & 9:

1. Remove existing aggregate surfaced, Built-Up Roof system assembly, metal and bituminous flashings and other roofing system components, down to the metal roof deck, and discard in accordance with SCDHEC regulations.
1. Remove and discard existing metal through wall scupper liners, conductor heads and downspouts.
2. Remove and discard existing metal expansion joint flashings.
3. Remove and discard all abandoned equipment curbs.
4. Remove, discard and repair remaining substrate surface at any obstruction which may interfere with the proper application of new materials.

3.3 PREPARING THE EXISTING SUBSTRATE DECKING FOR NEW ROOF CONSTRUCTION:

- A. Inspect roof deck, daily, during and after tear-off of BUR roofing system. Provide fall-thru protection over known or suspected areas of deteriorated roof deck
- B. Verify that attachment of the existing wood blocking meets the requirements of Table 2304.10.1, "Fastening Schedule," in the International Building Code. Install additional fasteners as necessary.
- C. Remove any existing deteriorated roof deck and replace with new decking to match existing profile and thickness. Maintain and submit daily log of deck replacement work.
- D. Do not proceed with installation of new roof decking until the Architect or Owner are notified and direction is given to proceed with the work.
- E. Extend wood blocking at equipment curbs, parapet walls and expansion joints as necessary to maintain minimum 8" base flashing heights. Expand wood blocking at equipment curbs as necessary to maintain a 1/2" overlap of equipment base vertical face.
- F. Application of new materials constitutes approval by the installing roofing contractor that the substrate conditions are satisfactory.
- G. Cementitious Wood Fiber Deck:
 1. If cement fiber decking is damaged or deteriorated, repair or replace in accordance with Section 03511 "Cementitious Wood Fiber Plank".
 2. Extend wood blocking at equipment curbs and expansion joints as necessary to maintain minimum 10" base flashing heights.
 3. If deck surface is not suitable for receiving new roofing, or if structural integrity of deck is suspect, immediately notify Roof Consultant. Do not proceed with installation until directed by Roof Consultant.
- H. Lightweight Gypsum Concrete Deck:
 1. If gypsum concrete decking is damaged or deteriorated, repair or replace in accordance with Section 03520 "Gypsum Concrete Roof Deck".
 2. Extend wood blocking at expansion joints as necessary to maintain minimum 10" base flashing heights above finished roof system.
 3. If deck surface is not suitable for receiving new roofing, or if structural integrity of deck is suspect, immediately notify Roof Consultant. Do not proceed with installation until directed by Roof Consultant
- I. Metal Deck:

1. Replace missing, broken, or loose side lap fasteners that secure deck panels to one another, using specified fasteners. Maximum spacing of side lap fasteners shall be 20" OC.
 2. At roof deck perimeter 6' edge, decrease fastener spacing of the existing roof deck to structural supports by installing additional specified, self-drilling fasteners spaced such that the maximum distance between fasteners is 6".
 3. Use a rotary wire brush to remove scale and rust from steel roof deck. Coat prepared areas with one coat of Rust-Oleum Rusty Metal Primer. Maintain and submit daily log of unit price work. See Section 01010 of these specifications for Unit Price Quantities to include in Base Bid for removal of rust and scale and for treatment of rusted deck.
 4. Remove any existing deteriorated steel roof deck and replace with new steel roof deck of like gauge and profile. Maintain and submit daily log of unit price work. See Section 01010 of these specifications for Unit Price Quantities to include in Base Bid for metal deck replacement.
 5. Do not proceed with installation of new roof decking until Roof Consultant or Owner are notified and direction is given to proceed with the work.
- J. Confirm that all items to be removed, have been, and that appropriate substrate has been installed and appropriately attached to structure for support of the new roofing system.
- K. CORRECT ALL UNSATISFACTORY SUBSTRATE CONDITIONS PRIOR TO THE APPLICATION OF NEW ROOF SYSTEM MATERIALS. RENAIL EXISTING AND ADD NEW NAILS TO ROOF SHEATHING TO ASSURE SOLID, SECURE DECK.

3.4 INSTALLATION OF NEW WOOD BLOCKING AT PARAPET WALLS:

- A. Remove and discard existing coping cap and metal flashings.
- B. Install new 2x4 blocking on top of the existing wood blocking, flush with the inside and outside face of the coping, as shown on the Project Drawings.
- C. Secure new wood blocking to existing wood blocking with (2) wood screws spaced every 16" O.C.
- D. Install ¾" plywood sheathing attached to new wood blocking with fasteners spaced 6" O.C.
- E. The exterior, top, and interior face of the new wood blocking are to be covered with 45 mil peel-and-stick SAWU membrane on the same day blocking is installed.

3.5 INSTALLATION OF NEW WOOD BLOCKING AT EAVES

- A. At RA 2:
 1. Secure existing blocking with additional fasteners as necessary to decrease fastener spacing to 16" O.C.
 2. Install new 2 x 6 vertically on the exterior side of the eave, flush with the existing blocking. Cut a notch on the back side of the new wood blocking to receive new metal fascia wrap.
 3. Secure new 2 x 6 wood blocking over the existing wood blocking with the top 2 x 6 board cut with a slight taper to provide slope over the eave to gutter. Fasten with wood screws at 16" O.C., staggered.
 4. Stagger board ends a minimum 24" over existing wood blocking and between layers.
- B. At RAs 4, 5 & 6:
 1. Secure existing blocking with additional fasteners as necessary to decrease fastener spacing to 16" O.C.

2. Install new 2 x 6 vertically on the exterior side of the eave, flush with the existing blocking. Cut a notch on the back side of the new wood blocking to receive new metal fascia wrap.
3. Secure two layers of new 2 x 6 wood blocking over the existing wood blocking with the top 2 x 6 board cut with a slight taper to provide slope over the eave to gutter. Fasten with wood screws at 16" O.C., staggered.
 - a. Stagger board ends a minimum 24" over existing wood blocking and between layers.
4. The exterior, top, and interior face of the new wood blocking are to be covered with 45 mil peel-and-stick SAWU membrane on the same day blocking is installed. Extend SAWU onto the existing roof surface a minimum of 6".
- C. The exterior, top, and interior face of the new wood blocking are to be covered with 45 mil peel-and-stick SAWU membrane on the same day blocking is installed. Extend SAWU onto the existing roof surface a minimum of 6".

3.6 INSTALLATION OF NEW WOOD BLOCKING AT EXPANSION JOINTS:

- A. Prior to fastening the new wood blocking to the existing wood blocking, verify that the existing blocking is securely attached to the structure. If necessary, secure existing blocking with additional fasteners as necessary to decrease fastener spacing to 16" O.C.
- B. At roof-to-wall expansion joints, install new 2 x 6 wood blocking on top of the existing wood blocking at the expansion joint, as shown on Project Drawings.
 1. New wood blocking should finish approximately 10" minimum above the new roof assembly.
 2. Fasten new wood blocking to top of existing wood blocking with two screws at 16" O.C.
 3. Cut a slight taper to the top pieces of wood blocking, providing slope toward the new roofing assembly.
 4. The exterior, top, and interior face of the expansion joint are to be covered with 45 mil peel-and-stick SAWU membrane on the same day blocking is installed.
 5. Create an envelope fold between the wood blocking on either side of the joint, using 20 mil PVC flashing filled with un-faced fiberglass batt insulation.

3.7 INSTALLATION OF NEW DRAIN INSERTS AT EXISTING MAIN DRAINS (RA 8):

- A. Remove existing clamping ring and dome from the main drain bowl and discard.
- B. After existing roof assembly has been removed around drain sumps, install new wood blocking around existing main roof drain to support the flange of the new drain insert.
 1. New wood blocking should finish approximately 1.5" above metal roof deck.
- C. After application of the base sheet and base ply, coat both top and bottom surfaces of drain insert flanged flashing with asphalt primer and allow to dry. When dry, set primed flange over field membrane plies in solid bed of black plastic roof cement.
- D. Secure flange of the drain insert to previously installed wood blocking with a minimum of six (6) fasteners evenly spaced around the drain insert flange.
- E. Expand mechanical seal to provide a watertight connection to the existing drain leader.
- F. Seal flange with one base ply to field membrane ply. Fit stripping ply snugly to drain insert opening. Extend stripping ply at least six inches beyond the flange.

- G. After the new roof assembly has been installed, install new clamping ring and strainer basket to the body of the new drain insert.

3.8 NEW OVERFLOW SCUPPER CONSTRUCTION:

- A. At locations indicated on the roof plan, cut new overflow scupper openings in the existing and new wood blocking at the parapet walls.
- B. Rough openings for the new overflow scuppers shall be a minimum of 9" high x 11" wide.
- C. Frame the rough opening with new 2 x 8 wood blocking on the top, bottom and sidewalls.
- D. Fasten new wood blocking to the masonry or wood walls with appropriate fasteners.
- E. Finished opening of the new overflow scuppers shall be a minimum of 6" high x 8" wide when new scupper liner is installed.

3.9 EXISTING ABANDONED EQUIPMENT CURB REMOVALS:

- A. Remove and discard abandoned equipment curbs and caps.
- B. Where openings in the existing roof deck are less than 18", install a 1/8" steel plate over the opening, extending a minimum of 6" beyond the opening in all directions.
 - 1. Fasten steel plate to the roof deck with a minimum of 3 fasteners per side.
- C. Where openings in the roof deck are larger than 18" but less than 36", install new 3" x 3" x 5/16" miscellaneous steel angle to existing steel angle framing the opening with (2) ITW Buildex, Traxx fasteners on each end. The top flange of angle shall be flush with the bottom of the roof deck.
- D. Where openings in the roof deck are larger than 36" x 36", install miscellaneous steel angle perpendicular to existing angles or bar joists at opening ends and 30" O.C. maximum intermediate spacing. Secure to top chord of existing bar joist angle with (2) ITW Buildex, Traxx fasteners on each end.
- E. Where the opening in the roof deck does not fall on a bar joist, install new 3" x 3" x 1/4" miscellaneous steel angles perpendicular to perimeter steel angles and secure to steel angle with 1.5"x2" miscellaneous angle clips fastened with (2) 1/4" ITW Buildex, Traxx fasteners through steel angle and to each other through the angle flange with (2) 1/4" bolts.
- F. Install new 22-gauge galvanized steel "B" deck to miscellaneous steel angles and attach with hex-headed, self tapping fasteners at 6" O.C.

3.10 EXISTING ROOFING SYSTEM ASSEMBLIES DISPOSAL:

- A. Collect and place demolished materials in containers daily. Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.
- B. For Asbestos Containing Material (ACM) use protocol as required by all regulatory agencies having jurisdiction. Utilize disposal site as selected by the Owner.
- C. Do not burn demolished material on site.
- D. Transport demolished materials off Owner's property and dispose of legally.

END OF SECTION 07591

SECTION 07620 - FLASHING AND SHEET METAL

PART 1 GENERAL

1.1 WORK INCLUDED

- 1.1.1 Fabrication and installation of fascia extension, coping cap and locking cleats.
- 1.1.2 Fabrication and installation of primary and overflow scupper liners.
- 1.1.3 Fabrication and installation of new conductor head and downspouts.
- 1.1.4 Fabrication and installation of new metal edge trim and fascia wrap.
- 1.1.5 Fabrication and installation of new gutter and downspouts.
- 1.1.6 Fabrication and installation of new counter flashings and receivers.
- 1.1.7 Fabrication and installation of new expansion joint flashing.
- 1.1.8 Installation of new HVAC rail.
- 1.1.9 Installation of new drain flashing.
- 1.1.10 Fabrication and installation of new miscellaneous flanged flashings.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- 1.2.1 Rough Carpentry - Section 06100
- 1.2.2 Modified Bitumen Membrane Roofing – Section 07550
- 1.2.3 Reroofing Removals & Preparations – Section 07591

1.3 QUALITY ASSURANCE

- 1.3.1 Qualifications of the Manufacturer: Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the Architect.
- 1.3.2 Qualifications of the Installers: Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and are completely familiar with the specified requirements and the methods needed for the proper performance of the work in this section.

1.4 SHOP DRAWINGS

- 1.4.1 Submit shop drawings for all metal component shapes in accordance with specifications.

1.4.2 Indicate material profile, jointing pattern, jointing details, fastening methods, and installation details.

1.5 SUBMITTALS

1.5.1 Refer to Shop drawings, Product Data and Samples - Section 01340

1.6 STORAGE AND HANDLING

1.6.1 Store materials dry in accordance with Specifications.

1.6.2 Stack material to prevent twisting, bending, or abrasion.

1.6.3 During storage prevent material contact with any substance that would discolor or stain, including soil and water.

1.7 SCHEDULING

1.7.1 All new sheet metal work shall be closely coordinated with the installation of the new roofing membrane such that roofing membrane terminations will not be left unprotected by metal.

1.7.2 New sheet metal components shall be installed directly after roofing work such that roofing membrane terminations will not be left unprotected by metal.

1.7.3 Immediately after installation of new sheet metal work install all bituminous flashings such that moisture is not trapped under new metal components.

1.8 GUARANTEE

1.8.1 All new materials and workmanship for work provided under this section of the specifications shall be guaranteed in writing by the contractor to be maintained in a watertight condition without cost to the Owner for a period of two (2) years after date of final completion.

PART 2 PRODUCTS

2.1 SHEET METAL MATERIAL

2.1.1 Pre-finished Metal: Smooth 0.040 aluminum, ASTM B204, primed both sides and factory finished on one side with Kynar based fluoropolymer coating. Metal to be masked with protective plastic film. Color to be selected by Owner from the manufacturer's premium color chart. Accepted manufacturers are Vincent Metals and Petersen Aluminum.

2.1.2 Aluminum, Sheet: Conforming to ASTM B09. Note: Divorce from any preservative treated lumber with at a minimum one layer of 15 Lb. asphalt saturated felt.

2.1.3 Mill Finish Aluminum Sheet: Aluminum sheets conforming to ASTM B209. Note:

Divorce from any preservative treated lumber with at a minimum one layer of 15 Lb. asphalt saturated felt.

- 2.1.4 Termination Bar: Shall be Aluminum Alloy 6061-T6, 1/8-inch x 1 1/4 inch.
- 2.1.5 Stainless steel: 24 gage, Type 302/304 Mill Rolled Finish No.2D or 2B, Conforming to ASTM A167, Federal Specification QQ-S-766C.
- 2.1.6 Solder for Stainless Steel: Solder joints with stainless steel type flux, 50/50 solder, neutralize flux after soldering.

2.1.7 METAL COMPONENT WEIGHT & FINISH SUMMARY:

2.1.7.1	coping cap	.040 pre-finished aluminum
2.1.7.2	fascia extension	.040 pre-finished aluminum
2.1.7.3	locking cleats	.050 mill finished aluminum
2.1.7.4	primary scupper liner	24 ga. stainless steel
2.1.7.5	overflow scupper liner	24 ga. stainless steel
2.1.7.6	outside closure	.040 pre-finished aluminum
2.1.7.7	conductor head	.040 pre-finished aluminum
2.1.7.8	downspout	.040 pre-finished aluminum
2.1.7.9	downspout strap assembly	1/8" x 1-1/2" aluminum flat bar
2.1.7.10	metal edge trim	.040 pre-finished aluminum
2.1.7.11	metal fascia wrap	.040 pre-finished aluminum
2.1.7.12	gutter	.040 pre-finished aluminum
2.1.7.13	gutter bracket	1/8" x 1-1/2" aluminum flat bar
2.1.7.14	gutter spacer	1/8" x 1" aluminum flat bar
2.1.7.15	counter flashing, curb	.040 mill finished aluminum
2.1.7.16	counter flashing, wall	.040 pre-finished aluminum
2.1.7.17	expansion joint cap and flange	.040 pre-finished aluminum
2.1.7.18	drain flashing	4 lb. soft lead
2.1.7.19	miscellaneous flanged flashing	24 ga. stainless steel

2.2 EQUIPMENT RAIL

- 2.2.1 18-gauge galvanized steel.
- 2.2.2 Wood Nailer: "B" Style Overhang.
- 2.2.3 Minimum curb height 14"; actual curb height to be field verified.
- 2.2.4 Unitized Construction
- 2.2.5 Internally Reinforced
- 2.2.6 Continuous Welded Corner Seams

2.3 ACCESSORY MATERIALS

- 2.3.1 All miscellaneous clamps, straps and supports, not otherwise designated above, to be stainless steel.
- 2.3.2 Nails: Shall be hot-dipped galvanized or stainless-steel ring shank nails, size as required by construction. Use only stainless-steel nails with aluminum fabrications.
- 2.3.3 Metal to Metal Screws: Shall be ITW Buildex SCOTS stainless steel 12-14x1" (Part No. 1165209) with bonded washer.
- 2.3.4 Wood to Metal Screws: Shall be ITW Buildex TRAXX™ Climacoat™ flat head 12-24X2 1/2" (part No. 1094000).
- 2.3.5 Wood to Masonry Fasteners: Shall be ITW Buildex TAPCON™ Blue Climaseal™ flat head 1/4x2-3/4" (part No. PFH 3189407) with drill bit (part No. 3099910).
- 2.3.6 Wood to Wood Screws: Shall be ITW Buildex DEC-KING™ Climacoat™ bugle head, size for length required 6x1- 1/4" (part No. 2176500) for sheathing to sheathing application.
- 2.3.7 Caulking: Sealant shall be Sikaflex - 1a, manufactured by Sika Corporation; Chem-Calk 900, manufactured by Bostik, Inc.; or Sonolastic NP-1, manufactured by Sonneborn Building Products or approval equal. Color shall be selected by Owner.
- 2.3.8 Cleaner: For Sikaflex 1a, cleaner shall be Xylol, Toluol, Methly ethyl ketone or commercial solvent recommended by the sealant manufacturer.
- 2.3.9 Primer: Shall be as recommended by sealant manufacturer.
- 2.3.10 Flexible Vinyl Flashing: Shall be 20 mil PVC, width as required, such as that manufactured by BMCA, a division of GAF.
- 2.3.11 Masonry Expansion Fasteners: Shall be Powers Zamac Nailin drive anchor with Type 304 stainless steel nail 1/4" x 2" (Catalog No. 2876).

- 2.3.12 One-Piece, Vibration Resistant Masonry Anchor: Shall be Powers SPIKE® ¼ inch diameter manufactured from high grade carbon steel (ASTM B 633) with mushroom head at one end and a specially designed "S" shaped expansion mechanism on the working end. Perma-Seal Fluoropolymer Coating. Pre-drill hole 1/2-inch depth greater than SPIKE length. Johns Manville CD-10 Fastener w/ CR-10 coating approved equal.

PART 3 EXECUTION

3.1 INSPECTION

- 3.1.1 Inspect all surfaces to which metal is to be applied to verify they are clean, smooth, and free of depressions, waves, or projections and have solidly supported joints. Do not install metal unless surfaces are even, sound, clean, dry and free from defects that might affect the application of the new material.

3.2 REMOVALS

- 3.2.1 See Reroofing Removals & Preparations – Section 07591

3.3 FABRICATION, GENERAL

- 3.3.1 Fabricate and install sheet metal sections in 10-foot lengths except where shorter lengths are required by construction.
- 3.3.2 Form sections square, true, and accurate to size, free from distortion, sharp edges, and other defects detrimental to appearance or performance.
- 3.3.3 Junctures, intersections, corners, and unions of sheet metal fabrications shall be formed with 18-inch legs.
- 3.3.4 Interior and exterior corners and joints of coping cap shall be formed with 1-inch standing seams.
- 3.3.5 All Sheet Metal Requirements and Details are referenced to SMACNA Architectural Sheet Metal Manual, Seventh Edition.

3.4 INSTALLATION

- 3.4.1 Dissimilar metals shall be kept separated to prevent galvanic action. Preventative measures shall include separation by suitable electrolosis breaking material.
- 3.4.2 Separate any aluminum components from preservative treated lumber with a minimum divorcing layer of 15 lb. asphalt saturated building felt. NEVER USE ALUMINUM FASTENERS IN PRESERVATIVE TREATED LUMBER.
- 3.4.3 All metal flanges shall be installed on top of membrane in accordance with membrane manufacturer's written installation instructions.

- 3.4.4 Flash in metal flanges per roofing system manufacturer's written recommendations unless in conflict with contract documents and/or detail drawings. Resolve any conflict with Architect, prior to installation of stripping plys.
 - 3.4.5 Install metal to be water and weather tight with lines, arises, and angles sharp and true with plane surfaces free of waves or buckles.
 - 3.4.6 Form and install new counterflashing metal as shown in detail drawings. Lap joints 3 inches.
 - 3.4.7 All exposed edges of sheet metal shall be folded back, or hemmed, on concealed surfaces (minimum 1/2").
 - 3.4.8 All hemmed edges to be engaged in locking cleats shall have 3/4" hem with a folded back return of 5/8". Hem angle maximum 30°. Reference SMACNA Architectural Sheet Metal Manual (Seventh Edition) Figure 2-1 Detail 1.
 - 3.4.9 Install shop formed gravel stops, fascias, coping caps, control joints and expansion joint covers in 10-foot lengths, maximum, with a minimum number of pieces for each straight run. Adjust joint spacing so that no metal fabrication less than 5' in length is required.
 - 3.4.10 All locking cleats to be one gauge heavier than metal fabrication being secured by the cleat.
- 3.5 FABRICATION AND INSTALLATION OF FASCIA EXTENSION, COPING CAP AND LOCKING CLEATS:
- 3.5.1 Attach new continuous metal locking cleat to existing and new wood blocking with fasteners spaced 6" O.C.
 - 3.5.2 Attach new continuous metal fascia extension (profile like Detail 1 of Figure 2-1) to existing and new wood blocking with concealed pancake head fastener spaced 6" O.C. in a row approximately 1" down from the fascia top edge. Engage 3/4" drip edge to the continuous metal locking cleat and tong continuous 5/8" fold to backside of locking cleat.
 - 3.5.2.1 Fascia extensions and coping cap should be spaced to provide an equal exposure for each piece of metal.
 - 3.5.3 Form and install new metal coping cap in accordance with SMACNA Architectural Sheet Metal Manual Figure 3-4 A.
 - 3.5.4 Attach new continuous metal locking cleat to the inside and outside face of the parapet wall with fasteners spaced 6" O.C.
 - 3.5.5 Prior to the application of the metal coping cap, install a strip of 20 mil PVC flashing in as long a strip as practical over the wood blocking and metal locking cleats. Lap ends 6" minimum and cement with flashing cement.

- 3.5.6 Use maximum 10' sections with minimum number of sections in each straight run. Form 1" standing seam at ends of sections and seal.
 - 3.5.7 Engage the coping cap with locking cleats on the interior and exterior face of the parapet wall.
 - 3.5.8 Continuously crimp the hem of the coping cap to the locking cleat on the exterior and interior sides of the parapet wall.
- 3.6 FABRICATION AND INSTALLATION OF PRIMARY AND OVERFLOW SCUPPER LINER
- 3.6.1 Form and install new metal Through Parapet Main Scupper in accordance with SMACNA Figure 1-27A and Project Drawings. Lock and solder all joints and seams.
 - 3.6.2 Form and install new metal Through Parapet Overflow Scupper in accordance with SMACNA Figure 1-26A, 1-30A and Project Drawings. Lock and solder all joints and seams.
 - 3.6.3 Cover all concrete or masonry surfaces to be in contact with the scupper with a bed of black plastic roofing cement.
 - 3.6.4 Apply asphalt primer to top and bottom of scupper flanges and allow drying before installation in wall.
 - 3.6.5 Secure scupper flanges to the inside face of parapets with specified fasteners at 6" O.C.
 - 3.6.6 Install conductor heads at primary scuppers before installation of scupper liner.
 - 3.6.7 Install an exterior closure flange at overflow scuppers before installation of scupper liner.
 - 3.6.8 Strip scupper flanges with one stripping ply and cover with the base flashing membrane, both applied in manufacturer's recommended flashing adhesive.
- 3.7 FABRICATION AND INSTALLATION OF NEW CONDUCTOR HEAD AND DOWNSPOUTS:
- 3.7.1 Refer to SMACNA Figure 1-25F and project drawings.
 - 3.7.2 Fabricate conductor head with built-in overflow provisions on left and right sides of conductor head.
 - 3.7.3 Fabricate conductor head so that the Through Wall Scuppers penetrates through the center of the conductor head back wall.
 - 3.7.4 Secure back of the conductor head to the face of masonry with exposed drive pins on either side of scuppers. Assure that attachment to masonry is permanent and

secure.

- 3.7.5 Fabricate downspouts to be 3" x 4" in accordance with SMACNA Figure 1-32B with flat lock or s-lock seams. Flair ends of downspout tube to receive higher lengths of downspout.
 - 3.7.6 Downspout Straps for shall be fabricated in accordance with SMACNA Figure 1-35C. At downspouts, form downspout straps from 1/8" x 1.5" aluminum flat bar, spaced at ± 5 feet OC. Wrap three sides of straps with pre-finished metal matching color of downspouts.
 - 3.7.7 Apply sealant between flat surface of Downspout Straps and walls, prior to securing.
 - 3.7.8 Provide elbows and splash blocks at outlets where required to direct water away from building.
 - 3.7.9 Where downspouts drain onto adjacent roof areas, provide new metal splash pans below downspout outlet.
 - 3.7.10 Where downspouts at grade do not tie into existing sub-grade drainage system, provide new concrete splash pans below downspout outlet.
- 3.8 FABRICATION AND INSTALLATION OF NEW GUTTER AND DOWNSPOUTS:
- 3.8.1 Install new gutters at eave ends of RAs 2, 4, 5 & 6 as specified herein, reference Roof Plans for gutter and downspout locations. Refer to SMACNA Architectural Sheet Metal Manual (Seventh Edition) Figure 1-2; Style A.
 - 3.8.2 Form from 0.040-inch- thick, pre-finished metal sheet. Match profile indicated on drawings, complete with end pieces, outlet tubes, and other special pieces as required.
 - 3.8.2.1 Size of gutter to be 5 inches wide by 4 inches deep.
 - 3.8.3 Fabricate in minimum 120-inch-long sections, sized according to SMACNA's "Architectural Sheet Metal Manual."
 - 3.8.4 Install lap type gutter expansion joints at center of continuous runs exceeding 50' in length, per SMACNA Figure 1-6.
 - 3.8.5 Furnish and install gutter brackets spaced 36 inches o.c., fabricated from aluminum flat bar. Cover gutter supports with formed, pre-finished metal cover of finish and color to match gutter.
 - 3.8.6 Furnish and install gutter spacers spaced 36 inches o.c., staggered off gutter brackets 18" o.c., fabricated from aluminum flat bar.
 - 3.8.7 Fabricate downspouts to be 3" x 4" in accordance with SMACNA Figure 1-32B with

flat lock or s-lock seams. Flair ends of downspout tube to receive higher lengths of downspout.

- 3.8.8 Downspout Straps for shall be fabricated in accordance with SMACNA Figure 1-35C. At downspouts, form downspout straps from 1/8" x 1.5" aluminum flat bar, spaced at ± 5 feet OC. Wrap three sides of straps with pre-finished metal matching color of downspouts.
 - 3.8.9 Apply sealant between flat surface of Downspout Straps and walls, prior to securing.
 - 3.8.10 Provide elbows and splash blocks at outlets where required to direct water away from building.
 - 3.8.11 Where downspouts drain onto adjacent roof areas, provide new metal splash pans below downspout outlet.
 - 3.8.12 Where downspouts drain at grade, tie-in to existing sub-grade drainage system.
- 3.9 FABRICATION AND INSTALLATION OF NEW METAL EDGE TRIM AND FASCIA WRAP:
- 3.9.1 Form metal fascia wrap in accordance with project drawings and SMACNA Architectural Sheet Metal Manual (Seventh Edition) Figure 2-2A.
 - 3.9.2 Install new metal fascia wrap prior to installation of new metal gutter brackets and floating gutter.
 - 3.9.3 Secure metal fascia wrap to new or existing wood blocking with fastens spaced at 6" O.C. in a row approximately 1" down from the fascia top edge.
 - 3.9.4 Form metal edge trim in accordance with project drawings and SMACNA Architectural Sheet Metal Manual (Seventh Edition) Figure 2-1B and Figure 2-1 Detail 1 and the Basic Flange Nailing Pattern.
 - 3.9.5 After installation of the new metal gutter, set 20 mil PVC flashing over base ply and wood blocking at the eave in solid bed of black plastic roof cement, lapping over the back wall of the new metal gutter. Install flashing in continuous runs, with a minimum of 6" end laps, where necessary.
 - 3.9.6 Prior to the application of metal edge trim, prime both the top and bottom surface of the metal flange that comes in contact with bituminous roofing materials.
 - 3.9.7 Set metal edge trim bedded in roofing cement over 20 mil PVC flashing, also bedded in roofing cement over base ply membrane, as indicated on the drawings for roof edge conditions.
 - 3.9.8 Metal flange shall be fastened through membrane with fasteners spaced at 3" O.C. staggered.

- 3.9.9 Strip flange in with one stripping ply and cover with the cap sheet membrane, both applied in manufacturer's recommended flashing adhesive.
- 3.9.10 Lap end laps a minimum of 3" and shingle upslope at rake conditions creating a water-shedding condition at the joints between sections.
- 3.9.11 At rake conditions, provide a ¾" gravel stop at metal edge trim.
- 3.9.12 Prior to the installation of any fascia that is in direct contact with preservative treated wood, install a divorcing sheet of 15-lb asphalt impregnated building paper.
- 3.10 FABRICATION AND INSTALLATION OF NEW COUNTER FLASHINGS AND RECEIVERS:
 - 3.10.1 Form and install new two-piece counter flashing metal with lap in joints a minimum of 3 inches and lock joint lap. Notch and lap counterflashing sections a minimum of 3 inches.
 - 3.10.2 At equipment curbs, form counter flashings with a minimum 1-½" flange that rests on top of the curb and secure to the top of the curb with roofing nails spaced at 6" O.C.
 - 3.10.3 At masonry walls, remove existing raggle mounted counter flashing and clean out reglet to receive new counter flashing. Install counter flashing with lead wedges at 6" O.C. Apply sealant to reglet once receiver and wedges have been installed.
 - 3.10.4 After counterflashing receiver has been installed, pop rivet new counter flashing to receiver at 6" O.C.
- 3.11 FABRICATION AND INSTALLATION OF NEW EXPANSION JOINT FLASHING:
 - 3.11.1 Form and install new metal expansion joint covers as follows:
 - 3.11.1.1 At roof-to-roof expansion joints, install expansion joint flange and cover in accordance with the Project Drawings and in accordance with SMACNA Figure 5-5 A.
 - 3.11.1.1.1 Install new metal expansion joint flange and fasten to substrate with fasteners at 4" O.C. staggered.
 - 3.11.1.1.2 Attach a locking cleat to wood blocking with fasteners spaced at 6" O.C. on the side opposite the expansion joint flange.
 - 3.11.1.1.3 Install new fiberglass batt insulation inside polyethylene envelope fold between the new or existing wood knee-walls or the adjacent construction.
 - 3.11.1.1.4 Prior to the application of the expansion joint cover, install a strip of 20-mil PVC flashing in as long a strip as practical over

the flange and insulation envelope. Lap ends 6" minimum and cement with flashing cement.

- 3.11.1.1.5 Engage the hemmed end of the expansion joint cap to the locking cleat and tong the opposite end of the expansion joint cap over the expansion flange, leaving 1" between the flange and the cap to allow for structural movement.
 - 3.11.1.1.6 Tongued end of the expansion joint cover should have a 1.5" coverage over the expansion flange and 1" between the edge of the expansion joint cover and inside face of the curb.
 - 3.11.1.1.7 Use maximum 10' sections with minimum number of sections in each straight run. Form 1" standing seam at ends of sections and seal.
- 3.11.1.2 At roof-to-wall expansion joints, install expansion joint flange and cover in accordance with the Project Drawings and similar to SMACNA Figure 5-6 B.
- 3.11.1.2.1 Install new metal expansion joint flange and fasten to substrate with fasteners at 4" O.C. staggered.
 - 3.11.1.2.2 Install new fiberglass batt insulation inside polyethylene envelope fold between the new or existing wood knee-walls or the adjacent construction.
 - 3.11.1.2.3 Prior to the application of the expansion joint cover, install a strip of 20-mil PVC flashing in as long a strip as practical over the flange and insulation envelope. Lap ends 6" minimum and cement with flashing cement.
 - 3.11.1.2.4 Attach vertical face of the expansion joint cover to substrate masonry with masonry fasteners at maximum spacing of 12" O.C. and do not attach through end laps.
 - 3.11.1.2.5 Tong the expansion joint cap over the expansion flange, leaving 1" between the flange and the cap to allow for structural movement.
 - 3.11.1.2.6 Tongued end of the expansion joint cover should have a 1.5" coverage over the expansion flange and 1" between the edge of the expansion joint cover and inside face of the curb.
 - 3.11.1.2.7 Use maximum 10' sections with minimum number of sections in each straight run. Lap ends of sections 4" and apply three (3) parallel rows of sealant between the laps of the sloped and vertical faces of the cover.

3.11.1.2.8 After new expansion joint cap has been installed, install new metal two-piece counterflashing and receiver as described in this section.

3.12 INSTALLATION OF NEW HVAC RAIL.

3.12.1 Field measure and verify the height of the new HVAC rail from the top of the existing metal deck to the underside of the HVAC equipment.

3.12.2 Set HVAC rail on metal deck and secure with fasteners spaced 6" O.C.

3.12.3 Install new rigid insulation on both sides of the new HVAC rail. Rigid insulation to finish flush with the wood nailer on top of the rail.

3.12.3.1 Install additional wood blocking if necessary to fully support the new or existing HVAC equipment.

3.12.4 After new roof membrane has been installed, install new HVAC rail cap and secure to wood nailer with long life fasteners at 12" o.c.

3.13 INSTALLATION OF NEW DRAIN FLASHING:

3.13.1 Prior to the installation of the new modified bitumen cap sheet, install new drain flashings at existing roof drains and overflow drain over the base ply.

3.13.2 Use 4 lb. Lead sheet 3'x3' or at least large enough to extend a minimum of 12" outside the drain flashing flange.

3.13.3 Cut hole in the center of the lead flashing with a diameter 2" less than the inside diameter of the flashing flange.

3.13.4 Prior to the application, prime top and bottom surface of lead flashing with asphalt primer, center over drain and set in a bed of black plastic roofing cement. Install drain clamping ring over lead sheet and pull it down uniformly and tight.

3.13.5 Trim excess lead from inside flashing flange leaving approximately 1-1/2" of lead extending into the drain bowl. Mallet lead to conform to shape of drain bowl. Remove and install new lead flashing if flashing is torn or cut.

3.13.6 Where bolts penetrate lead flashings, assure holes are punched through lead flashings at a smaller diameter than that of bolts. Apply clamping flange and secure uniformly and tight.

3.13.7 Cover lead flashing sheet with one stripping ply base ply. Extend the ply at least 12" beyond the lead flashing. Stripping plies to be the same as membrane plies.

3.14 FABRICATION AND INSTALLATION OF NEW MISCELLANEOUS FLANGED FLASHINGS:

3.14.1 Prime with asphalt primer top and bottom surfaces, set flange over base ply membrane in solid bed of black plastic roof cement. If flange width exceeds 12 inches, secure it to previously installed plywood sheathing with suitable fasteners placed near each corner and at the center of each side.

3.14.2 Install one stripping ply of base ply membrane. Fit stripping plies snugly to the vertical flange. Extend ply at least six inches beyond the flange.

3.14.3 Extend flashings a minimum height of 8" up the vertical surface.

END OF SECTION 07620

SECTION 09900 – PAINTING

PART 1 GENERAL

1.1 WORK INCLUDED

- A. Wire brush, prime and paint existing roof hatch.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Reroofing Removals & Preparations – Section 07591

1.3 QUALITY ASSURANCE

- A. Qualifications of the Manufacturer: Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the Consultant.
- B. Qualifications of the Installers: Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and are completely familiar with the specified requirements and the methods needed for the proper performance of the work in this section.

1.4 SUBMITTALS

A. Product data

1. Submit complete list of products proposed for use to Architect at least 30 days prior to commencement of painting work.
2. Indicate manufacturer, brand name, quality, and type paint for each surface to be finished.

- B. Color samples: Submit two sets of color samples from paint/coating manufacturers' standard colors, for color selections by Architect.

C. Brush-outs

1. Following issuance of final color schedule, prepare actual brush-outs for each paint, stain, or finish specified.
2. Submit brush-outs in duplicate; minimum size of 120 sq. in.
3. Apply products in number of coats specified for actual work.

1.5 STORAGE AND HANDLING

- A. Store materials in Contractor's designated storage area.

- B. Maintain neat, clean conditions in storage area; remove rags and waste materials at end of each day's work.

- C. Close containers at end of day's work. Leave no materials open.

1.6 JOB CONDITIONS

A. Environmental requirements

1. Comply with manufacturer's recommendations regarding environmental conditions under which

- materials may be applied.
2. Apply no materials in spaces where dust is being generated.
- B. Protection: Cover finished work of other trades, prefinished items, and surfaces not being painted concurrently.
- C. Safety precautions
1. Provide temporary fire protection equipment in materials storage area.
 2. Prohibit smoking in storage area.

1.7 SCOPE OF WORK

- A. Gas Pipe: All gas piping on all RAs as noted in this specification and on the Drawings.
- B. Roof Access Hatches: All exposed metal of the roof hatch.

PART 2 PRODUCTS

2.1 PAINTING MATERIALS

- A. Acceptable manufacturers: Except as otherwise noted, products specified as a standard of quality and color are manufactured by Sherwin-Williams Co. Products of the following manufacturers equal in type, quality, and color are acceptable for use, subject to approval of product list by Architect.
1. Rose-Talbert Paints
 2. Devoe Paint
- B. Industrial Urethane Alkyd: Industrial Urethane Alkyd Enamel is a high-solids, high gloss, 2.8 lb/gal VOC compliant coating intended for interior/exterior use in industrial environments, such as B54-150 Series, as manufactured by Sherwin-Williams Co.
1. Roof Hatch: Paint color will be Sherwin-Williams 4008 Umbra.
- C. Where products other than those of the manufacturer listed as the standard quality are specified in the Painting Schedule, such products have been selected to achieve specific results and substitutions will be allowed only if specifically approved by the Architect.
- D. See Paragraph 3.3 Painting Schedule for specific product information by application criterion.
- E. Miscellaneous materials:
1. Primer: Kem Bond HS Primer
 2. Paint thinners and tints shall be products of same manufacturer as paints or if approved by manufacturer for use with his products.
 3. Shellac, turpentine, patching compounds, and similar materials required for execution of work shall be pure, best quality products.

PART 3 EXECUTION

3.1 PREPARATION

- A. Prior to the roofing removals, prepare the existing ladders and their components to receive new paint.
- B. After the new roof has been installed and gas piping reconnected and checked for leaks, prepare the existing gas piping and couplings to receive new paint.
- C. Protect the surface of the existing roof areas to remain and the new roof membrane while preparing and painting the existing carbon steel components.
- D. Surfaces to receive finishes shall be free of debris, oils, rust, dust, or other deleterious materials.
- E. Gas Piping:
 - 1. Remove rust and unsound metal back to sound material with scraper or wire brush.
 - 2. Wash with xylol to remove grease, oil, and contaminants. Wipe dry with clean cloth.
- F. Roof Hatch:
 - 1. Remove rust and unsound metal back to sound material with scraper or wire brush.
 - 2. Wash with xylol to remove grease, oil, and contaminants. Wipe dry with clean cloth.

3.2 APPLICATION

- A. Apply paint materials using clean brushes, rollers, or spraying equipment
- B. Apply materials at rate stated on label placed on can by paint manufacturer for type surface being painted.
- C. Comply with manufacturer's recommendations for drying time between coats.
- D. Finish coats shall be smooth, free of brush marks, streaks, laps or pileup of paint.
- E. Do not apply additional coats until completed coat has been inspected by Architect. Only inspected coats of paint will be considered in determining number of coats applied.
- F. The quantities of coats listed in the Painting Schedule are the minimum. Contractor is responsible for application of any additional coats necessary to achieve required coverage and color uniformity.

3.3 PAINTING SCHEDULE

- A. Exterior Surfaces - Field Applied
 - 1. Urethane Alkyd Enamel Gloss
 - a. 1st Coat: Kem Bond HS Primer
 - b. 2nd Coat: Pro Industrial Urethane Alkyd Enamel
 - c. 3rd Coat: Pro Industrial Urethane Alkyd Enamel

END OF SECTION 09900

SECTION 15010 – GENERAL MECHANICAL



PART ONE – GENERAL

1.1 SCOPE

- A. The General Conditions and Special Conditions are a part of these specifications.
- B. Drawings and specifications are complementary each to the other and what is called for by either shall be as binding as if called for by both.
- C. Provide all supervision, labor, material, equipment, machinery, plant and any other items necessary for a complete, safe and quietly operating mechanical system.
- D. Examine other drawings and specifications and bring to the attention of the Architect prior to bid time any omissions or discrepancies in this Division.

1.2 CODES, RULES, PERMITS, FEES, APPLICABLE PROVISIONS

- A. The Contractor shall comply with all local, municipal and state laws and the latest revision of the regulations of the National Electric Code, the International Building Code, the International Plumbing Code, the International Gas Code and the International Mechanical Code, in the performance of his work wherever these laws and regulations may apply.
- B. The Contractor shall give all required notices, obtain necessary permits and pay all required fees.
- C. Deliver to Architect, permit and licenses, including certificates from local and state health departments approving fire protection system and equipment.
- D. Before and/or at completion of work, the Engineer shall cause to be made any and all tests which he may consider necessary. Should it develop during tests that the work is defective and does not comply with these specifications, such changes as are necessary shall be made to put the work in proper condition and the expense of such subsequent tests shall be borne by this Contractor.
- E. The following requirements are supplementary to the tests specified for individual equipment and /or systems in this section of these specifications:
 - 1. Concealed or insulated work shall remain uncovered until required tests have been completed, but in the event that the project construction requires it, the Contractor shall make arrangements for tests on portions of the work involved as the project progresses.
 - 2. The Architect shall be notified in advance of all tests and shall be represented at such tests. The cost of labor, material, instruments, etc., required for tests shall be borne by the Contractor, except where specified elsewhere.
 - 3. Acceptance tests for operation and performance as specified and/or required for all equipment and systems shall be in the presence of the Architect, a representative of the

Owner, as well as representatives of agencies having jurisdiction, upon completion of the work.

1.3 DRAWINGS:

- A. Project Drawings: The Drawings accompanying this specification are generally diagrammatic and do not show all details of bolts, nuts, connections and the like, required for the complete system and do not indicate the exact location of piping, fixtures, equipment, etc., unless definitely dimensioned or noted. While these drawings shall be followed as closely as possible, all dimensions shall be checked at the building and any necessary changes shall be made in accord with structural and architectural conditions, equipment to be installed or with the work of the different trades, without any additional cost to the Owner and as directed by the Architect. The drawings and specifications are complimentary to the other and what is called for by one shall be as binding as if called for by both. Any component item under this contract shall be furnished and installed by the Contractor without extra charge.

1.4 EXAMINATION OF CONDITIONS:

- A. It is understood and agreed that the Contractor has, by careful examination, satisfied as to the nature and location of the work, the conformation of the ground, the character, quality and quantity of the materials to be encountered, the general and local conditions and all other matters which can affect the work under this contract.

1.5 COORDINATION/COORDINATION DRAWINGS:

- A. Coordinate work with other trades to avoid interference and establish necessary space requirements and tie-ins for each trade.
- B. Prior to starting installation, furnish to the General Contractor and all Subcontractors concerned, copies of approved shop drawings showing location of equipment, piping, etc.
- C. Schedule periodic meetings with other trades before and during installation to avoid conflicts and assure that pipes and equipment are installed in the best manner, taking into consideration headroom, maintenance, appearance and replacement.
- D. The mechanical contractor shall produce either AutoCAD or Revit coordination drawings including the mechanical, electrical, plumbing, and fire sprinkler systems to be installed in order to avoid installation conflicts during construction. Coordination meetings shall be held after completion of these drawings to resolve potential installation conflicts. Additionally, a 3-dimensional drawing of the proposed mechanical room piping and equipment layout shall be generated and submitted to the engineer for approval prior to any pipe or equipment installation in the main mechanical room. This drawing shall include all equipment to be installed in this space. Any mechanical equipment, ductwork, or associated appurtenance that is installed prior to receiving written coordination drawing approval from the engineer is subject to removal and replacement of all installed material at the contractor's expense. This relates to coordination and installation deficiencies with respect to the requirements of the contract documents as identified by the engineer, architect or the commissioning agent.

END OF SECTION 15010

SECTION 15040 – GENERAL COMPLETION

PART ONE – GENERAL:

1.1 GENERAL REQUIREMENTS FOR INSTALLATION:

- A. Piping, fixtures, equipment, etc. shall be located to avoid interference with structural and architectural conditions or with the work of different trades. Provide off-sets where necessary to avoid footings, piers, columns, beams, windows, piping, electrical fixtures and other systems, etc. Specifically inform the General Contractor as to the correct size and location of all chases, openings, supports, sleeves, etc. required for the system. Furnish and install sleeves, inserts, bolts, etc. and all arrange for the cutting of walls, floors, roofs, etc. and the proper closing of all openings. Cutting of construction, where unavoidable, must be done by the General Contractor but shall be paid for by this Contractor. No part of the building may be broken out, cut, burned or permanently removed without the approval of the Architect.

PART TWO – PRODUCTS:

2.1 WORKMANSHIP AND MATERIALS:

- A. Workmanship shall be of the best quality and none but competent mechanics skilled in their trades shall be employed. The Contractor shall furnish the services of an experienced superintendent who will be constantly in charge of the erection of the work until completed and accepted.
- B. Unless otherwise hereinafter specified, all materials and equipment shall be new, of best grade and as listed in printed catalogs of the manufacturer. Each article of its kind shall be the standard products of a single manufacturer.
- C. The Architect shall have the right to accept or reject material, equipment and/or workmanship and determine when the Contractor has complied with the requirements herein specified. Where departures from indicated arrangements are required, written approval for such changes shall be obtained from Architect's representative.
- D. All manufactured materials shall be delivered and stored in their original containers. Equipment shall be clearly marked or stamped with the manufacturer's name and rating.
- E. All material and equipment used on this project shall be stored in a weatherproof bonded warehouse. Contractor shall submit insurance certificate to the Architect prior to storing any materials or equipment. No equipment, materials or roof-top heat pumps used on this project shall be stored outside exposed to the weather. Before final payment can be made, a notarized statement with the material invoiced to the Owner must be furnished to the Architect.

2.2 DIVISION OF WORK:

- A. Coordinate all opening locations with General Contractor, see paragraph 2.4.
- B. This Contractor shall furnish roof curbs and caps. Curbs and caps to be installed and flashed by the General Contractor, unless otherwise noted.
- C. Furnish door grilles to General Contractor for installation.
- D. Refer to the Electrical and Control Sections of this specification. The Electrical Subcontractor

shall provide all wiring except:

1. Temperature Control Wiring
2. Equipment Control Wiring
3. Interlock Wiring

The Electrical Subcontractor shall furnish all power wiring complete from power source to motor or equipment junction box, including power wiring through starters. Electrical Subcontractor shall install all starters not factory mounted on equipment. The Mechanical Subcontractor shall, regardless of voltage, provide all temperature control wiring for equipment provided under this Division. The Mechanical Subcontractor shall furnish all starters and contactors to the Electrical Subcontractor and shall provide and be responsible for over-load heaters in all starters furnished. Over-loads shall be provided in each ungrounded conductor.

2.3 FINISHES:

- A. Finishes for all water coolers, grilles, registers, diffusers, room fan coil units, room air conditioning units, louvers and any other item exposed to view shall be selected by Architect and shall be equivalent to baked enamel. Submit color charts along with submittal data.

2.4 OPENINGS – CUTTING, REPAIRING:

- A. This Contractor shall cooperate with the work to be done under the other sections in providing information as to openings required in walls, slabs and footings for all piping and equipment, including sleeves, where required.
- B. All drilling, cutting and patching required for the performance of work under this Section shall be performed by the General Contractor and the cost thereof shall be borne by this Contractor.
- C. Holes in Concrete: Sleeves shall be furnished, accurately located and installed in for before pouring of concrete. This Contractor shall pay all additional costs for cutting of holes as the result of the incorrect location of sleeves. All holes through existing concrete shall be either core drilled or saw cut. All holes required shall have the approval of the Structural Engineer prior to cutting or drilling. All penetrations shall be grouted all around with cement.

2.5 EXCAVATION AND BACKFILL:

- A. General: The Contractor shall do all excavating and backfilling necessary to receive the work shown on the drawings.

Excavations shall be made to the proper depth and the trenches shall be graded uniformly to provide a solid bearing along the entire length of the pipe. Bell holes shall be provided in trenches at the joints in hub and spigot pipe to facilitate caulking and so that piping will not be supported in hubs. All trenches shall be excavated so that pipes will have at least six (6) inches clearance on each side. Pipes in fill or loose sand shall have trench bottom tamped to 95% maximum density compaction prior to laying pipe.

- B. Dewatering and Shoring: Pumps shall be furnished as required to keep trenches dry during the laying and jointing of the mains. Provide shoring where required, maintaining trenches against settlement until final acceptance.
- C. Backfilling: Do not fill any trenches until all piping has been inspected. After the work is installed, tested, inspected and approved, the trenches shall be refilled in six (6) inch layers with clean, damp earth, with each layer thoroughly tamped before proceeding with additional layers. Remove from site all excess earth, rock and other debris resulting from excavation and backfill work.

2.6 NAMEPLATES:

- A. On all manufactured equipment, provide engraved plastic nameplates as manufactured by Seton Nameplate Co., Columbia-Engravers, International Nameplate Co. or equal. Unless otherwise noted, nameplates shall be 1/16" thick plastic with white letters on a black background. Attach nameplates with two (2) round-head chrome plated screws.
- B. Unless otherwise noted, letters identifying equipment in equipment rooms to be 1/2" high. All other letters shall be 1/8" high. Hand lettering, under typing tape, embossed letters on plastic, etc. will not be acceptable.
- C. Provide additional nameplates for mechanical equipment that is suspended above lay in/inaccessible ceilings. Nameplates shall be located directly below suspended equipment and attached to the ceiling gird (not tiles) to indicate approximate location of equipment.

2.7 CLEANING EQUIPMENT AND MATERIALS:

- A. Provide for the safety and good condition of all materials and equipment until final acceptance by the Owner. Protect all materials and equipment from damage. Provide adequate and proper storage facilities during the progress of the work. Special care shall be taken to provide for bearings, open connections, pipe coils, pumps and similar equipment.
- B. All fixtures, piping, finished surfaces and equipment shall have all grease, adhesive labels and foreign materials removed.
- C. All piping shall be drained and flushed to remove grease and foreign matter. Pressure regulating assemblies, traps, flush valves and similar items shall be thoroughly cleaned. Remove and thoroughly clean and reinstall all strainer screens after the system has been in operation for ten (10) days.

2.8 CLEANING UP:

- A. Remove from the premises all unused material and debris resulting from the performance of work under this section.

2.9 DAMAGES:

- A. Cost of repairing damage to building, building contents and site during the construction and guarantee period resulting from this work including damage to ceilings or walls is a part of this contract.

2.10 FINISHED PLANS:

- A. As-Build Drawings: Upon completion of work, the Contractor shall furnish and deliver to the Owner two (2) sets of as-built drawings to correspond in size to the tracings, showing among other things, layouts of utility systems and functional systems (such as air distribution, water, storm drainage and sanitary sewer). All pertinent dimensions and elevations of buried work shall be given.

2.11 INSTRUCTIONS:

- A. Provide a hard-back, three-ring file folder containing all warranties, catalog data and the manufacturer's recommendations and the frequency with which each is to be done. Each sheet shall be initialed by the manufacturer's agent as being correct. Provide columns on each sheet so that they may be dated by maintenance personnel when each individual function is performed.

Contractor shall furnish a typed maintenance manual in hard-back, three-ring binder explaining all maintenance functions. The Contractor shall instruct and demonstrate each maintenance function to the Owner's Representative. The Owner's Representative shall in turn, sign the maintenance sheets indicating his/her understanding of the instructions. Coordinate all equipment start-ups with the Owner so that they may be present.

- B. The Contractor shall instruct the Owner's Representative in complete detail as to the proper operation of the overall system. Advise the Owner as to where to order common replacement items. Deliver to the Owner, the manufacturer's agent's name, address and telephone number of each piece of equipment.
- C. The Contractor shall provide a complete listing of filter sizes and counts of all mechanical equipment to Owner's Representative.

2.12 GUARANTEE:

The Contractor agrees:

- A. Contractor shall correct defects in workmanship materials, controls and operation of the system for a period of 1 year from the date of substantial completion and acceptance of work. Any equipment/material installed by the contractor replaced during the first-year warranty period shall be guaranteed for an additional year starting from the date of replacement. A manufacturer 5-year parts and labor warranty shall be provided for all HVAC equipment that utilizes a compressor or compressors. This warranty shall cover the entire refrigeration system including the refrigerant. The manufacturer's warranty certificate shall be included in the contractor's closeout documents provided at the completion of the project.
- B. That the systems installed will safely, quietly and efficiently perform their respective functions in accordance with the design.
- C. To service completely the systems for a period of one (1) year.

This work shall include: Adjustment of belts and drives, care of cooling towers (where applicable), complete oiling and greasing of mechanical equipment and labor for changing of air filters. Replacement filters will be furnished by the Owner. Contractor is responsible for providing and changing filters with the frequency as deemed necessary by the engineer and/or commissioning agent during the building construction. All HVAC units that are operated during construction shall have MERV 8 Minimum construction filters. Final Operating filters shall be MERV 8 minimum. Additionally, contractor shall protect all ductwork and mechanical equipment openings with construction quality sheet plastic to prevent construction dust/debris from entering into air or water moving equipment. All equipment, pipe, ductwork or related appurtenances fouled by construction debris shall be removed and replaced. Ventilation air units shall not be used to dehumidify the building during construction activities. VAV's shall only be operated after final cleaning of the building.

END OF SECTION 15040

SECTION 15050 – BASIC MATERIALS AND METHODS

PART ONE – GENERAL:

1.1 APPROVALS AND SUBSTITUTIONS:

- A. All requests for substitutions shall be submitted so as to be received by the Engineer at least ten (10) days before bid date and must be approved before award of contract.
- B. Contract prices shall be based on material and equipment as specified, unless written approval is obtained for any deviations. Requests for substitutions before bid date may be submitted by Contractors or by Equipment Manufacturer's Representatives.
- C. Requests for approvals shall be submitted in the form of a letter (with one [1] copy minimum) on a letterhead of submitting firm, along with a self-addressed stamped return envelope. Letter shall be addressed to the Engineer and referenced to this project. Faxed requests are not acceptable.
- D. If there are no deviations between the items submitted and the plans and specifications then the submittal letter should contain the statement, "Items are in accordance with plans and specifications with no deviations." An item with deviations from the plans and specifications may be submitted for approval consideration. Letter should then state, "Item submitted is in accordance with plans and specifications, except for the following deviations." Deviations should then be listed in itemized form.
- E. Items approved shall not be construed as authorizing deviations from the plans and specifications. Contractor shall be responsible for verifying all dimensions with available space conditions with provisions for proper access, maintenance and part replacement and for coordination with other trades – electrical, plumbing, structural, etc. for proper services and construction requirements.
- F. Where such approved deviations require a different quality and arrangement of ductwork, piping, wiring, conduit and equipment from that specified or indicated on the drawings, the Subcontractor shall furnish and install any such ductwork, piping, structural supports, insulation, controllers, motors, starters, electrical wiring and conduit and any other additional equipment required by the system at no additional cost to the Owner.

PART TWO – PRODUCTS AND EXECUTION:

2.1 MANUFACTURER'S INSTRUCTIONS:

- A. Prior to purchasing equipment, procure product manufacturer's application, installation and operating instructions for use in conjunction with the system design drawings and specifications during construction. If there is any conflict between the manufacturer's publications and the design drawings and specifications, immediately notify the Engineer in writing. Upon notification by the Engineer, proceed in accordance with his/her instructions.

2.2 SHOP DRAWINGS:

- A. The Subcontractor shall submit for approval detailed shop drawings of all equipment and all material required to complete the project and no material or equipment may be delivered to the job site or installed until the Subcontractor has in his possession the approved shop drawings for the particular material or equipment. The shop drawings shall be complete as described herein. The Subcontractor shall furnish the number of copies required by the General Contractor and

Special Conditions of the contract but in no case less than six (6) copies. Shop drawings shall be submitted in appropriately sized 3-ring binders. Submittals shall be comprehensive and include all equipment/products to be provided. Partial submittals will be disapproved.

- B. Prior to delivery of any material to the job site and sufficiently in advance of requirements to allow Architect ample time for checking, submit for approval detailed dimensional drawings or cuts showing construction, size, arrangement, operating clearances, performance characteristics and capacity. Each item of equipment proposed shall be a standard catalog product of an established manufacturer and of equal quality, finish and durability to that specified.
- C. Samples, drawings, specifications and/or catalogs submitted for approval shall be properly labeled indicating specific service for which material or equipment is to be used, section and article number of specifications governing, Contractor's name and name of project.
- D. Catalogs, pamphlets or other documents submitted to describe items on which approval is being requested shall be specific and identification in catalog, pamphlet, etc. of each item submitted shall be clearly made in ink. Data of a general nature will not be accepted.
- E. Approval by the Architect and/or Engineer of shop drawings for any material, apparatus, devices and layouts shall not relieve this Contractor from the responsibility of furnishing same of proper dimension, size, quantity, quality and all performance characteristics to efficiently perform the requirements and intent of the contract documents.

In addition, approval shall not relieve this Contractor from responsibility for errors of any sort on the shop drawings. If the shop drawings deviate from the contract documents, this Contractor shall advise the Architect and/or Engineer of the deviations in writing accompanying the shop drawings, including the reasons for deviations.

- F. Failure of the Subcontractor to submit shop drawings in ample time for checking shall not entitle him/her to an extension on contract time and no claim for extension by reason of such default will be allowed.

END OF SECTION 15050

SECTION 15700 - PACKAGED HEAT PUMPS

PART ONE – GENERAL:

- 1.1 Unit shall be self-contained, roof mounted type consisting of filters, evaporators, fan and motor, electric heaters, outside air intake, cooling coil, condensate collector and drain, compressor, condenser fan and motor, inter-connecting refrigerant piping and factory installed controls with 24V remote control center. The units shall be designed in accordance with UL requirements, A.R.I. rated and meet all applicable requirements of ASHRAE 90.1.
- 1.2 Units shall be as manufactured by Trane or Daikin.

PART TWO – PRODUCTS:

2.1 UNIT CASING:

- A. Cabinet: Galvanized steel phosphatized and finished with an air-dry paint coating with removable access panels. Structural members shall be 16 gauge with access doors and removable panels of minimum 20 gauge.
- B. Units' cabinet surface shall be tested 500 hours in salt spray test in compliance with ASTM B117.

2.2 AIR FILTERS:

- A. 2" pleated media filters shall mount integrally within the unit and shall be accessible through access panels.

2.3 MOTOR COMPRESSORS:

- A. Motor compressors shall be manufacturer's standard spring mounted hermetic type fully serviceable on job location with five (5) year warranty.

2.4 FANS:

- A. Fans shall be forward double width double inlet centrifugal type fan with self-aligning grease lubricated ball or sleeve bearings with permanent lubrication fittings. Fans shall have internal thermal overload protection.

2.5 ELECTRIC HEATERS:

- A. Electric heaters shall be of the open coil type designed to fit within the unit. Heaters shall be complete with contactors, control transformer, automatic thermal high limit, manual reset high limit control, fan interlock, fuse block with fuse for each phase and disconnect. Heaters must be UL listed.

2.6 COILS:

- A. Provide a thermal expansion valve for each refrigeration circuit. Factory pressure test at 450 psig and leak tested at 200 psig. Coils shall be configured with aluminum fin surface mechanically bonded to copper tubing coil.

2.7 REFRIGERATION SYSTEM:

- A. Compressor(s): Provide compressors with direct drive operating at 3,600 rpm integral centrifugal oil pump, inlet dirt separator, rolling element bearings, crankcase heater, completely enclosed compression chamber with no leakage paths. Provide suction cooled motor with over-temperature and over-current protection.
- B. Compressor(s) shall be manufactured by the HVAC unit manufacturer.
- C. Units shall have cooling capabilities down to 60 degrees F.
- D. Provide with thermostatic temperature control in the compressor windings to protect against excessive temperatures-, high- and low-pressure conditions.

2.8 CONTROLS:

- A. Units shall have factory wired controls including all components necessary for standard sequences of heating and cooling.

2.9 ACCESSORIES:

- A. Unit shall come with factory outside air intake hood with bird screen and balancing and motorized dampers. Coordinate with Controls Specifications as applicable.
- B. Provide factory coil guards for condenser coils.
- C. Provide with energy recovery ventilation package and hot gas reheat where indicated on plans.

2.10 WARRANTY:

- A. Heat pumps shall be provided with a warranty of two (2) years for parts and labor plus an additional three (3) years parts and labor on the compressors.

PART THREE – EXECUTION:

- 3.1 Mount unit on structural aluminum or hot dipped galvanized seismic roof curb per Section 23 05 48 with flashing assembly that complies with the National Roofing Contractors Association requirements. The roof curb on the top elevation must be true and level. Contractor shall provide supplemental steel to attach curb to structure as recommended by seismic curb manufacturer. See Seismic Specifications for product and design criteria.
- 3.2 Provide 1" Type "L"- hard copper P-trap assembly at each condensate drain connection with threaded cleanout plug. Depth of trap shall be sufficient for drainage with static pressure of unit.

END OF SECTION 15700

SECTION 15710 – SPLIT SYSTEM HEAT PUMPS

PART ONE – GENERAL:

- 1.1 Units shall be provided complete with indoor and outdoor sections, refrigerant piping and factory installed controls. Systems shall be A.R.I. 210 and 270 rated, UL listed and meet all applicable requirements of ASHRAE 90.1.
- 1.2 Heat pump system shall be as manufactured by Daikin or Trane.

PART TWO – PRODUCTS:

2.1 INDOOR UNIT:

- A. Indoor unit shall be constructed of galvanized steel with baked enamel finish properly reinforced for maximum rigidity and shall be internally insulated. Casing shall be sectionalized construction consisting of fan section, coil section, electric heater section, filter section as indicated and drain pan. Removable panels shall be furnished to provide access to internal parts and shall be gasketed to minimize leakage.
- B. Evaporator coil shall be manufacturer's standard of sufficient size to provide the heating and/or cooling requirements as specified. Provide factory mounted non-bleed thermal expansion valve and low ambient cooling down to 30 degrees. Provide subcooling circuit(s). Refrigerant shall be R-410A.
- C. Evaporator fan shall be centrifugal double inlet forward curve blade type and shall be variable speed. Fans shall be statically and dynamically balanced and shall have permanently lubricated bearings and shall be complete with built-in thermal overload protection.
- D. Electric heaters shall be the open coil type designed to fit within the unit. Heater shall be complete with contactors, control transformers, automatic thermal high limit, fusible links for each heater circuit and fan interlock. Heaters shall be UL listed. Provide single point power.

2.2 OUTDOOR UNIT:

- A. Outdoor unit shall be fabricated of heavy G-90-gauge galvanized steel with baked enamel finish for weatherproof installation and vertical air discharge. The unit shall be readily accessible for maintenance and shall be complete with all operating and safety controls ready for electrical connection. Units shall be provided with factory supplied louvered coil guards. Unit shall be provided with Seacoast coil protection.
- B. Motor compressor shall be the unit manufacturer's standard for heat pump service. Provide factory-assembled and pre-wired units suitable for outdoor use consisting of cabinet, compressor(s), condensing coil and fan(s), integral subcooling circuit(s), internal thermal overload protection, suction line accumulator, filter drier, crankcase heaters, hard start capacitor, and controls. Provide expansion valve(s) and check valves for split system heat pump unit(s). Accessories shall be factory mounted. Provide heat pump condensing unit fully charged from the factory for up to 15 feet pf piping. Unit shall be designed to operate at temperatures as high as 115 F. Cooling capacities shall be matched with air handling unit that is ARI certified. The unit shall be UL listed.

- C. Condenser fan shall be the propeller type arranged for vertical discharge. Fan shall be statically and dynamically balanced. Fan motor shall have permanently lubricated bearings and shall have built-in thermal overload protection.
- D. Coils: Condenser coils shall be dipped and baked with Epoxy, Phenolic, or Heresite Seacoast coated copper fins and seamless copper tubing. Provide subcooling circuit(s).
- E. Performance Ratings: Energy Efficiency Rating (SEER) not less than 13.00 SEER per ARI, as a matching system.

2.3 CONTROLS:

- A. Units shall have factory wired controls, including all components necessary for standard sequences of heating and cooling. Provide controls in accordance with Controls Specification Sections.

PART THREE – EXECUTION:

3.1 OUTDOOR UNIT:

- A. Mount unit with clearances as recommended by manufacturer. Provide vibration isolators of the cork and neoprene type under the outdoor unit. Securely mount unit with anchor bolts through isolators into support base.

3.2 INDOOR UNIT:

- A. Support indoor unit on 2 ½" x 2 ¼" angle iron with four (4) spring type vibration isolators.
- B. Provide four (4) 16-gauge galvanized steel straps of sufficient size to secure unit to angle supports.
- C. Install indoor unit with manufacturer's required minimum clearances to all service panels.

3.3 INDOOR UNIT AUXILIARY DRAIN PAN:

- A. Provide an auxiliary drain pan of 16-gauge galvanized steel a minimum 2" deep with all welded seams. Pan shall extend a minimum of 3" beyond unit casing on all sides. Provide a float switch in pan to de-energize unit if pan fills with condensate.

3.4 REFRIGERANT PIPING:

- A. Refrigerant piping shall be type "ACR" hard nitrogenized copper with silver brazed joints and cleaned and capped wrought copper fittings installed in accordance with manufacturer's instructions. Refrigerant lines shall be sealed and charged with nitrogen after installation.
- B. Contractor shall note the length of the refrigerant lines. The following items shall be provided as specified above and in accordance with the heat pump manufacturer's recommendations for "long line" applications as necessary:
 - 1. Liquid and suction line sizing
 - 2. Indoor and outdoor thermal expansion valves
 - 3. Refrigerant charge by the "weigh-in" method
 - 4. Oil return (only if required by manufacturer)

5. Crankcase heater, “hard start” gear and liquid filter/dryer accessories for heat pump units

3.5 CONDENSATE PIPING:

- A. Condensate piping shall be type “L” hard copper full size of indoor unit connection 1” minimum with P-trap and cleanout tee with plug at trap. Route condensate drain as indicated.

3.6 INSULATION:

- A. Insulation shall be provided on refrigerant suction and condensate piping. Insulation shall be $\frac{3}{4}$ ” thick “Rubatex” or “Armaflex.” Seal all joints with adhesive. Provide 1” thick “Rubatex” or “Armaflex” on refrigerant suction piping 1 $\frac{1}{2}$ ” O.D. and larger. Insulation shall not be cut lengthwise to install. All exterior refrigerant piping shall be covered with 22-gauge aluminum or 24-gauge stainless steel jackets and banded 4’ on center.
- B. All piping shall be hung with clevis type hangers complete with insulation saddles. Route liquid line above suction and tie wrap 4’ o.c. with $\frac{3}{8}$ ” wide nylon straps without compressing insulation. Pipe hangers shall be as manufactured by Michigan Hanger Co., Grinnell or B- Line. Hangers equal to M-CO #403.

3.7 WARRANTY:

- A. Contractor shall correct defects in workmanship materials, controls and operation of the system for a period of 1 year from the date of substantial completion and acceptance of work. Any equipment/material installed by the contractor replaced during the first-year warranty period shall be guaranteed for an additional year starting from the date of replacement. A manufacturer's 1-year parts warranty shall be provided for all HVAC equipment that utilizes a compressor or compressors. An additional 4-year manufacturer's parts warranty shall be included for the compressors only for a total of 5-years. All warranties shall begin after the date of substantial completion. For the first year, the mechanical contractor is responsible for all labor associated with the above-mentioned warranties. The manufacturer's warranty certificate shall be included in the contractor's closeout documents provided at the completion of the project.

3.8 INSTALLATION:

- A. Heat pumps shall be installed in strict accordance with the manufacturer's recommendations. Provide equipment startup by manufacturer's personnel.

END OF SECTION 15710

SECTION 15713 – SPLIT SYSTEM HEAT PUMPS (DUCTLESS FAN-COIL)

PART ONE – GENERAL:

- 1.1 Units shall be provided complete with indoor and outdoor sections, refrigerant piping and factory installed controls. Systems shall be A.R.I. rated, UL listed and meet all applicable requirements of ASHRAE 90.1.
- 1.2 Heat pump system shall be as manufactured by Mitsubishi, Sanyo, or Daikin.

PART TWO – PRODUCTS:

2.1 INDOOR UNIT:

- A. Indoor unit shall be self contained console type for wall or ceiling as indicated. Unit shall have supplemental electric heat and ventilation airconnection.
- B. Evaporator coil shall be manufacturer's standard of sufficient size to provide the heating and/or cooling requirements as specified and shall be complete with quick-attach fittings for pre-charge tubing as applicable.
- C. Evaporator fan shall be statically and dynamically balanced and shall have permanently lubricated bearings and shall be complete with built-in thermaloverload protection.
- D. Electric heaters shall be the open coil type designed to fit within the unit. Heater shall be complete with contactors, control transformers, automatic thermal high limit, fusible links for each heater circuit and fan interlock. Heaters shall be UL listed.

2.2 OUTDOOR UNIT:

- A. Outdoor unit shall be fabricated of heavy gauge galvanized steel with baked enamel finish for weatherproof installation and vertical air discharge. The unit shall be readily accessible for maintenance and shall be complete with all operating and safety controls ready for electrical connection. Units shall be provided with factory supplied coil guards.
- B. Motor compressor shall be the unit manufacturer's standard for heat pump service and shall be complete with internal thermal overload protection, crankcase heater and suction line accumulator.
- C. Condenser fan shall be the propeller type arranged for vertical discharge. Fan shall be statically and dynamically balanced. Fan motor shall have permanently lubricated bearings and shall have built-in thermal overload protection.
- D. Each outdoor unit shall be provided with filter-drier.

2.3 CONTROLS:

- A. Units shall have factory wired controls, including all components necessary for standard sequences of heating and cooling.

PART THREE – EXECUTION:

3.1 OUTDOOR UNIT:

- A. Mount unit with clearances as recommended by manufacturer. Provide vibration isolators of the cork and neoprene type under the outdoor unit. Securely mount unit with anchor bolts through isolators into support base. Provide factory coil guards.

3.2 REFRIGERANT PIPING:

- A. Refrigerant piping shall be type "ACR" copper with silver brazed joints and cleaned and capped wrought copper fittings installed in accordance with manufacturer's instructions.

3.3 CONDENSATE PIPING:

- A. Condensate piping shall be type "L" hard copper full size of indoor unit connection 1" minimum with P-trap and cleanout tee with plug at trap. Route condensate drain as indicated.

3.4 INSULATION:

- A. Insulation shall be provided on refrigerant suction and condensate piping. Insulation shall be 3/4" thick "Rubatex" or "Armaflex." Seal all joints with adhesive. Insulation shall not be cut lengthwise to install. All exterior refrigerant piping shall be covered with 22-gauge aluminum or 24-gauge stainless steel jacket.
- B. All piping shall be hung with clevis type hangers complete with insulation saddles. Route liquid line above suction and tie wrap 4' o.c. with 3/8" wide nylon straps without compressing insulation. Pipe hangers shall be as manufactured by Michigan Hanger Co., Grinnell or B-Line. Hangers equal to M-CO #403.

3.5 WARRANTY:

- A. Heat pumps shall be provided with a warranty of two (2) years for parts and labor plus an additional three (3) years parts and labor on the compressors.

3.6 INSTALLATION:

- A. Heat pumps shall be installed in strict accordance with the manufacturer's recommendations.

END OF SECTION 15713

SECTION 15732 – WALL HUNG PACKAGED HEAT PUMPS WITH ENERGY RECOVERY

PART ONE – GENERAL:

- 1.1 Units shall be provided complete and ready for operation with factory mounted controls and heat recovery ventilator assembly. Systems shall be A.R.I. rated, UL listed and meet all applicable requirements of ASHRAE 90.1.
- 1.2 Heat pumps shall be manufactured by Bard, Marvair, or prior approved equal.

PART TWO – PRODUCTS:

2.1 HEAT PUMPS:

- A. Unit shall be constructed of galvanized steel with baked enamel finish properly reinforced for maximum rigidity and shall be internally insulated. Casing shall be sectionalized construction consisting of fan section, coil section, electric heater section, filter section as indicated and drain pan. Removable panels shall be furnished to provide access to internal parts and shall be gasketed to minimize leakage. Heat pumps shall have single point power entry and internal fused disconnect for entire unit.
- B. Evaporator coil shall be manufacturer's standard with copper tubes and aluminum fins of sufficient size to provide the heating and/or cooling requirements as specified.
- C. Evaporator fan shall be centrifugal double inlet forward curved blade type and shall be direct driven. Fans shall be statically and dynamically balanced and shall have permanently lubricated bearings and shall be complete with built-in thermal overload protection.
- D. Electric heaters shall be the open coil type designed to fit within the unit. Heater shall be complete with contactors, control transformers, automatic thermal high limit, fusible links for each heater circuit and fan interlock. Heaters shall be UL listed.
- E. Units shall be provided with factory installed energy recovery wheel assembly built into unit with an outside air capacity of up to 450 cfm. Outside air shall be controlled by a factory mounted relay(s) interlocked with the building control system which will close the outside air damper and de-energize the exhaust and outside air fans during unoccupied hours.
- F. Units shall be provided with hot gas reheat humidity control.
- G. Motor compressor shall be the unit manufacturer's standard for heat pump service and shall be complete with internal thermal overload protection, crankcase heater and suction line accumulator.

2.2 CONTROLS:

- A. Units shall have factory wired controls including all components necessary for standard sequences of heating and cooling. Provide heat/cool thermostat with automatic changeover and humidistat in accordance with Controls Specification.
- B. Units shall be provided with hot gas reheat humidity control with multi-stage capability. Hot gas reheat shall be capable of producing "neutral" air (75° F) at "No Load" conditions (Unoccupied) without the need for supplemental electrical reheat.

PART THREE – EXECUTION:

3.1 INSTALLATION:

- A. Mount unit with clearances as recommended by the manufacturer. Coordinate wall openings with General Contractor as applicable.

END OF SECTION 15732

SECTION 15748 – PACKAGED VENTILATION AIR DEHUMIDIFICATION UNITS

PART ONE – GENERAL:

- 1.1 Units shall be self contained, split or packaged as indicated, consisting of filters, evaporators, fans and motors, heat exchangers, outside air intake, cooling coil, condensate collector and drain, compressor, condenser fan and motor, total energy wheel, hot gas reheat coil, interconnecting refrigerant piping and factory installed control end devices wired to a terminal strip with no controller and no interface. Units must be capable of providing first source sensible cooling. The units shall be designed in accordance with UL requirements and be A.R.I rated.
- 1.2 Units shall be ETL/UL listed and meet all applicable requirements of ASHRAE 90.1 – AHRI-920, with respect to performance operating points with no interruption in dew point/reheat delivery. All points in AHRI-920 must be achieved at all times.
- 1.3 Provide Manufacturer's 5 Year Parts & Labor Warranty for whole unit.
- 1.4 Units shall be as manufactured by Trane Model KCC or equal by Greenheck- Model RVE as alternate bid. See bid form.

PART TWO – PRODUCTS:

2.1 BASE FRAME:

- A. Cabinet Base Rails: Side and end base rails shall include openings for forklift and tie-down access. To protect unit base from fork damage side rails shall include removable heavy gauge fork pockets.

2.2 UNIT CASING:

- A. Unit shall be built for outdoor use with cabinet panels constructed of 2" double-wall foamed panel construction throughout the indoor section of unit to provide nonporous, cleanable interior coated galvanized steel surfaces. All interior seams exposed to airflow shall be sealed. Insulation shall be 2" polyisocyanurate foam metal encapsulated with no exposed edges. Initial R value of 6.6 per inch of thickness.
- B. Cabinet construction shall provide double wall hinged access doors providing easy access for all parts requiring routine service. Water and Air Tight Hinged Access Doors shall provide access to air filters, heating section, electrical and control cabinet sections, ERV and 100% power exhaust fan section, supply air fan section, evaporator and reheat coil sections. Insulated doors shall be constructed to allow the hinges to be reversed in the field. Hold-open device shall be factory installed on all hinged access doors. Chains shall not be used as hold-open devices. Fans and energy recovery components shall be mounted on slide racks for ease of maintenance.
- C. Drain Pan material shall be Type 430 Stainless steel drain and constructed to sloped in two directions to ensure positive drainage with corners exposed to standing water and drain fittings welded liquid tight to prevent leaks. Pan shall have a minimum depth of 2". Base of drain pan shall be insulated with 1" thick foam insulation.
- D. Cabinet top cover shall be one-piece construction or where seams exist, it shall be double-hemmed and gasket-sealed.

- E. Interior Corrosion Protection: Interior surfaces shall be a stainless steel. Cabinet shall include interior liner constructed of 304 stainless steel seams. All unit coils shall be coated-see coating requirements below in specification.
- F. Exterior Corrosion Protection: Exterior cabinet panels shall be a base coat of G-90 galvanized steel with exterior surfaces cleaned, phosphatized and finished with a weather-resistant baked enamel finish. Unit's surface shall be in compliance with ASTM B45 salt spray testing at a minimum of 672-hour duration.

2.3 HEAT EXCHANGER – ENERGY RECOVERY SECTIONS

- A. The rotor media shall be made of aluminum, formed into a honeycomb structure to prevent corrosion, minimize pressure loss, avoid plugging, and to maintain wheel performance through the expected life of the unit. Paper, Plastic, Mylar, Air-Exchange wheels, or fibrous media are not acceptable. The rotor media must be coated to resist corrosion. All surfaces must be coated with a non-migrating desiccant layer to ensure that adequate latent capacity is provided. The desiccant coating must be firmly bonded to the aluminum surface and will not be dislodged when challenged with high velocity air up to 5000 feet per minute. Products that lose desiccant when served with high velocity air are not acceptable. The cassette must be a slide out design for serviceability. The media shall be cleanable with low temperature steam, hot water or light detergent without degrading the latent recovery.
- B. Sensible and latent recovery efficiencies must be clearly documented through a testing program conducted in accordance with ASHRAE Standard 84 and AHRI 1060. The testing must have been conducted by a qualified independent organization. The performance test reports must be provided for engineering review as part of the submittals for this project. The rotor design shall ensure laminar airflow to minimize parasitic pressure loss and to optimize the operating efficiency of the system fans. The pressure loss across the media shall be no greater than the scheduled pressure loss values.
- C. The rotor media shall be permanent, with an anticipated life of 20 years. It must be tested in accordance with ASTM Standard E-84 and provide smoke and flame spread ratings of less than 25 and 50 as required by NFPA 90A and UL 1995. A copy of the ASTM E-84 test report confirming the method of test and results shall be provided with the submittal. Heat recovery wheels incorporating "throw-away" media and tested to UL900 for Class 2 filters are not acceptable.
- D. The rotor shall be supplied with perimeter brush seals and face contact seals to minimize air leakage and wheel bypass. The rotor media shall be supported by a structural aluminum hub and aluminum reinforcing spoke system. The rotor bearings must be greaseable and provide L10 life in excess of 20 years.
- E. The cassette framework shall be made of galvanized steel to prevent corrosion. The rotor must be driven by long-life polyurethane/polyester composite link belt system. The rotor/cassette shall be designed so that belt can be removed or serviced without the removal of the bearing. A 3 phase A/C gear motor shall be utilized to accommodate variable speed applications.

2.4 FAN SECTIONS:

- A. The supply and exhaust fans shall be centrifugal plenum type heavy duty Class I or II with non-overloading backward inclined or airfoil wheels, AMCA certified. Supply and Exhaust Fans shall be high efficiency backward curved impeller. Fan wheel shall be statically and dynamically balanced. Provide shafts constructed of solid hot rolled steel, ground and polished, with key-way, and protectively coated with lubricating oil. Bearings shall be heavy duty grease lubricated self-

aligning ball or roller pillow block type.

- B. Supply and Exhaust Fans shall be provided with factory mounted and wired variable frequency drives and Supply and Exhaust Fans shall be provided with integral Piezometer Flow Rings for Air Flow Measurement.
- C. Condenser fans shall be direct drive with premium efficiency motors, statically and dynamically balanced, draw through in the vertical discharge position. Shall be direct drive vertical discharge design with low-noise corrosion resistant glass reinforced polypropylene props, powder coated wire discharge guards and electro-plated motor mounting brackets. Provide condenser fans with integral, factory mounted variable frequency drives (VFDs) for modulating head pressure control.

2.5 MOTORS & DRIVES:

- A. Fan, motor and belt drive shall all be mounted on a spring isolated chassis (minimum isolation efficiency 90-95%). Belt drives shall have a minimum service factor of 1.5. Motor electrical connections are to be factory pre-wired to the unit control panel.

2.6 DAMPERS:

- A. General: All dampers shall be of low leakage type with blade edge and side seals. Dampers shall be constructed of galvanized steel (14-gauge frames/16-gauge blades) with self-lubricating porous bronze bearings.
- B. Outside & Exhaust Air Shut-Off Dampers: Parallel blade dampers with electric modulating operators shall be provided to prevent infiltration of unconditioned air into the building when unit is not in operation.
- C. Recirculation Air Damper: Parallel blade damper with electric two (2) position actuator shall be provided to allow for space dehumidification when in the unoccupied mode without the introduction of outside air.

2.7 EVAPORATOR, CONDENSER, HGRH COILS:

- A. Cooling/dehumidification coils, Condenser coils, Hot gas reheat coils shall be constructed with copper tubes mechanically bonded to configured aluminum plate fins with performance certified by A.R.I. standards. Coils shall be factory leak tested in accordance ANSI/ASHRAE 15-1992 at a minimum pressure of 500 PSIG.
- B. Evaporator coil shall include six rows of cooling interlaced for superior sensible and latent cooling with a maximum of 12 FPI for ease of cleaning.
- C. The condenser coil shall have a fin designed for ease of cleaning.
- D. Reheat coil shall be fully integrated into the supply airstream and be capable of delivering design supply air temperature. To prevent re-hydration of condensate from evaporator coil, the evaporator coil face and the hot gas reheat coil face shall be separated by a minimum of six inches.
- E. Coil Coating for condenser, evaporator, Hot Gas Reheat Coils: All coils shall have a factory applied flexible epoxy polymer e-coat uniformly applied to all coil surface areas with no material bridging between fins. The coating process will ensure complete coil and coil casing encapsulation and a uniform dry film thickness of 1.2 mills on all surface areas including fin edges and meet 5b rating cross hatched adhesion per ASTM B3359- 93. Corrosion durability will be

confirmed through testing with no less than 6,000 hours salt spray resistance per ASTM B117-90 using scribed aluminum test school coupons. Field coatings and spray coatings are not acceptable.

2.8 FILTERS:

- A. The supply and exhaust air filters shall be 2" deep MERV 8 pleated cartridge type as standard, provided an average efficiency of 25-30% by ASHRAE Standard 52-76 test method. In addition, provide 4" deep MERV 13 pleated filters. Filters shall be Farr or equal. Face velocity through the filters shall not exceed 500 FPM at the unit's rated nominal capacity.

2.9 HEATING:

- A. Modulating Indirect Gas Fired Heating System: Completely assembled and factory installed heating system shall be located in the primary heating position located downstream of the indoor fan assembly and be integral to unit and approved for use downstream from refrigerant cooling coils in units mounted outdoors. Threaded gas connection shall terminate at manual shut-off valve. Provide capability for sidewall or thru-base gas piping.
- B. Heaters shall include high turn-down burners firing into individual stainless- steel tubular heat exchangers. Heat exchangers shall be constructed of type 304 stainless steel and be a high efficiency dimpled tubular design capable of draining internal condensate. Units with multiple heaters shall include one fully modulating high turndown heater with additional on-off heater sections. Total heater turndown shall be of 20:1.
- C. Heater outdoor air inlet shall be hooded and include internal baffle system to prevent rain blow thru. To prevent recirculation of flue gas and to prevent flue gas condensate from draining onto and obstructing the heater air inlet the inlet shall be hooded and shall be located a minimum of 11" beneath the flue outlet. Inlet hood shall include bird screen.
- D. Heater flue outlet(s) shall include hooded outlet with wire cloth all constructed of Type 304 stainless steel. Hooded outlet shall be sealed to prevent flue gas recirculation.
- E. Gas Burner Safety Controls: Provide safety controls for the proving of combustion air prior to ignition, continuous air proving monitoring following ignition and continuous electronic flame supervision.
- F. Unit controls shall monitor heat output and shall discontinue all heating attempts and or unit operation in the event the heating section fails to ignite or fails to maintain programmed supply air temperature/time.
- G. Inducer fan shall be direct drive high pressure centrifugal type with two speeds and shall include built- in thermal overload protection.
- H. Limit controls: High temperature automatic reset limits shall be located on blower wall and in indoor fan chamber to shut off gas flow in the event of excessive temperatures resulting from restricted indoor airflow, or loss of indoor airflow.
- I. Flame roll-out safeties shall provide continuous monitoring of proper burner operation.

2.10 ELECTRICAL:

- A. Control panel(s) shall be provided with hinged access doors and an approved locking device in a NEMA 3R enclosure. All high voltage power components such as fuses, switches and contactors

shall include a service personnel protection barrier or shall be a listed as touch-safe design. Field wiring access to be provided thru unit base into isolated enclosure with removable cover.

1. Power wiring to be single point connection.
 2. Wiring internal to the unit shall be colored and numbered for identification.
 3. Unit shall be factory wired to field wiring terminal block mounted in isolated enclosure.
 4. Factory wired main non-fused power disconnect and overcurrent device shall be rated for total unit connected power
 5. SCCR rating shall be a minimum of 65kA
 6. Factory wired Voltage/Phase monitor shall be included as standard. In the event of any of the following, the units will be shut down and a fault code will be stored in the monitor for the most recent 25 faults. Upon correction of the fault condition the unit will reset and restart automatically.
 - a. Phase Unbalance Protection: Factory set 2%
 - b. Over/Under/Brown Out Voltage Protection: +/-10% of nameplate voltage
 - c. Phase Loss/Reversal
 - d. Single Phase Protection
- B. Factory to mount and wire 120-volt convenience outlet. Field wiring of convenience outlet not acceptable.
- C. All low voltage field wiring connections shall be made at factory installed lowvoltage terminal strip.

2.11 COMPRESSORS AND AIR-COOLED CONDENSING UNIT:

- A. Unit shall be provided complete with an air-cooled condensing unit of the size and capacity as indicated on the equipment schedule. Provide each unit with two hermetically sealed independent refrigerant circuits factory-supplied completely piped with liquid line filter-drier, liquid line charging port, suction and liquid line pressure ports, sight glass, and thermal expansion valve, suction line accumulator, and charge compensator
- B. ACCU shall have a minimum of two (2) independent refrigerant circuits, a minimum of 2 modulating digital scroll compressors-one for each circuit- to provide infinite modulating capacity between 5% and 100% of capacity for each circuit. Hot gas bypass is not permitted.
- C. Condensing Unit/Compressors must be able to provide mechanical cooling down to 55 F ambient while maintaining DX Cooling Coil Leaving Air Dew Point at a constant 48 F, and, be able to provide 20-degree temp rise with fullhot gas reheat capacity.
- D. Each compressor shall have a crankcase heater to minimize the amount of liquid refrigerant present in the oil sump during off cycles. Each compressor shall be mounted on rubber vibration isolators, to reduce the transmission of noise.
- E. Unit shall be capable of providing design supply air conditions (leaving air - dry bulb and wet bulb) during part load operation. Part Load Design point shall be demonstrated at engineer's request; 68F db / 64.3F wb ambient conditions, unit shall deliver supply air design conditions (leaving air - dry bulb and wet bulb), while maintaining 70 reheat.
- F. Provide each circuit with automatic reset high and low pressure and high temperature switches for safety control.
- G. Condenser coil hail guards shall be factory installed.

2.12 UNIT CONTROLS:

- A. Main Unit Controller (MCM) shall be provided by CMI. (There shall be no control interface

devices, no integration, no BacNet, and no controllers provided by the VAU manufacturer.) VAU manufacturer shall provide and factory install the following control end devices and wire all to a terminal strip, with no controller and no interface:

1. Outdoor Air Temperature Sensor
2. Outdoor Air Humidity Sensor
3. Outdoor Air Flow Measuring Station
4. Outdoor Air Modulating Damper and Actuator
5. Outdoor Air Total Energy Wheel Modulating Bypass Damper and Actuator
6. Exhaust Air Total Energy Wheel Modulating Bypass Damper and Actuator
7. Total Energy Wheel Rotation Sensor
8. Total Energy Wheel Enable
9. Return Air/Mixed Air Modulating Damper and Actuator
10. Return Air Temperature Sensor
11. Return Air Humidity Sensor
12. Return Air Duct Pressure Sensor
13. Filter Differential Pressure Switch – Status
14. Exhaust Fan Piezometer Air Flow Station
15. Exhaust Fan ECM Variable Speed Fan Control
16. Exhaust Damper and Actuator
17. Exhaust Damper End Switch
18. Exhaust Air Temperature Sensor
19. 0-10 vDc Input for Single/Dual Digital Compressor Capacity Modulation
20. Evaporator Leaving Air Temperature Sensor
21. 0-10 vDc Input for Hot Gas Reheat Modulation
22. Supply Fan Status
23. Supply Fan Piezometer Air Flow Measuring Station
24. Supply Fan ECM Variable Speed Fan Control
25. Modulating Gas Heat
26. Unit Leaving Air Temperature Sensor for Discharge Air Temperature.

PART THREE – EXECUTION:

- 3.1 Unit shall be provided with factory start-up and check-out by manufacturer's personnel, no exceptions. Provide written report by manufacturer documenting start-up to Engineer for approval. Inspections and 5-year parts and labor warranty work shall be performed by manufacturer's personnel, no exceptions. Manufacturer shall employ a minimum of 10 certified technicians, within 25 miles of job site, qualified to work on equipment.
- 3.2 Mount unit on structural aluminum or hot dipped galvanized seismic roof curb per Section 15890 with flashing assembly that complies with the National Roofing Contractors Association requirements. The roof curb on the top elevation must be true and level. Contractor shall provide supplemental steel to attach curb to structure as recommended by Curb Manufacturer. See Specification Section 15890 for product and design criteria.
- 3.3 Provide type "L" hard copper P-trap assembly at each condensate drain connection with threaded cleanout plug full size of unit connection a 1" minimum. Depth of trap shall be sufficient for drainage with static pressure of unit.
- 3.4 Insulation shall be provided on refrigerant section and condensate piping. Insulation shall be ¾" thick "Rubatex" or "Armaflex." Seal all joints with adhesive. Insulation shall not be cut lengthwise to install. All exterior refrigerant piping shall be covered with 22-gauge aluminum or 24-gauge stainless steel jackets. Provide 1" thick "Rubatex" or "Armaflex" on refrigerant suction piping 1 ½" O.D. and larger.

- 3.5 All piping shall be hung with clevis type hangers complete with insulation saddles. Route liquid line above suction and tie wrap 4' o.c. with 3/8" wide nylon straps without compressing insulation. Pipe hangers shall be as manufactured by Michigan Hanger Co., Grinnell or B-Line. Hangers equal to M-CO #403.

END OF SECTION 15748

SECTION 15808 – DUCTWORK

PART ONE – GENERAL:

- 1.1 Ductwork, including exhaust, shall conform to all applicable requirements of the latest issue of NFPA Pamphlet No. 90A. All ductwork, elbows, take-offs, transitions and etc. shall conform to the recommendations of SMACNA duct construction standards as a minimum requirement, unless otherwise indicated by the contract documents.
- 1.2 Ductwork shall be installed to operate without noise or vibration and shall be air tight. The Contractor shall be responsible for measuring at the building all conditions, space available, piping, light fixtures, ceiling heights, etc. that affect ductwork installation prior to fabrication. Ductwork shall be constructed as job progresses, not in advance.

PART TWO – PRODUCTS:

2.1 LOW PRESSURE DUCTWORK:

- A. Low pressure and exhaust ductwork shall be galvanized sheet steel constructed to the requirement of SMACNA Table 1-5 for 2" W.G. static pressure, unless otherwise noted. Duct and fitting sealing requirements shall be in accordance with SMACNA Table 1-2, Seal Class "A". Duct tape is not allowed. Seismic restraints shall be provided for all ducts with a cross sectional area of six (6) square feet and larger in accordance with the International Building Code, International Mechanical Code and SMACNA Seismic Restraint Manual, Latest Edition. Gauges and reinforcing shall be as follows:

MAXIMUM SIDE INCHES	STEEL U.S. STANDARD GAUGE*	TYPE OF TRANSVERSE JOINT CONNECTIONS	BRACING
Up to 24	24	S, Drive, Pocket or Bar Slips, 7'-10" o.c.	None
25 to 30	24	S, Drive, Pocket or 1" Bar Slips, 7' – 10" o.c.	1" x 1" x 1/8" Angles 4' o.c.
31 to 40	22	Drive, 1" Pocket or 1" Bar Slips on Centers	1" x 1" x 1/8" Angles 4' o.c.
41 to 60	22	1 1/2" Angle Connections, 1 1/2" Pocket or 1 1/2" Bar Slips with 1 3/8" x 1/8" Bar reinforcing 7' 10"	1 1/2" x 1 1/2" x 1/8" Angles 4' o.c.

		o.c.	
61 to 90	20	1 ½" Angle Connections, 1 ½" Pocket or 1 ½" Bar Slips with 1 3/8" x 1/8" Bar reinforcing 7'10" o.c.	1 ½" x 1 ½" x 1/8" Angles 2' o.c.
91 and Up	18	2" Angle Connections, 1 ½" Pocket or 1 ½" Bar Slips with 1 3/8" x 1/8" Bar reinforcing 3'9" o.c.	1 ½" x 1 ½" x 1/8" Angles 2' o.c.

2.2 ROUND INSULATED FLEXIBLE DUCTS & SPIN-IN COLLARS:

- A. Insulated flexible ducts shall consist of an inner core of acoustically transparent CPE inner film or perforated corrugated aluminum with sound attenuating features complete with a factory applied exterior jacket of R 4.5 fiberglass insulation and reinforced metalized vapor barrier with 0.05 ASTM E96 permeance rating. Duct shall be UL listed as Class 1 air duct, standard UL 181 with flame spread and smoke developed ratings of 25 and 50 respectively. Minimum working pressure shall be 4" W.G. positive. Flexible ducts shall be:
 - 1. Flexmaster 1M – Acoustical Insulated
 - 2. Clevaflex – Clevaform DB-series-type DBA acoustical duct
- B. Spin-in collars shall be constructed of galvanized steel with scoop and damper.

PART THREE – EXECUTION:

- 3.1 *Gauge Stamps: Turned out and on bottom of ducts.
- 3.2 All supply and return duct elbows with an inside radius of less than ¾ of duct width shall have single thickness turning vanes. All square elbows shall have double thickness turning vanes.
- 3.3 All exhaust duct elbows shall have not less than 6" inside radius. All square elbows shall have single thickness turning vanes.
- 3.4 Splitter dampers and branch take-off extractors shall be installed where indicated and shall be adjustable and shall have locking quadrants.
- 3.5 All branch take-offs shall be 45-degree entry type per SMACNA Fig. 2-6. No straight tap or butt fittings allowed.
- 3.6 Flexible duct connections shall be provided where ductwork connects to equipment and shall be

- Ventglas 30 oz. woven glass fabric double coated with neoprene, fire retardant, waterproof, air tight and UL listed.
- 3.7 Duct sizes indicated on plans are interior dimensions. Increase metal duct sizes as required for acoustical or interior insulation.
 - 3.8 All ductwork shall be supported by 1" x 1/8" galvanized iron straps with a maximum spacing of 8'. Straps shall be bolted or clamped to the structure and be turned and fastened to bottom of the duct so that duct weight is not on the fastening screws.
 - 3.9 Provide 1" diameter test slots with cover for insertion of thermostat or test instruments at all locations required to perform operations under paragraph "Balancing."
 - 3.10 Provide duct access doors to afford easy access to entering air side of items requiring maintenance or inspection (such as thermostats, fire damper, etc.). Doors shall be of ample size for service required (18" x 12" minimum) and provided with frame, brass hinges, handle, clamping device and gasket for air tight joint.
 - 3.11 Round flexible ducts shall be installed in extended condition free of sags and kinks using only the minimum length required to make the connection. Abrupt bends and turns that crimp the duct and restrict the air flow will not be permitted. Horizontal supports shall be 3/4" wide 22-gauge flat galvanized steel sheet banding material. Flexible ducts shall be supported on 36" centers. Maximum allowable length of a flexible duct shall be 8'. If extended run-out is indicated, round galvanized steel shall be used for run-out length in excess of 8'.
 - 3.12 The entire duct system shall be free from rattles. If rattles exist after ductwork has been installed, the labor and materials necessary to eliminate rattles shall be done at the expense of this Contractor.
 - 3.13 All return duct connections to air devices shall be rectangular unless otherwise indicated on plans. Use of flexible duct is prohibited on any return or exhaust ductwork.
 - 3.14 Where ceiling plenum returns are used, the return duct shall be fitted with a bell- mouth entry covered with 1" x 1" galvanized hardware cloth.
 - 3.15 Kitchen hood exhaust ductwork systems shall be constructed to the requirements of NFPA 96. Ductwork shall be a minimum of 18-gauge 316 stainless steel with all seams and joints sealed liquid tight with a continuous external weld. Dishwasher hood exhaust shall be 16-gauge stainless steel.
 - 3.16 Prior to substantial completion, Contractor shall retain an independent licensed and professional testing agency that specializes in indoor air quality that will test for excessive dust and/or debris that may be present in the duct system. If it is determined that cleaning of duct is necessary, the Contractor shall employ a qualified duct cleaning agency to perform the work at no additional cost to the Owner.

END OF SECTION 15808

SECTION 15820 – DAMPERS

PART ONE – GENERAL:

- 1.1 Mechanical Contractor shall furnish and install all dampers as indicated on drawings or called for under Specifications.
- 1.2 Dampers shall be as manufactured by Air Balance, Inc., Phillips-Aire, Ruskin Manufacturing Co. or Louvers and Dampers, Inc.

PART TWO – PRODUCTS:

2.1 MANUAL & AUTOMATIC DAMPERS:

- A. Manual and automatic dampers shall be of the multi-louver opposed blade type equipped with an external operating shaft. Locking device shall be provided for manual dampers.

2.2 FIRE DAMPERS:

- A. Fire dampers for low pressure and exhaust ductwork shall be parallel blade positive closure mounted in a galvanized steel channel frame. Dampers shall be curtain type meeting all UL 555 and NFPA requirements. Dampers shall be high free area style with blade package mounted out of air stream. Dampers in stainless steel ductwork shall be constructed of type 304 stainless steel. Fuse line shall be 160 degrees. Fire dampers shall have a UL label with a 1 ½ hour rating for use in partitions with ratings of up to two (2) hours. Fire dampers shall have a UL label with a three (3) hour rating for use in partitions with ratings of up to four (4) hours.
- B. Fire dampers shall be provided as follows:
 1. In all duct passages through fire rated assemblies.
 2. In all duct passages through floor.
 3. In fire rated openings used for return air passages.
 4. See Architectural floor plans for locations and ratings of all fire rated assemblies.
- C. Ceiling radiation dampers shall be installed at air device penetrations of a fire rated ceiling. Dampers shall be UL listed with 165 degrees F. fusible link. Phillips-Aire Series 8 (rectangular) or 9 (round) dampers or approved equal.

2.3 SMOKE DAMPERS:

- A. Smoke dampers shall be classified by Underwriters Laboratories as Leakage Rated Dampers for Use in Smoke Control Systems under the latest version of UL Standard 555S and shall bear a UL label. Smoke dampers and their operators shall be qualified under UL 555S to a minimum elevated temperature of 250 degrees F. Dampers shall be qualified at UL 555S Leakage Class II. Combination dampers shall comply with both UL 555 and UL 555S.
- B. Electric operators shall be installed by the damper manufacturer at time of damper fabrication. Installation of damper with operator and smoke detectors shall be coordinated with Controls Contractor to provide a complete and operational smoke damper in accordance with NFPA 90A.

- C. Provide smoke dampers and smoke detectors at each duct penetration of a smoke wall. Refer to Architectural plan for locations of all smoke walls. Refer to control sections of Specifications for smoke detector hardware requirements. Detectors shall meet requirements of NFPA 72.

PART THREE – EXECUTION:

- 3.1 Fire and smoke dampers shall be provided with access doors to operate and reset. Provide identification markers with lettering a minimum of 1/2" high on each access door stating "fire damper" or "smoke damper" as applicable per requirements of I.B.C. 715.4 and I.M.C. 607.4. Areas around dampers shall be fire stopped with fire resistant materials consistent with UL tested assembly requirements.
- 3.2 Where fire and smoke dampers are located above a hard or security ceiling, Contractor shall provide access doors in ceiling to reach dampers. Coordinate door and frame style with Architectural Finish Schedule. Submit to Architect for approval.

END OF SECTION 15820

SECTION 15850 - INSULATION

PART ONE - GENERAL:

- 1.1 All insulation shall have a composite fire and smoke hazard rating which shall include insulation, jacket, facing, and adhesive. Flame spread rate shall not exceed 25 with smoke development not in excess of 50. Accessories (adhesives, mastics, cements, tapes) shall be rated as specified for insulation. Samples of all types of insulation shall be submitted for approval. Piping and duct work shall be tested, thoroughly cleaned and approved before insulation is applied.

PART TWO - PRODUCTS:

- 2.1 Insulation shall be as manufactured by Manville, Certain-Teed, Owens-Corning, Knauf, or approved substitute.

PART THREE - EXECUTION:

3.1 SUPPLY, RETURN, AND OUTSIDE AIR DUCTWORK:

- A. All concealed ductwork, including flexible duct connections, diffuser boots, and backs, VAV box heater/manifold sections, etc. shall be insulated with 2" thick, 1 pcF density, flexible insulation with factory applied vapor barrier consisting of Foil-Scrim-Kraft. Insulation shall be secured to ductwork with Benjamin Foster 85-20 adhesive. All joints shall be stapled and finished with a 3" wide strip of glass fabric and mastic.
- B. All exposed ductwork shall be insulated internally with 1" Armaflex type SA insulation secured with weld pins. Ductwork in mechanical rooms is considered concealed.
- C. All transfer air ducts shall be insulated internally as described for exposed ductwork above.

3.2 DUCTWORK SERVING VENTILATION AIR UNITS:

- A. All supply and return/exhaust air ductwork serving ventilation air units shall be externally insulated with 2" Armaflex type SA sheet elastomeric insulation secured with weld pins. Exterior ductwork shall be covered with 26 GA stainless steel jacketing and flashed to the exterior wall of the building weathertight.

END OF SECTION 15850

SECTION 15882 - CONDENSATE DRAIN PIPING FOR HVAC

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes condensate drain piping for HVAC units.

1.2 SUBMITTALS

- A. Product Data: For each product indicated include a material and manufacturers list on Contractor's letterhead with appropriate minimum standards referenced.

PART 2 PRODUCTS

2.1 MATERIALS

- A. 1" and 2" Schedule 40 PVC piping and appropriate, reducers, enlargers, 90° elbows, and pre-manufactured P-traps, as required; as manufactured by NIBCO, Elkhart, IN, 800-234-0227 or equal.
- B. Condensate Drain Support: MIRO 1.5 supports, as manufactured by MIRO Industries, Sandy, Utah, 800-768-6978.

PART 3 EXECUTION

3.1 ASSEMBLY

- A. At the condensate pan drain, install a 90° elbow, outlet down. Connect to pre-manufactured ¾" "P" trap and utilize reducers immediately before and after "P" trap. Provide cold connection to 1" drain piping collection system. Terminate 1" drain piping at internal roof drains or at gutters with 90° elbows, outlet down. Secure pipe to drain strainer basket or to gutter spacers with stainless steel wire.
 - 1. If more than one condensate drain can be tied together, provide cold connection of 1" PVC drain line into 2" PVC drain piping collection system.
- B. Support 1" and 2" drain piping collection system at 5' O.C. using MIRO 1.5 supports.
- C. Set condensate drain support stand in a bed of utility cement on a sacrificial cap sheet membrane, which extends a minimum of 4" beyond the condensate drain pipe support base in all directions. Sacrificial cap sheet membrane shall be spot adhered to the cap sheet surfacing.

END OF SECTION 15882

SECTION 15890 - VIBRATION AND SEISMIC CONTROL

PART ONE - GENERAL:

- 1.1 All vibration isolation and seismic control materials specified herein shall be provided by a single manufacturer to assure single responsibility for their proper performance. Installation of all vibration and seismic control materials specified herein shall be accomplished following the manufacturer's written instructions.
- 1.2 The Contractor shall furnish a complete set of shop drawings and other necessary information, of all mechanical equipment to receive vibration isolation and seismic devices, to the vibration isolation and seismic control materials manufacturer. The information to be furnished shall include operating weight of the equipment to be isolated, distribution of weight to support points and dynamic characteristics along with any internal isolation systems to be analyzed. The Contractor shall also furnish a complete layout of piping and ductwork to be isolated, including vertical risers, showing size or weight and support points of the piping and ductwork system, to the vibration isolation and seismic control materials manufacturer, for selection and layout of mountings.
- 1.3 The vibration and seismic control materials manufacturer shall use the above listed information to design a complete system of vibration and seismic mounts in accordance with the contract documents along with the International Building Code with date as indicated on the code analysis section of the contract documents, SMACNA "Seismic Restraint Manual" latest edition, and ASHRAE HVAC Applications handbook, Sound and Vibration Control section, latest edition. The vibration and seismic control materials Contractor shall analyze all "multiple degrees of freedom" systems and provide properly designed isolation systems avoiding all resonance frequencies. To accomplish this, the vibration and seismic control materials supplier shall employ an Engineer registered in the State of South Carolina to design all isolation and restraint systems and prepare a complete set of calculations and shop drawing submittals with his professional Engineer's seal certifying that the design meets all requirements of these contract documents. A seismic design "errors and omissions" insurance certificate must accompany submittals from the vibration and seismic Engineer. Manufacturer's product liability insurance certificates are not acceptable.
- 1.4 The vibration and seismic control Engineer or his designated representative shall inspect the project upon completion of the applicable work and provide written certification that the installation is in compliance with the approved shop drawing submittals. This certification shall also bear the professional Engineer's seal and shall become part of the contract closeout documents. All seals shall be signed and dated appropriately.
- 1.5 Vibration and seismic control systems shall be provided by Vibration Mounting and Controls, Mason Industries, Consolidated Kinetics, or prior approved equal.

PART TWO - PRODUCTS AND EXECUTION:

2.1 VIBRATION ISOLATION:

- A. All mechanical equipment shall receive external vibration isolation. Internal component isolation of equipment shall not be considered equivalent but shall be considered when analyzing systems with multiple degrees of freedom.
- B. Vibration isolators shall be selected based upon known operating weight distributions and dynamic characteristics of the isolated equipment, with the quantity and location as required by

the component drawing. Isolator type shall be tabulated for each isolated piece of equipment. Complete calculations of vibration analysis shall be included with submittals, including but not limited to fundamental and harmonic frequencies.

- C. Isolators shall have either known non-deflected heights of spring element or calibration markings so that, after adjustment, when carrying their load, the deflection under load can be verified to determine if the load is within the proper range of the isolator and if the correct degree of vibration isolation is being provided.
- D. Isolators shall function in the linear portion of the load versus deflection curve. Theoretical vertical natural frequency shall not differ from the design objectives by more than + 10%.
- E. Spring mounts shall have seismic housings as required by Paragraph 2.2.
- F. Isolation of equipment shall be as follows:
 - 1. Suspended equipment shall be isolated from the building structure by means of noise and vibration isolators. Units shall be supported with spring and neoprene type isolators, springs to be as described above. Isolators shall be VMC Series RSH.
 - 2. Roof mounted equipment shall be isolated from the building structure by means of a structural aluminum or hot dipped galvanized structural steel isolation curb. The structural spring isolation curbs shall bear directly on the roof support structure and be flashed and waterproofed into the roof's membrane waterproofing system. Roof curbs shall be installed to accommodate the pitch of roof. Contractor shall provide and install all supplemental steel required for seismic attachment of curb to structure as designed by manufacturer. Field fabricated curbs shall not be used. Curb shall come factory assembled. No bolt together corners will be allowed. The curb shall consist of a rigid lower section containing properly spaced pockets with fully adjustable spring isolators. All springs shall be color coded for proper identification and spring pocket shall allow for easy removal or replacement of any spring without disturbance of the supported equipment. Pockets shall have removable waterproof covers to allow for spring adjustment. Spring pockets shall contain combination vertical and horizontal restraint in conjunction with a 1/4-inch-thick neoprene rubber bushing which will resist wind and seismic forces. All springs shall be installed in series with a 1/4-inch-thick neoprene acoustical cup or pad. Curbs supplied shall be factory acoustically lined with 1 inch 3 PCF duct liner. An air tight neoprene seal shall be incorporated into the curb design to prevent air leakage or infiltration. Air seal must not be exposed so that it could be damaged or that in the event of the air seal failure, water could leak into the curb's interior. Wood nailer and flashing shall be provided and curbs shall be manufactured to NRCA standards. Curbs shall include a means of incorporating a sound barrier package, consisting of two layers of waterproof gypsum board furnished and installed by the Mechanical Contractor. Provide 6", R-19 sound attenuating batt insulation equal to Certa Sound as manufactured by Certaineed, batt insulation shall fill all voids within the curb between the roof deck and the unit above. Additionally, the mechanical contractor shall provide 1/2" treated plywood around the entire perimeter of the curb over the rigid insulation supplied by the roofer to allow for roofer to properly flash curb. Individual pier supported curbs are not acceptable. Roof equipment supports to be VMC type P or R.
 - 3. Mechanical equipment as noted shall be mounted on a rigid structural steel base. The equipment including the base shall be mounted on or suspended from vibration isolators as applicable. Base shall be VMC Type WFB.
 - 4. Floor mounted equipment as noted shall be provided with a noise and vibration isolated structural steel concrete slab inertia base mounted on isolators. Spring mounts shall be recessed at corners. Inertia base shall be VMC Type MPF or WPF as applicable.

2.2 SEISMIC CONTROL:

- A. All mechanical equipment, piping, ductwork, etc. shall be provided with seismic restraints in accordance with the International Building Code, International Mechanical Code, and SMACNA Seismic Restraint Manual, Latest Edition requirements, as a minimum.
1. All equipment isolated or not, shall be bolted to the structure to allow for seismic acceleration with no failure or displacement. All connections shall be positive bolted type; no friction clamps of any kind are allowed.
 2. Provide cable and connection sets for suspended equipment at each of four corners secured to the building structure.
 3. Provide seismic roof curb systems fastened to roof structure for roof to equipment.
 4. Floor mounted equipment shall be provided with seismically housed springs or springs with seismic snubbers as determined by the equipment to be isolated.

END OF SECTION 15890

SECTION 15900 - CONTROLS

PART ONE - GENERAL:

- 1.1 The control equipment shall be the standard product of a single, reputable control manufacturer and shall be installed by trained mechanics regularly employed by the control manufacturer. The system shall be the electric type. A typewritten control sequence shall be framed and displayed where directed.
- 1.2 All items of equipment, materials, and labor necessary and/or incidental to the hereinafter specified sequence of operation shall be provided with the control system. Items such as auxiliary controls, interlocks, relays or other sequencing devices shall be fully coordinated with the heating and cooling equipment approved for the installation.
- 1.3 All control wiring required for this installation is included in this contract and shall be color coded. All control wiring shall be in conduit. Conduit, wiring sizes, and type of insulation shall be in accordance with DIVISION 16E - ELECTRICAL, and shall conform to the latest issue of the National Electrical Code. All electrical equipment shall bear UL labels. Each control circuit shall be protected by a circuit breaker of the proper size.

PART TWO - PRODUCTS AND EXECUTION:

- 2.1 SMOKE WALLS:
 - A. Contractor shall provide circuits, conduit, wire, detectors, and listed operator/smoke damper at each duct penetration of a smoke wall in accordance with NFPA 72 and 90A.
- 2.2 THERMOSTATS/HUMIDISTATS:
 - A. Thermostats shall be mounted 48" above finished floors, unless otherwise noted. Provide heavy-duty key lock steel guards by "AA" Industries, Model T18L secured to wall with lead anchors and #10 screws or equal by Shaw-Perkins.
- 2.3 CONTROLLERS:
 - A. All controllers shall be labeled with engraved bakeolite plastic plates indicating control function and correct set point. Label shall clearly relate to controller by functional name as indicated on control wiring diagram.
- 2.4 FIRE PROTECTION:
 - A. All air handling units 2000 CFM and above shall be provided with smoke detectors in the return air ducts and smoke dampers in accordance with the International Mechanical Code. Air handling units that are a part of a smoke control system shall have smoke detectors and smoke dampers regardless of capacity.
 - B. The smoke detectors shall be designed to detect combustion gases, fire and smoke in the supply and return air streams of the air handling units as indicated. The smoke detectors shall consist of sampling tubes which extend into the return and supply air section and, while the fan is operating, shall continuously sample air. The smoke detector shall be of the ionization type. Materials and equipment shall be the standard catalogued products of concerns regularly engaged in the manufacture of the products and shall be the latest standard design that conforms to the specification requirements and bear the UL label and Factory Mutual Laboratories label.

The smoke detection system shall be interlocked with the smoke dampers and air handling unit fan motor and shall, when energized, close the smoke dampers and shut down the fan motor. Smoke dampers shall be wide open before air handling unit fan motor begins operating. Smoke detectors shall have reset switch and red alarm light. Provide extra contacts for tie-in with building fire alarm system. If no fire alarm system is provided under Division 16, this Contractor shall provide an alarm panel with visual and audible signals for each detector with a location map. Graphic annunciator panel shall be located at a constantly attended location per I.M.C. Section 6.06.4.1. Coordinate location with Owner and Architect. Installation shall meet requirements of NFPA 72.

- C. Smoke Dampers: Dampers shall meet the requirements of NFPA 72, 90A, UL 555 and 555S. All damper frames shall be constructed of No. 13 gauge galvanized sheet metal and shall have hat-shaped end channels for duct mounting. Damper blades shall not exceed 6" in width. All blades are to be corrugated type construction, fabricated from two sheets of No. 22 gauge galvanized sheet-metal spot welded together. All damper blade bearings are to be made of oil impregnated sintered bronze and will turn freely in the frame. Replaceable synthetic elastomer seals shall be provided. The dampers shall be provided with seals installed along the top, bottom and sides of the frame and along the upper edge of each blade edge. Seals shall provide a tight-closing, low-leakage damper. Leakage and flow characteristics charts shall be submitted prior to installation of dampers.
- D. Furnish shop dampers to ductwork contractor for installation. Control contractor shall supervise damper installation.
- E. For air handling units 2000 CFM and under capacity but serving an area used for egress, provide smoke detectors in accordance with International Mechanical Code requirements.
- F. Provide necessary control devices and wiring to shut off kitchen make-up air units upon activation of the kitchen hood fire extinguishing system. Provide controls to shut off hood exhaust fans when exhaust air temperature reaches 350 degrees F. Interlock with building fire alarm system.
- G. Provide ionization type smoke detector in the inlet of each exhaust fan of 15,000 CFM or more. Sampling tubes shall detect combustion gases and/or smoke and stop the fan when detector is activated. Detector unit shall be equipped with reset switch and red alarm light. Provide extra contacts for tie-in with building fire alarm system.

2.5 ENERGY MANAGEMENT SYSTEM (EMS) - (SEE EMS SPEC. SECTION):

- A. Provide control center located as indicated on the HVAC drawings, per Section 15904 of the specifications. The control center shall contain numbered terminals of sufficient quantity to permit the required connections. Provide two 120v power supplies and a water pipe ground wire inside control center.
- B. Provide conduit and install Belden #9967 2-conductor shield cable from panel to main distribution switchboard. Provide current transformers on main bus bars for demand limiting function.

2.6 CERTIFICATION:

- A. Furnish to the Architect/Engineer two copies of certification signed by authorized representative of the control company that:
 - 1. Control system has been checked-out and operates according to drawings and specifications.
 - 2. All controls are guaranteed unconditionally for one year from date of acceptance and will be serviced for this period free of charge.
 - 3. Photostatic copies of as-built wiring diagram and control zones have been framed under glass

- and posted on job.
4. Maintenance personnel or responsible party has been instructed as to the operation of control system. Keys for guards and control centers have been turned over to Owner.
- B. The control and energy management systems shall be as manufactured by Siemens.

END OF SECTION 15900

SECTION 15904 - ENERGY MANAGEMENT SYSTEM (DDC HEAT PUMP)

PART ONE - GENERAL:

1.1 GENERAL:

- A. This specification defines the minimum equipment and performance requirements for a direct digital control building control system.

Acceptable manufacturer is as follows:

- Siemens

1.2 SUBMITTALS/DRAWING:

- A. The Control Contractor shall submit prior to installation a set of installation drawings and control strategies for review by the Consultant and/or Owner's representative. These drawings shall include the physical location of building control system equipment and system architecture. The complete sequence of operation of the control system shall be provided.
- B. Upon completion of the installation and final system adjustment, the Control Contractor shall provide a full set of as-built drawings of the installation and the control strategies. In addition, the Control Contractor shall provide a floppy disk containing the as-built control drawings in AutoCAD format.
- C. Framed control diagrams shall be mounted on the wall inside the appropriate mechanical room.

1.3 GUARANTEE:

- A. The entire control system shall be installed by the control manufacturer and guaranteed free of defects and shall include required servicing and maintenance for a minimum of one (1) year after final acceptance.

PART TWO - PRODUCTS AND EXECUTION:

2.1 CONTROL AND INTERLOCK WIRING:

- A. All electrical work required under this section of specifications shall comply with the latest National Electrical Code. Control system power supply shall be served by a separate breaker and fused in control center for secondary protection.
- B. The mechanical contractor shall furnish and turn over to the electrical contractor, motor starters for mounting and power connections thru starter to motor. Disconnect switches when required shall be furnished by electrical contractor.
- C. All control wiring shall be run in rigid conduit below grade or, on outdoor installation. Galvanized EMT may be run in dry wall construction, above ceilings, or in equipment rooms where permitted by electrical specifications.
- D. Control wiring shall be color coded #16 TFF of TFFN wire with 600-volt insulation. Run all wiring between terminal points without changing color. Color code of control wiring shall be as indicated on control wiring diagram. Multi-conductor thermostat cable will not be acceptable.

2.2 TRAINING/OWNER'S INSTRUCTION:

- A. The Control System Contractor shall provide two (2) copies of an operator's manual describing all operating and routine maintenance service procedures to be used with the system. The Control Contractor shall instruct the Owner's designated representatives in these procedures during the start-up and test period. The duration of the instruction period shall be no less than eight (8) hours. These instructions are to be conducted during normal working hours. The instructions shall consist of both hands-on and classroom training at the job site.

2.3 SYSTEM ARCHITECTURE:

- A. The building control system shall consist of a network of independent, stand-alone control units (SCU) and terminal equipment controllers (TEC).
- B. The SCU's shall interface to a new color graphic central operator's computer. All graphic software shall be provided to match the existing graphic format.
- C. Under this contract, a graphic display shall be created for each of the following:
 - overall building layout with temperatures displayed
 - heat pump unit
 - VAV units
 - ventilation air units
 - VAV boxes
 - fans
 - water heaters
 - lighting controls

2.4 OPERATOR INTERFACE:

- A. The building control system shall permit full operator communication including: obtaining information about the performance of his system, allowing the operator to change the system operation, and diagnosing system malfunctions. Operator communication shall be through the use of any one of the following operator terminals, each of which shall be supplied under this contract:

- *portable laptop computer
- *printer
- *central operator's computer

- B. The network shall be addressable as a whole and shall not require referencing a particular control until for the commanding or monitoring of points on the network.

2.5 LAN CONTROLLER UNIT (LCU):

- A. Each control unit shall be capable of full operation either as a completely independent unit or as a part of the building-wide control system.
- B. Control strategies shall be Owner definable at each control unit, and for all control units in the system from any one (1) operator terminal. Each control unit shall provide the ability to support its own operator terminal if so desired.
- C. Each LAN Controller unit shall include its own microcomputer controller and power supply. All memory shall be stored in an eeprom chip so as to never lose memory upon power failure.

- D. The LCU (field panel) shall be furnished with a use programmable language and internal memory of at least 128 K RAM for local storage of extended trend date.
- E. The LCU (field panel) shall have built-in diagnostics to display at the operator terminal the amount of available RAM in each LCU (field panel) on the network.
- F. The network shall be able to detect changes in any LCU's (field panel's) and terminal equipment controller's point status, and report this change to all terminals accessing the network.
- G. The operator shall have the capability to override the operation of any LCU (field panel) or terminal equipment controller by command at a terminal connected to any LCU (field panel) on the network. The LCU (field panel) shall accept and execute operator commands to override all terminal equipment controller functions including set points from the LCU (field panel) operator terminal.

2.6 TERMINAL EQUIPMENT CONTROLLERS:

- A. Terminal equipment controllers shall be provided for each piece of equipment as specified. The energy management system shall support specific controllers for the following types of equipment as a minimum:
 - 1. Heat pumps
 - 2. Ventilation air units
 - 3. Vav units
 - 4. Vav boxes
 - 5. Exhaust fans
 - 6. Water heaters
- B. Controllers shall include all point inputs and outputs necessary to perform the specified control sequences.
- C. Each controller performing space temperature control shall be provided with a matching room temperature sensor. The sensor may be either RTD or thermistor type.
 - 1. Each room temperature sensor shall include a terminal jack integral to the sensor assembly. The terminal jack shall be used to connect a portable laptop or similar operator's terminal to control and monitor all hardware and software points associated with the controller.
 - 2. Each room sensor shall also include the following auxiliary devices:
 - Set point Adjustment Dial
 - Digital Temperature Read-Out
 - Override Switch
 - 3. The set point adjustment dial shall allow for modification of the temperature by the occupant. Set point adjustment may be locked out, overridden or limited as to time or temperature through software by an authorized operator at the central workstation, LCU, or via the portable programming tool.
 - 4. The override switch shall initiate override of the night setback mode to normal (day) operation when activated by the occupant. The override function may be locked out, overridden or limited as to the time through software by an authorized operator at the central workstation, LCU, or via the portable programming tool.
 - 5. Each heat pump will have a supply air temperature sensor connected to its corresponding TEC.

- E. Each controller shall have connection provisions for a portable laptop or similar operator's terminal. This connection shall be possible at both the controller and at the matching room temperature sensor as previously specified. The terminal may be used for readout of system variables, override control, adjustment of control parameters, air balancing, servicing and troubleshooting. The terminal shall provide the user with the following functionality as a minimum:
- Display system status (heating, cooling, etc.)
 - Display all point values and set points
 - Set and change all set points
 - Set and change heating/cooling dead-bands
 - Set and change PID loop gains
 - Set and change system mode (occupied/unoccupied)
 - Set and change system mode times
 - Override all set points
 - Override all digital and analog outputs
 - Command all digital and analog outputs
 - Select application mode
 - Assign controller address
1. All communication and displays via the portable terminal shall be in full English language with accompanying English and SI (International System of Units) engineering units for all displayed data. Selection between English and SI units shall be accomplished via a single keystroke on the portable terminal.
 2. In addition to local interface capabilities, all functionality as specified above may be performed both from the central operator's workstation and from any LCU on the communications network via the same portable terminal. From a terminal connected to any LCU it shall be possible to issue global commands to groups of controllers. All commands shall be able to be changed globally from any graphic in the system.

2.7 BUILDING CONTROL FUNCTIONS:

- A. The LAN Controller unit shall be capable of performing the following energy management routines as a minimum:
- *time of day scheduling
 - *start/stop time optimization
 - *duty cycling (temperature compensated)
 - *event-initiated programs
- B. The system shall permit the generation of job-specific control strategies that can be activated in any of the following ways:
- *continuously
 - *at a particular time-of-day
 - *on a pre-defined date
 - *when a specific measured or controlled variable reads a selected value or state
 - *when a piece of equipment has run for a certain period of time
- C. Upon a loss of commercial power to any control unit, the other units within the network shall not be affected, and the loss of operation of that unit shall be reported at the designated operator's terminal. Upon resumption of commercial power, the control unit shall resume full operation

without operator intervention. The unit shall also automatically reset its clock such that proper operation of timed sequences is possible without the need for manual reset of the clock.

2.8 DIAGNOSTICS:

- A. The system shall also allow on-line diagnosis via telephone modem from a remote location (vendor's headquarters of local branch office or other remote site).

2.9 SEQUENCE OF OPERATION:

A. Heat Pumps:

1. A Terminal Equipment Controller (TEC) shall be provided for each heat pump. The TEC shall enable the heat pump for operation according to its individual occupied/unoccupied schedule. The TEC shall control the heat pump stages of heating and cooling to maintain the space temperature set points.
2. Motorized outside air dampers shall remain closed during all unoccupied times. Motorized outside air dampers shall remain closed upon the initial startup of the applicable heat pumps. After the room has reached its warm-up or cool-down temperature, the outside air damper shall open. For packaged heat pumps with energy recovery ventilators, ventilators shall operate only during occupied hours.
3. When commanded to change over to the Unoccupied Mode, the terminal equipment controller shall raise the cooling set point and lower the heating set point to an operator determined value.
4. During the Unoccupied Mode, the terminal equipment controller may be reset to the Occupied Mode for an operator determined time period. This reset shall be activated by a signal from a local override switch on the room temperature sensor or by command from the operator's terminal. At the end of the operator determined time period, the terminal equipment controller shall return to the Unoccupied Mode.
5. For packaged heat pumps with hot gas reheat, a separate humidistat shall be provided to control humidity to a predetermined level.

B. Ventilation Air Units:

1. A Terminal Equipment Controller (TEC) shall be provided for each unit. The TEC shall enable the unit for operation according to its individual occupies/unoccupied schedule. The TEC shall control the stages of cooling to maintain the space temperature and humidity set points.
2. Controls Contractor shall provide space humidity transducers as required.
3. During Occupied Mode the ventilation air units shall provide dehumidified air to each classroom as scheduled on the plans. CO2 sensors in each space will control modulating bypass dampers at ventilation air unit. The most demanding sensor will control the amount of outside air taken in relative to re-circulated air. Ventilation air unit shall remain in re-circulation mode until most demanding sensor reaches 1000 ppm.
4. During the Unoccupied Mode, the terminal equipment controller may be reset to the Occupied Mode for an operator determined time period. This reset shall be activated by a signal from a local override switch on the room temperature sensor or by command from the operator's terminal. At the end of the operator determined time period, the terminal equipment controller shall return to the Unoccupied Mode.
5. Programming of unit shall be as recommended by manufacturer.

C. VAV Air Handling Units:

1. Each air handling unit shall be optimally started and stopped by the control system according to its occupied and unoccupied schedule. The AHU smoke dampers shall open, and then the supply fan shall ramp up to its cooling airflow(CFM).

2. For units utilizing outside air for ventilations, during unoccupied hours and morning startup operation, the motorized outside air damper shall remain closed. When in occupied operation, the outside air damper shall modulate to maintain its minimum required outside airflow (CFM) as measured by a duct airflowstation. For units connected to ventilation air units, the motorized isolationdamper shall be closed whenever the unit is stopped.
3. At duct static pressure transmitter shall be located at two-thirds the distance down the longest duct run and shall allow the controls to operate the supply fan VFD in order to maintain the duct static pressure setpoint. A duct static pressure high limit switch shall shut down the air handling unit and alarm the control system if its set point is exceeded. Operate units based on supply air static pressure and temperature reset.
4. The air handling unit supply air temperature shall be controlled to maintain itssetpoint.
5. AHU duct smoke detectors shall be provided and installed under this section of the Specifications. Wiring the AHU duct smoke detectors to the fire alarm system shall be accomplished by Division 16. Interlock wiring for shutdown of the air handling units for the AHU duct smoke detectors shall be accomplished under this section of the Specifications. The AHU duct smoke detectors will alarm the system in the event that products of the combustion are detected.
6. The AHU will be provided with a filter status airflow switch across the AHU filter bank which will alarm the system when the airflow pressure drop exceeds itssetpoint.

D. VAV Boxes with Electric Heat:

1. During the occupied mode, the Terminal Equipment Controller (TEC) modulates the primary supply air damper within user defined separate heating and cooling maximum and minimum air volume settings by sensing the inlet air velocity (CFM).
2. On a rise in temperature above the room cooling setpoint, the Terminal Equipment Controller (TEC) shall modulate open the duct supply air damper tomaintain room temperature.
3. Similarly, on a fall in temperature below he room heating setpoint, the Terminal Equipment Controller (TEC) shall modulate the supply duct damper to its minimum position of 50% of rated air flow, and then the electric heating coil shall be modulated to maintain the room temperature.
4. When commanded to change over the Unoccupied Mode, the Terminal Controller shall raise cooling setpoint and decrease the heating setpoint (as appropriate) to operator-determined values.
5. During the Unoccupied Mode, the Terminal Controller shall be reset to the Occupied Mode for an operator determined time period. This reset shall be activated by a signal from a local override switch on the room temperature sensor. At the end of the operator determined time period, the TerminalController shall return to the Unoccupied Mode.
6. The Controls Contractor shall be responsible for providing power wiring to all VAV box controls as required for proper operation.

E. Exhaust Fans:

1. Exhaust fans shall be controlled by the building energy management system, local thermostat, or wall switch as indicated on the contract drawings and equipment schedule. Operate group toilets based on building occupied schedules.

F. Unit Heaters and Water Heaters:

1. Unit heaters and water heaters shall be controlled by the building energy management system or local thermostat as indicated on contract drawings.

END OF SECTION 15904

SECTION 15990 - TESTING AND BALANCING AIR SYSTEMS

PART ONE - GENERAL:

1.1 SCOPE:

- A. The Owner shall employ a testing and balancing firm specialized in total system testing and balancing. The balancing firm shall be a member of the Associated Air Balance Council (AABC) or certified by the National Environmental Balancing Bureau (NEBB). The balancing firm shall provide all labor, equipment, engineering and test equipment required to test, adjust, and balance all heating, ventilating, air-conditioning, and exhaust systems as hereinafter specified.
- B. Approved Testing and Balancing Firms are:
 - 1. TAB Services, Inc. – Atlanta, GA
 - 2. Carolina Air and Water Balancing – Columbia, SC
 - 3. Hilton Services – White Rock, SC
 - 4. Phoenix Agency, Inc. - Winston-Salem, NC
 - 5. Palmetto Air & Water Balance - Greenville, SC

PART TWO - PRODUCTS AND EXECUTION:

- 2.1 The balancing contract shall incorporate the following:
- 2.2 All medium pressure ducts shall be duct air leak tested with less than 5% leakage prior to insulation by the Mechanical Contractor and verified by the TAB Contractor. Note that all VAV systems that include VAV boxes and utilize static pressure sensors for fan operation, regardless of operation static pressure, shall be considered medium pressure and therefore require duct air leak testing.
- 2.3 Test, adjust and balance the complete mechanical system.
- 2.4 Upon completion of the air handling systems, the Contractor shall have an air balancing firm perform the following tests and compile the following information for each item of equipment and submit four bound copies of this information to the Architect for approval.
- 2.5 Install at each piece of mechanical equipment, a "Data Register" showing all significant operating temperatures, pressures, amperes, voltage, brake horsepower, etc. "Data Register" to be enclosed in a vinyl-film holder securely attached to the equipment or wall in immediate area after balance reports have been accepted. See section 2.10 for data to be included in certified report.
- 2.6 All test equipment will be furnished by the Balancing Contractor and will remain his property. All instruments will have been calibrated recently.
- 2.7 The Balancing Firm shall warrant solely that the system will be set to within 10% of the values as established by the plans and specifications, and also adjust to minimize drafts in all areas.
- 2.8 Any changes that are required for the final balancing results as determined by the Balancing Contractor will be provided by the respective Contractors who are to supply and install such equipment under their contractual obligations. Such changes may encompass, but are not necessarily restricted to, the changing of pulleys, belts, dampers, or adding dampers or access panels. The General Contractor shall be responsible for providing access to all devices that are

not accessible from a 12' ladder.

2.9 TESTING AND BALANCING PROCEDURE (AIR):

- A. Before starting air balance, check the following items:
 - 1. Check air filters to be sure they are clean and in position.
 - 2. Check for proper belt tension and alignment.
 - 3. Check fan and motor lubrication.
 - 4. Check motor overload protectors or heaters for proper size.
 - 5. Check for proper rotation.
- B. Measure supply air volumes by means of the duct traverse method, taking a minimum of sixteen (16) readings. Seal duct access holes with metal snap-in-plugs. The use of duct tape to seal access holes will not be permitted.
- C. Adjust balancing dampers for required branch duct air quantities. Dampers shall be permanently marked after air balance is complete.
- D. Adjust grilles and diffusers to within 10% of individual requirements specified, and also adjust so as to minimize drafts in all areas.
- E. The total air delivery in any particular fan system shall be obtained by adjustment of the particular fan speed.
- F. The drive motor of each fan shall not be loaded over the corrected full load amperage rating of the motor involved.
- G. All duct systems are to be balanced for lowest static pressure and lowest fan speed possible to deliver required air quantity as required by ASHRAE Standard 90.1 with applicable adopted year.
- H. Unless otherwise noted, adjust quantity of return air from space to pass 90% of air supplied to space.
- I. Where splitter and volume dampers have been provided for balancing of air in ducts, balancing shall be done with register and diffuser volume dampers as fully open as possible.
- J. Do not operate fans during times when construction process or clearing would allow dirt or rubbish to accumulate in the system.

2.10 TESTING OF EQUIPMENT THERMAL PERFORMANCE:

- A. All heating and cooling equipment shall be properly tested for cooling and heating performance based on the specified data on the mechanical equipment schedules. All systems shall be evaluated based on outside air conditions, mixed return air temperature, coil supply air temperature, building supply air temperatures including fan heat and performance based on entering and leaving air temperatures all heat exchangers. All temperature readings shall be recorded in dry bulb and wet bulb (DB/WB) values to indicate total energy transfer.
- B. Ventilation Air Units (VAU): The acceptable tolerance for the coil leaving air temperature conditions for ventilation air units (DB/WB) during design conditions is 0.5 degrees F above stated design values on the schedule. Any ventilation air unit not meeting the coil leaving air temperature shall be noted as a deficiency in the report.
- C. Packaged/Applied VAV Units: The acceptable tolerance for the coil leaving air temperature

conditions for ventilation air units (DB/WB) during design conditions is 1 degree F above stated design values on the schedule. Any unit not meeting the coil leaving air temperature shall be noted as a deficiency in the report.

- D. Note: Any unit with scheduled coil leaving air temperatures on the plans that are not specified as Ventilation Air Units (VAU) shall comply item

2.10 CERTIFICATION:

- A. Furnish to the Architect/Engineer two (2) copies of the following data, signed by an authorized representative:

1. Room
2. Supply or Return Size
3. Design CFM
4. Measured CFM
5. Percent of Design CFM
6. Outside air conditions (DB/WB)
7. Mixed air return conditions (DB/WB)
8. Coil leaving temperature (DB/WB)
9. Building supply temperature including fan heat (DB/WB)
10. Heat exchanger performance EAT/LAT (DB/WB) as applicable
11. Hot gas reheat performance to produce neutral air (DB) as applicable
12. Coil delta T in heating (DB)
13. Voltage/amps/phase (Design/Actual)
14. RPM
15. BHP actual / Nameplate H.P.
16. Turns open / ECM fan settings / multi speed motor settings
17. ESP. Design/Actual
18. Installed compressor tonnage
19. Static pressure operating set point at remote sensor (VAV systems)
20. VAV Box maximum and minimum operating setpoints (VAV systems)
21. Verification of BAS Static pressure reset programming (VAV systems)
22. Verification of BAS supply air temperature reset programming (VAV systems)
23. Outside air volume verification, both fixed and variable volume, as scheduled

Note that the above information shall be included in the certified report as a minimum. Additional information shall be provided as required for the equipment utilized.

2.11 FINAL AIR BALANCE:

- A. Perform final air balance after building is occupied. On final air balance adjust air quantities as required to maintain space temperatures in building at 74 degrees (summer) and 70 degrees (winter) plus or minus 2 degrees F. Submit data sheets on recorded temperatures. Indicate time of day and outdoor temperature on data sheets.
- B. A preliminary Test and Balance Report shall be issued to the Mechanical Contractor and Engineer prior to the issuance of the final Testing and Balancing Report outlining all deficiencies in the installed system. These listed deficiencies shall be corrected and/or resolved prior to finalizing the Test and Balance Report after building occupancy of required.
- C. Final Air Balance shall occur prior to Office of School Facilities inspection as applicable.
- D. The General Contractor shall account for TAB in the construction schedule. Failure to properly prepare systems for TAB with sufficient time prior to final inspections and/or complete

deficiencies found causing delays will result in additional costs billed to the General Contractor.

END OF SECTION 15990

SECTION 16010 – GENERAL REQUIREMENTS

PART ONE - GENERAL:

1.1 SCOPE:

- A. The General and Special Conditions are a part of this Section of the Specifications.
- B. Provide all labor, equipment, material, and operations required for complete, safe, and quietly operating electrical systems in accordance with Specifications and Drawings and subject to terms and conditions of the contract.
- C. Drawings and Specifications are complementary and what is called for by either shall be as binding as if called for by both.
- D. Examine other Drawings and Specifications and bring to the attention of Architect prior to bid time any omissions or discrepancies in this DIVISION.

1.2 CODES, RULES, PERMITS, FEES, AND APPLICABLE PROVISIONS:

- A. Comply with the current adopted year of the National Electrical Code, International Building Code, Life Safety Code, and Municipal Code requirements. In case of conflict, Municipal Code shall govern.
- B. The Contractor shall give all requested notices, obtain necessary permits, and pay all required fees.
- C. Deliver to Architect permits and certificates.

1.3 DRAWINGS:

- A. Project Drawings: The Drawings accompanying this Specification are generally diagrammatic and do not show all details of bolts, nuts, connections, and the like required for the complete system, and do not indicate the exact location of conduit, fixtures, equipment, etc., unless definitely dimensioned or noted. While these Drawings shall be followed as closely as possible, all dimensions shall be checked at the building and any necessary changes shall be made to accord with structural and architectural conditions, equipment to be installed or with the work of the different trades, without additional cost to the Owner, and as directed by the Architect. Any component item which is necessary for the proper operation of any system under this contract shall be furnished and installed by the Contractor without extra charge.

1.4 EXAMINATION OF CONDITIONS:

- A. It is understood and agreed that the Contractor has, by careful examination, satisfied himself as to the nature and location of the work, the conformation of the ground, the character, quality, and quantity of the materials to be encountered, the general and local conditions, and to all other matters which can affect the work under this contract.

1.5 COORDINATION:

- A. Coordinate work with other trades to avoid interferences and establish necessary space requirements and tie-ins for each trade.

- B. Prior to starting installation, furnish to the General Contractor and all Sub-Contractors concerned, copies of approved shop drawings showing location of equipment, piping, and etc.
- C. Schedule periodic meetings with other trades before and during installation to avoid conflicts and assure that conduits and equipment are installed in the best manner, taking into consideration head-room, maintenance, appearance, and replacement.

END OF SECTION 16010

SECTION 16040 – GENERAL COMPLETION, ELECTRICAL

PART ONE - GENERAL:

1.1 GENERAL REQUIREMENTS FOR INSTALLATION:

- A. Piping, fixtures, equipment, etc., shall be located to avoid interference with structural and architectural conditions, or with the work of different trades. Provide off-sets where necessary to avoid footings, piers, columns, beams, windows, other piping, mechanical systems, and other systems, etc., specifically inform the General Contractor as to the correct size and location of all chases, openings, supports, sleeves, etc., required for the system. Furnish and install sleeves, inserts, bolts, etc., and arrange for the cutting of walls, floors, roofs, etc., and the proper closing of all openings. Cutting of construction, where unavoidable, must be done by the General Contractor, but shall be paid for by the electrical contractor. No part of the building may be broken out, cut, burned, or permanently removed without the approval of the Architect.

PART TWO - PRODUCTS:

2.1 WORKMANSHIP AND MATERIALS:

- A. Workmanship shall be of the best quality and none but competent mechanics skilled in their trades shall be employed. The Contractor shall furnish the services of an experienced superintendent, who will be constantly in charge of the erection of the work, until completed and accepted.
- B. Unless otherwise hereinafter specified, all materials and equipment shall be new, of best grade, and as listed in printed catalogs of the manufacturer. Each article of its kind shall be the standard product of a single manufacturer.
- C. The Architect shall have the right to accept or reject material, equipment and/or workmanship, and determine when the Contractor has complied with the requirements herein specified. Where departures from indicated arrangements are required, written approval for such changes shall be obtained from Architect's representative.
- D. All manufactured materials shall be delivered and stored in their original containers. Equipment shall be clearly marked or stamped with the manufacturer's name and rating.
- E. All material and equipment used on this project shall be stored in a weatherproof, bonded warehouse. Contractor shall submit insurance certificate to the Architect prior to storing any materials or equipment. No equipment or materials used on this project shall be stored outside exposed to the weather. Before final payment can be made, a notarized statement with the material invoiced to the Owner must be furnished to the Architect.

2.2 DIVISION OF WORK:

- A. Coordinate all opening locations with General Contractor, see paragraph 2.3.
- B. The electrical contractor shall provide concrete foundations, curbs and pads for electrical equipment and fixtures. Unless otherwise noted, set all floor and/or ground mounted equipment on 6" high concrete pads reinforced with 6 x 6 10/10 mesh. Pads shall be approximately 6" larger than equipment base and have 1" x 1" chamfer on all edges. Pads to have carborundum brick rubbed finish. Surface finish shall be uniformly smooth.

- C. General Contractor will provide flashing of conduits into roofing. The electrical contractor shall provide counterflashing.
- D. Provide complete power wiring and connections for mechanical systems specified under the mechanical specifications. This work includes all raceways, conductors, outlets, and pull boxes, line voltage, on-off switches where indicated and disconnecting means as indicated and required by applicable codes. Where magnetic motor starters (controllers) are furnished by others, install and wire complete; where controllers are provided already mounted on equipment, wire complete. In all cases, provide power wiring to controller and load controlled. Wire sizes between controllers and loads shall be the same as feeder size to controller, do not reduce. Make all connections and color code per this DIVISION. Safety switch enclosures shall be NEMA Type 3R outdoors and wet locations; NEMA Type 1 elsewhere. Not included in this DIVISION are temperature control wiring, equipment control wiring and interlock wiring required to operate the mechanical system. Refer to the mechanical specifications for a summary list of types of equipment provided under that DIVISION. The electrical contractor shall provide outlet box for thermostat with 3/4" conduit to corresponding mechanical unit. The electrical contractor shall provide a 3/4" empty conduit between indoor air handling unit and exterior heat pump on split system units; this conduit is in addition to thermostat conduit noted above.

2.3 OPENINGS - CUTTING, REPAIRING:

- A. The electrical contractor shall cooperate with the work to be done under other Sections in providing information as to openings required in walls, slabs, and footings for all conduits and equipment, including sleeves, where required.
- B. All drilling, cutting, and patching required for the performance of work under this Section shall be performed by the General Contractor and the cost thereof shall be borne by the electrical contractor.
- C. Holes in Concrete: Sleeves shall be furnished, accurately located and installed in form before pouring of concrete. The electrical contractor shall pay all additional costs for cutting of holes as the result of the incorrect location of sleeves. All holes through existing concrete shall be either core drilled or saw cut. All holes required shall have the approval of the Structural Engineer prior to cutting or drilling.

2.4 EXCAVATION AND BACKFILL:

- A. General: The Contractor shall do all excavating and backfilling necessary to receive the work shown on the drawings.

Excavations shall be made to the proper depth, and the trenches shall be graded uniformly to provide solid bearing along the entire length of the conduit. All trenches shall be excavated so that conduits will have at least (6) inches clearance on each side. Conduits in fill or loose sand shall have trench bottom tamped to 95% maximum density compaction prior to laying conduits.

- B. Backfilling: Do not fill any trenches until all conduits have been inspected. After the work is installed, tested, inspected, and approved, the trenches shall be refilled in six-inch layers with clean, damp earth, with each layer thoroughly tamped before proceeding with additional layers. Remove from site all excess earth, rock and other debris resulting from excavation and backfill work.

2.5 NAMEPLATES:

- A. On all panelboards, disconnect switches, transformers, and enclosures provide engraved

phenolic plastic nameplates. Unless otherwise noted, nameplates to be 1/16" thick plastic with 1/4" high white letters on black background. Hand lettering, typing under tape, embossed letters on plastic, etc., will not be acceptable

- B. Attach nameplates with two rivets.

2.6 CLEANING EQUIPMENT AND MATERIALS:

- A. Provide for the safety and good condition of all materials and equipment until final acceptance by the Owner. Protect all materials and equipment from damage. Provide adequate and proper storage facilities during the progress of the work.
- B. All fixtures, conduits, finished surfaces, and equipment shall have all grease, adhesive labels, and foreign materials removed.

2.7 CLEANING UP:

- A. Remove from the premises all unused material and debris resulting from the performance of work under this Section.

2.8 DAMAGES:

- A. Cost of repairing damage to building, building contents, and site during construction and guarantee period resulting from this work is a part of this contract.

2.9 TEST PERFORMANCE:

- A. Upon completion of the work, the system shall be free of faults, including short circuits, grounds, and open circuits, and loads balanced across phases to obtain minimum neutral current in all feeders and branch circuits. All communications systems shall operate at a standard representative of the best state of the art for the particular system involved. All life safety systems shall be demonstrated and certified as to operation in compliance with the codes and the intent of these Specifications. Test system in the presence of the Engineer or his representative, and operate to comply with the true intent of Plans and Specifications. Defray cost of all adjustments required to correct deficiencies; replace defective material and equipment, do not repair.

2.10 FINISHED PLANS:

- A. As-built Drawings: Upon completion of the work, the Contractor shall furnish and deliver to the Owner two (2) sets of as-built drawings to correspond in size to the tracings, showing among other things, layouts of utility systems and functional systems (such as public address, fire alarm and telephone). All pertinent dimensions and elevations of buried work shall be given.

2.11 INSTRUCTIONS:

- A. Provide a hard back, three-ring file folder containing all warranties, catalog data and the manufacturer's recommendations and the frequency with which each is to be done. Each sheet shall be initialed by the manufacturer's agent as being correct. Provide columns on each sheet so that they may be dated by maintenance personnel when each individual function is performed. Contractor shall furnish a typed maintenance manual in a hard back, three-ring binder explaining all maintenance functions. The Contractor shall instruct and demonstrate each maintenance function to the Owner's Representative. The Owner's Representative shall in turn sign the maintenance sheets indicating his understanding of the instructions. Coordinate all equipment start-ups with the Owner, so that they may be present.

- B. The Contractor shall instruct the Owner's Representative in complete detail as to the proper operation of the overall systems. Advise the Owner as to where to order common replacement items. Deliver to the Owner the manufacturers' agent's name, address, and the telephone number of each piece of equipment.

2.12 GUARANTEE:

The Contractor agrees:

- A. To correct defects in workmanship, materials, controls, equipment, and operation of the system for a period of one (1) year from the date of acceptance.
- B. To remove any item not specified or given written approval and replace it with the specified item.
- C. That the systems installed will safely, quietly, and efficiently perform their respective functions in accordance with the design.

END OF SECTION 16040

SECTION 16050 – BASIC MATERIALS AND METHODS

PART ONE - GENERAL:

1.1 APPROVALS AND SUBSTITUTIONS:

- A. All requests for substitutions shall be submitted so as to be received by the Engineer at least ten (10) calendar days before bid date. Approved material will be listed in addendum form.
- B. Contract prices shall be based on material and equipment as specified, unless written approval is obtained for any deviations. Requests for substitutions before bid date may be submitted by Contractors or by Equipment Manufacturer's Representatives.
- C. Requests for approvals should be submitted in the form of a letter (with one copy minimum) on a letterhead of submitting firm, along with a self-addressed, stamped, return envelope. Letter shall be addressed to the Engineer and referenced to this project.
- D. If there are no deviations between the items submitted and the plans and specifications, then the submittal letter should contain the statement, "Items are in accordance with plans and specifications with no deviations". An item with deviations from the plans and specifications may be submitted for approval consideration. Letter should then state, "Item submitted is in accordance with plans and specifications, except for the following deviations." Deviations should then be listed in itemized form.
- E. Items approved shall not be construed as authorizing deviations from the plans and specifications. Contractor shall be responsible for verifying all dimensions with available space conditions with provisions for proper access, maintenance, and part replacement, and for coordination with other trades - mechanical, plumbing, structural, etc., for proper services and construction requirements.
- F. Where such approved deviations require a different quantity and arrangement of wiring, conduit and equipment from that specified or indicated on the drawings, the Sub-Contractor shall furnish and install any such structural supports, controllers, starters, electrical wiring and conduit, and any other additional equipment required by the system, at no additional cost to the Owner.

PART TWO - PRODUCTS AND EXECUTION:

2.1 MANUFACTURER'S INSTRUCTIONS:

- A. Prior to purchasing equipment, procure product manufacturer's application, installation, and operating instructions for use in conjunction with the system design drawings and specifications during construction. If there exists any conflict between the manufacturer's publications and the design drawings and specifications, immediately notify the Engineer, in writing. Upon notification by the Engineer, proceed in accordance with his instructions.

2.2 Operations and Maintenance Manuals:

- A. Prior to project closeout, the Sub-Contractor shall submit for approval, a completed operations and maintenance manual to the engineer for review. The operations and maintenance manual shall contain at least the following items. Exclusion of items is permissible only when the scope of electrical work outlined in these contract documents does not include an item listed below:

1. Electrical Contractor's warrantee / guarantee showing dates of acceptance and duration.
2. Product data sheets, diagrams, performance curves, and charts published by the manufacturer. Complete electrical characteristics and manufacturer's part numbers shall be provided for all equipment.
3. Charts which explain the conduit color coding scheme used for conduit and wire throughout the facility.
4. Insulation resistance test results for all feeders.
5. Operating & users instruction manual(s) for Lighting control systems
6. Final circuit breaker trip and time delay settings
7. Chart listing fuse ampacity, type and manufacturer's part number installed in each disconnect.
8. Operating & users instruction manual(s) for any generators, transfer switches, or lighting inverters.
9. Copy of the UL "Master Label" for any lighting protection system required elsewhere in the contract documents.
10. Operating & users instruction manual(s) for the fire alarm system.
11. As built shop drawings and plans for the fire alarm system indicating device locations and all calculations.
12. Digital media with as built fire alarm system program and all required programming password & user names.
13. Copy of the fire alarm system paperwork required by the NFPA to be completed by the fire alarm system installer.
14. Operating & users instruction manual(s) for the security, telephone, public address, or sound augmentation and reinforcement systems.
15. A copy of the seismic submittal for electrical installation signed and sealed by the seismic engineer.

2.3 SHOP DRAWINGS:

- A. The Sub-Contractor shall submit for approval detailed shop drawings of all equipment and all material required to complete the project, and no material or equipment may be delivered to the job site or installed until the Sub-Contractor has in his possession the approved shop drawings for the particular material or equipment. The shop drawings shall be complete as described herein. The Sub-Contractor shall furnish the number of copies required by the General and Special Conditions of the contract, but in no case less than six (6) copies.
- B. Prior to delivery of any material to the job site, and sufficiently in advance of requirements to allow Architect ample time for checking, submit for approval detailed, dimensioned drawings or cuts, showing construction, size, arrangement, operating clearances, performance characteristics and capacity. Each item of equipment proposed shall be a standard catalog product of an established manufacturer and of equal quality, finish, and durability to that specified.
- C. Samples, drawings, specifications, and/or catalogs submitted for approval shall be properly labeled indicating specific service for which material or equipment is to be used, section and article number of specifications governing, Contractor's name, and name of project.
- D. Catalogs, pamphlets, or other documents submitted to describe items on which approval is being requested, shall be specific and identification in catalog, pamphlet, etc., of item submitted shall be clearly made in ink. Data of a general nature will not be accepted.
- E. Approval by the Architect and/or Engineer of shop drawings for any material, apparatus, devices, and layouts shall not relieve the electrical contractor from the responsibility of furnishing same of proper dimension, size, quantity, quality, and all performance characteristics to efficiently perform the requirements, and intent of the contract documents. In addition, approval shall not relieve the electrical contractor from responsibility for errors of any sort on the shop drawings. If the shop

drawings deviate from the contract documents, the electrical contractor shall advise the Architect and/or Engineer of the deviations, in writing, accompanying the shop drawings, including the reasons for deviations.

- F. Failure of the Sub-Contractor to submit shop drawings in ample time for checking shall not entitle him to an extension on contract time, and no claim for extension by reason of such default will be allowed.
- G. The table on the following pages shall be included in the front of the shop drawing submittal. Sections of the specifications that are included in the specifications manual for this project shall require a submittal for each item listed. Incomplete or partial submittals shall be rejected.

Spec Section	#	Item Description
Site Lighting	1	Landscape lighting fixtures
	2	Lamps
	3	Type FSIFP outlet boxes
General Completion	1	Insurance Certificate indicating that stored materials are held in a bonded warehouse
	2	Superintendent's name, job trailer phone and fax numbers
	3	Name Plates type and attachment method
Conduit	1	Conduit , Cables, Tubing
	2	Supports
	3	Fittings and connectors
	4	Expansion joints
	5	Ground Bushings
	6	Tracing tape
	7	Sealants
	8	Fire Wall Penetrations (Provide U.L. Listing Number)
Busways	1	Busway
Under floor Ducts	1	Duct system sharing joiners, spaces, covers, supports, seats, etc.
Surface Metal Raceway	1	Surface raceway system - include all components
Wires and Cables	1	Wire – minimum size, manufacturer, insulation type
	2	Connectors and lugs
Outlets, Switches & Boxes	1	Outlet boxes
	2	Floor Boxes
Wall Switches	1	Switches (Also indicate color, load type, terminal type, and rating)
	2	Plates
Receptacles	1	Receptacles
	2	Plates
Lighting Control Relay System	1	Relay cabinet and relay modules
	2	Override switches
	3	Cables
	4	Photocells

Spec Section	#	Item Description
Dimming System	1	Dimmer panel and dimmer modules
	2	Control consoles
Lighting	1	
ControlSensors		Sensors
	2	Power Packs
Motor Starter	1	Motor starters
Motor Control Center	1	
		Documentation showing installers experience with submitted system
	2	Motor control center with all components and appurtenances.
Panel boards	1	
		Panel boards (also indicate short circuit current rating and withstand rating)
Fuses	1	
		Fuses
	2	Fuse Cabinet
Main Switchboard	1	Main Switchboard (also indicate short circuit current rating and withstandrating)
Motor & Circuit Disconnects	1	Disconnect Switches
Dry Type Transformers	1	Dry type transformers
Pad Mounted xformers	1	Pad mounted transformer
Generator Set	1	Generator
	2	Transfer Switch
	3	Vibration Isolation
	4	Mounting / pad dimensions
	5	Cooling system
	6	Exhaust system
	7	Control system
	8	Engine heater
	9	Battery and charger
	#	Main line circuit breaker
External TVSS / SPD	1	Surge Protective Devices
Underground Electrical Work	1	Ground rods
Service and Metering	1	Meter sockets
	2	CT cabinets
Grounding	1	Grounding devices and fitting
	2	Ground rods

Spec Section	#	Item Description
Lighting Fixtures	1	Light Fixtures
	2	Lighting Control Systems
	3	Arc Keeper Devices
	4	Generator Transfer / Switch bypass devices (GTD)
	5	Occupancy Sensors
	6	Lighting Inverter Systems
Exterior Sports Lighting Poles	1	Data and calculation showing that submitted pole complies with contract documents
	2	Data and calculation showing that submitted foundation complies with contract documents
	3	Poles
	4	Foundations
	5	Lighting protection system
Emergency Lighting System	1	Inverter units
	2	Battery charger
	3	Batteries
	4	Cabinets
Fire Alarm System	1	Fire Alarm System Control Panel
	2	Power Supply / Batteries
	3	Smoke Detectors / Heat Detectors
	4	Addressable modules
	5	Cables and Wiring
	6	Manual Pull Stations
	7	Notification Devices
	8	Documentation that certifies that the installer has been factory trained on the submitted system.
Security System	1	Control panel
	2	Control key pads
	3	Enclosure
	4	Magnetic door contacts
	5	Motion detector
	6	Sounder
Office phone Sys.	1	Telephone system control cabinet

Spec Section	#	Item Description
	2	Hand/desk sets
	3	Wire and cables
Integrated Telecomm / Telemedia Systems	1	Integral Telephone, public address and telemedia control system
	2	Outline drawing of system control cabinet
	3	FCC registration number with signal equivalent
	4	Wiring diagrams showing typical connector
	5	Certification of completion and installation and service training from system manufacturer
Classroom Intercom, Master-clock & Program System	1	Console
	2	AM-FM tuner, cassette player
	3	AM-FM antenna
	4	Administrative telephone
	5	Staff telephone
	6	Room call-in switch
	7	Digital master clock
	8	Speakers/ back boxes
	9	Exterior speakers
Public Address System Replacement	10	Cable
	1	Equipment cabinet
	2	Control panel
	3	AM-FM tuner, cassette player
	4	Power amplifier
	5	Selection panels
	6	Master clock and program distribution system
	7	Room call-in switch
	8	Speakers/ back boxes
	9	Exterior speakers
	10	Cable
	1	
Public Address Communication Sys(w/phones)		FCC registration number of the submitted system
	2	Data sheets for all equipment being provided

Spec Section	#	Item Description
	3	Internal control cabinet drawings showing internal block diagram connections
	4	Wiring diagrams showing typical field wiring connections
	5	Documentation that installer maintains service and parts for submitted system
Sound Augmentation Systems	1	Microphones, receptacles, extension cables and stands
	2	Mixer/ pre-amp
	3	Amplifiers
	4	Cables
	5	Equipment housing
	6	CD player
	7	Monitor headphone
	8	Equalizer
	9	Crossover network
	10	High frequency horns and drivers
	11	Low frequency loudspeaker and enclosure
Sound Reinforcement System	1	Microphones, receptacles, extension cables and stands
	2	Mixer/ pre-amp
	3	Equalizer
	4	Crossover network
	5	Amplifier
	6	speakers
	7	Equipment housing
	8	Cable
Athletic Field Sound Augmentation System	1	Microphones
	2	Amplifiers / mixers
	3	Speakers & mounting brackets
	4	Equipment housing
	5	Cd players/mixers/compressors/power conditioners
	6	Cables / wall plates
Coaches' Communication Sys	1	Master station
	2	Headset 1 belt system
	3	Head coach switch module

Spec Section	#	Item Description
	4	Extension cables
Television DistributionSystem	1	Block diagram of system showing catalog numbers of amplifiers, splitter,taps and cables
	2	Head end amplifiers
	3	Noise filters
	4	Pre-amplifiers, re-amplification and pads
Media Management Center and Video Distribution	5	Coaxial cable
	1	Internal control cabinet block diagram
	2	Wiring diagrams showing typical field wiring connections
	3	FCC registration number
	4	Data sheets for all equipment being provided
	5	Cable
Telecom Infrastructure	1	Cable trays and supports
	2	Fire wall penetrations
	3	Grounding equipment
	4	Hand Hole Boxes and Covers
	5	Cables
	6	Communication outlets
	7	Grounding equipment
Vibration & SeismicControl	1	Complete set of calcs and shop drawings with PE seal certifying that the design meets seismic req.
	2	Seismic design errors and omissions insurance certificate.

END OF SECTION 16050

SECTION 16111 – CONDUIT

PART ONE - GENERAL:

- 1.1 Minimum size conduit shall be ½". Other sizes shall be as indicated on the Plans, or required by the National Electrical Code for number and size of conductors installed. All conduit joints shall be cut square, threaded, reamed smooth and drawn tight. Bends or offsets shall be made with standard conduit ells, field bends made with an approved bender or hickey, or hub-type conduit fittings. Number of bends per run shall conform to National Electrical Code limitations. All wiring, regardless of voltage, shall be in conduit.

PART TWO - PRODUCTS:

2.1 RIGID METAL CONDUIT (OR IMC):

A. Shall be used for:

1. Service.
2. Exposed branch circuits where subject to damage.
3. Branch circuits underground where outside of building line if not installed under 3" of concrete.

2.2 RIGID NONMETALIC CONDUIT (RNC):

A. Shall be used for:

1. Branch and feeder circuits underslab where inside of the building line (ground floor only).
2. Branch circuits underground where outside of the building line and below at least 3" of concrete or within duct banks

B. Shall be schedule 40 PVC.

2.3 PVC COATED RIGID GALVANIZED METAL CONDUIT

A. Shall be used for:

1. Corrosive exterior environments around cooling towers.

2.4 ELECTRICAL METALLIC TUBING (EMT):

A. Shall be used for:

1. All areas not listed in paragraphs 2.1, 2.2 and 2.3.

PART THREE - EXECUTION:

3.1 RACEWAYS:

- A. Horizontal and vertical conduit runs may be supported by one hole malleable straps, clamp-backs or other approved devices with suitable bolts, expansion shields, or beam clamps for mounting to building structure or special brackets. Adjustable hangers may be used to suspend large conduits when separately located. If adjustable trapeze hangers are used to support groups of parallel

conduits, U-bolt or similar type clamps shall be used at the end of a conduit run and at each elbow. J-bolts or approved clamps shall be installed on each third intermediate trapeze hanger to fasten each conduit. Hangers shall be painted with two coats of oil paint. Where excessive corrosive conditions are encountered, hanger assemblies shall be protected, after fabrication, by sheradizing or galvanizing, special paint, or other suitable preservative methods. The use of perforated iron straps, wire, etc., for supporting conduits will not be permitted. The required strength of the supporting equipment and the size and type of anchors shall be based on the combined weight of conduit, hanger, and cable.

- B. Conduit installed in exterior wall shall be routed in stud or block cavity not in air spaces between block and brick.
- C. Where any run of rigid conduit may change to a run of EMT, or vice-versa, such a change shall be made in a junction or outlet box, as elsewhere required, with each conduit terminating separately therein.
- D. Conduit shall be continuous from outlet to outlet and from outlets to cabinets, pull boxes or junction boxes, and shall be secured to all boxes with locknuts and bushings in such a manner that each system shall be electrically continuous throughout. Conduit ends shall be capped to prevent entrance of foreign materials during construction.
- E. Conduit terminals at cabinets and boxes shall be rigidly secured with locknuts and bushings as required by the National Electrical Code and other electrical codes. All conduit bushings shall be of the insulating type with two locknuts.
- F. All conduit shall be installed complete before conductors are pulled in. All conduit shall be cleaned and free of foreign matter inside before any conductors are pulled in. A run of conduit which has become clogged shall be entirely freed, or shall be replaced.
- G. A pullwire shall be left in each run of empty conduit. Pullwire shall be 16 gauge galvanized steel.
- H. Run all conduit at right angles to or parallel to walls of building.
- I. Use short pieces, approximately two feet, of flexible metal conduit to connect motors and other devices subject to motion and vibration.
- J. Support conduit and secure to forms when cast in concrete so that conduit will not be displaced during pouring of concrete. Stuff boxes and cork fittings to prevent entrance of contaminants during concrete pouring and at other times during construction prior to completion of conduit installation.
- K. Use expansion fittings with copper bonding jumpers to assure ground continuity across expansion joints in walls, floors, and ceilings. Use double locknuts and bushings on panel feeders at panel enclosures.
- L. Install grounding bushing on all conduit entering or leaving main switchboard. Connect each bushing to switchboard ground bus with a separate #4 bare copper conductor, lugged to bus.
- M. Any EMT connectors must be all steel compression type with insulated throat. EMT couplings shall be all steel compression type. No cast fittings of any type will be accepted.
- N. Color coding shall be provided every 8'-0" on conduit or factory colored conduits shall be used and shall be as follows:

1. 480 volt, single and three phase - Orange
 2. 208 volt, single and three phase - Green
 3. 120 volt - Yellow
 4. Fire alarm system - Red
 5. Motor and other control systems - Blue
 6. Telephone and communications - White
 7. Security - Brown.
- O. All firewall penetrations shall be properly fireproofed with U.L. listed system that conforms to the wall or floor type, wall or floor fire rating, and to the size and number of conduits penetrating the wall or floor.
- P. Conduit shall not be routed within 1.5" of the underside of a corrugated metal roof deck and shall not be fastened to or supported from the underside of a corrugated metal roofdeck.
- Q. Underground conduits outside of the building line shall be installed as follows:
1. Conduits shall be a minimum of 30" below grade.
 2. Rigid non-metallic conduit shall have an electronically detectable tracing tape installed above them.
 3. Rigid non-metallic conduit bends shall be pre-manufactured "factory" bends or field made bends using "hot box" style conduit benders.
 4. Rigid non-metallic conduit shall be installed below a minimum of 3" of concrete
 5. Rigid non-metallic conduit joints shall be made per the manufacturer's instructions including use of primer prior to application of glue.
- R. Underground conduits inside of the building line shall be installed as follows:
1. Conduits shall be run under vapor barrier and shall be routed or shall be installed deep enough to prevent penetration of building footers or other structural supports.
 2. Conduit shall have rigid steel 90's installed where penetrating slab. Rigid steel 90's shall have two coats of asphaltum and all wrench marks and etc., shall be touched-up after conduit has been assembled.
 3. Rigid non-metallic conduit joints shall be made per the manufacturer's instructions including use of primer prior to application of glue.
- S. Conduits shall not be installed within the concrete slabs of intermediate floor levels.
- T. Conduits which are subjected to large temperature differences or those which enter the building from the exterior shall be sealed. The sealing method shall be equal to poly water FST. Conduits to be sealed include:
1. Those which enter the building from the exterior.
 2. Those which enter coolers or freezers.
 3. Those which pass through unconditioned portion of the building.
 4. Those which supply rooftop equipment.
- U. Conduits shall not be installed above or on top of a roof without expressed permission of the engineer. Conduits serving rooftop equipment shall be routed within the building and penetrate the roof plane vertically at the equipment being supplied.
- V. Conduits installed in masonry construction shall be routed vertically in block cavities. They shall not be routed horizontally for more than 24" within block wall where such installation requires excessive cutting or notching of each block.

- W. Where surface mounted conduits are permitted, they shall be painted to match the adjacent wall surfaces.
- X. Bridging between steel joist framing shall not be used to support conduits.
- Y. Parallel sets of conductors routed below grade shall be installed in duct banks.
 - 1. Duct bank shall be encased in concrete with at least three inches of concrete at the top and bottom and two inches on each side. A horizontal and vertical separation between the ducts of 3 inches shall be maintained by installing thermoplastic high impact spacers at 4 foot intervals. Spacers shall be equal to Carlon #SPxW30-2.
 - 2. Stagger the joints of the conduits by rows and layers so as to provide a duct line having the maximum strength.
 - 3. During construction, protect partially completed duct lines from the entrance of debris such as mud, sand and dirt by means of suitable conduit plugs.
 - 4. As each section of a duct line is completed, draw a testing mandrel not less than 12 inches long with a diameter 1/4 inch less than the size of the conduit through each conduit, after which draw a brush having the diameter of the conduit, and having stiff bristles through until the conduit is clear of all particles of earth, sand, and/or gravel; then immediately install conduit plugs.
 - 5. Conduits shall be sized as indicated on project drawings. Provide steel reinforcing in concrete duct bank as indicated on drawings. Separate conduit as indicated.
 - 6. Install the top of the concrete envelope not less than 30 inches below grade or as indicated on project Drawings.
- Z. Concrete used to cover below grade conduits shall be 3000 psi concrete with 1 inch maximum aggregate

END OF SECTION 16111

SECTION 16120 – WIRES AND CABLES

PART ONE - GENERAL:

1.1 CONDUCTORS:

- A. Provide soft-drawn copper conductors in raceways as shown on Drawings. Conductors shall conform to the latest NEC requirements and meet ASTM specifications, with 75/90 degree C, Type THWN/THHN insulation.
- B. All wire and cable shall be new, with size, grade of insulation, voltage and manufacturer's name permanently imprinted on outer covering at regular intervals, and delivered to the job site in complete coils and reels. All wires sized #10 and smaller shall be solid, and sizes #8 and larger shall be stranded.

1.2 COLOR CODING:

- A. Wire and cable shall have colored insulation in sizes #10 and smaller; and in sizes #8 and larger shall be color coded on the job using Scotch color tape, E-Z code, Brady, or equal wire markers. Color coding shall be as follows:

240 DELTA/120 or
208 WYE/120 VOLT SYSTEM

Phase A - Black
Phase B - Red
Phase C - Blue
Neutral - White
Grounding - Green

480 WYE/277 VOLT SYSTEM

Phase A - Brown
Phase B - Orange
Phase C - Yellow
Neutral - Gray

*Provide permanent identification of color coding in each branch circuit panelboard as per NEC.

PART TWO - PRODUCTS:

2.1 CONDUCTORS:

- A. Wire and cable shall be as manufactured by Colonial Wire & Cable, Essex, Southwire Co., General Cable, Rome Cable, or approved equal.

2.2 CONNECTORS:

- A. Connectors, lugs, and terminals, shall be as manufactured by 3M Company, Ideal, Anderson, Thomas & Betts, OZ Electrical Mfg. Co., or approved equal.

PART THREE - EXECUTION:

3.1 CONDUCTORS:

- A. Minimum wire size for all branch circuits shall be #12 except where indicated otherwise. If the distance from the panelboards to the first outlet exceeds 50 ft., the minimum size conductor for this run shall be #10. If the distance from the panelboards to the first outlet exceeds 100 ft., the

minimum size conductor for this run shall be #8. If in special cases this distance must be exceeded, larger conductors of sizes noted on the plans shall be installed.

- B. Do not pull conductors before completion of masonry, concrete, and other trades which generate dust and debris.
- C. Wire and cables shall be suitably protected from weather during storage and handling and shall be in good condition when installed.

3.2 TERMINATIONS:

- A. Conductors #8 and larger shall be connected to equipment by means of pressure type mechanical lugs. Where multiple conductors are connected to the same terminal, each conductor shall be provided with an individual lug.
- B. Solderless connectors of the proper type shall be used for all wiring connections. Where compression type connectors are noted on the plans and in the specifications, they shall be installed with approved hydraulic tools to assure a permanent, mechanically secure, high-conductivity joint. Where soldered joints are specified, the cable joint shall be mechanically strong before soldering. Solder shall be carefully applied without use of acid. Soldered connection shall be wrapped with rubber and friction or insulating plastic tape in a manner approved for circuit voltage.

3.3 TAPS AND SPLICES:

- A. All cable taps, and splices shall be made secure with solderless pressure type connectors, unless otherwise specified. Where compression type connectors are noted on the plans and in the specifications, they shall be installed with approved hydraulic tools to assure a permanent, mechanically secure, high-conductivity joint. Where soldered joints are specified, the cable joint shall be mechanically strong before soldering. Solder shall be carefully applied without use of acid. Soldered connection shall be wrapped with rubber and friction or insulating plastic tape in a manner approved for circuit voltage.
- B. All high-voltage conductor and cable splices, connections, and terminations shall be made with termination or splicing kits containing the necessary connectors and insulating materials for the specific cable size and type involved.
- C. Where conductors are to be connected to metallic surfaces, the coated surfaces of the metal shall be polished before installing the connector. Lacquer coating of conduits shall be removed where ground clamps are to be installed.
- D. Join conductors with twist on wire connectors sized for the number and gauge of conductors or by soldering, brazing, or welding. Tape all soldered or brazed connections or cover with approved prefabricated insulating devices to provide insulation resistance at the connection equal to that of the wire. Make splices in boxes or fittings only. Push in type wire connectors shall not be used.

3.4 INSULATION RESISTANCE TESTING

- A. All panel board and switchboard feeders shall be tested prior to energizing. 480V feeders shall be tested at 1000 VDC, 208V and 240V feeders shall be tested at 500 VDC.
- B. All current carrying and neutral conductors in every set of conductors shall be tested. Each current carrying and neutral conductor shall be tested to ground and to each other.
- C. All resistance measurements shall be recorded after 60 seconds and all measurements shall be

temperature corrected to 60 degrees F.

- D. For each test measurement, the electrical contractor shall record the following information: Project name, date, temperature, humidity, testers name, testing device manufacturer and model number, feeder origin and termination points, test voltage, set number (for parallel feeders), conductor length, conductor size, measurement origin and termination (for example "A phase to ground "or" A phase to B phase"), insulation resistance in meg-ohms per foot at 60 degrees F, and the signature of the tester. A sample form is attached and a spreadsheet which calculates the corrected insulation readings in meg-ohms per foot at 60 degrees F is available from the engineer.
- E. All feeder insulation resistance measurements shall be forwarded to the engineer for review prior to energizing of the feeder. Copies shall also be collected into a binder and submitted to the owner as part of the operations and maintenance (O & M) documentation.
- F. Cables with an insulation resistance measurement corrected to 60 degrees F, which is less than 2 meg-ohms per foot shall be replaced by the electrical contractor at no additional cost to the owner.

END OF SECTION 16120

SECTION 16160 – PANELBOARDS

PART ONE - GENERAL:

1.1 DESCRIPTION OF WORK

- A. Where shown on the plans, indicated in the riser diagram, or listed in the panelboard schedule, furnish and install power, distribution, and lighting panels of the size and type indicated.

1.2 SUBMITTAL REQUIREMENTS

- A. Where indicated on the plans, manufacture shall furnish a selective coordination report with the product submittal. This report shall include all of the time current curves for all of the overcurrent devices in the indicated system.

1.3 BASIS OF DESIGN

- A. The overcurrent protection system basis of design is GE. Any changes necessary to achieve selective coordination of other approved manufacturer's equipment shall be the sole responsibility of the electrical contractor.

PART TWO - PRODUCTS:

2.1 MANUFACTURERS

- A. Panelboards shall be manufactured by General Electric, Square D, Siemens, Cutler Hammer, or prior approved equal.

2.2 MATERIALS AND COMPONENTS

- A. Distribution and power panelboards shall be of the dead-front safety type, equipped with thermal-magnetic circuit-breaker branches of sizes and types noted on the Drawings or indicated in the panelboard schedule. Breakers shall provide instantaneous trip on short circuits and time-delay trip on overloads. Main busbars shall be equipped with solderless lugs and all spaces shall be bussed. Panelboard assembly shall be enclosed in a code - gauge steel cabinet with ample wiring gutters on top, sides, and bottom. Cabinet doors shall be equipped with spring latches with locks and shall be keyed alike.
- B. Lighting panelboards shall be of the circuit breaker type of sizes listed in the panelboard schedule or noted on the Drawings. The panels shall have mains only with solderless lugs on the main busbars. Branches shall have circuit breakers of the sizes indicated on the panel schedule. Cabinets shall be of the code - gauge steel with ample wiring gutters for all wires and connections. Doors shall be the single type with spring latches with locks and all keyed alike.
- C. Unless otherwise indicated on the drawings, all panelboards shall have a fully rated symmetrical short circuit fault current rating of at least 22,000 amperes. Series rated panels are not acceptable.
- D. All panelboards shall have bolt on breakers. Plug in breakers are not acceptable.
- E. Circuit breakers shall be 20-amp, 1 pole unless indicated otherwise.

- F. Panels shall be 17" minimum width.
- G. Surface Mounted panels which are noted elsewhere in these contract documents to have TVSS/SPD protection shall have TVSS/SPD units mounted adjacent to the panels. See the details and other specifications for more details.
- H. Flush mounted panels which are noted elsewhere in these contract documents to have TVSS/SPD protection shall have integral units with Performance characteristics as close as possible to the external units. Integral TVSS/SPD units shall be furnished by the panelboard manufacturer.

PART THREE - EXECUTION:

3.1 INSTALLATION

- A. From each flush mounted panelboard, stub a minimum of five one inch empty conduits into area above ceiling.
- B. Install in each panelboard a plastic-covered typewritten circuit directory in metal frame. Indicate name, address and service telephone number of installer. Directory shall list the load served and the location of the load for each breaker. Directory shall indicate the final room numbers designated by the owner and not necessary those shown by the architect on the floor plans.
- C. All multiwire branch circuits shall have a handle tie supplied by the panel board manufacture installed to simultaneously open all ungrounded conductors. The electrical contractor may substitute multi pole breakers for this purpose at his discretion. All conductors that comprise the multiwire branch circuit shall be bundled and tye-wrapped together at the point where they enter the panel.
- D. Electrical contractor shall furnish and install leak protection pans under all non-electrical system piping which passes over electrical panels and pitch pan to drain away from electrical equipment.
- E. The electrical contractor shall apply warning label which states "Warning arc flash hazard appropriate PPE required". The warning label design shall comply with ANSI Z535.4
- F. Except where existing panels are being replaced, conductors shall not be spliced within a panel or pass through a panel. Conductors shall be neatly routed within the panel and excess wiring shall be removed.

3.2 NAMEPLATES:

- A. On all panelboards, provide engraved phenolic plastic nameplates. Unless otherwise noted, nameplates to be 1/16" thick plastic with 1/4" high white letters on black background. Hand lettering, typing under tape, embossed letters on plastic, etc., will not be acceptable.
- B. Attach nameplates with two rivets.
- C. Label shall indicate, panel name, supplying panel or transformer, voltage and phasingsimilar to:

PANEL PA1 120/208 VOLTS / 3 PHASESUPPLIED FROM 45 KVA TRANSFORMER T1

END OF SECTION 16160

SECTION 16161 – FUSES

PART ONE - GENERAL:

1.1 MATERIALS AND COMPONENTS:

- A. Fuses shall be listed and meet UL and/or NEMA Standards for Class K5, J, L, and RKI fuses, or as indicated on the drawings.
- B. Where fuses are required elsewhere in the specifications or on the drawings for individual motor circuit protection, for motor control centers, and for motor starters, these fuses shall be class K5 fuses unless otherwise indicated. Class K5 fuses shall be dual element cartridge design with high interrupting capacity, current limiting effect, 200,000 ampere RMS symmetrical at rated voltage minimum, and a minimum time delay of ten (10) seconds at fivehundred percent (500%) load.
- C. Class J and L fuses shall be provided as indicated on the Drawings for protection of non-motor loads.
- D. Fuse voltage rating shall be 250 volts for 120/208 volt system and 480 or 600 volts for 277/480 volt system.

1.2 SPARE FUSE CABINET

- A. All spare fuses shall be stored in their original cartons in a spare fuse cabinet furnished and installed by the electrical contractor. The cabinet shall be steel, surface mounted, with a hinged door, phenolic "Spare Fuse" label, flush lock, finished with gray baked enamel, and sized as required to house all spare fuses. A directory listing type and location of each fuse shall be mounted on the inside of the door. Spare fuse cabinet shall be similar to BUSSMAN Cat. No. SFC.
- B. The spare fuse cabinet shall be wall mounted within sight of the main service panel or switchboard.

PART TWO - PRODUCTS:

2.1 FUSES:

- A. Fuses shall be as manufactured by BUSSMAN or GOULD SHAWMUT.
- B. Fuses over 600 amps up to 6,000 amps shall be UL Class 'L' time-delay fuses equal to BUSSMAN "HI-CAP" KRP-C. The fuses shall hold five hundred percent (500%) of rated current for a minimum of four (4) seconds and clear twenty (20) times rated current in 0.01 seconds or less.
- C. Fuses up to 600 amps used for service entrance equipment shall be UL Class RKI dual-element fuses equal to BUSSMAN "LOW-PEAK" LPN-RK for 250 volts or LPS-RK for 600 volts. The fuses shall hold five hundred percent (500%) of rated current for a minimum of ten (10) seconds.
- D. Fuses protecting other than service entrance equipment rated over 100 amps up to 600 amps shall be UL Class K5 dual-element fuses equal to BUSSMAN "FUSETRON" FRN-R for 250 volts or FRS-R for 600 volts unless otherwise noted on the Drawings.

- E. Fuses 100 amps and under shall be UL Class K5 dual-element fuses equal to BUSSMAN "FUSETRON" FRN-R for 250 volts or FREER for 600 volts unless otherwise noted on the Drawings.

PART THREE - EXECUTION:

3.1 FUSES:

- A. The electrical contractor shall furnish and install fuses for all switches, switchboards, distribution panel, or any other electrical equipment furnished under this division of these specifications requiring fuses.
- B. The electrical contractor shall furnish one additional set of each type and rating of fuse as spare as well as any required puller or installation devices. These shall be installed in the original boxes in the spare fuse cabinet.
- C. The electrical contractor shall provide a chart listing fuse ampacity, type and manufacturer's part number installed in each disconnect. A copy shall of this chart shall be collected into a binder and submitted to the owner as part of the operations and maintenance (O & M) documentation.

END OF SECTION 16161

SECTION 16170 – MOTOR AND CIRCUIT DISCONNECTS

PART ONE - GENERAL:

- 1.1 Furnish and install heavy-duty disconnect switches at locations shown on Drawings, and in accordance with NEC requirements. Operating mechanisms shall be the quick-make, quick-break type, with arc-suppressing characteristics. Enclosures shall be NEMA Type 1 indoors and NEMA Type 3R in outdoor and wet locations; equipped with cover interlock and provisions for padlocking operating handle in "ON" and "OFF" position.
- 1.2 Fuses shall be Gould Shawmut or Bussmann. Spare fuse cabinet shall be wall mounted with shelves suitable size to store spare fuses and fuse pullers specified. One additional set of each type/rating of fuse shall be included as spare.

PART TWO - PRODUCTS:

- 2.1 Safety switches shall be by the same manufacturer as panelboards.

PART THREE – EXECUTION

3.1 NAMEPLATES:

- A. On all disconnects, provide engraved phenolic plastic nameplates. Unless otherwise noted, nameplates to be 1/16" thick plastic with 1/4" high white letters on black background. Hand lettering, typing under tape, embossed letters on plastic, etc., will not be acceptable.
- B. Attach nameplates with two rivets.
- C. Label shall indicate, load served, supplying panel and breaker, voltage and phasing similar to:

AHU #1A
120/208 VOLTS / 3 PHASE
SUPPLIED FROM
PANEL PA1 CIRCUIT 32

END OF SECTION 16170