

# CEILING RENOVATIONS

BEECH HILL ELEMENTARY SCHOOL

DORCHESTER DISTRICT TWO



SPECIFICATIONS  
CONSTRUCTION DOCUMENTS

05/16/25

DOCUMENT 00 0101 - PROJECT TITLE PAGE

PROJECT MANUAL FOR:

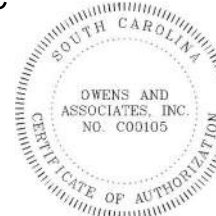
PROJECTS: BEECH HILL ELEMENTARY SCHOOL  
1001 Beech Hill Road,  
Summerville, SC 29485

OWNER: DORCHESTER COUNTY SCHOOL DISTRICT 2  
815 South Main Street  
Summerville, SC 29483

ARCHITECT: M NIXON DESIGN, LLC  
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Charleston, SC 29412  
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END OF DOCUMENT 00 0101

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Not Used

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Not Used

END OF DOCUMENT 00 0101

DOCUMENT 00 0115 – LIST OF DRAWING SHEETS

PART 1 - GENERAL

1.1 SUMMARY

A. The following drawings entitled “**Beech Hill ES - Ceiling Renovations**” bearing the date May 16, 2025, accompany this Project Manual and are integral thereto:

G000	COVER SHEET
G001	GENERAL NOTES
G010	OSF FORM F3
G011	OSF FORM F3
G012	OSF FORM F3
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G100	AREA PLAN
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END OF DOCUMENT 00 0115

## SECTION 01 1000 - SUMMARY

### PART 1 - GENERAL

#### A. SUMMARY This Section includes the following:

1. Work covered by the Contract Documents.
2. Time of Completion
3. Work under other contracts.
4. Use of premises.
5. Owner's occupancy requirements.
6. Specification formats and conventions.

#### 1.02 WORK COVERED BY CONTRACT DOCUMENTS

- A. Project Identification: Beech Hill Elementary Schools
- B. Project Location: 1001 Beech Hill Road, Summerville, SC
- C. Owner: Dorchester District Two, 815 North Main Street, Summerville, SC 29843
- D. Owner's Representative. The Owner will designate, at the time the purchase order is issued to the Contractor, the names and telephone numbers of its representatives. These will serve as the point of contact between the Contractor and Owner.
- E. Project will be constructed under a single contract.

#### 1.03 TIME OF COMPLETION

- A. The work shall be completed by August 1, 2026 after the issuance of a "Notice to Proceed" all work, including TAB, inspection(s), must be 100% completed during this time, all equipment operational and each room ready for Owner.
- B. All close-out documents and final billing can be completed after August 1, 2026.
- C. The completion time will be extended should unforeseen problems create bona fide and unavoidable delays in the diligent pursuit of the project completion.
- D. Should the completion date elapse, the contractor shall be assessed \$500 in agreed damages per day until the project is completed.

#### 1.04 WORK UNDER OTHER CONTRACTS

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

#### 1.05 USE OF PREMISES

- A. Work may be conducted as follows:
  1. 6:00 A.M. to 8:00 P.M., Monday through Friday, except for recognized Dorchester District Two Schools' holidays.
  2. Should the contractor desire to work outside of the above hours, a request must be submitted at least 48 hours in advance of the desired work period.

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

#### 1.06 OWNER'S OCCUPANCY REQUIREMENTS

- A. Owner Occupancy: Owner will occupy site and existing buildings during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with normal operations. Maintain existing exits, unless otherwise indicated.
  - 1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.
- B. Contractor shall obtain approval from authorities having jurisdiction for each specific portion of the Work to be completed before Owner occupancy.
  - 1. Before partial Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed.
  - 2. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of building.

#### 1.07 SPECIFICATION FORMATS AND CONVENTIONS

- A. Division 1: Sections in Division 1 govern the execution of the Work of all Sections in the Specifications.

END OF SECTION

SECTION 01 2100 – ALLOWANCES

PART I - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including AIA Documents A101 and A201, as amended, General and Supplementary conditions and other Division-1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section specifies administrative procedural requirements governing handling and processing allowances.
  - 1. Selected materials and equipment, and in some cases, their 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.
- B. Types of allowances required include the following:
  - 1. General Contingency Allowance \$50,000 per school
- C. Procedures for submitting and handling Change Orders are included in Section 01 2600 “Contract Modification Procedures” and Article 7 of the AIA A201 General Conditions of the Contract for Construction.
- D. Inclusion of unit prices is explained in Section 012200 “Unit Prices”.

1.3 SELECTION AND PURCHASE

- A. At earliest feasible date after Contract award, advise Owners Representative of date when final selection and purchase of each product or system described by allowance must be completed in order to avoid delay in performance of Work.
  - 1. When requested by Owners Representative, obtain proposals for each allowance for use in making final selections; include recommendations that are relevant to performance of Work.
  - 2. Purchase products and systems as selected from designated supplier.

- B. Costs Included in Allowances: Cost of product to Contractor or Subcontractor, delivery to site and applicable taxes (less applicable trade discounts), product handling at the site, including unloading, uncrating, and storage; protection of products from elements and from damage, and labor for installation and finishing, unless specifically stated otherwise in allowance for particular product. Cost shall also include overhead (including, but not limited to, field and home office overhead, insurance, bonds, labor burden, etc.) and profit associated with each item.
  
- D. Owners Representative (in consultation with the Architect & Engineers) Responsibilities:
  - 1. Consult with Contractor in consideration and selection of products, suppliers and installers.
  - 2. Select products in consultation with Owner and transmit to Contractor.
  - 3. Prepare Change Order, if an increase or decrease in price exists from the listed allowance amount.
  
- E. Contractor Responsibilities:
  - 1. Assist Owners Representative in selection of products, suppliers and installers.
  - 2. Obtain proposals from suppliers and installers and offer recommendations.
  - 3. On notification of selection by Owners Representative, execute purchase agreement with designated supplier and installer.
  - 4. Arrange for and process shop drawings, product data, and samples. Arrange for delivery.
  - 5. Promptly inspect products upon delivery for completeness, damage, and defects. Submit claims for transportation damage.

#### 1.4 SUBMITTALS

- A. Submit proposals for purchase of products or systems included in allowances, in form specified for Submittals.
- B. Submit invoices or delivery slips to indicate actual quantities of materials delivered to site for use in fulfillment of each allowance.

#### 1.5 UNUSED MATERIALS

- A. Return unused materials to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.
- B. When not economically feasible to return unused material for credit and when requested by Owners Representative, prepare unused material for Owner's

storage, and deliver to Owner's storage space as directed. Otherwise, disposal of excess material is Contractor's responsibility.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 INSPECTION

- A. Inspect product covered by allowance promptly upon delivery for damage or defects.

### 3.2 PREPARATION

- A. Coordinate materials and installation for each allowance with related construction to ensure that each allowance item is completely integrated and interfaced with related construction activities.

### 3.3 SCHEDULE OF ALLOWANCES

1. General Contingency Allowance	\$50,000.00 per school
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END OF  
SECTION

## SECTION 01 2200 — UNIT PRICES

### PART I - GENERAL

#### 1.01 SECTION INCLUDES

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

#### 1.02 RELATED DOCUMENTS

- A. AIA Documents A101 and A201, as amended, Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, and the Technical Specification Divisions 2 through 48 apply to this Section.

#### 1.03 GENERAL DESCRIPTION

- A. A unit price is an amount proposed by Bidders and stated on the Bid Form as a price per unit of measurement for materials or services that will be added to or deducted from the Contract Sum by Change Order in the event the estimated quantities or Work required by the Contract Documents are increased or decreased.
- B. The unit prices shall include all labor, materials, bailing, shoring, removal, overhead, profit, insurance, etc., to cover the finished work of the kinds called for.
- C. New Light Fixtures to be supplied by the Owner.
- D. Refer to individual Specification Sections for construction activities requiring the establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections and as listed on the Form of Proposal.
  - 1. The Owner reserves the right to reject the Contractor's measurement of work-in- place that involves the use of established unit prices, and to have this Work measured by an independent surveyor at the Owner's expense.

PART II – REQUIRED UNIT PRICES

2.01 DESCRIPTION

<u>ITEM</u>	<u>UNIT</u>	<u>COST</u>
Supply and Install Ceiling Grid & Tile	SF	
Demolish & Install 2x4 Light Fixture	EA	
Demolish & Install 2x2 Light Fixture	EA	
Supply & Install HVAC Supply Grille	EA	
Supply & Install HVAC Return Grille	EA	
Supply & Install 2x2 HVAC Filter	EA	
Supply & Install 4"x4" Electrical Box Cover Plate	EA	

END OF  
SECTION

## SECTION 01 2600 – CONTRACT MODIFICATIONS PROCEDURES

### PART 1 - GENERAL

#### 1.1 DESCRIPTION

- A. NO EXTRA WORK SHALL BE PERFORMED WITHOUT FIRST RECEIVING WRITTEN APPROVAL FROM THE OWNERS REPRESENTATIVE.
- B. Work included: Make such changes in the Work, in the Contract Sum, in the Contract Time of Completion, to any combination thereof, as are described in written Construction Change Directives or written Change Orders signed by the Owner, the Owner's Representative and the Architect and issued after execution of the Contract, in accordance with provisions of this Section.
- C. Related Work:
  - 1. Documents affecting work of this Section include, but are not necessarily limited to, AIA Documents A101 and A201, as amended, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
  - 2. Changes in the Work are described further in Article 7 and other articles of the General Conditions.

#### 1.2 QUALITY ASSURANCE

- A. Included within the Contractor's quality assurance program such measures as are needed to assure familiarity of the Contractor's staff and employees with these procedures for processing Change Order data.

#### 1.3 SUBMITTALS

- A. Make submittals directly to the Owner's Representative.
- B. Submit the number of copies called for under the various items listed in this Section along with appropriate back-up materials.

#### 1.4 PROCESSING CHANGES INITIATED BY THE OWNER

- A. Should the Owner contemplate making a change in the Work or a change in the Contract Time of Completion, the Owner's Representative will issue a Proposed Change Order request or a Construction Change Directive to the Contractor.
  - 1. Proposed Change Order requests will describe the contemplated change and will request that the Contractor provide a detailed price and estimate of time that it seeks in the event the change is authorized by the Owner.
  - 2. Construction Change Directives will be dated and will be numbered in sequence.

3. The Construction Change Directives will describe the contemplated change, and will carry one of the following instructions to the Contractor:
  - a. Make the described change in the Work at no change in the Contract Sum and no change in the Contract Time of Completion in accordance with Paragraph 7.3 of the General Conditions.
  - b. Make the described change in the Work, and provide for a credit or cost to be determined in accordance with Paragraph 7.3.7 of the General Conditions.
- B. If the Contractor has been directed by the Owner's Representative to make the described change in the Work at no change in the Contract Sum and no change in the Contract Time of Completion, but the Contractor wishes to make a claim for one or both of such changes, the Contractor shall proceed with the change and shall notify the Owner's Representative as provided for under Article 15.1 of the General Conditions.
- C. If the Contractor has been directed by the Owner's Representative to make the described change subject to later determination of cost or credit in accordance with Paragraph 7.3 of the General Conditions, the Contractor shall:
  1. Take such measures as needed to make the change;
  2. Consult with the Owner's Representative and/or Architect and reach agreement on the most appropriate method for determining credit or cost for the change.
- D. If the Contractor has been directed by the Owner's Representative to promptly advise him as to credit or cost proposed for the described change, the Contractor shall:
  1. Analyze the described change and its impact on costs and time;
  2. Secure the required information and forward it to the Owner's Representative for review;
  3. Meet with the Owner's Representative and/or Architect as required to explain costs and, when appropriate, determine other acceptable ways to achieve the desired objective;
  4. Alert pertinent personnel and subcontractors as to the impending change and, to the maximum extent possible, avoid such work as would increase the Owner's cost for making the change, advising the Owner's Representative in writing when avoidance no longer is practicable.

#### 1.5 PROCESSING CHANGES INITIATED BY THE CONTRACTOR

- A. If the Contractor recommends a change in the Work, he shall submit a Proposed Change Order with detailed cost and time information as detailed below.

## 1.6 PROCESSING CHANGE ORDERS

### CONTRACTOR'S ACTIONS

- A. Make written reply to the Owner's Representative in response to each Proposed Change Order request or Construction Change Directive.
  - 1. State proposed change in the Contract Sum, if any.
  - 2. State proposed change in the Contract Time of Completion, if any.
  - 3. Clearly describe other changes in the Work required by the proposed change or desirable therewith, if any.
  - 4. Include full backup data such as, subcontractor's letter of proposal or similar information.
  - 5. Submit this response in a single copy.

### OWNER'S REPRESENTATIVE'S ACTIONS

- A. When cost or credit for the change has been agreed upon by the Owner and the Contractor, or the Owner has directed that cost or credit be determined in accordance with provisions of Paragraph 7.3 of the General Conditions, the Owner's Representative will issue a Change Order or Constructive Change Directive to the Contractor.
- B. Change Orders will be dated and will be numbered in sequence.
- C. The Change Order will describe the change or changes, will refer to the Construction Change Directive(s) involved, and will be signed by the Contractor, Owner, the Owner's Representative and the Architect.
- D. The Owner's Representative will issue three copies of each Change Order to the Contractor.
  - 1. The Contractor promptly shall sign all three copies and return all three (3) copies to the Owner's Representative for the Architect's signature.
  - 2. The Owner's Representative will sign and forward the five copies to the Architect for his signature.
  - 3. The Architect will sign all five copies and return five copies to the Construction Manager for the Owner's signature.
  - 4. The Owner will sign all five copies, retain one copy for his file and return the remaining four copies to the Owner's Representative who will then forward fully executed copies to the Contractor, Architect and the Office of School Facilities.
- E. Should the Contractor disagree with the stipulated change in Contract Sum, or change in Contract Time of Completion, or both:
  - 1. The Contractor promptly shall return three copies of the Change Order, unsigned by him, to the Owner's Representative with a letter signed by the Contractor describing the reason(s) for the Contractor's disagreement.
  - 2. The Contractor's disagreement with the Change Order shall not in any

way relieve the Contractor of his responsibility to proceed with the change as ordered under pertinent provisions of the Contract Documents.

END OF  
SECTION

## SECTION 01 2900 – PAYMENT PROCEDURES

### PART 1 - GENERAL

#### 1.1 DESCRIPTION

- A. Work included: Comply with procedures described in this Section when applying for progress payment and final payment under the Contract.
- B. Related Work:
  - 1. Documents affecting work of this Section include, but are not necessarily limited to, AIA Documents A101 and A201, as amended, General Conditions AIA 201-2009 Article 9, Supplementary Conditions and Sections in Division 1 of these Specifications.
  - 2. The Contract Sum and the schedule for payments are described in the Form of Agreement, AIA A101 as amended.
  - 3. Payments upon Substantial Completion and Completion of the Work are described in the AIA A201, General Conditions, as amended
  - 4. The Owner's Representative's and Architect's approval of applications for progress payment and final payment is contingent upon the Owner's Representative's and Architect's approval of status of Project Record Documents pursuant to the requirements of Section 01 7839 and the AIA A201 General Conditions, as amended.
  - 5. The Owner's Representative's and Architect's approval of applications for progress payment is contingent upon receipt of Project Schedule updates, properly cost loaded if required, to be submitted along with each pay application as described in Section 01 0101 Project Schedule and the AIA A101 and A201, as amended.

#### 1.2 QUALITY ASSURANCE

- A. Prior to approval of payment application Number One, secure the Owner's Representative's approval of the Project Schedule Section 01 0101, Submittal Schedule Section 01 3300 Submittal Procedures, and Schedule of Values Section 01 2973 of these Specifications.
- B. During progress of the Work, modify the Schedule of Values as approved by the Owner's Representative to reflect changes in the Contract Sum due to Change Orders or other modifications of the Contract.

- C. Base requests for payment on the approved Schedule of Values.
- D. Payment Application Times: Each progress payment date is as indicated in the Agreement. The period of construction Work covered by each Application or Payment is the period indicated in the Agreement.
- E. Application Preparation: complete every entry on the form, including notarization and execution by person authorized to sign legal documents on behalf of the Contractor. Incomplete applications will be returned without action.

### 1.3 SUBMITTALS

- A. Formal Submittal: Unless otherwise directed by the Owner's Representative:
  - 1. After review of the draft payment application by the Contractor, Owner's Representative and Architect, submit a formal submittal of the request for payment by filling in all appropriate information, by typewriter or neat lettering in ink, on AIA Document G702, "Application and Certificate for Payment", plus Continuation Sheets, AIA Document G703, using data from the Schedule of Values and the accompanying cost loaded schedule, if applicable. Submit other supporting documentation required by the Owner's Representative as detailed by the AIA A101 and A201 including, but not limited to lien waivers, Consent of Surety, etc.
  - 2. Sign and notarize the Application and Certificate for Payment.
  - 3. Unless instructed by the Owner's Representative to submit pay applications electronically via email, submit the original of the Application and Certificate for Payment, plus two (2) identical copies of the entire Application including all continuation sheet or sheets, to the Architect. All copies shall bear original signatures and original notarizations.
  - 4. The Architect will review the formal submittal and, upon agreement, will distribute:
    - a. After approval of Architect who will retain one copy, the Owner's Representative will retain one copy and transmit one copy to the Contractor.
  - 5. Request for Payment against any change order will not be honored until the change order is signed by all appropriate parties.
- B. Application for Payment at Substantial Completion: Following issuance of the Certificate of Substantial Completion, submit an Application for Payment; this application shall reflect any Certificates of Partial Substantial Completion issued previously for Owner occupancy or designated portions of the Work.

Administrative actions and submittal that shall proceed or coincide with this application include:

1. Occupancy permits and similar approvals.
2. Warranties (guarantees) and maintenance agreements.
3. Test/adjust/balance records.
4. Maintenance instructions.
5. Start-up performance reports.
6. Change-over information related to Owner's occupancy, use operation and maintenance.
7. Final cleaning.
8. Application for reduction of retainage and consent of surety.
9. Advice on shifting insurance coverage's and proof of the continuation of required insurance coverage.
10. Punch list of incomplete Work, recognized as exception to Architect's Certificate of Substantial Completion (area by area).
11. Change of door locks to Owner's access keys.
12. Satisfactory completion of training, commissioning, etc.
13. Any other items requested by the Owner's Representative including release of liens/claims from subcontractors/suppliers, etc.

C. Final Payment Application: In conjunction with the requirements of administrative actions and submittals which must precede or coincide with submittal of the final payment Application for Payment include the following:

1. Completion of Project closeout requirements.
2. Completion of items specified for completion after Substantial Completion.
3. A final release which indicates no further claims will be submitted against this contract.
4. Assurance that Work is complete.
5. Transmittal of required Project Construction Records to Owner including all record documents.
6. Proof that all taxes, fees and similar obligations have been paid.
7. All required lien releases/waiver of claims from subcontractors, suppliers and other vendors.
8. Consent of Surety.

END OF  
SECTION

## SECTION 01 2973 - SCHEDULE OF VALUES

### PART 1 - GENERAL

#### 1.1 DESCRIPTION

- A. Work included: Provide a detailed breakdown of the agreed Contract Sum showing values allocated to each of the various parts of the Work, as specified herein and in other provisions of the Contract Documents.
- B. Related Work:
  - 1. Documents affecting work of this Section include but are not necessarily limited to AIA A101 and A201, as amended, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
  - 2. Schedule of Values is required to be compatible with the continuation sheet, accompanying applications for payment, as described in Section 01 2900 – Payment Procedures as well as schedule cost loading if required

#### 1.2 QUALITY ASSURANCE

- A. Use required means to assure arithmetical accuracy of the sums described.
- B. When so required by the Owner's Representative and/or Architect, provide copies of the subcontractor's Schedule of Values or other data acceptable to the Owner's Representative and/or Architect, substantiating the sums described.

#### 1.3 SUBMITTALS

- A. Format and Content: Use the Project Manual Table of Contents as a guide to establish the format for the Schedule of Values.
  - 1. Identification: Include the following Project identification on the Schedule of Values:
    - a. Project name and location.
    - b. Name of the Architect.
    - c. Project number.
    - d. Contractor's name and address.
    - e. Date of submittal.
  - 2. Arrange the Schedule of Values in a tabular form with separate columns to indicate the following for each item listed for each construction phase:
    - a. Generic name.

- b. Related Specification Section.
    - c. Name of subcontractor.
    - d. Name of manufacturer or fabricator.
    - e. Name of supplier.
    - f. Dollar value.
    - g. Percentage of Contract Sum to the nearest one-hundredth percent, adjusted to total 100 percent.
  3. Provide a breakdown of the Contract Sum in sufficient detail to facilitate continued evaluation of Applications for Payment and progress reports. Break principal subcontract amounts down into several line items.
  4. Round amounts off to the nearest whole dollar; the total shall equal the Contract Sum.
  5. For each part of the Work where an Application for Payment may include materials or equipment, purchased or fabricated and stored, but not yet installed, provide separate line items on the Schedule of Values for initial cost of the materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
  6. Margins of Cost: Show line items for indirect costs, and margins on actual costs, only to the extent that such items will be listed individually in Applications for Payment. Each item shall be complete including its total cost and proportionate share of general overhead and profit margin.
    - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place shall be shown as separate line items in the Schedule of Values.
  7. Schedule Updating: Update the Schedule of Values when Change Orders or Construction Change Directives result in a change in the Contract Sum.
- B. Prior to first application for payment, submit a proposed schedule of values to the Owner's Representative.
  1. Meet with the Owner's Representative and determine additional data, if any required to be submitted.
  2. Secure the Owner's Representative's approval of the schedule of values prior to submitting first application for payment. **NO APPLICATIONS FOR PAYMENT WILL BE PROCESSED PRIOR TO APPROVAL OF THE SCHEDULE OF VALUES**, as well as other submittals required by contract to accompany payment applications.
  3. AIA Form G703 and "Form A" provided by the Owner's Representative shall be submitted with all columns and spaces completed.

END OF  
SECTION

## SECTION 01 3119 – PROJECT MEETINGS

### PART 1 - GENERAL

#### 1.1 DESCRIPTION

- A. Work included: Various project meetings will be conducted throughout the construction period to enable orderly review during progress of the Work, to provide for systematic discussion of problems, to provide for efficient dispute resolution and to coordinate all phases of the Project toward completion in accordance with the Contract Documents.
- B. This Section specifies administrative and procedural requirements for project meetings including, but not limited to:
  - a. Pre-construction conferences
  - b. Weekly Project meetings
  - c. Quality Control Meetings
  - d. Pre-installation conferences
  - e. Informal jobsite meetings (no minutes required)
  - f. Toolbox safety meetings (no minutes required)

#### 1.2 QUALITY ASSURANCE

- A. Each person designated by the Contractor to attend and participate in these project meetings must have proper authority to commit the Contractor to actions agreed upon in the project meetings. Any change in personnel by a Contractor will be forwarded in writing to the Owner's Representative prior to the change.

#### 1.3 SUBMITTALS

- A. Agenda Items: To the maximum extent practicable, advise the Owner's Representative and Architect/Engineer in writing at least 24 hours in advance of project meetings of agenda items proposed by the Contractor.
- B. Minutes:
  - 1. Unless indicated otherwise, the Owner's Representative will compile minutes of each meeting, and will furnish one copy to the Contractor, Architect/Engineer(s) and required copies to the Owner. The Contractor may make and distribute such other copies as appropriate.
  - 2. The Contractor's Quality Control Officer will compile minutes for Quality Control Meetings and Pre-installation Meetings. The QC Officer will furnish one copy to the Owner's Representative and Architect.

### PART 2 – PRODUCTS (No products are required in this Section)

## PART 3 - EXECUTION

### 3.1 MEETING SCHEDULE

- A. The preconstruction conference will be held prior to the start of work on site and within 15 working days of the Notice to Proceed.
- B. Informal job site meetings with on-site job superintendents will be held daily or on an as needed basis. Contractor safety meetings will be held on a weekly basis, at a minimum.
- C. Formal project meetings with attendance of the Prime Contractor's office Project Manager and Superintendent will be held weekly.
- D. Pre-installation and other quality control meetings will be held as requested by the Owner's Representative or Contractor prior to installation of specific items or as required by the contract specifications.
- E. Coordination meetings will be held as requested by the Owner's Representative or Contractor prior to any project work requiring coordination with the Owner, Contractor, subcontractors, governmental agencies or suppliers of specific items or as required by the contract specifications.
- F. Coordinate as necessary to establish a mutually acceptable schedule for all meetings.

### 3.2 MEETING LOCATION

- A. The Owner's Representative will establish meeting location. To the maximum extent practicable, meetings will be held at the job site.

### 3.3 PRECONSTRUCTION MEETING

- A. A Preconstruction Meeting will be scheduled to be held within 5 working days after the Owner has issued the Notice to Proceed.
  - 1. Provide attendance by authorized representatives of the Prime Contractor and major subcontractors, at the Contractor's discretion.
  - 2. The Owner's Representative will advise other interested parties, including the Owner, and request their attendance, as necessary.
- B. Minimum Agenda: Data will be distributed and discussed on at least the following items:
  - 1. Organizational arrangement of Prime Contractor's forces and personnel, and identification of major subcontractors, material suppliers, Owner's Representative, and Architect.
  - 2. Channels and procedures for communication.
  - 3. Construction schedule, including sequence of critical work.

4. Contract Documents, including distribution of required copies of original Documents and revisions.
5. Processing of Shop Drawings and other data submitted to the Owner's Representative for transmittal to Architect for review.
6. Processing of Bulletins, field decisions, CCDs, Change Orders, and Payment Applications.
7. Rules and regulations governing performance of the Work;
8. Procedures for safety and first aid, security, quality control, housekeeping and related matters.
9. Preparation of record drawings.
10. Use of the premises.
11. Office, work and storage areas.
12. Equipment deliveries and priorities.
13. Working hours.
14. Request for Information format.
15. Notification of Defective and Non-Conforming Work format.
16. Rejection of Work format.
17. Inspection Procedures
18. Quality Control

### 3.4 PROJECT MEETINGS

#### A. Attendance:

1. To the maximum extent practicable, assign the same person or persons to represent the Prime Contractor at project meetings throughout progress of the Work.
2. Conduct progress meetings at the Project site on a weekly basis, or more frequently if necessary. Notify the Owner's Representative and Architect of scheduled meeting dates. Coordinate dates of meetings with preparation of the payment request.
3. Attendees: In addition to representatives of the Owner and Architect, each subcontractor, supplier or other entity concerned with current progress or involved in planning, coordination or performance of future activities shall be represented at the meetings by persons familiar with the Project and authorized to conclude matters relating to progress.

#### B. Minimum Agenda:

1. Review, revise as necessary, and approve minutes of previous meetings.
2. Review progress of the Work since last meeting, including status of submittals for approval. Determine where each activity is in relation to the Contractor's Construction Schedule, whether on time or ahead or behind schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Review of Project Superintendent and Quality Control Manager's daily reports since the last Project Meeting.
3. Identify problems that impede planned progress.
4. Develop corrective measures and procedures to regain planned schedule.

5. Complete other current business.
6. Review Quality and work standards, updated as-built documents, and record documents as required.
7. Schedule Updating: Revise the "look ahead" construction schedule after each progress meeting where revisions to the schedule have been made or recognized. The Contractor shall issue the revised "look ahead" schedule concurrently with the report of each meeting.
8. Review the present and future needs of each entity present, including such items as:
  - a. Interface requirements.
  - b. Time.
  - c. Sequences.
  - d. Deliveries
  - e. Off-site fabrication problems.
  - f. Access.
  - g. Site utilization.
  - h. Temporary facilities and services.
  - i. Hours of work.
  - j. Hazards and risks.
  - k. Cleaning and site conditions.
  - l. Change Orders.
  - m. Documentation of information for payment requests.
  - n. Critical submittals.
  - o. Critical RFI's.
  - p. Quality Control

C. Revisions to minutes:

1. Unless published minutes are challenged in writing prior to the next regularly scheduled progress meeting, they will be accepted as properly stating the activities and decisions of the meeting.
2. Persons challenging published minutes shall reproduce and distribute copies of the challenge to all indicated recipients of the particular set of minutes.
3. Challenge to minutes shall be settled as priority portion of "old business" at the next regularly scheduled meeting.

- D. Reporting: No later than three (3) days after each progress meeting date, the Owner's Representative will distribute copies of minutes of the meeting to the Contractor, Architect/Engineer(s), and Owner.

END OF  
SECTION

## SECTION 01 3201 – PROJECT SCHEDULE

### PART 1 - GENERAL

#### 1.0 GENERAL

The Contractor shall prepare, maintain and update a schedule prepared using only, Primavera Project Planner Software by Primavera Systems, Inc. (P6) as a means of project control and decision making for the project. The P6 Schedule shall be prepared in such a manner as to permit the orderly planning, organization and execution, to avoid conflict and ensure the orderly progress of work. The schedule shall be sufficiently detailed to accurately depict all the work required by the Contract. The P6 schedule shall be updated and revised as necessary no less than monthly and shall accurately reflect and report the actual performance and progress of the work in accordance with Section 01 3201 Project Schedule.

#### 1.1 SUBMITTALS

The following shall be submitted in accordance with the paragraph herein titled “Submittal Procedures,” Section 7.0 SCHEDULE SUBMISSION, and as required in Article 3.10 of the General Conditions of the Contract for Construction AIA Document A201 – 2009 as amended, and Division I Sections.

##### 1.1.1 Schedules

- a. P6 Project Schedule (Target Schedule).
- b. Monthly Schedule Updates
- c. Look ahead Schedules as required by the Program Manager

#### 1.2 QUALIFICATIONS

- a. Scheduling Consultant: Engage a consultant to provide planning, evaluation, and reporting using CPM scheduling.
- b. In-House Option: Owner may waive the requirement to retain a consultant if Contactor employs skilled personnel with experience in CPM scheduling and reporting techniques. The Scheduler shall have previously developed, created and maintained at least 5 previous computerized schedules of similar size and complexity of this contract. A resume outlining the qualifications of the Scheduler shall be submitted for acceptance by the Program Manager. If at a later date, the Program Manager, with concurrence of the Owner, notifies the Contractor that the Contractor's Scheduler is objectionable, the Contractor will propose a new Scheduler in writing, meeting the qualification requirements. Payments will not be processed until an acceptable Scheduler is provided.

## PART 2 - EXECUTION

### 2.0 GENERAL

Pursuant to the requirements of the Contract Documents, a Project schedule as described below shall be prepared. The scheduling of construction shall be the responsibility of the Contractor. Contractor management personnel shall actively participate in its development and maintenance.

Subcontractors and suppliers working on the project should also contribute in developing and maintaining an accurate Project Schedule. The approved Project Schedule shall be used for project management and Coordination, to measure the progress of the work, to aid in evaluating time extensions, and to provide the basis for all progress payments.

### 2.1 BASIS FOR PAYMENT

The schedule shall be the basis for measuring contractor progress. Lack of an approved schedule shall result in the inability of the Program Manager and Architect to evaluate the Contractor's progress for the purpose of payment. The Contractor shall provide the necessary schedule and cost reports for review and agreement of invoice quantities. No progress payments will be made until the schedule and other documents as required have been approved by the Program Manager.

#### 2.2.1 Payment

Each pay application should correlate to the latest schedule update. No pay applications will be processed without the schedule update as well as other required submittals.

## PART 3

### 3.0 PRELIMINARY MEETING

If requested by the Program Manager, participate in a preliminary meeting to discuss the proposed schedule requirements prior to submission of the schedule.

## PART 4 – PROJECT SCHEDULE

### 4.0 PROJECT SCHEDULE REQUIREMENTS

The Contractor shall provide a detailed Primavera Schedule within thirty (30) calendar days of contract award. The Contractor shall provide a Primavera Schedule that has incorporated all requirements of the specifications. Failure of the Contractor to meet the requirements of this specification shall result in the disapproval of the schedule.

#### 4.1 USE OF CRITICAL PATH METHOD

The Primavera Schedule of network calculation shall be used to generate the Project Schedule. The P6 Schedule will show the order and interdependence of activities and the sequence in which the work is to be accomplished as planned. The basic concept of a P6 schedule is to show how the start of any given activity is dependent on the completion of preceding activities and how its completion restricts or restrains the start of following activities. The following Criteria will be utilized by the Owner's Representative to determine the acceptability of the Project Schedule.

##### 4.1.1 Critical Sequence

The project critical path shall provide a realistic and uninterrupted sequence of activities to achieve project completion in a timely manner as required by the Contract Documents.

##### 4.1.2 Constructability

The project schedule must represent a realistic sequence of construction activities.

#### 4.2 SCHEDULE REQUIREMENTS

The project schedule shall include an appropriate level of detail. Failure to develop or update the Project schedule or provide data to the Program Manager at the appropriate level of detail, as specified by the Program Manager, shall result in the disapproval of the schedule.

Failure by the Contractor to include any element of work required for performance of the Contract shall not excuse the Contractor from completing the Work within the Contract Time and/or any Contract Milestone Date.

Seasonal weather conditions shall be considered and included in the planning and scheduling of all work influenced by high or low ambient temperatures, wind and/or precipitation to ensure completion of all Work within the Contract Time. Completion time will not be extended for normal adverse weather. The time for completion as stated in the Contract Documents includes due allowance for adverse weather day which will be defined as days that rainfall for the Charleston, SC station and the rain begins to fall prior to 3:00 pm on- site that day. Structural steel activities will include adverse weather days defined as any day rain falls prior to 3:00 pm or days in which excessive wind is present. For the purpose of this agreement, the Contractor agrees that normal adverse weather will be defined and that he will anticipate losing working days to weather in accordance with the following table:

January – 8 days	July – 9 days
February – 7 days	August 9 days
March – 7 days	September – 7 days
April – 6 days	October – 5 days

May – 6 days                      November – 5 days  
June – 8 days                      December – 6 days

#### 4.2.1 Activity Durations

Contractor submission shall use reasonable activity durations. Reasonable durations are those that allow the progress of activities to be accurately determined between payment periods (no more than 5 percent of all non-procurement activities original durations shall be greater than 15 work days).

#### 4.2.2 Submittal and Material Procurement Activities

In addition to construction activities, the P6 schedule shall include the submittal and approval of materials, samples, and shop drawings, the procurement of critical and long lead-time materials and equipment. Schedule submittal activities shall allow sufficient time for material to be procured and installed even if the submittal is unacceptable, and re-submittal is required.

Coordinate transmittals of different types of submittals for related elements of the work so processing will not be delayed by need to review submittals concurrently for coordination.

#### 4.2.3 Owner Activities

Owner and other agency activities shall be shown. These activities include, but are not limited to, approvals, inspections, utility tie-ins, and owner furnished equipment. A minimum of a fifteen (15) calendar day duration will be allowed for processing, approval and return of submittal, samples and shop drawings where approval is required.

#### 4.2.4 Administrative Activities

The Contractor shall include a level of activity detail to adhere to required administrative procedures, but not limited to, preparing schedules, safety plans, permits, inspections/surveys, installing and removing temporary facilities/utilities, pre-installation meetings, pour notifications, start-up/testing, Sub Contractor/Project closeout, and training of personnel.

#### 4.2.5 Project Milestones

Project milestones shall be included in the schedule to indicate key project and construction milestones including interim completion, final completion and construction assigned milestones. Phase completion dates, if contained in this contract, must be included as project milestones.

#### 4.2.6 Contract Specifications

The project Schedule shall include a level of activity detail to adhere to contract specifications (i.e. permit, notification, specified sequence of work, cure times, and required test and inspection points.)

#### 4.3 SCHEDULE PROJECT COMPLETION

The schedule interval shall extend from the Notice to Proceed to the Contract Completion date.

#### 4.4 SCHEDULE LOGIC

The schedule logic shall indicate a level of interdependency to indicate how the completion of one activity initiates the start of succeeding activities.

##### 4.4.1 Negative Lags

Lag durations contained in the project schedule shall not have negative value.

##### 4.4.2 Activities Ties

As a minimum, all activities with the exception of the start milestone and final completion milestone must have at a minimum one proceeding relationship tie and one succeeding relationship tie.

#### 4.5 Cost Loading

The schedule shall be cost loaded, and meet the following criteria:

- a. Cost loaded schedule must correlate with the Schedule of Values.
- b. All construction activities shall be cost loaded and represent realistic costs and be consistent throughout the schedule.
- c. Include receipt of material with estimated procurement cost for major items for which payment of material will be requested.

#### 4.6 ACTIVITY CODING

At a minimum, all activities will be coded to identified activity type, work area, phase, work type and responsibility. The assigned code structure must be incorporated into the schedule along with any other coding that the contractor deems necessary.

#### 4.7 ACTIVITY CALENDARS AND WORK PERIODS

The Project Schedule shall indicate the contractor's intended work schedule.

#### 4.8 SCHEDULE ABBREVIATIONS

The contractor shall clearly explain abbreviations used in the CPM schedule in a legend of symbols either separate or attached to the schedule.

### PART 5

#### 5.0 PROJECT SCHEDULE SUBMISSION AND APPROVAL

The Contractor shall provide the submissions as described below. The data disk, program, reports, and network diagrams required for each submission are contained in Section 7.0 SCHEDULE SUBMISSION.

#### 5.1 PROJECT SCHEDULE

The Project Schedule shall be submitted for approval within thirty (30) calendar days after Notice to Proceed. The schedule shall provide reasonable sequence of activities that represent work through the entire project and shall be at a reasonable level of detail. The Contractor and major Subcontractors shall review the CPM schedule prior to final submittal.

##### 5.1.1 Review and Evaluation

The Contractor shall participate in a meeting to discuss, review and evaluate the proposed schedule and reports with the Program Manager. Revisions necessary as a result of this review shall be resubmitted for approval by the Program Manager within seven Calendar days after the Conference. Allow seven days for the Program Manager review.

##### 5.1.2 Approved Schedule

Once the Program Manager approves the schedule, the schedule will then be considered "frozen" and then be classified as the "target schedule." The target schedule will be the baseline to analyze all changes. The approved schedule shall then be the schedule to be used by the Contractor for planning, organizing and directing the work, reporting the progress and requesting payment for work accomplished.

Upon establishment of a Target schedule, the Contractor shall sign on the face of the Construction Schedule documents, which shall then indicate the Contractor's acceptance and approval of the Construction Schedule.

Acceptance by the Owner of the Contractor's Construction Schedule will be a condition precedent to the making of any progress payments under the Contract. The Owner will notify the Contractor in writing of acceptance of the Construction Schedule.

## 5.2 SCHEDULE UPDATES

Once the schedule is approved, the monthly schedule update will begin within 30 days.

### 5.2.1 Pay Application

Schedule updates shall be submitted with each pay application. The pay application will not be approved until an approved schedule update is submitted as well as other required submittals. See Section 2.2: BASIS FOR PAYMENT.

### 5.2.2 Progress Reporting

The Contractor and the Contractor's Scheduler must, at a minimum, attend monthly progress meetings to report project schedule status and upcoming work status.

## 6.0 SCHEDULE UPDATES

The Contractor shall submit schedule updates every month through project completion. These submissions shall enable the Program Manager to assess Contractors progress. If the Contractor fails or refuses to furnish the information and project schedule data, which, in the judgment of the Program Manager and/or Architect, is necessary for verifying the Contractor's progress, the Contractor shall be deemed not to have provided adequate information upon which progress payment may be made.

### 6.1 PROJECT COMPLETION

Project completion and interim completions shall be easily identified and based on early completion date. Calculation on project updates shall be such that if the early finish of the last activity falls after the contract completion date, then the float calculation shall reflect a negative float on the critical path.

#### 6.2.1 Late Completions

If negative float exists and is over 14 calendar days, then a recovery schedule will be prepared to reflect how the contractor intends to recover the lost time per Section 6.5 RECOVERY SCHEDULE. Payment requests may be reduced or withheld until CPM schedule is brought back into compliance with contract requirements.

### 6.2 OUT OF SEQUENCE PROGRESS

Activities that have posted progress without predecessors being completed (Out-of-Sequence Progress) will be allowed only on a case-by-case approval by the Program Manager. The Program Manager may direct that changes in schedule logic be made to correct any or all out-of-sequence work.

### 6.3 SCHEDULE REVISIONS

If a major change in scope of work, sequencing means or methods or some other factor that makes the baseline schedule obsolete occurs, the Contractor shall submit the revised plan for the approval of the Program Manager. If schedule changes are required (i.e. activities added, durations changed, sequences changed) the Program Manager shall be notified in writing stating the schedule revisions and the reasons for change. The Program Manager considers these changes to be of a major nature, the Contractor may be required to revise and resubmit for approval, without additional cost to the Owner. Upon approval, the revised schedule will be considered the new baseline to which future analysis will be performed.

### 6.4 RECOVERY SCHEDULE

Whenever the Contractor fails to achieve a milestone established in the Contract Schedule, or the Contractor's progress is not commensurate with that required to adhere to the contract time or milestones, the Contractor shall promptly undertake appropriate action at no additional cost to the Owner to recover the CPM Schedule.

#### 6.5.1

The Contractor shall submit with the next application for payment a written recovery statement to the Program Manager describing the cause for slippage and the action planned by the Contractor to recover the Schedule.

#### 6.5.2

The Contractor's failure or neglect to take appropriate recovery action and to submit a written recovery statement shall constitute reasonable evidence that the Contractor is not executing the work, or separate part of the work, with a diligence that will insure its completion within the applicable contract time. The Program Manager shall constitute this as the basis to recommend the withholding an appropriate amount of any payment otherwise due and may recommend that the Owner order the Contractor to take "Extraordinary Measures" which are detailed as follows: In the event the Owner determines that the performance of the Work has not progressed or reached the level of completion required by the Contract Documents, the Owner shall have the right to order the Contractor to take corrective measures necessary to expedite the progress of construction, including, without limitation, (1) working additional shifts or overtime; (2) supplying additional manpower, equipment, and facilities; and (3) other similar measures (referred to collectively as "Extraordinary Measures"). Such Extraordinary Measures shall continue until the progress of the Work complies with the stage of completion required by the Contract Documents. The Owner's right to require Extraordinary Measures is solely for the purpose of ensuring the Contractor's compliance with the construction schedule. The Contractor shall not be entitled to an adjustment in the Contract Sum in connection with Extraordinary Measures required by the Owner.

## 7.0 SCHEDULE SUBMISSION

The contractor shall submit Disks, Programs, Reports, Diagrams and Charts with all project schedules and updated schedules in accordance with the submission section requirements. The Contractor shall include on all reports and graphics the Project Title, Contractor Name, Update Number, Revision Number and Date.

### 7.1 DATA DISK

One data disk containing the project schedule shall be provided with all schedule submissions.

#### 7.1.1 File Medium

Required data shall be submitted on Compact Disc.

#### 7.1.2 Disk Label

A permanent exterior label shall be affixed to each disk submitted. The label shall indicate the type schedule (Preliminary, Target, Update, or Change), File name, full contact number, project name, project location, Contractor, data date, name and telephone number of person responsible for the schedule.

#### 7.1.3 File Name

Each File submitted shall have a name related to the project name and version number. The contractor shall develop a naming convention that will ensure that the names of the files submitted are unique and indicate sequence of submittal.

## 7.2 SCHEDULE REPORTS

### 7.2.1 Activity Data

The computer-generated schedule reports shall include a tabulation of each activity shown on the detailed network diagram. The format for each activity for the schedule reports listed below shall contain the following information as a minimum:

- a. Activity Numbers
- b. Activity Description
- c. Original duration
- d. Remaining Duration
- e. Early Start Date
- f. Early Finish Date
- g. Percentage Complete
- h. Total float

- i. Responsibility Code
- j. Budget amount of activity, if cost loaded
- k. Contractor's earnings based on portion of activity completed, if cost loaded
- l. Actual Start and Finish dates shall be printed for those activities in progress or completed.

#### 7.2.2 Required Sorts

Provide the following report with each required submission

- a. Total float report listing all uncompleted activities sorted first by total and then by early start.
- b. Cost earned report listing all activities having a budget amount used as the Contractor's monthly invoice sorted first by responsibility code then by activity number, if cost loaded.
- c. Cost earned summary report showing total budget and earned amounts for each responsibility code, if cost loaded.

#### 7.3 ACTIVITY BAR CHARTS

Bar Chart diagrams shall be submitted to represent the following:

- a. Two-week look ahead Bar Chart sorted by early start.
- b. Bar Chart containing all activities indicating actual progress versus Baseline target schedule sorted by area and early start.
- c. Bar chart summarized by work type to contract completion.

#### 7.4 SCHEDULE NARRATIVE

Submit a detailed progress narrative report describing current and anticipated problem areas and/or delaying factors with their impact together with an explanation of corrective actions taken or proposed.

#### 7.5 SCHEDULE CHANGES

A detailed report shall be provided indicating all proposed schedule revisions and are subject to the Program Manager's approval.

#### 8.0 REQUESTS FOR TIME EXTENSIONS

In the event the Contractor requests an extension of the contract completion date, he shall furnish such justification, project schedule data and supporting evidence as the Program Manager may deem necessary for a determination as to whether or not the Contractor is entitled to an extension of time under the provisions of the contract.

## 9.0 OWNERSHIP OF FLOAT

Float available in the schedule, at any time, shall not be considered for the exclusive use of either the Owner or the Contractor. Float belongs to the Project and may be utilized by both the Owner and Contractor.

END OF  
SECTION

## SECTION 01 4126 – PERMITS AND RIGHTS-OF-WAY

### PART 1 - GENERAL

#### 1.1 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:
  - 1. 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.

#### 1.2 SUBMITTALS

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

### PART 2 - PRODUCTS

No products are required for this work.

### PART 3 - EXECUTION

#### 3.1 BUSINESS LICENSE

- A. Determine licenses necessary 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 issued by the Office of School Facilities and does not require payment or fees.
- B. Contractor shall secure all other permits required whether of temporary or permanent nature. Contractor will pay those associated permit fees.

END OF SECTION

SECTION 01 4200 – REFERENCES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Throughout the Project Documents, reference is made to specifications and standards issued by nationally recognized professional and/or trade organizations.
  - 1. Unless otherwise specifically stated, all manufacturer's catalogs, specifications, instructions or other information or literature that are referred to in the specifications shall be considered as the latest edition and/or revision of such publication that is in effect on the date of the Invitation or Advertisement for Bids.
  - 2. When standard specifications such as the American Society for Testing and Materials, Federal specifications, Department of Commerce (Commercial Standards), American Institute of Steel Construction, or other well-known public or trade associations, are cited as a standard to govern materials and/or workmanship, such specifications or portions thereof as referred to shall be equally as binding and have the full force and effect as though it were copied into these specifications. Such standards as are mentioned are generally recognized by and available to the trades concerned. The Owner's Representative will, however, upon request of a bidder or Contractor, furnish for inspection a copy of any standard specifications mentioned or direct the bidder or Contractor to an easily available copy. Unless otherwise specifically stated, the standard specifications referred to shall be considered as the latest edition and/or revision of such specifications that is in effect on the date of the Invitation for Bids. In case of any conflicts between standard specifications and the written portion of the Specifications, the specifications as actually written herein will govern.
  - 3. The referenced standards are generally identified by abbreviating the name of the organization following with the specification/standard number.
  - 4. Unless specifically indicated otherwise, all references to standards refer to the latest edition available at the time of bidding.

1.2 ABBREVIATIONS

- A. Wherever the following abbreviations are used in these Project Documents, they are to be construed the same as the respective expressions represented:
  - AIA                    American Institute of Architects
  - AISC                   American Institute of Steel Construction

AISI	American Iron and Steel Institute
ALS	American Lumber Standards
ANSI	American National Standards Institute, Inc.
APA	American Plywood Association
ARI	Air Conditioning and Refrigeration Institute ARMA Asphalt Roofing Manufacturers Association
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASPE	American Society of Plumbing Engineers
ASTM	American Society for Testing Materials
EPA	Environmental Protection Agency
GA	Gypsum Association
IEEE	Institute of Electrical and Electronics Engineers
MCAA	Mechanical Contractors Association of America
NEC	National Electric Code (Now NFPA)
NECA	National Electrical Contractors Association
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NIST	National Institute of Standards and Technology
NPCA	National Paint and Coating Association
OSHA	Occupational Safety and Health Administration
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
UL	Underwriters Laboratories, Inc.

END OF  
SECTION

## SECTION 01 4500 – QUALITY CONTROL

### **PART 1 – GENERAL**

#### **1.1 REQUIREMENTS INCLUDED**

- A. Quality control of products and workmanship.
- B. Manufacturer's instructions.
- C. Manufacturer's certificates and field services.

#### **1.2 RELATED REQUIREMENTS**

- A. AIA A101 and A201, as amended
- B. Division 00 – Procurement and Contracting Requirements
- C. Division 01 – General Requirements
- D. Section 013201 – Project Schedule
- E. Section 013300 – Submittals Procedures: Submittal of manufacturer's instructions.
- F. Section 014700 – Cleaning
- G. Section 016600 – Product Storage and Handling Requirements
- H. Section 019113 – General Commissioning Requirements
- I. Individual Specification Sections – Quality requirements

#### **1.3 DESCRIPTION / SUBMITTALS**

- A. Maintain quality control over supervision, subcontractors, suppliers, manufacturers, products, services, workmanship, handling & storage, inspections, and site conditions to produce Work in accordance with Contract Documents.
- B. The Contractor is required to submit a “Quality Control Plan” for this project in writing for approval from the Owners Representative. The QC Plan is required to be submitted and approved prior to the start of work and processing of the first Application for Payment.

The Contractor's QC Plan MUST include, but not limited to the following:

1. Identify the Contractor's Quality Control Officer and provide qualifications. The Contractor's Quality Control Officer must be on site full time when work is being performed on site.
2. Prepare Daily QC reports addressing the quality aspects of the project work being performed by Subcontractors and the Contractors forces.
3. Develop Logs and Checklist to monitor the detailed quality assurance requirements listed in individual specifications.
4. Review specifications, drawings, shop drawings, and submittals and conduct preconstruction meetings for each activity of work.
5. Evaluate Construction techniques and identify potential problems prior to installation.
6. Develop a method of verification that ongoing work is acceptable.
7. Maintain an adequate inspection system and perform or schedule inspections that will insure IBC, OSF and Local Codes are contract compliant.
8. Review the OSF Inspections Program Manual's testing requirements and schedule all required tests and inspections.
9. The Contractor shall notify the Owners Representative of required inspections and maintain inspection records on site available to the Architect/ Engineer, Owners Representative, and Owner.
10. Have Manufacturer provide qualified representative to observe and inspect field conditions, quality of workmanship, test and start-up of equipment, adjustment and balance of equipment as required in individual specification sections.
11. Hold QC Coordination Meetings to show how Subcontractors installations will interface with other Subcontractors and the Contractor's installations. Provide Coordination between the Contractor, Subcontractors, Owners Representative, Architect, Engineers, Inspectors and Commissioning Agents. Provide all project team members with reports, verifications and approvals of Quality Control Activities.

12. The Contractor's QC plan shall establish, maintain and document Quality Control to conform to the Contract Documents. The plan should be divided into at least 3 phases:

Preparatory Phase

Prior to the start of a Particular Construction Activity the Contractor's QC Officer must notify the Owners Representative two weeks in advance to meet and discuss the following:

1. Contract Documents.
2. Verify that appropriate submittals and shop drawings have been submitted and approved.
3. Review and establish procedures to ensure that scheduling and provisions have been made to provide required IBC Chapter 1 and 17 Inspections.
4. Examine the work area and verify that any required preliminary work has been completed.
5. Discuss construction methods, tolerances and workmanship and cleanliness standards, and the approach that will be used to provide quality construction by planning ahead and identifying potential problems for each definable feature of work.
6. Review the safety plan and appropriate activity hazard analysis to ensure that applicable safety requirements are met, and that required Material Safety Data Sheets are submitted.
7. Schedule preconstruction meetings with all parties.

Production Phase

The Contractor must notify the Owners Representative at least two (2) work days in advance of starting each initial phase. The Owners Representative, the Contractor's Superintendent and QC Officer observes the initial segment of the work activity to verify the work complies with the Contract Documents. The Production Phase must be repeated for each new crew to work on site, or when acceptable levels of specified quality are not being met. Perform the following for each Construction Activity.

1. Establish the quality of workmanship required.
2. Develop and maintain the pre-functional checklist.

3. Resolve conflicts.
4. Ensure that testing is being scheduled and performed by the approved testing company.
5. Check that work activities comply with the Safety Plan.
6. The Contractors QC Officer will document the Production Phase Checklist and include them in Quality Control Reports.

Follow up Phase (Performed Daily)

The follow up phase is performed on each work activity identified on the Schedule for ongoing work "Daily" until the completion of each activity and documented in Quality Control Reports. The follow up phase checklist should include at least the following.

1. Verify the work is in compliance with Contract Documents.
  2. Maintain the quality of workmanship required.
  3. Verify that testing is being performed.
  4. Identify problems and Verify that rework items are being corrected.
  5. Perform Safety Inspections.
  6. The Contractors QC Officer shall document the Follow up Phase work activities and include them in Quality Control Reports.
- C. Contractor is to assign the duties of quality control (QC) to dedicated Quality Control Officer.

#### **1.4 WORKMANSHIP**

- A. Comply with industry standards of the region except when more restrictive tolerances or specified requirements indicate more rigid standards or precise workmanship.
- B. Provide suitably qualified personnel to produce Work of specified quality.
- C. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration and cracking.
- D. Provide finishes to match approved samples.
- E. All items shall be installed in a workmanlike manner in accordance with the best

recognized practice in the field concerned. Manufactured items shall be installed in strict accordance with manufacturer's printed directions, specifications and/or recommendations for installation of highest quality. All working parts shall be properly adjusted after installation and left in perfect working order. Unless otherwise indicated, items exposed to weather or subject to flooding or wetting shall be installed so as to shed and not hold water. Items shall in all cases be installed plumb and true and/or in proper relation to surrounding materials.

#### **1.5 MANUFACTURER'S INSTRUCTIONS**

- A. Require compliance with instructions in full detail, including each step in sequence.
- B. Should instructions conflict with Contract Documents, request clarification from Owners Representative before proceeding.

#### **1.6 MANUFACTURER'S CERTIFICATES**

- A. When required in individual Specifications section, submit manufacturer's certificate, in duplicate, certifying that products meet or exceed specified requirements, executed by responsible officer.

#### **1.7 MANUFACTURER'S FIELD SERVICES**

- A. When required in individual Specifications section, have manufacturer provide qualified representative to observe field conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment and test, adjust, and balance of equipment, as applicable, and make written report of observations and recommendations to Owners Representative.

END OF  
SECTION

## SECTION 01 4700 - CLEANING

### PART 1 - GENERAL

#### 1.1 DESCRIPTION

- A. Work included: Throughout the construction period, maintain the buildings and site in a standard of cleanliness as described in this section and the Contract Documents. Failure to do so may result in a reduction of the Contract Sum if the Owner's Representative has the required cleanup performed by others.
- B. Related work:
  - 1. Documents affecting work of this section include but are not necessarily limited to AIA A101 and A201, as amended, General Conditions, Supplemental Conditions, and Sections in Division 1 of these Specifications.
  - 2. In addition to standards described in this section, comply with requirements for cleaning as described in pertinent other sections of these Specifications.

#### 1.2 QUALITY ASSURANCE

- A. Conduct daily cleaning and inspection and more often if necessary, to verify that requirements for cleanliness are being met.
- B. In addition to the standards described in this section, comply with pertinent requirements of governmental agencies having jurisdiction.

### PART 2 - PRODUCTS

#### 2.1 CLEANING MATERIALS AND EQUIPMENT

- A. Provide required personnel, equipment and materials needed to maintain the specified standard of cleanliness.

#### 2.2 COMPATIBILITY

- A. Use only the cleaning materials and equipment which are compatible with the surface being cleaned, as recommended by the manufacturer of the material.

## PART 3 - EXECUTION

### 3.1 PROGRESS CLEANING

#### A. General

1. HVAC contractor provide temporary filter media over the existing return duct openings for each RTU and provide regular filter changes to the primary filters located within the units during construction, This double filtration will help to protect the units from damage, protect the building from reaching high humidity levels and to help to clean the building air through filtration during construction. HVAC Contractor will need to be diligent on monitoring the condition of the filter media during construction.
2. Retain stored items in an orderly arrangement allowing maximum access, not impeding traffic or drainage and providing required protection of materials.
3. Do not allow accumulation of scrap, debris, waste material and other items not required for construction of this work.
4. At least once each week and more often if necessary, completely remove all scrap, debris and waste material from the job site. Provide adequate storage for all items waiting removal from the job site, observing requirements for fire protection and protection of the ecology.
5. Locations on site for stored materials and/or debris must be pre-approved by the Owner's Representative.

#### B. Site

1. Daily, and more often if necessary, inspect the site and pick up all scrap, debris and waste material. Remove such items to the place designated for their storage.
2. Weekly, and more often if necessary, inspect all arrangements of materials stored on the site. Restack, tidy, or otherwise service arrangements to meet the requirements of subparagraph 3.1.1A above.
3. Maintain the site in a neat, safe and orderly condition at all times.

#### C. Final Cleaning – Perform final cleaning as detailed in each technical specification, and as follows:

1. Clean each room at the completion of construction to be turned over to the Owner.
2. Conduct cleaning and waste removal operations to comply with local laws and ordinances, Federal and local environmental and antipollution regulations.
3. Employ experienced workers or professional cleaners for final cleaning. Clean each surface or until to condition of clean as defined in Paragraph 3.2.1.

4. Complete the following cleaning operations before requesting inspection for a Certificate of Substantial Completion for the entire project, or any portion of the project.
  - a. Remove tools, construction equipment, machinery, and surplus material from project site.
  - b. Clean exposed interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Restore reflective surfaces to their original condition.
  - c. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics and similar spaces.
  - d. Sweep concrete floors broom clean in unoccupied spaces.
  - e. Vacuum carpet and similar soft surfaces, removing debris and excess nap. Shampoo if visible soil or stains remain.
  - f. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
  - g. Remove labels that are not permanent.
  - h. 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.
  - i. Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
  - j. Remove grease, dust, dirt, stains, labels, fingerprints, protection and other foreign materials from sight-exposed interior and of concealed spaces to ensure performance.
  - k. HVAC –Clean permanent air filters. Clean exposed surfaces of diffusers, registers and grills.
  - l. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
  - m. Clean light fixtures, lamps, globes and reflectors to function with full efficiency. Replace burned-out bulbs and those noticeably dimmed by hours of use, and defective and noisy starts in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
  - n. Comply with all safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on project property. Do not discharge volatile, harmful or dangerous materials into drainage systems. Remove waste materials from the project site and dispose of lawfully.
  - o. Contractor shall maintain finally cleaned areas until the project is accepted by the Owner.

### 3.2 FINAL CLEANING

- A. "Clean," for the purpose of this Article, and except as may be specifically provided otherwise, shall be interpreted as meaning the level of cleanliness generally provided by skilled cleaners using commercial quality building maintenance equipment and materials.
- B. Prior to completion of the work, remove from the job site all tools, surplus materials, equipment, scrap, debris, and waste. Conduct final progress cleaning as described in Article 3.1A above.
- C. Schedule final cleaning as approved by the Architect/Engineer to enable the Owner to accept a completely clean work.

END OF  
SECTION

## SECTION 01 6600 – PRODUCT STORAGE AND HANDLING REQUIREMENTS

### PART 1 - GENERAL

#### 1.1 DESCRIPTION

- A. Work included: Protect products scheduled for use in the work by means including, but not necessarily limited to, those described in this Section.
- B. Related work:
  - 1. Documents affecting work of this Section include, but are not necessarily limited to, AIA A101 and A201, as amended, and Sections in Division 1 of these specifications.
  - 2. Additional procedures also may be prescribed in other Sections of these specifications.

#### 1.2 QUALITY ASSURANCE

- A. Include within the Contractor's quality assurance program such procedures as are required to assure full protection of work and materials.

#### 1.3 MANUFACTURERS' RECOMMENDATIONS

- A. Except as otherwise approved by the Architect/Engineer(s), determine and comply with manufacturer's recommendations on product handling, storage and protection.

#### 1.4 PRODUCT DELIVERY

- A. Schedule delivery to minimize long-term storage at the site and to prevent overcrowding of construction spaces.
- B. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.

#### 1.5 PACKAGING

- A. Deliver products to the job site in their manufacturer's original container, with labels intact and legible.
  - 1. Maintain packaged materials with seals unbroken and labels intact until time of use.
  - 2. Promptly remove damaged material and unsuitable items from the job site and promptly replace with material meeting the specified requirements, at no additional cost to the Owner.
- B. The Architect/Engineer(s) may reject as non-complying such material and products that do not bear identification satisfactory to the Architect/ Engineer as to manufacturer, grade, quality and other pertinent information.

#### 1.6 PROTECTION OF MATERIAL AND WORK

- A. General

1. Carefully and properly protect all materials of every description, both before and after being used in the work.
  2. Provide any enclosing or special protection from weather deemed necessary by the Architect or Owner's Representative at no additional cost to the Owner.
- B. Partial payments under the Contract will not relieve the Contractor from responsibility.
1. When materials and work at the site which have been partially paid for are not adequately protected by the Contractor, such materials may be protected by the Owner at the expense of the Contractor and no further partial payment thereon will be made.
- C. Maintain finished surfaces clean, unmarred, and suitably protected until accepted by the Owner.

#### 1.7 STORAGE

- A. Store all items of equipment, component parts, etc. in accordance with the manufacturer's recommendations or as may otherwise be necessary to prevent damage or deterioration of any sort.

#### 1.8 REPAIRS AND REPLACEMENTS

- A. In the event of damage, promptly make replacements and repairs to the approval of the Architect/Engineer and at no additional cost to the Owner.
- B. Additional time required to secure replacements and to make repairs will not be considered by the Architect/Engineer to justify an extension in the contract time of completion.

END OF  
SECTION

## SECTION 01 7329 — CUTTING AND PATCHING

### PART 1 - GENERAL

#### 1.1 DESCRIPTION

- A. Work included: This Section establishes general requirements pertaining to cutting (including excavating), fitting and patching of the work required to:
1. Make the several parts fit properly;
  2. Uncover work to provide for installing, inspection, or both, of ill-timed and/or covered work;
  3. Remove and replace work not conforming to requirements of the Contract Documents; and
  4. Remove and replace defective work.
- B. Related Work:
1. Documents affecting work of this section include, but are not necessarily limited to, AIA A101 and A201, as amended, General Conditions, Supplementary Conditions, Sections in Division 1 of these Specifications, and requirements of the technical Specifications.
  2. In addition to other requirements specified; upon the Owner's Representative's and/or Architect's request to uncover work to provide for inspection by the Owner's Representative and/or Architect or others of covered work, and remove samples of installed materials for testing.
  3. Do not cut or alter existing work or work performed under separate contracts without the Architect's written permission.

#### 1.2 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.
- B. Operational and Safety Limitations: Do not cut and/or patch the following operating elements or safety related components in a manner that would result in reducing their capacity to perform as intended, or result in increased maintenance, or decreased operational life or safety.
1. Shoring, bracing, and sheeting.
  2. Primary operational systems and equipment.
  3. Air or smoke barriers.

4. Water, moisture, or vapor barrier.
5. Membranes and flashings.
6. Fire protection systems.
7. Noise and vibration control elements and systems.
8. Control systems.
9. Communications systems.
10. Conveying systems.
11. Electrical wiring systems.

C. Visual Requirements: Do not cut and/or patch construction exposed on the exterior or in occupied spaces, in a manner that would, in the Architect's or Owner's Representative's opinion, result in a visual evidence of cutting and patching. The Contractor shall remove and replace Work cut and/or patched in a visually unsatisfactory manner.

### 1.3 SUBMITTALS

A. Request for Architect's consent:

1. Should conditions of the Work, or schedule indicate a required change of materials or methods for cutting and patching, so notify the Owner's Representative and Architect and secure the Architect's written permission and any required Change Order prior to proceeding.

B. Where approval of procedures for cutting and patching is required from the Architect before proceeding, submit a written proposal to the Owner's Representative describing procedures well in advance of the time cutting and patching will be performed and request approval to proceed. Include the following information, as applicable, in the proposal:

1. If considered a change to the Work, and prior to cutting and patching performed pursuant to the Architect's instructions, submit cost estimate to the Architect via the Owner's Representative. Secure the Architect's and Owner's Representative's approval of cost estimates and type of reimbursement before proceeding with cutting and patching.
2. Submit written notice to the Owner's Representative designating the time the Work will be uncovered, to provide for the Owner's Representative's and/or Architect's observation.
3. Describe the extent of cutting and/or patching required and how it is to be performed; indicate why it cannot be avoided.
4. 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.
5. List products to be used and firms or entities that will perform Work.
6. Indicate dates when cutting and patching is proposed to be performed.

7. List utilities that will be disturbed or affected, including those that will be relocated and those that will be temporarily out-of-service. Indicate how long service will be disrupted.
8. Where cutting and patching involves addition of reinforcement to structural elements, submit details and engineering calculations to show how reinforcement is integrated with the original structure.
9. Approval by the Architect to proceed with cutting and patching does not waive the Architect's right to later require complete removal and replacement of a part of the Work found to be unsatisfactory.
10. Any disruptions to the Owner occupied space/public space or active utility cutoffs must be scheduled, approved and coordinated with the Owner. The Owner requires a seventy-two
11. (72) hour minimum notice. Contractors are requested to coordinate same accordingly.
12. Discrepancies: If uncovered conditions are not as anticipated, immediately notify the Owner's Representative and secure needed directions. Do not proceed until unsatisfactory conditions are corrected.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. For replacement of items removed, use materials complying with pertinent Sections of these Specifications.

### 2.2 PAYMENT FOR COSTS

- A. The Owner will reimburse the Contractor for cutting and patching performed pursuant to any written Change Order. Perform other cutting and patching needed to comply with the Contract Documents at no additional cost to the Owner.

## PART 3 - INSPECTION

### 3.1 SURFACE CONDITIONS

- A. Inspection:
  1. Inspect existing conditions; including elements subject to movement or damage during cutting, excavating, patching and backfilling.
  2. Examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed.
  3. After uncovering the work, inspect conditions affecting installation of new work. Take corrective action before proceeding, if unsafe or unsatisfactory conditions are encountered.

B. Discrepancies:

1. If uncovered conditions are not as anticipated, immediately notify the Owner's Representative and secure needed directions.
2. Do not proceed until unsatisfactory conditions are corrected to the satisfaction of the Owner's Representative and/or Architect.

3.2 PREPARATION PRIOR TO CUTTING

- A. Provide required protection including, but not necessarily limited to, shoring, bracing and support to maintain structural integrity of the Work. Protect all existing construction.
- B. Provide required fire protection including, but not necessarily limited to, fire blankets and fire extinguishing equipment.

3.3 PERFORMANCE

- A. Employ skilled workmen to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay.
- B. Cutting: Cut existing construction using methods least likely to damage elements to be retained or adjoining construction.
  1. In general, where cutting is required, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots neatly to size required with minimum disturbances 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 diamond core drill.
  4. Comply with requirements of applicable specification Sections where cutting and patching requires excavating and backfilling.
  5. By-pass utility services such as pipe or conduit before cutting, where services are shown or required to be removed, relocated or abandoned. Cut-off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal the remaining portion of pipe or conduit to prevent entrance or moisture or other foreign matter after by-passing 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 removal of walls or partition extends from one finished area into another, patch and repair floor and wall surfaces in the new space to provide an even surface of uniform color and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary to achieve uniform color and appearance.
  - a. Where patching occurs in a smooth painted surface, extend final coat over entire unbroken area containing the patch, after the patched area has received primer and second coat.
4. Patch, repair or re-hang existing ceilings as necessary to provide an even plane surface of uniform appearance. All damaged products shall be replaced with approved equals at the Contractor's expense.

#### 3.4 CLEANING

- A. Thoroughly clean areas and spaces where cutting and patching is performed or used as access. Completely remove paint, mortar, oils, putty and items of similar nature. Thoroughly clean piping, conduit and similar features before painting or other finishing is applied. Restore damaged pipe covering to its original condition.

END OF SECTION

## SECTION 01 7700 – CLOSEOUT PROCEDURES

### A. DEFICIENCY LISTS

1. During the construction of the Work, the Architect/Engineer shall inspect the work for general conformance to the Contract Documents. Concurrently, the Owner's Representative will determine in general if the Work observed is being performed in accordance with the Contract Documents and will report to both the Owner and the Architect defects and deficiencies observed in the Work.
2. Should observations or inspections reveal work that is not in conformance with the Contract Documents, and if the nature of the non-conformance warrants, at the sole discretion of the Owner's Representative and/or Architect/Engineer, a written list of deficiencies will be issued.
3. The "deficiency list" as hereinafter called, shall stipulate the item or items of work that are in non- conformance and shall specify a reasonable time for the deficient work to be brought into conformance with the Contract Documents, but in no event shall this time exceed thirty (30) days.
4. Upon receipt of the deficiency list, the Contractor shall by any and all means at his disposal, endeavor to correct the work within the time stipulated. The Contractor shall notify the Owner's Representative in writing when the work has been corrected and request inspection.
5. If the inspection reveals the deficiency has been corrected, the item shall be rescinded from the deficiency list.
6. During the period that the deficiency list is in effect, the Owner's Representative and/or Architect may, at their discretion, reduce progress payments accordingly until the deficiency is corrected.
7. During the course of construction, the Architect/Engineer(s) will perform periodic site visits and inspections. Written comments of the Architect/Engineer(s) pertaining to such visits shall be issued as an Architect/Engineer(s) Field Report. It shall be the responsibility of the Contractor to issue a response to each Field Report within ten (10) days of receipt. Failure to respond in writing within this time period could result in delays of approval of progress payment requests.

### B. PUNCH LIST/FINAL INSPECTION

1. When the Contractor determines that his work or portions of his work are sufficiently near completion to warrant a preliminary inspection, he shall prepare a preliminary punch list and submit it along with a written request for a

preliminary review to the Owner's Representative and Architect.

2. At a mutually agreeable time, the Owner's Representative, Architect and Contractor shall conduct a preliminary review of the Work for completeness and general conformance to the Contract Documents. At this preliminary review, a punch list of incomplete or non-conformance work shall be prepared by the Contractor.
3. The Owner's Representative shall establish a reasonable time period for the completion or correction of all items on the preliminary review punch list, but in no event shall this time exceed fourteen (14) days. At the completion of the preliminary review punch list, the Substantial Completion inspection shall be scheduled.
4. The Substantial Completion inspection shall be performed by the Architect/Engineer with attendance by the Owner's Representative and Contractor. The Owner may attend at its discretion. The Contractor shall present to the Architect/Engineer a certification letter that the project is complete along with a written list of any incomplete work, and a reason why the item of work is incomplete and give a date when the work will be complete. Substantial Completion inspection shall NOT be conducted unless the Contractor presents this certification letter and list.
5. At the conclusion of the Substantial Completion inspection the Architect will review the project and determine if the completeness of the work allows Substantial Completion to be established. In addition to an overall state of completeness, other items that must be completed when making this determination include;
  - a. A preliminary copy of the completed TABS report has been submitted for review.
  - b. The Office of School Facilities Inspection has been successfully completed.
  - c. Inspection by the SC Office of the State Fire Marshal has been successfully completed.

Should the amount of incomplete work be such that a Certificate of Substantial Completion cannot be issued, another Substantial Completion inspection shall be required.

7. Once Substantial Completion has been established, the Architect and Owner's Representative shall issue a Certificate of Substantial Completion and a Substantial Completion punch list.
8. If the Contractor fails to obtain Final Completion with 100% of the Substantial Completion punch list completed with-in 30 days of the date of Substantial

Completion, the Owner shall be entitled to liquidated damages as noted in paragraph 3.6.1 of AIA Document A101-2009 Standard Form of Agreement Between Owner and Contractor, and as noted in paragraph 9.10.5 of AIA Document A201-2009 General Conditions of the Contract for Construction. Additionally, at the end this thirty (30) day period the Owner reserves the right to take over the project and expedite the completion of the remaining punch list items at any time with their forces, or by contract, or any other means available, with all cost, including those for additional oversight by the Owner's Representative and/or Architect, deducted from the remaining contract funds. Substantial Completion punch list liquidated damages will continue until a Final Completion Certificate is obtained regardless of how the punch list is completed.

9. Any work on site after the date of Substantial Completion, including punch list work, must not prevent school operations, and must be coordinated with the Owner's Representative and the School Principal with adequate notice. In addition, the Contractor's Superintendent must be on site any time work is in progress. By bidding this work, the Contractor acknowledges that he will provide an on-site superintendent at all times work is in progress.
10. Upon completion of all Work, including punch list work, the Contractor shall submit a written request that the work is ready for a final inspection and acceptance, as described in Article 9.10 of AIA Document A201-2009 General Conditions of the Contract for Construction.

C. PROJECT CLOSEOUT

1. Final Closeout and Payment
  - a. No release of retainage or final payment application shall be processed for payment until final inspection and final acceptance of all work and closeout documentation has been received, approved and accepted by the Architect and Owner's Representative.
  - b. Contractor shall submit final closeout items within thirty (30) days after Date of Substantial Completion. If closeout documents are not timely submitted and the Owner determines that they are impacting operations of the school, the Owner may elect to procure closeout submittals directly from the appropriate subcontractor, supplier or other vendor with all related costs deducted from the Contract Sum by change order.
2. Closeout Checklist
  - a. The Closeout Checklist items must be submitted to the Owner's Representative and approved by the Architect, see insert.
2. Related Work

- a. Other requirements affecting work of this Section include, but are not necessarily limited to, AIA A101 and A201- 2009 General Conditions, as amended, Division 01 – Section 013300 - Submittal Procedures, 017823 Operation & Maintenance Data, and 017836 Warranties/Bonds.

D. RESPONSIBILITY

1. It shall be the Contractor's responsibility to see that all requirements of this Section of the Specifications are executed and completed in a timely manner. The Contractor shall be responsible for any Architect and Owner's Representative costs due to late submittal of closeout documents or incomplete work, including uncompleted punch list items, beyond thirty (30) days past the date of Substantial Completion.
2. No provisions of this Section of the Specifications shall in any way relieve the Contractor of the completion of his work on time and in accordance with the approved Construction Schedule.

END OF SECTION

## SECTION 01 7823 – OPERATIONS AND MAINTENANCE DATA

### PART 1 - GENERAL

#### 1.1 DESCRIPTION

- A. Work included: To aid the continued instruction of operating and maintenance personnel, and to provide a positive source of information regarding the products incorporated into the Work, furnish and deliver the data described in this Section and in pertinent other sections of these Specifications.
- B. Related Work:
  - 1. Documents affecting work of this section include, but are not necessarily limited to, AIA A101 and A201- 2009 General Conditions, as amended and Sections in Division 01 of these Specifications.
  - 2. Required contents of submittals also may be amplified in pertinent other Sections of these Specifications.

#### 1.2 QUALITY ASSURANCE

- A. In preparing data required by this Section, use only personnel who are thoroughly trained and experienced in operation and maintenance of the described items, completely familiar with the requirements of this Section, and skilled in technical writing to the extent needed for communicating the essential data.

#### 1.3 SUBMITTALS

- A. Comply with pertinent provisions of AIA A101 and A201- 2019 General Conditions
- B. Submit the Operation and Maintenance Manual to the Architect electronically in pdf format with Shop Drawing submittals
  - 1. Refer to Closeout Checklist for submission criteria.
- C. Submittals of approved copies of operation and maintenance data will be a prerequisite for approval of payment applications.

### PART 2 - PRODUCTS

#### 2.1 INSTRUCTION MANUALS

- A. Where instruction Manuals are required to be submitted under other Sections of these Specifications, prepare in accordance with the provision of this Section.

B. Format:

1. Size: 8-1/2" x 11"
2. Paper: White bond, at least 20 lb. weight
3. Text: Neatly written or printed
4. Drawings: 11" in height, preferable; bind in with text; foldout acceptable; larger drawings acceptable but fold to fit within the Manual and provide a drawing pocket inside rear cover or bind in with text.
5. Flysheets: Separate each portion of the Manual with neatly prepared flysheets briefly describing contents of the ensuing portion; flysheets may be in color.
6. Binding: Use heavy-duty plastic or fiber
7. Measurements: Provide all measurements in U.S. standard units such as feet-and- inches, lbs. and cfm; where items may be expected to be measured within ten years in accordance with metric formula, provide additional measurements in the "International System of Units" (SI).

C. Provide front and back covers for each Manual, using durable material approved by the Architect, and clearly identified on or through the cover with at least the following information:

OPERATING AND MAINTENANCE INSTRUCTIONS

(\_\_\_ Name and address of Work \_\_\_\_\_)

(\_\_\_ Name of Contractor \_\_\_\_\_)

(\_\_\_ General subject of this manual\_)

(\_\_\_ Approval signature of Program Manager\_)

(\_\_\_ Approval date \_)

D. Contents: Include at least the following:

1. Neatly typewritten index near the front of the Manual, giving immediate information as to location within the Manual of all emergency information regarding the installation.
2. Complete instructions regarding the installation and maintenance of all equipment involved including lubrication, disassembly, and reassembly.
3. Complete nomenclature of all parts of all equipment.
4. Complete nomenclature and part number of all other data pertinent to procurement procedures.
5. Copy of all guarantees and warranties issued.
6. Manufacturer's bulletins, cuts, and descriptive data, where pertinent, clearly indicating the precise items included in this installation and deleting, or otherwise clearly indicating, all manufacturer's data.
7. Such other data as required in pertinent Sections of these Specifications.

## **PART 3 - EXECUTION**

### **3.1 INSTRUCTION MANUALS**

- A. Complete the Manuals in strict accordance with the approved preliminary drafts and the Owners Representative and Architect's review comments.
  
- B. Any and all other items required by the specific specifications relating to the maintenance and operations of the various components of the work or any and all certificates and testing reports required by the specific specifications shall be incorporated into the maintenance manuals. Items of this nature shall include but are not limited to:
  - 1. Test and balance reports of HVAC systems.
  - 2. Test and certification reports of electrical systems such as fire alarm and life safety systems, communications systems, clock systems, etc.

END OF SECTION

## SECTION 017836 – WARRANTIES AND BONDS

### PART 1 - GENERAL

#### 1.1 WORK INCLUDES

- A. Compile specified warranties and bonds.
- B. Compile specified service and maintenance contracts.
- C. Co-execute submittals when so specified.
- D. Review submittals to verify compliance with Contract Documents.
- E. Submit to Program Manager for review and transmittal to Owner.
- F. Related Requirements in Other Parts of Project Manual:
  - 1. Bid or Proposal Bonds: Instruction to Bidders.
  - 2. Performance Bond and Labor and Material Payment Bond: General Conditions of the Contract.
  - 3. General Warranty of Construction: General Conditions of the Contract.
- G. Related Requirements Specified in Other Sections:
  - 1. Comply with pertinent provisions of AIA A101 and A201- 2009 General Conditions, as amended, Division 01 – Section 013300 - Submittal Procedures, and Division 01 - Section 017700 – Closeout Procedures.
  - 2. Operations & Maintenance Data: Section 017823 – Operations and Maintenance Data.
  - 3. Warranties and Bonds Required for Specific Products:
  - 4. Provision and Warranties & Bonds, Duration:

#### 1.2 SUBMITTAL REQUIREMENTS

- A. Assemble warranties, bond and service and maintenance contracts, executed by each of respective manufacturers, suppliers, and subcontractors.
- B. Number original signed copies required: Three (3) each OR One (1) Electronic PDF.
- C. Table of Contents: Neatly typed, in orderly sequence. Provide complete information for each item.
  - 1. Product or work item.
  - 2. Firm, with name of principal, address and telephone number.
  - 3. Scope.
  - 4. Date of beginning of warranty, bond or service and maintenance contract.
  - 5. Duration of warranty, bond or service and maintenance contract.
  - 6. Provide information for Owner's personnel:
    - a. Proper procedure in case of failure.
    - b. Instances which might affect validity of warranty or bond.
  - 7. Contractor, name or responsible principal, address and telephone number.

#### 1.3 FORM OF SUBMITTAL

- A. Electronic Submission Options:
  - 1. Procure or similar online submittal portal.

2. Alternate:
  - a. Data Disk – Submit three (3) flash drive containing the project schedule shall be provided with all schedule submissions.
  - b. File Medium - Required data shall be submitted on flash drive.

#### 1.4 TIME OF SUBMITTALS

- A. For equipment or component parts of equipment put into service during progress of construction:
  1. Submit "Draft" documents within sixty (60) days of Notice to Proceed for format approval.
  2. Note: Warranty periods for equipment started during construction will not start until substantial completion for the project.
- B. Submit final documents thirty (30) days after Date of Substantial Completion.
- C. For items of work, where acceptance is delayed materially beyond Date of Substantial Completion, provide updated submittal within ten days after acceptance, listing date of acceptance as start of warranty period.

#### 1.5 SUBMITTALS REQUIRED

- A. Submit warranties, bonds, and service and maintenance contracts as specified in respective sections of Specifications.

END OF  
SECTION

## SECTION 017839 – PROJECT RECORD DOCUMENTS

### PART 1 - GENERAL

#### 1.1 DESCRIPTION

A. Work included:

1. Throughout progress of the Work, maintain an accurate record of changes in the Contract Documents, as described in Article 3.1 below and in Article 3.11.2 of the AIA A201 -2009 General Conditions of the Contract for Constructed, as amended.
2. Upon completion of the Work, deliver the recorded changes to the Owners Representative.

B. Related work:

1. Documents affecting work of this Section include, but are not necessarily limited to, AIA A101 and A201- 2009 General Conditions, as amended, and Sections in Division 1 of these specifications.
2. Other requirements affecting Project Record Documents may appear in pertinent other Sections of these specifications.

#### 1.2 QUALITY ASSURANCE

A. Delegate the responsibility for maintenance of Record Documents to one person on the Contractor's staff as approved by the Owners Representative.

B. Accuracy of records:

1. Accuracy of records shall be such that future searches for items shown on the Project Record Documents may rely reasonably on the information provided under this Section of the Work.

#### 1.3 SUBMITTALS

A. The Owners Representative and Architect/ Engineer's approval of the current status of Project Record Documents will be a prerequisite to the approval of requests for progress payment and request for final payment under the Contract.

B. Prior to submitting each request for progress payment, secure the Owners Representative approval of the current status of the Project Record Documents.

C. Prior to submitting the final request for payment, submit the final Project Record Documents to the Owners Representative for transmission to the Architect and secure the Architect's written approval.

#### 1.4 PRODUCT HANDLING

A. Maintain the job set of Record Documents completely protected from deterioration and

from loss and damage until completion of the Work and transfer to the Owners Representative.

- B. In the event of loss of recorded data, use means necessary to again secure the data to the Owners Representative approval.
  - 1. Such means shall include, if necessary in the opinion of the Owners Representative, removal and replacement of concealing materials.
  - 2. In such case, provide replacements to the standards originally required by the Contract Documents.

## PART 2 - PRODUCTS

### 2.1 JOB SET DOCUMENTS

- A. Promptly following receipt of the Owner's Notice to Proceed, secure from the Program Manager, at no charge to the Contractor:
  - 1. One complete set of all Documents comprising the Contract, including Plans, Specification Manuals, and Shop Drawings Log.

## PART 3 - EXECUTION

### 3.1 MAINTENANCE OF JOB SET

- A. Immediately upon receipt of the job set described in Paragraph 2.1-A above, identify each of the Documents with the title, "RECORD DOCUMENTS - JOB SET".
- B. Preservation:
  - 1. Considering the Contract completion time, the probable number of occasions upon which the job set must be taken out for new entries and for examination, and the conditions under which these activities will be performed, devise a suitable method for protecting the job set to the approval of the Architect.
  - 2. Do not use the job set for any purpose except entry of new data and for review by the Architect.
  - 3. Maintain the job set at the site of Work.
- C. Making entries on Job Set Drawings:
  - 1. Electronic PDF OR Use erasable colored pencil, preferably red (not ink or indelible pencil) to delineate changes.
    - If pencil is used, convert markups to PDF at completion of project.
  - 2. Note related Change Orders, Construction Change Directives, Supplemental Instructions, and Requests for Information on plan sheets where applicable.
  - 3. Maintain one complete copy of the Project Manual, including addenda, and one copy of other written construction documents such as Change Orders, Construction Change Directives, and modifications issued in printed form during

construction. Mark these documents to show substantial variations in actual work performed in comparison with the text of the Specifications and modifications.

4. Maintain one copy of each Product Data submittal. Mark these documents to show significant variations in actual Work performed in comparison with information submitted. Include variations in products delivered to the site, and from the manufacturer's installation instructions and recommendations.

D. Submittals – Submit the following all within thirty (30) days after the Date of Substantial Completion:

1. Submit "marked-up" set of record drawings, project manual, and other construction documents to the Architect.
2. Make any necessary additions as required by the Architect.
3. Submit field survey books to the Owners Representative.
4. Submit one complete set of Product Data (Shop Drawing) submittals to the Owners Representative. All submittals are to include approval stamp of the Architect.

END OF SECTION

## SECTION 01 4523 – COLLECTIVE INSPECTIONS AND STRUCTURAL TESTING

### PART 1 - PART 1 - GENERAL

#### 1.1 SCOPE

- A. This section includes a listing of special inspections to be performed during the progress of this project. A "Certificate of Occupancy" cannot be issued without documentation that these inspections have been performed and the work is in conformance with the Contract Documents.

#### 1.2 RESPONSIBILITY

- A. It shall be this Owner's responsibility to contract for Special Inspections; however, the Contractor shall be responsible for proper notification when inspection is required in the progress of the work, providing access to facilitate the inspection and making corrections necessary when work is not in compliance with the Contract Documents.

#### 1.3 REPORTS

- A. Copies of inspection reports signed by person performing the inspection or test shall be submitted to Owner's Representative, Architect, Contractor and Building Official. A copy shall also be kept in the job trailer.

#### 1.4 GENERAL REQUIREMENTS

- A. Special Inspections and Structural Testing shall be in accordance with Chapter 1 and Chapter 17 of the 2021 International Building Code.
- B. The program of Special Inspections and Structural Testing is a Quality Assurance Program intended to ensure that the work is performed in accordance with the Contract Documents.
- C. This specification section is intended to inform the Contractor of the Owner's Quality Assurance Program and the extent of the Contractor's responsibilities. This specification section is also intended to notify the Special Inspector, Testing Laboratory and other Agents of the Special Inspector of their requirements and responsibilities.

#### 1.5 SPECIAL INSPECTIONS

- A. Special Inspections shall be performed by a qualified Inspector and/or approved Testing Agency, acceptable to the Building Official.
  - 1. Contractor shall be responsible to notify Inspector in a timely manner when required inspections need to be performed.
  - 2. The Inspection/Testing firm shall be responsible for immediately notifying in writing the Owner and Building Officials of all failed inspections and/or tests. The Architect will be notified by the Owner.

#### 1.6 SCHEDULE OF INSPECTIONS AND TESTS

- A. Required inspections and tests are described in the "Statement of Special Inspections" attached at the end of this section.

## 1.8 QUALIFICATIONS

- A. The Testing Laboratory and individual technicians shall be approved by the Building Official.
- B. The Testing Laboratory shall maintain a full-time licensed Professional Engineer (P.E.) on staff who shall certify the test reports. The Engineer shall be responsible for the training of the testing technicians and shall be in responsible charge of the field and laboratory testing operations.
- C. Special inspections shall be performed by inspectors as indicated below:
  - 1. Special inspections of soils may be performed by inspectors with an education and background in geotechnical engineering.
  - 2. Technicians performing sampling and testing of concrete shall be ACI certified "Concrete Field Testing Technicians - Grade 1".
  - 3. Inspectors performing inspections of concrete work, such as inspections of concrete placement, batching, reinforcing, curing and protection, shall be ICC certified "Reinforced Concrete Special Inspector".
  - 4. Inspectors performing inspections of masonry shall be ICC certified "Structural Masonry Special Inspector".
  - 6. Inspectors performing visual inspections of welding shall be ICC certified "Structural Steel and Welding Special Inspectors". Technicians performing nondestructive testing such as ultrasonic testing, radiographic testing, magnetic particle testing or dye-penetrant testing shall be certified as an ASNT-TC Level II or Level III technicians.
  - 7. Inspectors performing inspections of spray fireproofing shall be ICC certified "Spray-Applied Fireproofing Inspector".
  - 8. Technicians performing standard tests described by specific ASTM Standards shall have training in the performance of such tests and must be able to demonstrate, either by oral or written examination, competence for the test to be conducted. They shall be under the supervision of a licensed Professional Engineer and shall not be permitted to independently evaluate test results.

## 1.9 SUBMITTALS

- A. The Special Inspector and Testing Laboratory shall submit to the Owner and Building Official for review a copy of their qualifications which shall include the names and qualifications of each of the individual inspectors and technicians who will be performing inspections or tests.
- B. The Special Inspector and Testing Laboratory shall disclose any past or present business relationship or potential conflict of interest with the Contractor or any of the Subcontractors whose work will be inspected or tested.

## 1.10 PAYMENT

- A. The Owner shall engage and pay for the services of the Special Inspector, Agents of the Special Inspector and the Testing Laboratory.
- B. If any materials which require Special Inspections are fabricated in a plant which is not located within 100 miles of the project, the Contractor shall be responsible for the travel expenses of the Special Inspector or Testing Laboratory.

1. Expenses shall be adequate to provide same-day round-trip transportation to remote plant. Expenses shall include travel, lodging and meals.
- C. The Contractor shall be responsible for the cost of any retesting or re-inspection of work which fails to comply with the requirements of the Contract Documents.

#### 1.11 CONTRACTOR RESPONSIBILITIES

- A. Contractor's Statement of Responsibility: Each Contractor responsible for the construction of a seismic force resisting system, designated seismic system or components listed in the Seismic Quality Assurance Plan shall submit a "Contractor's Statement of Responsibility", attached at the end of this section, to the Building Official and the Owner prior to the commencement of work. The Contractor's statement of responsibility contains the following:
1. Acknowledgement of awareness of the project's special inspection requirements.
  2. Acknowledgement that control will be exercised to obtain conformance with the construction documents approved by the Building Official.
  3. Procedures for exercising control within the Contractor's organization, the method and frequency of reporting and the distribution of the reports.
  4. Identification and qualifications of the person(s) exercising such control and their positions(s) in the organization.
- B. Fabricator's Certificate of Compliance: Each fabricator completing structural load bearing members and assemblies on the premises of the fabricator's shop that is exempt from in shop special inspections based on qualifications outlined and/or required by the individual material specifications, shall complete a Fabricator's Certificate of Compliance. The Certificate shall be completed at the end of fabrication and certify that all work performed in the shop is in accordance with the construction documents and approved shop drawings.
- C. The Contractor shall cooperate with the Special Inspector and his agents so that the Special Inspections and Testing may be performed without hindrance. The Contractor shall review the "Statement of Special Inspections" and shall be responsible for coordinating and scheduling inspections and tests. The Contractor shall notify the Special Inspector or Testing Laboratory at least 48 hours in advance of a required inspection or test. Un-inspected work that required inspection may be rejected solely on that basis.
- D. The Contractor shall provide incidental labor and facilities to provide access to the work to be inspected or tested, to obtain and handle samples at the site or at the source of products to be tested, and to facilitate tests and inspection, storage and curing of test samples.
- E. The Contractor shall keep at the project site the latest set of construction drawings, field sketches, approved and field use shop and erection drawings, and specifications for use by the Inspectors and Testing technicians.
- F. The Special Inspections program shall in no way relieve the Contractor of his obligation to perform work in accordance with the requirements of the Contract Documents or from implementing an effective Quality Control Program. All work that is to be subjected to Special Inspections shall first be reviewed by the Contractor's Quality Control personnel.
- G. The Contractor shall be solely responsible for construction site safety.

#### 1.12 LIMITS ON AUTHORITY

- A. The Special Inspector or Testing Laboratory may not release, revoke, alter or enlarge on the requirements of the Contract Documents.
- B. The Special Inspector or Testing Laboratory will not have control over the Contractor's means and methods of construction.
- C. The Special Inspector or Testing Laboratory shall not be responsible for construction site safety.
- D. The Special Inspector or Testing Laboratory has no authority to stop the work.

#### 1.13 RECORDS AND REPORTS

- A. Detailed daily reports shall be prepared of each inspection and test by the Special Inspector and Testing Laboratory. Reports shall include:
  - 1. Date of test or inspection
  - 2. Name of Inspector or Technician
  - 3. Location of specific areas tested or inspected
  - 4. Description of test or inspection and results
  - 5. Applicable ASTM standard
  - 6. Weather conditions
  - 7. Engineer's seal and signature
- B. The Special Inspector shall submit interim reports to the Owner and Building Official at the end of each week which includes all inspections and test reports received that week. Copies shall be sent to the Architect and Contractor.
- C. Any discrepancies from the Contract Documents found during a Special Inspection shall be immediately reported to the Contractor and Owner. If the discrepancies are not corrected, the Special Inspector shall notify the Owner and Building Official. Reports shall document all discrepancies identified and the corrective action taken.
- D. The Testing Laboratory shall immediately notify the Owner and Building Official by telephone, fax or email of any test results which fail to comply with the requirements of the Contract Documents.
- E. At the completion of the work requiring Special Inspections, each Inspection Agency and Testing Laboratory shall provide a statement to the Owner and Building Official that all work was completed in substantial conformance with the Contract Documents and that all appropriate inspections and tests were performed.

#### 1.14 FINAL REPORT OF SPECIAL INSPECTIONS

- A. The "Final Report of Special Inspections" shall be completed by the Special Inspector and submitted to the Owner and Building Official prior to the issuance of a "Certificate of Use and Occupancy".
- B. The "Final Report of Special Inspections" will certify that all required inspections have been performed and will itemize any discrepancies that were not corrected or resolved.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

Chapter 1 Inspections

MATERIALS	TYPE OF INSPECTION	CODE REFERENCE	PROVIDED BY:		
			Architect	Engineer	Testing Agent
Fire-resistant penetrations	Fire-rated assembly rating maintained	110.3.6			X
Other Inspections	As called for by jurisdiction authority	110.3.8			X
Final Inspections	After all work is completed	110.3.10			X

Chapter 17 SCHEDULE OF SPECIAL INSPECTIONS

Instructions

The Special Inspection requirements shall be based on Section 1705 of Chapter 17 of the 2015 International Building Code. Any deviations from the requirements of Section 1705 must be approved by the State Engineer's office. If Inspection is by "Other", the inspecting entity shall be identified

MATERIALS	TYPE OF INSPECTION	SERVICE	INSPECTION BY:		
			Architect	Engineer	Other
ACT Grid	Review Submittal Inspection of Installation and Anchorage of Suspension System	Field Inspection	X		X

Chapter 1 Inspections

END OF SECTION

## SECTION 07 8400 – FIRESTOPPING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Provide firestop systems consisting of a material, or combination of materials installed to retain integrity of fire resistance rated construction by maintaining effective barrier against spread of flame, smoke and/or hot gases through penetrations, fire resistive joints, and perimeter openings in accordance with the requirements of the Code for this project.
- B. Firestop systems shall be used in locations including, but not limited to, the following:
  - 1. Penetrations through fire resistance rated floor and roof assemblies including both empty openings and openings containing penetrants.
  - 2. Penetrations through fire resistance rated wall assemblies including both empty openings and openings containing penetrants.
  - 3. Membrane penetrations in fire resistance rated wall assemblies where items penetrate one side of the barrier.
  - 4. Joints between fire resistance rated assemblies.
  - 5. Perimeter gaps between rated floors/roofs and an exterior wall assembly.

#### 1.3 REFERENCES

- A. ASTM International:
  - 1. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
  - 2. ASTM E119 - Methods of Fire Tests of Building Construction and Materials.
  - 3. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Firestops.
  - 4. ASTM E1966 - Test Method for Resistance of Building Joint Systems.
  - 5. ASTM E1399 - Test Method for Cyclic Movement and Measuring Minimum and Maximum Joint Width.
  - 6. ASTM E2174 - Standard Practice for On-Site Inspection of Installed Fire Stops
  - 7. ASTM E2307 - Standard Test Method for Determining the Fire Endurance of Perimeter Fire Barrier Systems Using the Intermediate-Scale, Multi Story Test Apparatus (ISMA)
  - 8. ASTM E2393 - Standard Practice for On-Site Inspection of Installed Fire

## Resistive Joint Systems and Perimeter Fire Barriers

- B. Underwriters Laboratories Inc. (UL):
  - 1. UL Qualified Firestop Contractor Program.
  - 2. UL 263 - Fire Tests of Building Construction and Materials.
  - 3. UL 723 - Surface Burning Characteristics of Building Materials.
  - 4. UL 1479 - Fire Tests of Through-Penetration Fire Stops.
  - 5. UL 2079 - Tests for Fire Resistance of Building Joint Systems.
  - 6. UL Fire Resistance Directory -Volume 2:
  - 7. Through-Penetration Firestop Devices (XHJI)
  - 8. Fire Resistive Ratings (BXUV)
  - 9. Through-Penetration Firestop Systems (XHEZ)
  - 10. Fill, Void, or Cavity Material (XHHW)
  
- C. Factory Mutual Research (FM):
  - 1. FM 4991 - FM Approval Standard of Firestop Contractors – Class 4991

### 1.4 DEFINITIONS

- A. Firestopping: Use of material or combination of materials in a fire-rated structure (wall or floor) where it has been breached, so as to restore the integrity of the fire rating on that wall or floor.
  
- B. System: Use of specific firestop material or combination of materials in conjunction with specific wall or floor construction type and specific penetrant(s).
  
- C. Barrier: Any bearing or non-bearing wall or floor that has an hourly fire and smoke rating.
  
- D. Through-Penetration: Any penetration of a fire-rated wall or floor that completely breaches the barrier.
  
- E. Membrane-Penetration: Any penetration in a fire-rated wall or floor/roof-ceiling assembly that breaches only one side of the barrier.
  
- F. Fire Resistive/Construction Joint: Any gap, joint, or opening, whether static or dynamic, between two fire rated barriers including where the top of a wall meets a floor; wall edge to wall edge applications; floor edge to floor edge configurations; floor edge to wall.
  
- G. Perimeter Barrier: Any gap, joint, or opening, whether static or dynamic, between a fire rated floor assembly and an exterior wall assembly.
  
- H. Approved Testing Agencies: Not limited to: Underwriters Laboratory (UL), Factory Mutual (FM), Warnock Hersey, and Omega Point Laboratory (OPL).

## 1.5 PERFORMANCE REQUIREMENTS

- A. Penetrations: Provide through-penetration and membrane-penetration firestop systems that are produced and installed to resist the spread of fire, passage of smoke and other hot gases according to requirements indicated, to restore the original fire-resistance rating of assembly penetrated.
1. Provide and install complete penetration firestopping systems that have been tested and approved by nationally accepted testing agencies per ASTM E814 or UL 1479 fire tests in a configuration that is representative of field conditions.
  2. F-Rated Systems: Provide firestop systems with F-ratings indicated, as determined per ASTM E814 or UL 1479, but not less than one (1) hour or the fire resistance rating of the assembly being penetrated.
  3. T-Rated Systems: Provide firestop systems with T-ratings indicated, as well as F-ratings, as determined per ASTM E814 or UL 1479, where required by the Building Code.
  4. L- Rated Systems: Provide as required.
  5. W-Rated systems: Provide as required.
  6. For penetrations involving non-metallic, CPVC, PVC, or plastic piping, tubing or conduit, provide firestop systems that are chemically compatible in accordance with Manufacturer requirements.
  7. For penetrations involving insulated piping, provide firestop systems not requiring removal of insulation.
  8. For penetrations involving fire or fire/smoke dampers, only firestop products approved by the damper manufacturer shall be installed in accordance with the damper installation instructions.
- B. Fire Resistive Joints: Provide joint systems with fire resistance assembly ratings indicated, as determined by UL 2079 (ASTM E1399 and E1966), but not less than the fire resistance assembly rating of the construction in which the joint occurs. Firestopping assemblies must be capable of withstanding anticipated movements for the installed field conditions.
1. For firestopping assemblies exposed to view, traffic, moisture, and physical damage, provide products that after curing do not deteriorate when exposed to these conditions both during and after construction.
  2. For floor penetrations exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved either by installing floor plates or by other means, as specified by the Architect.
  3. L- Rated Systems: Provide firestop systems with L- ratings less than 5 cfm/sf.
- C. Firestopping products shall have flame spread ratings less than 25 and smoke-developed ratings less than 450, as determined per ASTM E84. Firestop products installed in plenum spaces shall have a smoke developed rating less than 50.
- D. Engineering Judgment (EJ): Where there is no specific third party tested and classified firestop system available for an installed condition, Contractor shall obtain

from firestopping material manufacturer an Engineering Judgment (EJ) to be submitted to Approving Authority, Design Professional and Authority Having Jurisdiction for approval prior to installation. EJ shall follow International Firestop Council (IFC) guidelines.

#### 1.6 ACTION SUBMITTALS

- A. Section 01 3300 – Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit product data for each type of firestopping product selected.
- C. Design Listings: Submit system design listings, including illustrations, from a qualified testing and inspecting agency that is applicable to each firestop configuration.
- D. Firestop Schedule: Submit schedule itemizing the following:
  - 1. Manufacturer's product reference numbers and/or drawing numbers.
  - 2. Listing agency's design number.
  - 3. Penetrating Item Description/Limits: Material, size, insulated or uninsulated, and combustibility.
  - 4. Maximum allowable annular space or maximum size opening.
  - 5. Wall type construction.
  - 6. Floor type construction.
  - 7. Hourly fire resistance rating of wall or floor.
  - 8. F rating.
  - 9. T, L, and W rating, if applicable.

#### 1.7 INFORMATIONAL SUBMITTALS

- E. Installation Instructions: Submit manufacturer's installation instruction for each firestop assembly.

#### 1.8 CLOSEOUT SUBMITTALS

- F. Installer Certificates: Installer shall submit certificates that firestopping systems have been installed in compliance with requirements and manufacture's written instructions.

#### 1.9 QUALITY ASSURANCE

- G. Single Source Limitations: Obtain firestop systems for all conditions from a single manufacturer.
- H. All firestopping shall be installed by a single subcontractor certified to install firestopping systems.

- I. Provide firestopping system design listings from approved agency.
- J. Materials from different firestop manufacturers shall not be installed in the same firestop system or opening.
- K. Materials used shall be in accordance with the manufacturer's written installation instructions.

#### 1.10 PREINSTALLATION CONFERENCE

- L. Convene Preinstallation conference minimum one week prior to commencing work of this section.
- M. Conference should be joint meeting attended by Owner's Representative and prime contractors, respective firestopping sub-contractors and firestopping company field advisor to review project requirements. Agenda for the conference should include the following topics:
  - 1. Review scope of work.
  - 2. Review shop drawings and firestop application log.
  - 3. Review mock-up requirements.
  - 4. Discuss identification labels and locations.
  - 5. Review schedule, coordination and sequencing with all trades.
  - 6. Review any engineering judgments or other special requirements.
  - 7. Function and frequency of inspections and testing labs.

#### 1.11 QUALIFICATIONS

- N. Contractor Qualifications: Acceptable Firestop Contractor shall be:
  - 1. Licensed by State or Local Authority where applicable, or
  - 2. FM Research approved in accordance with FM Standard 4991, or UL Qualified Firestop Contractor, or
  - 3. Meet the following requirements
    - a. Installation personnel shall be trained by approved firestop manufacturer.
    - b. Installation firm shall be experienced in installing firestop systems and fire resistive joint systems similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance.
    - c. Qualifications include having necessary experience, staff, and training to install manufacturer's products per specified tested and listed system requirements.
    - d. Minimum of three (3) years experience and shown to have successfully completed not less than 5 comparable scale projects and provide references.

#### 1.12 DELIVERY, STORAGE, AND HANDLING

- O. Deliver firestopping products to Project site in original, unopened containers or packages with intact and legible manufacturer's labels identifying product and manufacturer, date of manufacture/expiration, lot number, listing agency's classification marking, and mixing instructions for multi-component materials.
- P. Store and handle materials per manufacturer's instructions to prevent deterioration or damage due to moisture, temperature changes, contaminants, or other causes.
- Q. Install firestop materials prior to expiration date.

#### 1.13 PROJECT CONDITIONS

- R. Environmental Limitations: Install firestopping when ambient or substrate temperatures are within limits permitted by the manufacturer's written instructions. Do not install firestopping when substrates are wet due to rain, frost, condensation, or other causes.
- S. Ventilate per manufacturers written instructions on the product's Material Safety Data Sheet.
- T. Verify condition of substrates before starting work.
- U. Care should be taken to ensure that firestopping materials are installed so as not to contaminate adjacent surfaces.

#### 1.14 COORDINATION

- V. Coordinate construction of openings and penetrating items to ensure that firestopping assemblies are installed according to specified requirements. Opening shall not exceed maximum restrictions allowable for annular spacing per listing or acceptable Engineering Judgments.
- W. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.
- X. Do not conceal firestopping installations until Owner's inspection agency or Authorities Having Jurisdiction have examined each installation.
- Y. Schedule firestopping after installation of penetrants and joints but prior to concealing or obstructing access to areas requiring firestopping.

#### 1.15 WARRANTY

- Z. Manufacturer's standard limited warranty against manufacturing defect, outlining

its terms, conditions, and exclusions from coverage.

## PART 2 - PRODUCTS

### 2.1 FIRESTOPPING

- A. Basis-of-Design: Subject to compliance with requirements, provide firestopping systems from one of the following:
  1. 3M
  2. Hilti.

### 2.2 FIRESTOPPING, GENERAL

- A. Firestopping products specified in system design listings by approved testing agencies may be used providing they conform to construction type, penetrant type, annular space requirements and fire rating involved in each separate assembly.
- B. Manufacturer of firestopping products shall have been successfully producing and supplying these products for period of not less than three years and be able to show evidence of at least ten projects where similar products have been installed and accepted.
- C. Accessories: Provide components for each firestop system that is needed to install fill materials and to comply with performance requirements. Use only components specified by the firestopping manufacturer and by the approved testing agencies for the firestop systems indicated. Accessories include, but are not limited to the following items:
  1. Permanent forming/damming/backing materials, including the following:
    - a. Slag wool fiber insulation.
    - b. Foams or sealants used to prevent leakage of fill materials in liquid state.
    - c. Fire-rated form board.
    - d. Polyethylene/polyurethane backer rod.
    - e. Rigid polystyrene board.
  2. Temporary forming materials.
  3. Substrate primers.
  4. Steel sleeves

### 2.3 MIXING

- A. For products requiring mixing before application, comply with firestopping manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Verify that pipes, conduits, cables, and/or other items that penetrate fire-rated construction have been permanently installed prior to installation of firestops.

### 3.2 PREPARATION

- A. Surface Cleaning: Clean out openings immediately before installing firestop systems to comply with written recommendations of firestopping manufacturer and the following requirements:
  - 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of firestop systems.
  - 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with firestop systems.  
Remove loose particles remaining from cleaning operation.
  - 3. Remove laitance and form-release agents from concrete.

### 3.3 FIRESTOP SYSTEMS INSTALLATION

- A. General: Install firestop systems in accordance with firestopping manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Verify that environmental conditions are safe and suitable for installation of firestop products.
- C. Install forming/damming/backing materials and other accessories required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire resistance ratings required.
- D. Install joint forming/damming materials and other accessories required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths of installed firestopping material relative to joint widths that allow optimum movement capability and achieve fire resistance ratings required.

- E. Install metal framing, curtain wall insulation, mechanical attachments, safing materials and firestop materials as applicable within the system design.
- F. Install fill materials for firestop systems by proven techniques to produce the following results:
  - 1. Fill voids, joints and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
  - 2. Apply materials so they fully contact and adhere to substrates formed by openings and penetrating items.
  - 3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.
  - 4. Tool non-sag firestop materials after their application and prior to the time skinning begins. Use tooling agents approved by the firestopping manufacturer.
  - 5. On vertical pipe penetrations, lift riser clamps to permit the installation of firestopping around the entire pipe penetration. For penetrations involving fire or fire/smoke dampers, only firestop products approved by the damper manufacturer shall be installed in accordance with the damper installation instructions.

#### 3.4 FIELD QUALITY CONTROL

- A. Inspecting Agency: Authorities Having Jurisdiction, the Owner, or Owner's Representative shall be allowed to perform random destructive testing during inspection of firestop systems to verify compliance per listings or manufacturer's installation instructions. All areas of work must be accessible until inspection by the applicable Authorities Having Jurisdiction and inspection agencies. Contractor shall be responsible to repair tested assemblies with no cost to the owner.
- B. Proceed with enclosing firestop systems with other construction only after inspections are complete.
- C. Where deficiencies are found, repair or replace firestop systems so they comply with requirements.

#### 3.5 CLEANING AND PROTECTION

- A. Clean off excess fill materials adjacent to openings, as Work progresses by methods and with cleaning materials that are approved in writing by firestopping manufacturer(s) and that do not damage materials in which openings occur. Leave finished work in neat, clean condition with no evidence of spillovers or damage to adjacent surfaces.
- B. Provide final protection and maintain conditions during and after installation that

ensure firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated firestop systems immediately and install new materials to produce firestop systems complying with specified requirements.

END OF SECTION

## SECTION 09 5113 - ACOUSTICAL PANEL CEILINGS

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Acoustical panels.
2. Metal suspension system.
3. Metal edge moldings and trim.

##### B. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete.

#### 1.2 PREINSTALLATION MEETINGS

##### A. Preinstallation Conference: Conduct conference at Project site.

#### 1.3 ACTION SUBMITTALS

##### A. Product Data:

1. Acoustical panels.
2. Metal suspension system.
3. Metal edge moldings and trim.

##### B. Samples: For each exposed product and for each color and texture specified, 6 inches in size.

##### C. Samples for Initial Selection: For components with factory-applied finishes.

##### D. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of sizes indicated below:

1. Acoustical Panels: Set of 6-inch- square Samples of each type, color, pattern, and texture.
2. Exposed Suspension-System Members, Moldings, and Trim: Set of 6-inch- long Samples of each type, finish, and color.
3. Clips: Full-size seismic clips.

##### E. Delegated Design Submittals: For seismic restraints for ceiling systems.

1. Include design calculations for seismic restraints including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
1. Ceiling suspension-system members.
  2. Structural members to which suspension systems will be attached.
  3. Method of attaching hangers to building structure.
    - a. Furnish layouts for cast-in-place anchors, clips, and other ceiling attachment devices whose installation is specified in other Sections.
  4. Carrying channels or other supplemental support for hanger-wire attachment where conditions do not permit installation of hanger wires at required spacing.
  5. Size and location of initial access modules for acoustical panels.
  6. Items penetrating finished ceiling and ceiling-mounted items including the following:
    - a. Lighting fixtures.
    - b. Diffusers.
    - c. Grilles.
    - d. Speakers.
    - e. Sprinklers.
    - f. Access panels.
    - g. Perimeter moldings.
  7. Show operation of hinged and sliding components covered by or adjacent to acoustical panels.
  8. Minimum Drawing Scale: 1/4 inch = 1 foot.
- B. Qualification Data: For testing agency.
- C. Product Test Reports: For each acoustical panel ceiling, for tests performed by a qualified testing agency.
- D. Evaluation Reports: For each acoustical panel ceiling suspension system and anchor and fastener type, from ICC-ES.
- E. Field quality-control reports.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For finishes to include in maintenance manuals.

#### 1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Acoustical Ceiling Units: Full-size panels equal to 2 percent of quantity installed.

2. Suspension-System Components: Quantity of each exposed component equal to 2 percent of quantity installed.

## 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels, suspension-system components, and accessories to Project site and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

## 1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

## PART 2 - PRODUCTS

### 2.1 SOURCE LIMITATIONS

- A. Source Limitations for Ceiling System: Obtain each type of acoustical ceiling panel and its supporting suspension system from single source from single manufacturer.

### 2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer to design seismic restraints for ceiling systems.
- B. Seismic Performance: Suspended ceilings to withstand the effects of earthquake motions determined in accordance with ASCE/SEI 7.
- C. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  1. Flame-Spread Index: Class A in accordance with ASTM E1264.
  2. Smoke-Developed Index: 450 or less.

## 2.3 ACOUSTICAL PANELS - ACT1

- A. Basis of-Design Product: Subject to compliance with requirements, provide Armstrong Ceiling & Wall ([www.armstrongceiling.com](http://www.armstrongceiling.com), 877-276-7876); School Zone Fine Fissured, Item 1713, or comparable product, approved by the Architect, by one of the following.
  - 1. American Gypsum.
  - 2. Cardinal Acoustics, Inc.
  - 3. CertainTeed; SAINT-GOBAIN.
  - 4. USG Corporation.
- B. Acoustical Panel Standard: Provide manufacturer's standard panels in accordance with ASTM E1264 and designated by type, form, pattern, acoustical rating, and light reflectance unless otherwise indicated.
- C. Classification: Provide panels as follows:
  - 1. Type and Form, Type III: Mineral base with painted finish; Form 2, water felted.
  - 2. Pattern: CE (perforated, small holes and lightly textured).
- D. Color: White.
- E. Light Reflectance (LR): Not less than 0.82.
- F. Ceiling Attenuation Class (CAC): Not less than 35.
- G. Noise Reduction Coefficient (NRC): Not less than 0.70.
- H. Articulation Class (AC): Not applicable.
- I. Edge/Joint Detail: Square.
- J. Thickness: 3/4 inch.
- K. Modular Size: 24 by 48 inches.
- L. Antimicrobial Treatment: Manufacturer's standard broad spectrum, antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested in accordance with ASTM D3273, ASTM D3274, or ASTM G21 and evaluated in accordance with ASTM D3274 or ASTM G21.

## 2.4 ACOUSTICAL PANELS – ACT2

- A. Basis of-Design Product: Subject to compliance with requirements, provide Armstrong Ceiling & Wall ([www.armstrongceiling.com](http://www.armstrongceiling.com), 877-276-7876); School Zone Fine Fissured, Item 1713, or comparable product, approved by the Architect, by one of the following.

1. American Gypsum.
  2. Cardinal Acoustics, Inc.
  3. CertainTeed; SAINT-GOBAIN.
  4. USG Corporation.
- B. Acoustical Panel Standard: Provide manufacturer's standard panels in accordance with ASTM E1264 and designated by type, form, pattern, acoustical rating, and light reflectance unless otherwise indicated.
- C. Classification: Provide panels as follows:
1. Type and Form, Type III: Mineral base with painted finish; Form 2, water felted.
  2. Pattern: CE (perforated, small holes and lightly textured).
- D. Color: White.
- E. Light Reflectance (LR): Not less than 0.82.
- F. Ceiling Attenuation Class (CAC): Not less than 35.
- G. Noise Reduction Coefficient (NRC): Not less than 0.70.
- H. Articulation Class (AC): Not applicable.
- I. Edge/Joint Detail: Square.
- J. Thickness: 3/4 inch.
- K. Modular Size: 24 by 24 inches.
- L. Antimicrobial Treatment: Manufacturer's standard broad spectrum, antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested in accordance with ASTM D3273, ASTM D3274, or ASTM G21 and evaluated in accordance with ASTM D3274 or ASTM G21.

## 2.5 METAL SUSPENSION SYSTEM

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong Ceiling & Wall ([www.armstrongceiling.com](http://www.armstrongceiling.com), 877-276-7876); Prelude or comparable product, approved by the Architect, by one of the following.
1. Cardinal Acoustics, Inc.
  2. CertainTeed; SAINT-GOBAIN.
  3. USG Corporation.
- B. Metal Suspension-System Standard: Provide manufacturer's standard, direct-hung, metal suspension system and accessories in accordance with ASTM C635/C635M and designated by type, structural classification, and finish indicated.

- C. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized, G30 coating designation; with prefinished 15/16-inch- wide metal caps on flanges.
1. Fire Rating: None.
  2. Structural Classification: Heavy-duty system.
  3. End Condition of Cross Runners: Override (stepped) type.
  4. Face Design: Flat, flush.
  5. Cap Material:.
  6. Cap Finish: Painted white.

## 2.6 ACCESSORIES

- A. Attachment Devices: Size for five times the design load indicated in ASTM C635/C635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
1. Power-Actuated Fasteners [in Concrete?]: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing in accordance with ASTM E1190, conducted by a qualified testing and inspecting agency.
- B. Wire Hangers, Braces, and Ties: Provide wires as follows:
1. Zinc-Coated, Carbon-Steel Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper.
  2. Size: Wire diameter sufficient for its stress at three times hanger design load (ASTM C635/C635M, Table 1, "Direct Hung") will be less than yield stress of wire, but not less than 0.106-inch- diameter wire.
- C. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.
- D. Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.
- E. Angle Hangers: Angles with legs not less than 7/8 inch wide; formed with 0.04-inch-thick, galvanized-steel sheet complying with ASTM A653/A653M, G90 coating designation; with bolted connections and 5/16-inch- diameter bolts.
- F. Seismic Clips: Manufacturer's standard seismic clips designed to secure acoustical panels in place during a seismic event.
- G. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.
- H. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.

## 2.7 METAL EDGE MOLDINGS AND TRIM

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong Ceiling & Wall Solutions(www.armstrongceiling.com, 877-276-7876); product or comparable product, approved by the Architect, by one of the following.
  - 1. CertainTeed; SAINT-GOBAIN.
  - 2. Rockfon; ROCKWOOL International.
  - 3. USG Corporation.
  
- B. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.
  - 1. Edge moldings to fit acoustical panel edge details and suspension systems indicated and match width and configuration of exposed runners unless otherwise indicated.
  - 2. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.
  
- B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.
  
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders unless otherwise indicated, and comply with layout shown on reflected ceiling plans.
  
- B. Layout openings for penetrations centered on the penetrating items.

### 3.3 INSTALLATION OF ACOUSTICAL PANEL CEILINGS

- A. Install acoustical panel ceilings in accordance with ASTM C636/C636M , seismic design requirements, and manufacturer's written instructions.
- B. Suspend ceiling hangers from building's structural members and as follows:
  - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
  - 2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
  - 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
  - 4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly to structure or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
  - 5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
  - 6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
  - 7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
  - 8. Do not attach hangers to steel deck tabs.
  - 9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
  - 10. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
  - 11. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
- C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.
- D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
  - 1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.

2. Screw attach moldings to substrate at intervals not more than 16 inches on center and not more than 3 inches from ends. Miter corners accurately and connect securely.
  3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- F. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide precise fit.
1. Arrange directionally patterned acoustical panels as follows:
    - a. As indicated on reflected ceiling plans.
    - b. Install panels with pattern running in one direction parallel to [long] [short] axis of space.
    - c. Install panels in a basket-weave pattern.
  2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension-system runners and moldings.
  3. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
  4. Install seismic clips in areas indicated; space in accordance with panel manufacturer's written instructions unless otherwise indicated.

### 3.4 ERECTION TOLERANCES

- A. Suspended Ceilings: Install main and cross runners level to a tolerance of 1/8 inch in 12 feet, non-cumulative.
- B. Moldings and Trim: Install moldings and trim to substrate and level with ceiling suspension system to a tolerance of 1/8 inch in 12 feet, non-cumulative.

### 3.5 FIELD QUALITY CONTROL

- A. Special Inspections: Engage a qualified special inspector to perform the following special inspections:
1. Periodic inspection during the installation of suspended ceiling grids in accordance with ASCE/SEI 7.
- B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- C. Perform the following tests and inspections of completed installations of acoustical panel ceiling hangers and anchors and fasteners in successive stages and when installation of ceiling suspension systems on each floor has reached 20 percent completion, but no panels have been installed. Do not proceed with installations of acoustical panel ceiling hangers for the next area until test results for previously

completed installations of acoustical panel ceiling hangers show compliance with requirements.

1. Within each test area, testing agency will select one of every 10 power-actuated fasteners and postinstalled anchors used to attach hangers [to concrete?] and will test them for 200 lbf of tension; it will also select one of every two postinstalled anchors used to attach bracing wires to concrete and will test them for 440 lbf of tension.
  2. When testing discovers fasteners and anchors that do not comply with requirements, testing agency will test those anchors not previously tested until 20 pass consecutively and then will resume initial testing frequency.
- D. Acoustical panel ceiling hangers, anchors, and fasteners will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports.

### 3.6 CLEANING

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage.
- B. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09 5113



5-1-2025

PART ONE – GENERAL:

1.01 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.

1.02 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 complete sanitary and water systems. Furnish certificates from fire department 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.

## SECTION 230100 - GENERAL MECHANICAL

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.

### 1.03 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.

### 1.04 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.

### 1.05 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 head-room, maintenance, appearance and replacement.
- D. The mechanical contractor shall produce 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

## SECTION 230200 - GENERAL COMPLETION

### PART ONE – GENERAL:

#### 1.01 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:

#### 2.01 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.

#### 2.02 DIVISION OF WORK:

- A. Coordinate all opening locations with General Contractor, see paragraph 2.04.
- 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:

## SECTION 230200 - GENERAL COMPLETION

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.

### 2.03 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.

### 2.04 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.

### 2.05 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.

SECTION 230200 - GENERAL COMPLETION

2.06 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/accessible ceilings. Nameplates shall be located directly below suspended equipment and attached to the ceiling gird (not tiles) to indicate approximate location of equipment.

2.07 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.

2.08 CLEANING UP:

- A. Remove from the premises all unused material and debris resulting from the performance of work under this section.

2.09 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-Built 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

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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'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.
- 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. VAU's shall only be operated after final cleaning of the building.

END OF SECTION

PART ONE – GENERAL:

1.01 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:

2.01 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.

2.02 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)

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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

PART ONE - GENERAL:

- 1.01 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.
- 1.02 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.
- 1.03 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.
- 1.04 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.
- 1.05 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:

- 2.01 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 2.02.
  - 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 2" minimum deflection and 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 Certainteed, 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.

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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.

2.02 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 top 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

SECTION 233313 - DAMPERS

PART ONE – GENERAL:

- 1.01 Mechanical Contractor shall furnish and install all dampers as indicated on drawings or called for under Specifications.
- 1.02 Dampers shall be as manufactured by Air Balance, Inc., Phillips-Aire, Ruskin Manufacturing Co. or Louvers and Dampers, Inc.

PART TWO – PRODUCTS:

2.01 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.

2.02 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.

2.03 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.

SECTION 233313 - DAMPERS

- 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:

- 3.01 Fire and smoke dampers shall be provided with access doors to operate and reset. Provide identification markers with lettering a minimum of ½" 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.
- 3.02 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

SECTION 238090 - DUCTWORK

PART ONE – GENERAL:

- 1.01 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.
- 1.02 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:

2.01 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 sealant shall be low-VOC per LEED requirements. 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, referenced 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" o.c.	1 1/2" x 1 1/2" x 1/8" Angles 4' o.c.
61 to 90	20	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 2' o.c.

SECTION 238090 - DUCTWORK

		o.c.	
91 and Up	18	2" Angle Connections, 1 1/2" Pocket or 1 1/2" Bar Slips with 1 3/8" x 1/8" Bar reinforcing 3'9" o.c.	1 1/2" x 1 1/2" x 1/8" Angles 2' o.c.

B. MEDIUM PRESSURE DUCTWORK:

1. All supply ductwork from the air handling units to VAV boxes shall be classified medium pressure.
2. Rectangular ducts shall be constructed to the requirements of SMACNA Table 1-6 for 4" W.G. static pressure.
3. Round ducts to VAV boxes shall be constructed to the requirements of SMACNA Table 3.2 for 3" W.G. static pressure. All such duct shall be single wall spiral seam. No "snap-lock" seams are permitted. Round duct takeoffs shall be bell mouth type.
4. Duct and fitting sealing requirements shall be in accordance with SMACNA Table 1-2, Seal Class "A".

- C. Double wall round ducts shall be manufactured by United Sheet Metal, Monroe Metals, Inc. or Eastern Sheetmetal. Construction shall be as follows:

Round Duct Diameter in Inches	Spiral Seam Gauge	Longitudinal Seam Gauge
3" - 8"	30	28
9" - 14"	28	26
15" - 26"	26	24
27" - 36"	24	22
37" - 50"	22	20
51" - 60"	20	18
61" - 84"	--	16

D. Notes for Round Duct Construction:

1. The inside diameter and outside diameter of duct and fittings must be controlled for proper mating of components.
2. Fittings and requirements for sealing shall be in accordance with SMACNA Standards.
3. Ducts shall be constructed with a perforated interior skin and provided with a "grip-tight" finish suitable for final painting by the Contractor.
4. All components, fittings and boots of double wall duct system shall be submitted as shop drawings for approval. All round duct shown in exposed areas shall be double wall construction.

2.02 ROUND INSULATED FLEXIBLE DUCTS & SPIN-IN COLLARS:

## SECTION 238090 - DUCTWORK

- 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 6.0 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
  - (3) Thermoflex - MKE R6.0
- B. Spin-in collars shall be constructed of galvanized steel with scoop and damper.

### PART THREE – EXECUTION:

- 3.01 \*Gauge Stamps: Turned out and on bottom of ducts.
- 3.02 All supply and return duct elbows with an inside radius of less than  $\frac{3}{4}$  of duct width shall have single thickness turning vanes. All square elbows shall have double thickness turning vanes.
- 3.03 All exhaust duct elbows shall have not less than 6" inside radius. All square elbows shall have single thickness turning vanes.
- 3.04 Splitter dampers and branch take-off extractors shall be installed where indicated and shall be adjustable and shall have locking quadrants.
- 3.05 All branch take-offs shall be 45-degree entry type per SMACNA Fig. 2-6. No straight tap or butt fittings allowed.
- 3.06 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.
- 3.07 Duct sizes indicated on plans are interior dimensions. Increase metal duct sizes as required for acoustical or interior insulation.
- 3.08 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.
- 3.09 Provide  $\frac{1}{2}$ " 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  $\frac{3}{4}$ " 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 6'. If extended run-out is indicated, round galvanized steel shall be used for run-out length in excess of 6'.

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- 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 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.
- 3.15 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.
- 3.16 Contractor shall cover ends of all ductwork during construction, storage and installation per LEED requirement. 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.
- 3.17 Contractor shall perform performance testing on Kitchen Hood systems per the International Mechanical Code Section 507.6 and 507.6.1 and the Office of School Facilities. Smoke containment tests shall be performed by smoke candles or smoke puffers. Smoke bombs shall not be used. The mechanical contractor is responsible for providing the required approved smoke generation as listed above and all testing to prove hood smoke capture and containment performance.

END OF SECTION

## SECTION 238620 - INSULATION

### PART ONE - GENERAL:

- 1.01 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 ductwork shall be tested, thoroughly cleaned and approved before insulation is applied.

### PART TWO - PRODUCTS:

- 2.01 Insulation shall be as manufactured by Manville, Certain-Teed, Owens-Corning, Knauf, or as indicated.

### PART THREE - EXECUTION:

#### 3.01 SUPPLY AIR, RETURN AIR, AND OUTSIDE AIR DUCTWORK:

- A. All exposed ductwork in conditioned spaces shall be internally insulated as specified for transfer air ductwork. This does not include mechanical rooms. Ductwork in mechanical rooms shall be insulated as stated below for spaces.
- B. All concealed ductwork, including flexible duct connections, diffuser boots, and backs, 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.

#### 3.02 TRANSFER AND RETURN AIR DUCTWORK:

- A. All transfer and return air ductwork and other ductwork as elsewhere indicated shall be acoustically treated with 1" Armaflex type SA duct liner with fire resistive coating to meet NFPA 90A requirements. Liner shall be secured to the interior of the ductwork with Benjamin Foster 85-20 and additionally secured to the duct with weld pins and washers, 15" on center each way. Stick pins will not be allowed.

#### 3.03 CONDENSATE PIPING:

- A. Condensate and drain pan lines shall be insulated with ¾" thick "Rubatex" or "Armaflex". Seal all joints with adhesive. Insulation shall not be cut lengthwise to install.

#### 3.04 PENETRATIONS:

- A. All duct wall penetrations rated or non-rated shall be sealed airtight with sheet metal flanges on each side of duct. Fire penetrations shall be installed in accordance with fire damper manufacturer's installation instructions.

END OF SECTION

## SECTION 239950 - TESTING AND BALANCING AIR SYSTEMS

### PART ONE - GENERAL:

#### 1.01 SCOPE:

- A. The commissioning agent 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:

- 2.01 The balancing contract shall incorporate the following:
- 2.02 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.
- 2.03 Test, adjust and balance the complete mechanical system.
- 2.04 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.
- 2.05 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.
- 2.06 All test equipment will be furnished by the Balancing Contractor and will remain his property. All instruments will have been calibrated recently.
- 2.07 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.
- 2.08 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.
- 2.09 TESTING AND BALANCING PROCEDURE (AIR):
  - A. Before starting air balance, check the following items:

## SECTION 239950 - TESTING AND BALANCING AIR SYSTEMS

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:

## SECTION 239950 - TESTING AND BALANCING AIR SYSTEMS

- 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.
- E. 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



SECTION 260501 - GENERAL ELECTRICAL REQUIREMENTS, MATERIALS & METHODS

PART 1 - 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. Bring any conflicts between the two to the attention of the Engineer prior to bid time
- D. Examine other drawings and Specifications and bring any omissions or discrepancies to the attention of the Architect prior to bid time.

1.2 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.

1.3 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.

#### 1.4 WORKMANSHIP

- 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.

#### 1.5 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.

### PART 2 – PRODUCTS

#### 2.1 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 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 Electrical 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 3 - EXECUTION

### 3.1 CODES, RULES, PERMITS, FEES, AND APPLICABLE PROVISIONS

- A. Comply with the National Electrical Code, International Building Code, Life Safety Code, and Municipal Code requirements. The applicable code versions shall be as listed in on the plans. 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.

### 3.2 COORDINATION WITH OTHER TRADES

- 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.
- D. 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.
- E. General Contractor will provide flashing of conduits into roofing. The electrical contractor shall provide counterflashing.
- F. 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.
  - 1. Where magnetic motor starters (controllers) are furnished by others, Electrical Contractor shall install and wire complete.
  - 2. Where controllers are provided already mounted on equipment, Electrical Contractor shall wire complete.
  - 3. Where line voltage components such as transformers or motorized dampers are shipped loose from the manufacturer, the mechanical contractor shall mount the equipment in the HVAC unit. All 120 volt and greater wiring shall be installed and terminated by the Electrical Contractor.
  - 4. 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.
  - 5. Not included in the electrical scope of work are low voltage temperature and interlock control wiring required to operate the mechanical system. Refer to the mechanical specifications for a summary list of types of equipment provided under that division. However, 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.

### 3.3 GENERAL REQUIREMENTS FOR INSTALLATION:

- A. Conduit, 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.

### 3.4 SHOP DRAWINGS

- A. The Electrical 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 Electrical 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 Electrical 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 Electrical 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 in Appendix 1 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.

### 3.5 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.

### 3.6 EXCAVATION AND BACKFILL:

- A. General: The Electrical Contractor shall do all excavating and backfilling necessary to receive the work shown on the drawings.
- B. 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.
- C. 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.

### 3.7 NAMEPLATES:

- A. On all panelboards, disconnect switches, transformers, variable speed drives 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.

3.8 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.

3.9 CLEANING UP:

A. Remove from the premises all unused material and debris resulting from the performance of work under this Section.

3.10 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.

3.11 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. Cost of all adjustments required to correct deficiencies and replacement of defective material and equipment are the sole responsibility of the electrical contractor.

3.12 AS BUILT 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.

3.13 OPERATIONS AND MAINTENANCE MANUALS

- A. Prior to project closeout, the Electrical Contractor shall submit for approval, a completed operations and maintenance hard back, three-ring file 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.
  16. Written documentation that service grounding system resistance measures no more than 5 ohms. Measurements shall be made using the fall of potential method.
  17. Provide the manufacturer's recommended maintenance procedures for all electrical devices installed on the project and the frequency with which each is to be done.
  18. A copy of the lighting control sensor test report listing sensor location, and final settings from the sensor manufacturer's representative.

### 3.14 TRAINING:

- A. 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.

- B. 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.

3.15 GUARANTEE:

- A. The Contractor agrees:
  - 1. 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.
  - 2. To remove any item not specified or given written approval and replace it with the specified item.
  - 3. That the systems installed will safely, quietly, and efficiently perform their respective functions in accordance with the design.

3.16 APPENDIX 1: Required shop drawing submittals

Number	Spec Section	#	Item Description
26 05 01	General Electrical	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
26 05 19	Wires and Cables	1	Wire – minimum size, manufacturer, insulation type
		2	Connectors and lugs
26 05 26	Grounding & Bonding	1	Grounding devices and fitting
26 05 33	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)
26 05 34	Electrical Boxes	1	Outlet boxes
		2	Junction Boxes
26 09 23	Lighting Control Sensors	1	Sensors
		2	Power Packs
26 27 26	Wall Switches	1	Switches (Also indicate color, load type, terminal type, and rating)
		2	Plates
26 51 00	Lighting Fixtures	1	Light Fixtures

END OF SECTION 260501

## SECTION 260519 - WIRES AND CABLES

### PART 1 - GENERAL

#### 1.1 CONDUCTORS

- A. Provide soft-drawn copper conductors in raceways as shown on Drawings. Power Conductors shall conform to the latest NEC requirements and meet ASTM specifications, with 600v, 75/90 degree C, Type THHN/THWN-2 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.
- C. Multiconductor power cables of any kind are not acceptable unless specifically called for elsewhere in these contract documents. The use of cable assemblies which incorporate metal jackets to replace the functions of conduit is specifically prohibited unless allowed by the conduit specification.
- D. Conductors for 0-10v dimming control shall have 600v, 75/90 degree C, Type TFN/TFFN insulation to facilitate installation in the same raceways with power conductors without the use of barriers.

#### 1.2 COLOR CODING

- A. Phase and grounded neutral conductors #10 awg and smaller shall have continuous factory colored insulation. Phase and grounded neutral conductors larger than #10 may be have either continuous colored insulation of be color coded in the field using Scotch color tape, E-Z code, Brady, or equal wire markers.
- B. Equipment grounding conductors #6 awg and smaller shall have continuous factory colored insulation. Equipment grounding conductors larger than #6 may be have either continuous colored insulation of be color coded in the field using Scotch color tape, E-Z code, Brady, or equal wire markers.
- C. Color coding shall be as follows:

120/240V or 120/208V 3 PHASE SYSTEMS	480/277V 3 PHASE SYSTEMS
Phase A - Black	Phase A - Brown
Phase B - Red	Phase B - Orange
Phase C - Blue	Phase C - Yellow
Neutral - White	Neutral - Gray

120/240V or 120/208V SINGLE PHASE SYSTEMS  
Phase A - Black  
Phase B - Red  
Neutral - White

For all systems:  
Equipment Grounding Conductor - Green  
Isolated Ground – Green w/ Orange Stripe  
Lighting circuit with 4 wire dimming – Pink and / or Purple

## PART 2 - PRODUCTS

### 2.1 CONDUCTORS

- A. Wire and cable shall be as manufactured by Colonial Wire & Cable, Encore Wire Corporation, Southwire Co., General Cable, Cerro Wire, Allen Wire 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.

### 2.3 VARIABLE SPEED DRIVES

- A. Cables between variable speed drives and motors shall be rated 600v, with three grounds, overall uncoated copper tape shield, and PVC outer jacket equal to Southwire TC-VFD power cable.

## PART 3 - EXECUTION

### 3.1 CONDUCTORS

- A. Minimum wire size for all branch circuits shall be #12 except where indicated otherwise. Conductors for 0-10v dimming circuits may be rated 16awg. 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, SPLICES, AND CONNECTIONS

- 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 #10 and smaller for non motor connections 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.
- E. Join conductors for motor connections with split bolt wire connectors sized for the number and gauge of conductors. Conductors shall be coated with electrical marine grease equal to Caig laboratories Deoxit L27-ME before splicing. Tape all 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.
- F. Branch circuit homeruns and subpanel feeders shall be continuous from the device shown on the plans to the indicated panel or switchboard. Homeruns shall not be broken into parallel sets unless specifically noted on the plans. Unless otherwise noted on the plans, homeruns shall not be grouped into shared conduits nor combined to create multiwire branch circuits.
- G. In marine environments, all electrical splices or connections shall be at least 12" above the top of floating decks or fixed piers and shall be made with a sealed waterproof connector equal to dryconn. No splices shall be made below the top of floating decks or fixed piers

- H. Underground conductors shall not be spliced except where specifically call for on the drawings. Where called for, splices shall utilize long barreled compression connectors sealed with shrink wrap or pourable liquid waterproofing and shall be UL listed for direct burial even if installed in conduit, boxes or handholes.

### 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 260519



## SECTION 260526 – GROUNDING AND BONDING

### PART 1 - GENERAL

#### 1.1 PURPOSE

- A. Furnish and install grounding system to comply with NEC and as shown on Drawings.

### PART 2 - PRODUCTS

#### 2.1 DEVICES

- A. Grounding devices and fittings shall be as manufactured by Thomas & Betts, Appleton, OZ Electrical Mfg. Co., or approved equal.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Ground main service by exothermic welding the grounding conductor to main cold water pipe, building steel, footing rebar, and at least three 3/4" diameter x 10' long ground rods driven 10' apart outside building in unpaved earth. The rods shall be loop interconnected with a 250 mcm bare copper conductor thermal welded, using the proper style mold, to each rod below grade. The conductor from the service disconnect to the rod loop shall be sized as shown on the electrical drawings.
- B. Electrical Contractor shall provide Engineer with written documentation that service grounding system resistance measures no more than 5 ohms. Measurements shall be made using the fall of potential method. Supplemental grounding electrodes and / or soil supplements shall be installed as necessary to achieve the specified resistance. Copies shall also be collected into a binder and submitted to the owner as part of the operations and maintenance (O & M) documentation.
- C. All ground rods and fittings used shall be free from paint, grease, and other poorly conducting material, and contact surfaces shall be cleaned thoroughly to insure good metal-to-metal contact.
- D. Install bonding jumpers between all panelboards and feeder raceways connected thereto; across pull box and raceway expansion joints and across water meters located within buildings.
- E. All connections to equipment grounding conductors shall be accessible for inspection and shall be made with solderless connectors thermal welded, using the proper style mold, to the equipment or structure to be grounded. Unless otherwise indicated on drawings, grounding conductors within raceway system shall be installed in exposed rigid steel conduit with both conductor and conduit bonded at each end.

- F. Provide all circuits with an equipment ground. Equipment grounding conductors shall be sized in accordance with NEC Article 250.
- G. Do not use flexible metal conduit fittings as a grounding means. Pull a green ground wire in or around each piece of flexible conduit and screw to conduit system with lugs at both ends.
- H. Telecommunication systems shall be grounded and bonded per the telecommunication infrastructure specifications found elsewhere in these construction documents.
- I. Ground rods shall be installed in inspection boxes equal to Erico IH1250D.
- J. All ferrous metallic conduits containing grounding electrode conductors shall be bonded to the electrode conductor at both ends. Non-metallic conduits containing grounding electrode conductors shall be schedule 80.

END OF SECTION 260526

## SECTION 260529 – SUPPORTING DEVICES

### PART 1 - GENERAL

#### 1.1 DESCRIPTION

- A. Support and align all raceways, cable trays, wireways, cabinets, boxes, fixtures, equipment, etc., in an approved manner.
- B. Supports shall be in conformance with the requirements of the current building codes and local amendments, or the requirements of this Section, whichever is more stringent.
- C. Seismic anchorages, seismic restraints and fixture and equipment supports shall be in accordance with National Uniform Seismic Installation Guidelines (NUSIG).

### PART 2 - PRODUCTS

#### 2.1 MATERIALS, GENERAL

- A. Support raceways on approved types of wall brackets, ceiling trapeze hangers or malleable iron straps. "Perforated plumbers' strap" not permitted as means of support.
  - 1. Acceptable manufacturer's of support brackets and hangers: "Uni-strut," "Kindorf" or "B-line."
  - 2. "Caddy" fasteners are permitted for support of conduit to concealed metal studs and for conduit concealed above suspended acoustical ceilings.
  - 3. All supporting devices located outdoors or in areas subject to moisture shall be hot-dip galvanized or stainless steel.
- B. Do not support raceways or equipment from ceiling tie wire or T-bar, piping or ductwork. Support independently.
- C. Provide safety wires (a minimum of four [4] 12 gauge hangers) or equivalent chains for each light fixture installed in T-bar or other ceiling suspension systems. Safety wires and chains shall be securely attached to diagonally opposite corners of each fixture and to structure.
- D. Surface mounted lighting fixtures supported from T-bar grid shall be attached to the grid with a positive clamp device that completely surrounds the supporting member similar to Caddy "IDS." Provide safety wires as specified in the foregoing.
- E. Provide safety wires (a minimum of two [2] 12 gauge hangers) or equivalent aircraft cable for each pendant mounted fixture. Hangers or cable shall be securely attached to fixture, then routed through stem and securely attached to structure.

F. Earthquake Anchorages:

1. Anchor all equipment, raceways, cable trays, etc., to the building structure to resist earthquake forces in accordance with the requirements of the National Uniform Seismic Installation Guidelines for Architects, Engineers, Inspectors and Contractors.
2. Total lateral (earthquake) force shall be not less than 1.00 times the equipment weight acting laterally in any direction through the equipment center of gravity. Provide adequate backing at structural attachment points to accept the forces involved.
3. Provide equipment supported by flexible isolation mounts with earthquake restraining supports positioned as close to equipment as possible without contact in normal operation (earthquake bumpers). The maximum lateral displacement due to the computed earthquake force from above shall not exceed 1.5". Floor mounted equipment weighing less than 2,000 lbs may have one (1) 6 x 6 x 3/8 x 18" steel angle bolted to the floor with four (4) 5/8" diameter bolts placed on four (4) sides of the equipment.

G. Independent support wires above lay in ceilings shall be orange in color.

2.2 HARDWARE, COMPOSITIONS AND FINISHES

- A. In dry indoor areas, all threaded fasteners and associated hardware shall be steel, with a zinc or cadmium plated finish.
- B. In general, fasteners in outdoor, damp or corrosive environments shall be of the largest trade size that will fit the item being fastened, shall have the coarsest threads commercially available in that size, and shall be hot-dip galvanized steel. Zinc electroplate will be acceptable only in the smaller sizes where hot-dip galvanized is not commercially available. On metal construction, install with the full length of the threads and the hole wet with cold galvanized touch up compound (Z.R.C. or accepted equal).
- C. Where PVC, liquidtight flex or plastic-coated conduit is installed on wood construction in outdoor, damp or corrosive environments, fasteners shall be made of monel or stainless steel alloy suitable for marine environments, such as alloys 430, 446, 18-8, 304, 316 or 347.

2.3 STRUT

- A. U-channel strut for use in heated indoor areas shall be steel. For installations that will be finish painted as part of the project, factory finish of the strut shall be paintable galvanizing, or phosphatized and primed. For installations that will not be finish painted, the factory finish of the strut shall be galvanized.
- B. For outdoor installation of galvanized conduits and boxes, strut shall be steel with hot-dip galvanized finish. All field-cut ends and other breaks in the finish shall be thoroughly treated with cold galvanized touch-up compound (Z.R.C. or accepted equal).

- C. U-channel strut for support of PVC or plastic-coated conduits in outdoor, damp or corrosive environments shall be fiberglass, RobRoy "Rob-Glass" or accepted equal, assembled with the manufacturer's standard end sealant and corrosion-protected hardware and accessories.

## PART 3 - EXECUTION

### 3.1 FASTENING

- A. Secure boxes, wall brackets, cabinets and hangers by means of toggle bolts in hollow masonry; preset inserts or expansion bolts in solid masonry and concrete; machine screws, bolts or welding on metal surfaces; and wood or sheet metal screws in wood construction. Obtain permission from ANC before using any type of powder powered studs.

### 3.2 FIXTURE SUPPORTS

- A. For other than T-bar ceiling fixtures and for all fixtures weighing more than 56lbs, support luminaries from structural members capable of supporting total weight, under seismic conditions and independently from wiring system. Attach to steel members by approved beam clamps and rods.

### 3.3 PENDANT FIXTURES

- A. Loop and hook or swivel hanger assemblies for pendant fixtures shall be fitted with a restraining device to hold the stem in the support position during earthquake motions. Pendant-supported fluorescent fixtures shall also be provided with a flexible hanger device at the attachment to the fixture channel to preclude breaking of the support. The motion of swivels or hinged joints shall not cause sharp bends in conductors or damage to insulation.

### 3.4 ASSEMBLY MOUNTED OUTLET BOX

- A. A supporting assembly that is intended to be mounted on an outlet box shall be designed to accommodate mounting features on 4" boxes, 3" plaster rings and fixture studs.

### 3.5 WALL-MOUNTED EMERGENCY LIGHT UNIT

- A. Each wall-mounted emergency light unit shall be secured in a manner to hold the unit in place during a seismic disturbance.

3.6 SAFETY WIRES

- A. Attach safety wires to lighting fixtures so that no part of the fixture, in event of ceiling suspension system failure, will drop more than 6" below normal ceiling height. Each end of each wire shall be secured with a minimum of three (3) tight wraps.

3.7 STRUCTURAL ATTACHMENTS

- A. Provide adequate backing at structural attachment points to accept the forces involved.
- B. Attachment to plaster or gypsum board not permitted unless specifically approved in writing by ANC on case-by-case basis. Where approved, such attachment shall be by means of molly or toggle bolts.

3.8 ELECTRICAL BOXES INSTALLED IN ACOUSTIC PANEL CEILING

- A. Electrical boxes installed in acoustic ceiling tiles shall be of the type outlined in the electrical boxes section of these specifications.
- B. They shall be supported from Caddy (Erico) 512HDEEP heavy duty T Grid box hangers with 512HDXT extension brackets as necessary.
- C. Electrical boxes installed in acoustic ceiling tiles shall have one independent safety wire attached to structure secured with a minimum of three (3) tight wraps.

END OF SECTION 260529

## SECTION 260533 - CONDUIT

### PART 1 - GENERAL

#### 1.1 REQUIREMENTS

- A. 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 2 - PRODUCTS

#### 2.1 RIGID METAL CONDUIT (OR IMC)

- A. Shall be used for:
  - 1. Exposed branch circuits where subject to damage.
  - 2. Service entrance, Branch, & feeder 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 under slab where inside of the building line (ground floor only).
  - 2. Service entrance, Branch, & feeder 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.
  - 1. Non-metallic conduits containing grounding electrode conductors shall be schedule 80.

#### 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 2.01, 2.02 and 2.03.

## PART 3 - 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, transformers, and other devices subject to motion and vibration. Flexible conduits shall not be used in other applications without the approval of the engineer.
- 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 or 240 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 - Purple
  - 7. Security and access controls - Black.
- 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 roof deck.
- 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.
  6. Conduit shall have galvanized rigid steel 90's installed where conduits turn up into light poles or exterior electrical equipment. Rigid steel 90's in contact with concrete, shall have two coats of asphaltum and all wrench marks and etc., shall be touched-up after conduit has been assembled.
- 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. Conduit shall transition to metallic after the rigid 90 turn up. Vertical sections of rigid non-metallic conduit shall be not be installed and will not be accepted.
  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
- AA. Concealment:
  - 1. Unless otherwise noted, in new construction, conduits entering the building shall turn up and be concealed within walls.
  - 2. Other than in electrical rooms, mechanical closets, and utility platforms, below ceiling conduits in new construction shall be routed below slab or concealed within walls. Below ceiling conduits which are surface mounted to interior or exterior walls will not be accepted.
  - 3. In areas with ceilings, conduits shall be routed concealed above ceilings.
  - 4. In areas without ceilings, conduits shall turn out of walls and be routed above the level of the lowest structural member.
- AB. Flexible Conduit Penetrations

1. Where flexible conduits penetrate enclosures for electrical, mechanical or other equipment, the electrical contractor shall furnish and install a Liquid-tight flexible conduit connector fitting suitable for wet locations with Hex shaped gland nut, interior locknut and sealing ring.
2. Under no circumstances, shall flexible conduit pass through a penetration and be sealed only with grommets or sealants even if the grommets are provided by the enclosure manufacturer for this purpose.

END OF SECTION 260533

## SECTION 260534 - ELECTRICAL BOXES

### PART 1 - GENERAL

#### 1.1 OUTLET BOXES

- A. All outlet boxes shall be standard galvanized steel type, at least 4" x 4" x 1-1/2" deep, single or ganged of size to accommodate devices noted. Boxes shall be equipped with plaster ring or cover as necessary. Standard deep type boxes shall be used in floor slab construction so that concealed conduits entering sides of boxes can clear steel reinforcing rods. Extension rings, plaster rings and device extension covers shall be all steel.

#### 1.2 FLOOR BOXES

- A. Boxes for floor outlets shall be the cast-metal, threaded conduit entrance waterproof type with means for adjusting the cover plate to finished floor level. Boxes shall have an approved gasket or seal between adjusting ring and box. Cover plates on floor boxes shall be of heavy brass, with permanent ring or flange and rubber gasket.

#### 1.3 JUNCTION BOXES

- A. Where indicated on the plans, and where necessary to terminate, tap-off or redirect multiple conduit runs, the Electrical Contractor shall furnish and install appropriately designed junction boxes. They shall have full access screw covers mounted with corrosion-resistant machine screws. Box size shall be as required by the NEC for the number of conduits and conductors entering and leaving it.

#### 1.4 PULL BOXES

- A. Furnish and install pull boxes where necessary in the raceway system to facilitate conductor installation.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Boxes shall be as manufactured by Steel City, Thomas & Betts, OZ Electrical Mfg. Co., Raco, Appleton, Circle F Mfg., or approved equal.
- B. Floor outlets shall be as manufactured by Wiremold, Hubbell, T&B, Raco, or Steel City.

## PART 3 - EXECUTION

### 3.1 GENERAL

- A. Electrical Contractor shall furnish and install plugs for all knockout openings.
- B. Surface mounted exterior boxes shall be weatherproof aluminum.
- C. Masonry boxes shall be used in masonry walls.

### 3.2 OUTLET BOXES

- A. Electrical Contractor shall coordinate the mounting heights listed in this section with the general contractor to ensure that there are no conflicts with structural bond beams or other elements.
- B. Electrical Contractor shall grout any gap between flush mounted boxes and the wall surface that is larger than 1/8".
- C. Convenience outlets shall be located 1'-4" to bottom of box above finished floor, unless otherwise indicated on the plans.
- D. Wall-switch outlets shall be located 4'-0" to top of box above finished floor. When located near doors, they shall be installed on the lock side of the door, unless otherwise indicated on the plans.
- E. Clock outlets shall be installed 7'-4" to bottom of box above finished floor, unless otherwise indicated on the plans.
- F. Outlet boxes for concealed telecommunication systems shall be of the 4" square type 2 1/8" deep with single gang plaster ring and bushed opening cover plate. Telecommunication outlet boxes shall be installed at 1'-4" to bottom of box above finished floor unless otherwise indicated on the plans. Telecommunication boxes shall be installed with blank cover plates when cabling is not being installed by the electrical contractor
- G. Outlet boxes in firewalls which require a cutout larger than 16 square inches or where multiple boxes are shown whose combined area of cutouts exceeds 100 square inches in any 100 square foot of wall spaces shall have putty pads or other UL listed materials and methods and shall be installed per the UL listing of the chosen system.

### 3.3 JUNCTION BOXES

- A. Where intermediate cable supports are necessary because of box dimensions, provide insulated cross-brackets to support the conductors. Boxes shall be supported independently of conduits entering them. Brackets, rod hangers, bolts, or other suitable supporting means may be used.

- B. In service areas such electrical rooms, mechanical closets, or utility platforms, junction boxes containing splices, taps or connections for non-lighting circuits shall be installed no more than 60" afg.

#### 3.4 PULL BOXES

- A. In general, conduit runs of more than 100 feet, or more than three right angle bends, shall have a pull box installed at a convenient intermediate location. All boxes shall be of metal gauge and size as required by the NEC for the number and size of conduits and conductors involved. Boxes shall have removable screw covers. Boxes shall be securely mounted on the building structure with supporting facilities independent of the conduits entering or leaving the box.

#### 3.5 ELECTRICAL BOXES INSTALLED IN ACOUSTIC PANEL CEILINGS

- A. Electrical boxes installed in acoustic ceiling tiles shall be double deep boxes with single gang extension rings supported as per the Supporting device section of these specifications.

#### 3.6 ELECTRICAL BOXES INSTALLED ABOVE ACOUSTIC PANEL CEILINGS

- A. Electrical boxes installed above acoustic ceiling tiles shall be lowered to be within 24" of the acoustic tile.

#### 3.7. FIRE PROOFING:

- A. Electrical boxes shown in one or two hour rated walls shall be wrapped in intumescent putty pads equal to 3m #MPP+ when installed in any of the conditions listed below. Pads shall be installed per the manufacturer's installation instructions and in accordance with the requirements of the UL system for the applicable wall type.
  - 1. Boxes larger than 16 square inches.
  - 2. If horizontal spacing between boxes is less than 24 in.
  - 3. When multiple boxes are located in one stud cavity
  - 4. If the aggregate of all boxes exceeds 100 sq. in. per 100 sq. ft. of wall.
- B. Electrical boxes shall not be recessed in walls rated greater than 2 hours.

END OF SECTION 260534

## SECTION 260923 – LIGHTING CONTROL SENSORS

### 1.1 SCOPE OF WORK

#### A. Occupancy detection technology requirements:

1. The occupancy sensor system shall sense the presence of human activity within the desired space and fully control the on/off function of the lights.
2. Sensors shall utilize passive infrared (PIR) technology, which detects occupant motion, to initially turn lights on from an off state; thus preventing false on conditions.
3. Sensors with an additional "dual" technology shall be used to adequately detect maintained occupancy.
4. All sensing technologies shall not interfere with other electronic devices within the space (such as electronic white board readers).

#### B. Occupancy sensor operation requirements:

1. Sensors shall offer a minimum on timer of at least 15 minutes. This timer shall be in addition to the regular occupancy time delay that keeps lights on after last detected occupancy. User shall be able to disable/enable and change the value of this timer.
2. Sensors shall utilize an occupancy time delay that keeps lights on after last detected occupancy. Factory default setting of the occupancy time delay shall be 10 minutes.
3. Manual adjustment to the occupancy time delay so as to increase it shall be accommodated.
4. Installer, in accordance with manufacturer's recommendation, shall determine final sensor location. All sensors shall be factory calibrated for optimum performance for its installed PIR lens.
5. All sensor setting adjustments shall be digital and made using a push-buttons, dip switches, or analog dials. Sensors which require the use of tools of any kind shall not be accepted.
6. The installing contractor shall be responsible for a complete and functional system in accordance with all applicable local and national codes.

#### C. Contractor responsibilities:

1. Furnish, coordinate, receive, mount, connect, and place into operation all equipment.
2. Furnish all conduit, wire, connectors, hardware, and other incidental items necessary for the complete and properly functioning lighting control system as described herein and shown on the plans.

### 1.2 CODE AND STANDARD COMPLIANCE

- #### A.
- All electrical work shall be in accordance with the codes and agencies listed in the contract documents.

### 1.3 LISTING REQUIREMENTS

- A. All applicable products must be UL / CUL Listed.

### 1.4 SUBMITTAL REQUIREMENTS

- A. Request for substitutions:
  - 1. Refer to the "Basic Materials and Methods" specification for details and requirements.
- B. Product Submittals and shop drawings:
  - 1. Refer to the "Basic Materials and Methods" specification for details and requirements.
- C. As-Built drawings:
  - 1. Refer to the "Basic Materials and Methods" specification for details and requirements.

### 1.5 BASIS OF DESIGN

- A. The basis of design is interior products manufactured by Sensor Switch and exterior products manufactured by Wattstopper as listed elsewhere in this specification. It shall be the responsibility of the electrical contractor to verify the requirements of any approved alternate manufacturer's equipment prior to ordering materials. Modifications to any electrical system required for equipment which differs from the basis of design shall be the responsibility of the electrical contractor. In no case shall substitution of equipment result in additional costs to the owner.

### 1.6 COORDINATION WITH OTHER TRADES

- A. The electrical contractor shall review the proposed locations of all equipment in this specification with other trades prior to rough in. Conflicts with the work of other trades which require relocation of any equipment in this specification shall be approved by the Engineer of Record.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Approved manufacturers:
  - 1. Sensor Switch, Inc.
  - 2. Leviton
  - 3. Wattstopper
  - 4. Hubble Building Automation

## 2.2 WALL SWITCH OCCUPANCY SENSORS

- A. Sensor shall provide wall-to-wall PIR detection such that small hand motions are detected out to 20 ft (6.10 m).
- B. Sensors that utilize dual technology detection shall be used (as specified in above section, Occupancy Sensor Technology Requirements).
- C. For applications requiring independent control of two loads, a sensor with two dual relays and dual override switches shall be required. Each relay shall have independent programmable occupancy time delays.
- D. Sensors shall be capable of switching both 120 VAC and 277 VAC and run off of 50/60 Hz power. Load ratings shall be 800 W @ 120 VAC, 1200 W @ 277 VAC, and ¼ HP motor load.
- E. Sensor shall recess into single gang switch box and fit a standard GFI opening.
- F. Sensor shall meet NEC grounding requirements by providing a dedicated ground connection and intrinsically grounding through its mounting strap.
- G. Line and load wire connections shall be interchangeable, such that installer cannot make an improper connection to a line/load in a manner that will cause malfunction or damage to the sensor.
- H. Sensor shall not require a neutral connection regardless of number of poles and/or detection technology.
- I. Sensor shall not allow any leakage of current to pass to the load when sensor is in the unoccupied (off) condition. Sensor shall not require a minimum load to be connected in order to function.
- J. Sensor shall have optional features for photocell/daylight override, vandal resistant lens, low temperature/high humidity operation.
- K. All sensor settings, including time delay and photocell settings shall be digital and accessible for adjustment via a push-button without requiring removal of cover plate or tools of any kind.
- L. Wall Switch sensors shall have field programmable adjustments for selecting operational modes, occupancy time delays, minimum on time, and photocell set-point as applicable.
- M. All models shall be capable of both Auto-On and Manual On operation.
- N. All models shall be capable of a "Reduced Turn On" operation where the initial PIR turn on level is higher in order to eliminate PIR from reflective surfaces from being detected. PIR shall be returned to normal levels upon initial PIR detection.
- O. All models shall have a "Predictive Off" mode where user can manually turn the lights off when leaving the room and still have them come on automatically when they return to space.

- P. All models shall be capable of disabling override switch.
- Q. Occupancy sensor shall be equal to the following Sensor Switch model number. Device color and optional features as specified on individual datasheet.
  - 1. WSD PDT
- R. Vacancy sensor shall be equal to the following Sensor Switch model number. Device color and optional features as specified on individual datasheet.
  - 1. WSX PDT SA

### 2.3 WALL SWITCH OCCUPANCY SENSORS – LARGE AREAS

- A. Sensor shall provide wall-to-wall PIR detection such that small hand motions are detected out to 40 ft (12.19 m).
- B. Sensors that utilize dual technology detection shall be used (as specified in above section, Occupancy Sensor Technology Requirements).
- C. For applications requiring independent control of two loads, a sensor with two dual relays and dual override switches shall be required. Each relay shall have independent programmable occupancy time delays.
- D. Sensors shall be capable of switching both 120 VAC and 277 VAC and run off of 50/60 Hz. A version capable of switching 347 VAC shall also be available. Load ratings shall be 13A each pole, ¼ HP motor load.
- E. Sensor shall meet NEC grounding requirements by providing a dedicated ground connection and intrinsically grounding through its mounting strap.
- F. Line and load wire connections shall be interchangeable, such that installer cannot make an improper connection to a line/load in a manner that will cause malfunction or damage to the sensor.
- G. Sensor shall not require a neutral connection regardless of number of poles and/or detection technology.
- H. Sensor shall not allow any leakage of current to pass to the load when sensor is in the unoccupied (Off) condition. Sensor shall not require a minimum load to be connected in order to function.
- I. Sensor shall be equal to the following Sensor Switch model number. Device color and optional features as specified.
  - 1. LWS(H) PDT

## 2.4 LOW VOLTAGE OCCUPANCY SENSORS

- A. The installing contractor shall install one or more sensors with PIR coverage areas that cover the entire space and all entrance points. Exact placement and quantity required shall be per manufacturer's best practice recommendations.
- B. Sensors that utilize dual technology detection shall be used (as specified in above section, Occupancy Sensor Technology Requirements).
- C. Sensors shall utilize a digital PIR detector (dual element pyro-electric detector) component, so as to provide a high degree of RF immunity.
- D. Sensors shall operate on 12 to 24 VAC or VDC and consume no more than 5 mA so that up to 14 sensors may be connected to a single power pack.
- E. Upon initial power up, sensors must immediately turn on. Power packs may be wired on the line or load side of local switching and must not exhibit any delays when switch is energized.
- F. Each designated zone shall contain one sensor with a SPDT class 2 auxiliary relay, providing an input to building automation system (BAS). All sensors in designated zone shall communicate to sensor with relay for status to BAS. Sensor relay coil shall energize in the unoccupied state to load share the low voltage current from power pack. Note that power pack must be installed on the Line side of the local toggle switch for auxiliary relay to work properly.
- G. Sensors shall have test mode that temporarily shortens/disable all time delays (e.g., minimum on, occupancy, photocell transition, dimming rates) such that an installer can quickly test operation of sensor. Test mode shall time out and return sensor to normal operation should the installer forget to disable test mode after installation.
- H. Sensors shall have optional features for on/off photocell control, automatic dimming control photocell, high/low occupancy based dimming, and usage in low temperature/high humidity environments.
- I. Sensors shall be equal to the following Sensor Switch model numbers.
  - 1. CM PDT 10 (Dual tech, Ceiling Mount, Extended Range)
  - 2. WV PDT 16 (Dual tech, Corner Mount, Wide View) with WV-BR bracket.
  - 3. CM 6 (PIR, Ceiling Mount, High Bay 360°)
- J. Sensors with a recessed profile are acceptable substitutes for above ceiling mount sensors
- K. Fixture mounted box sensors are acceptable substitutes for above ceiling mount sensors

## 2.5 POWER PACKS

- A. Power packs shall accept and switch 120 or 277 VAC, be plenum rated, and provide class 2 power for up to 14 remote sensors.

- B. Power pack shall incorporate a Class 1 relay and an AC electronic switching device. The AC electronic switching device shall make and break the load, while the relay shall carry the current in the on condition. This system shall provide full 20 Amp switching of all load types, and be rated for 400,000 cycles.
- C. Power packs shall be single circuit, or two circuits. Slave packs may be used to control additional circuits. When two circuit power packs, or slave packs are used, the power packs must be wired directly to circuit breaker. Otherwise, power packs may be wired on the line or load side of the local switch.
- D. Power packs shall be equal to the following Sensor Switch model numbers.
  - 1. PP20 (Single Pole)
  - 2. PP20 2P (Two Pole)
  - 3. SP20 (Slave Pack)

## 2.6 LINE VOLTAGE OCCUPANCY SENSORS

- A. Sensors shall be self-contained and accept Class 1 wiring directly without the use of a power pack. The use of bases which accept line voltage and allow the use of low voltage sensors shall be acceptable.
- B. The installing contractor shall install one or more sensors with PIR coverage areas that cover the entire space and all entrance points. Exact placement and quantity required shall be per manufacturer's best practice recommendations.
- C. Sensors that utilize dual technology detection shall be used (as specified in above section, Occupancy Sensor Technology Requirements).
- D. Sensors shall utilize a digital PIR detector (dual element pyro-electric detector) component, so as to provide a high degree of RF immunity.
- E. Line and load wire connections shall be interchangeable, such that installer cannot make an improper connection to a line/load in a manner that will cause malfunction or damage to the sensor.
- F. Multiple sensors controlling the same load shall be wired in parallel.
- G. For applications requiring independent control of two loads, a sensor with two dual relays shall be required. Each relay shall have independent programmable occupancy time delays.
- H. Dual relay sensors shall have an optional operational mode called "Alternating On" where when during unoccupied periods, one relay is always left closed (thus one load is always on). The particular relay that is left closed alternates each cycle so that the aging of the connected lamps is even.
- I. Sensors shall be capable of switching both 120 VAC and 277 VAC and run off of 50/60 Hz power. Load ratings shall be 800 W @ 120 VAC, 1200 W @ 277 VAC, and ¼ HP motor load.

- J. High bay sensors controlling HID Bi-Level must incorporate a "Start to High" timer on initial power up to provide full light output for up to 20 minutes to prevent shortened lamp life.
- K. Sensors shall have test mode that temporarily shortens/disable all time delays (e.g., minimum on, occupancy, photocell transition, dimming rates) such that an installer can quickly test operation of sensor. Test mode shall time out and return sensor to normal operation should the installer forget to disable test mode after installation.
- L. Sensors shall have optional features for on/off photocell control, automatic dimming control photocell, high/low occupancy based dimming, and usage in low temperature/high humidity environments.
- M. Sensors shall be equal to the following Sensor Switch model numbers.
  1. CMR PDT 10 / CMR PDT 10 2P (Extended Range 360°, Dual Technology, Ceiling Mount – Single / Two Pole)
  2. CMRB PDT 10 / CMRB PDT 10 2P (Extended Range 360°, Dual Technology, Fixture Mount Box – Single / Two Pole)
  3. WVR PDT 16 / WVR PDT 2P (Wide View, Dual Technology, Wall Mount – Single / Two Pole) with WV-BR bracket
  4. CMR 6 / CMR 6 2P (High Bay 360°, PIR, Ceiling Mount – Single / Two Pole)
  5. CMRB 6 / CMRB 6 2P (High Bay 360°, PIR, Fixture Mount Box – Single / Two Pole)
- N. Sensors with a recessed profile are acceptable substitutes for above ceiling mount or fixture mount sensors

## 2.7 INDOOR PHOTOCELLS AND DAYLIGHT HARVESTING CONTROLS

- A. Low voltage photocell shall accept 12 to 24 VAC or VDC and provide a SPDT relay for interface with remote switching system. Sensor shall interface with occupancy sensors, directly with power pack, or other system as shown.
- B. Photocell shall provide for an on/off set-point, and a deadband to prevent the artificial light from cycling. Delay shall be incorporated into the photocell to prevent rapid response to passing clouds.
- C. Photocell set-point and deadband shall be automatically calibrated through the sensor's microprocessor by initiating an "Automatic Set-point Programming" procedure. Further adjustment may be made manually if needed.
- D. Deadband setting shall be verified and modified by the sensor automatically every time the lights cycle to accommodate physical changes in the space (i.e., furniture layouts, lamp depreciation, or lamp outages).
- E. Low voltage dimming sensors shall accept 12 to 24 VAC or VDC (from power pack or other low voltage source) and control 0 to 10 VDC dimmable ballasts by sinking up to 20 mA of class 2 current (typically 40 or more ballasts).
- F. Low voltage dimming sensor's set point shall be automatically calibrated through the sensor's microprocessor by initiating the "Automatic Set-point Programming" procedure. Min and max dim settings as well as set-point may be manually entered.

- G. Low voltage dimming sensors shall be equipped with an automatic override for 100 hour burn-in of lamps. This feature must be available at any time for lamp replacements. (Note: This function should be performed prior to any dimming of the lamps including the "auto set-point" setting.)
- H. Combination photocell/dimming sensors shall accept 12 to 24 VAC or VDC (from power pack or other low voltage source) and control the on/off function as well as the dimming function of 0 to 10 VDC dimmable ballasts.
- I. Combination photocell/dimming sensor's set-point and deadband shall be automatically calibrated through the sensor's microprocessor by initiating the "Automatic Set-point Programming" procedure. Min and max dim settings as well as set point may be manually entered.
- J. Combination photocell/dimming sensors shall be equipped with an automatic override for 100 hour burn-in of lamps. This feature must be available at any time for lamp replacements. (Note: This function should be performed prior to any dimming of the lamps including the "auto set-point" setting.)
- K. Dual zone option shall be available for photocell, dimming, or combination units. The second zone shall be controlled as an "offset" from the primary zone and shall be the zone farthest from the natural light source.
- L. Stand alone ambient light sensors (CM ALC version only) shall interface directly with the 0 to 10 VDC, without any other power source connection, and control dimmable ballasts by sinking up to 20 milliamps of class 2 current. Sensor shall incorporate a photodiode viewing out of a ceiling enclosure at a 30 degree angle from horizontal to detect diffused light from the ambient and artificial sources. Sensor shall allow for removal of response delays for adjustment, however provide dampening delay for normal operation. Settings shall be made manually.
- M. Line voltage versions of the above described photocell and combination photocell/dimming sensors shall be capable of switching both 120 VAC and 277 VAC and run off of 50/60 Hz power. Load ratings shall be 800 W @ 120 VAC, 1200 W @ 277 VAC, and ¼ HP motor load.
- N. Line voltage versions of the above described dimming sensors shall be capable of powering off 120/277 VAC.
- O. Line voltage versions of the above described photocell and combination photocell/dimming sensors shall be capable of switching 5 Amps of two phase power (208/240 or 480 VAC) shall be available. These sensors shall always simultaneously switch both phases as per NEC guidelines.
- P. Sensors shall be equal to the following Sensor Switch model numbers.
  - 1. CM PC (Photocell, On/Off, Low Voltage, Ceiling Mount)
  - 2. CM ADC (Dimming Photocell, Low Voltage, Ceiling Mount)
  - 3. CM PC ADC (Combination Photocell/Dimming Sensor, Low Voltage, Ceiling Mount)
  - 4. CM PC DZ, CM ADC DZ, or CM PC ADC DZ (Dual Zone, Low Voltage)
  - 5. CM ALC (Stand Alone Ambient Light Sensor for Daylight Harvesting)
  - 6. CMR PC (Photocell, On/Off, Line Voltage, Ceiling Mount)

7. CMR ADC (Dimming Photocell, Line Voltage, Ceiling Mount)
8. CMR PC ADC (Combination Photocell/Dimming Sensor, Line Voltage, Ceiling Mount)
9. CMR PC DZ, CMR ADC DZ (Dual Zone, Line Voltage)

Q. Sensors with a recessed profile are acceptable substitutes for above ceiling mount or fixture mount sensors

R. Fixture mounted box sensors are acceptable substitutes for above ceiling mount sensors

## 2.8 MOMENTARY SWITCHES FOR VACANCY SENSORS

A. Momentary switches shall be equal to the following Sensor Switch model numbers. Device color and optional features as specified on individual datasheet.

1. SPODM-SA
2. SPODM-SA-3X (Three way)

## 2.9 EXTERIOR MOTION SENSORS

A. Sensor shall be a completely self-contained device capable of detecting presence in the controlled range by detecting changes between infrared energy in motion and the background space.

B. Sensor shall employ dual PIR detectors and a three level Fresnel lens.

C. Pulse Count Processing and Detection Signature Analysis shall be used to examine the frequency, duration, and amplitude of the signal received by the sensor to ensure response only to those signals caused by human motion.

D. Line voltage sensors shall use Zero Crossing circuitry.

E. Sensor shall utilize mixed signal ASIC (application-specific integrated circuit) technology that combines analog and digital processing into one microprocessor.

F. Sensor shall be capable of mounting vertically or horizontally onto a standard outdoor junction box in a variety of locations, such as walls, ceilings, or eaves.

G. Sensor shall cover up to 52.5 feet, with a field of view of 270 degrees.

H. Sensor shall have an operating temperature range of -40°F to +130°F.

I. Sensor shall carry a UL rating of 773A as a rain tight device.

J. Sensor shall be manufactured with precision double-shot tooling and contain internal silicon gaskets.

K. Sensor shall include a built-in light level sensor, adjustable by the user, which will keep lights from turning on during daylight hours.

- L. Sensor shall have user-adjustable time delay settings, including an override ON option that enables controlled lights to be turned on remotely for the length of the time delay.
- M. Sensor shall have an additional single pole, double throw isolated relay with normally open, normally closed, and common outputs rated for 1 Amp at 24 VDC.
- N. Sensor shall operate at either 120 VAC or 277 VAC, 60 Hz.
- O. Sensor shall be compatible with all electronic ballasts and PL lamp ballast systems.
- P. Sensors shall be equal to the following Wattstopper model numbers.
  - 1. EW-200

## 2.10 SPARE PARTS

- A. Electrical contractor shall furnish an additional 2% of each type and number of the designed sensors, power packs, & switches (but not less than one of each type ) to be turned over to the owner, new and unopened at project substantial completion.

## PART 3 - EXECUTION

### 3.1 DELIVERY, STORAGE, AND HANDLING

- A. General: Comply with Product Requirements in other specification sections.
- B. Ordering: Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.
- C. Delivery
  - 1. Deliver materials in manufacturer's original, unopened, undamaged packages with intact identification labels.
  - 2. Deliver to other trades in a timely manner.
- D. Storage and Protection: Store materials away from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.

### 3.2 INSTALLATION

- A. Do not install equipment until the following conditions can be maintained in spaces to receive equipment:
  - 1. Ambient temperature: 0° to 50° C (32° to 122° F).
  - 2. Relative humidity: Maximum 90 percent, non-condensing.
  - 3. Lighting control system must be protected from dust during installation.
- B. Coordinate, receive, mount, connect, and place into operation all equipment.

- C. Install equipment in accordance with manufacturer's installation instructions.
- D. Provide complete installation of system in accordance with Contract Documents.
- E. Maintain performance criteria stated by the manufacturer without defects, damage, or failure.
- F. Provide equipment at locations and in quantities indicated on Drawings. Provide any additional equipment required to provide control intent.
- G. Ensure that daylight sensor placement minimizes sensors view of electric light sources; ceiling mounted and fixture-mounted daylight sensors shall not have direct view of luminaries.
- H. Furnish all conduit, wire, connectors, hardware, and other incidental items necessary for a properly functioning lighting control system as described herein and shown on the plans. The Electrical Contractor shall maintain performance criteria stated by the manufacturer without defects, damage, or failure.
- I. Compliance: Contractor shall comply with manufacturer's product data, including shop drawings, technical bulletins, product catalog installation instructions, and product carton instructions for installation.
- J. Cable runs are continuous between connected devices, no splicing allowed.
- K. All class 2 low voltage and network wiring shall be run separate from line voltage wiring and in its own metallic conduit per NEC and best practices.
- L. Power: The contractor shall test that all branch load circuits are operational before connecting loads to sensor system load terminals, and then de-energize all circuits before installation.
- M. Initial Settings:
  - 1. Contractor is responsible for proper sensitivity and time delay settings. Occupancy sensors shall be configured for 16 min delay in all spaces except group toilets which shall be configured for 32 min delay.
  - 2. Auto sensitivity and auto adaptation features shall be enabled on all sensors
- N. In spaces with only one occupancy sensor. The sensor shall operate on line voltage or be furnished with line voltage power bases. Spaces which are shown to have multiple circuits or multiple sensors shall utilize power packs.
- O. Emergency lights utilizing battery packs shall be provided with unswitched hot conductor for charging of the batteries. Power to battery packs shall not be switched by the occupancy sensor.
- P. Electrical contractor shall furnish 3 spare sensors and power bases to owner to serve as spares.
- Q. All sensor locations on the drawings are approximate. Refer to manufacturer's installation instructions prior to installation.

- R. Sensors shall be located a minimum of six (6) feet from hvac supply/return vents.
- S. Sensors mounted over doorways shall be placed one (1) foot inside threshold.
- T. Occupancy sensor power packs shall be furnished and mounted in two (2) dedicated two gang surface boxes above the lay in ceiling directly over the wall switch for the room. Furnish and install a blank cover plate for these boxes with a phenolic label which states "Occupancy Sensor Power Pack". Electrical contractor shall furnish and install phenolic label on ceiling grid directly below power pack location which states "power pack". The contractor is responsible for field verification of required number of power packs:
  - 1. One power pack is required for each controlled circuit.
  - 2. Each power pack can supply up to 150ma. Refer to installation guide for maximum number of sensors connected to power pack.
  - 3. If multiple circuits are to be controlled by a single sensor, auxiliary relays shall be used in conjunction with a power pack.

### 3.3 TESTING AND COMMISSIONING

- A. Upon completion of all line, load and interconnection wiring, and after all fixtures are installed and lamped, a qualified factory representative shall completely check the installation prior to energizing the system. Each installed occupancy sensor shall be tested in the test mode to see that lights turn off and on based on occupancy.
- B. Upon installation of all furnishings, a qualified manufacturer's representative shall adjust the sensors sensitivity and install masking devices as necessary to prevent motion in adjacent spaces from turning on the controlled lights. Sensitivity shall be set to the maximum setting which does not result in falsely triggering the sensor. Manufacturer's representative shall provide written test report of sensor location, and final settings to the engineer for review and include in the O&M manual.

### 3.4 WARRANTY

- A. Sensors, power packs and other components shall have a 5 year warranty.

### 3.5 TRAINING

- A. At the time of checkout and testing, the owner's representative shall be thoroughly instructed in the proper operation of the system.

END OF SECTION 260923

## SECTION 262726 - SWITCHES

### PART 1 - GENERAL

#### 1.01 SWITCHES

- A. Furnish and install white switches for lighting as shown on the Drawings.
- B. Switches shall operate quietly in any position. Mechanisms shall be the mechanical type, containing no fluids, and shall be suitable of control of both incandescent, fluorescent, LED lighting loads, as well as motor and appliance loads up to 85% of rated switch capacity.
- C. Terminals shall be screw type with terminals arranged for back or side wiring.
- D. Switches shall be rated 20 amps and for 120 or 277 volt circuits.

#### 1.02 PLATES

- A. Plates for switches shall be the same manufacturer as switch and shall be oversized stainless steel, unless indicated otherwise on the Drawings.
- B. Weatherproof exterior covers shall be cast equal to Legrand #CA1GL series.
- C. Plates for exhaust fans shall have phenolic label with text: "EXHAUST FAN"
- D. Plates for hot water circulation pumps shall have phenolic label with text: "CIRC PUMP"
- E. Plates for motorized backboards shall have phenolic label with text: "BACKBOARD"
- F. Plates for motorized projection screens shall have phenolic label with text: "SCREEN"
- G. Plates for Key operated switches shall be equal to P & S style #302
- H. Plates for narrow applications such as in or on metal frames of storefront and curtain wall glass assemblies shall be Equal to Pass and Seymour #SSN11

### PART 2 - PRODUCTS

#### 2.01 SWITCHES

- A. Approved switch manufacturers are as follows:
  - 1. Hubbell/Bryant
  - 2. Eaton/Cooper/Eagle/Arrow Hart
  - 3. P & S / Legrand
  - 4. Leviton
  - 5. Other by prior approval
- B. Switches shall be selected from the make and models listed in the chart below.

Other makes or models shall be substituted only by prior approval obtained per the substitution policies outlined elsewhere in these specifications.

SYMBOL	SWITCH CHARACTERISTICS	HUBBLE/ BRYANT	COOPER/ EAGLE / EATON	P&S/ LEGRAND	LEVITON
	SINGLE POLE SWITCH	1221x	1221x	CSB20AC1x	1221-Sx
3	3 WAY SWITCH	1223x	1223x	CSB20AC3x	1223-Sx
4	4 WAY SWITCH	1224x	1224x	CSB20AC4x	1224-Sx
2	DOUBLE POLE SWITCH	1222x	1222x	CSB20AC2x	1222-Sx
K	KEYED SWITCH			20ACx-KL	
D	INCANDESCANT DIMMER. 1500W	AS153		CD1600	
D1	INCANDESCANT DIMMER. 2000W	AS203		CD2003	
FD	FLOURESCENT DIMMER, MARK X		SF8AP7	ADFE277-10A	IPX12
D10	0-10V DIMMER		SF10P	CD4FBL	AWSMT-7DW
EP	EXPLOSION PROOF	FXS-41C	EDSx2129/30/40		
P	PILOT LIGHT SWITCH (Illuminated on)	HBL1221/3/ILx	AH1221/3/4LT	PS20AC1/3-CPL	1221-PLC
CF	CEILING FAN		SFS5P	ADFC-6A	6627-PW
M	MOMENTARY	HBL1556		1251	1256

2.02 EMERGENCY STOP BUTTONS / SHUNT TRIP BUTTONS

- A. Emergency stop and Shunt trip buttons shall be mushroom head, maintained push / pull operation equal to GE #CR104PBM01R5A with Ring guard (GE # CR104PXG14) and Emergency Stop nameplate.

2.03 SWITCH BYPASS DEVICES

- A. Switch bypass devices shall be equal to LC&D #GR2001 emergency shunt relay

2.04 ROTARY TIMERS

- A. Rotary time switch shall be rated 10 amps, 4 hours, no hold equal to Intermatic FF4H

PART 3 - EXECUTION:

3.01 IDENTIFICATION:

- A. The panel and circuit number(s) supplying each switch shall be indicated with permanent markings on the inside of each cover plate.

3.02. DEVICES:

- A. Branch circuit wiring shall be long enough to allow removal of the switch 2" beyond the face of the wall surface without disconnection of conductors.
- B. Use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.
- C. Use a torque screwdriver when a torque is recommended or required by the manufacturer.

- D. When conductors larger than No. 12 AWG are installed, splice No. 12 AWG pigtails for device connections.
- E. Tighten unused terminal screws on the device.
- F. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.

3.03. LOCATION:

- A. Verify locations in relation to door swings, and place devices on the strike side.
- B. Gang plates where two or more similar devices occur at the same location.

3.04. MOUNTING:

- A. Switches shall be installed flush and level with the wall surface. Oversize gaps which are visible around the exterior of the cover plate shall be sealed and painted to match adjacent surfaces.
- B. Switches shall be installed so that top of box is 48" above finished floor unless otherwise indicated.

3.05 EMERGENCY STOP BUTTONS / SHUNT TRIP BUTTONS

- A. Emergency stop and Shunt trip buttons shall be installed in Nema enclosure appropriate for the location shown on the plans with additional labels as detailed on the electrical drawings.
- B. Exterior shunt trip buttons shall be installed in stainless steel weather proof enclosure with lockable cover.

END OF SECTION 262726

## SECTION 265100 - LIGHTING FIXTURES

### PART 1 - GENERAL

#### 1.1 SCOPE OF WORK:

- A. Electrical Contractor shall furnish all luminaries, lighting equipment and components shown on the Plans, listed in the fixture schedule, and specified herein. He shall furnish all labor and materials required to install specified equipment in the manner indicated. All luminaries and lighting equipment shall be delivered to the building complete with suspension accessories, canopies, hickeys, casings, sockets, holders, reflectors, ballasts, diffusing material, louvers, plaster frames, recessing boxes, etc., all wired and assembled as indicated.

#### 1.2 LISTING REQUIREMENTS:

- A. All fixtures shall be listed for the installed location shown of the plans.

#### 1.3 SUBMITTAL REQUIREMENTS:

##### A. Request for Substitutions:

- 1. Refer to the "Basic Materials and Methods" specification for details and requirements.

##### B. Product Submittals and shop drawings:

- 1. Refer to the "Basic Materials and Methods" specification for details and requirements.
- 2. All lamps and ballasts require performance documentation to be submitted which shows the combined system performance.

##### C. As-Built Drawings:

- 1. Refer to the "Basic Materials and Methods" specification for details and requirements.

#### 1.4 BASIS OF DESIGN:

- A. The basis of design of fluorescent lamps and ballasts is OSRAM-Sylvania. Products with identical features and performance which are manufactured by Philips or GE are acceptable.
- B. LED lamps and drivers shall be energy efficient and shall be suitable for interior and exterior installations as scheduled. They shall be compatible with the designed lighting controls.

1.5 OPERATIONS AND MAINTENANCE REQUIREMENTS:

- A. Refer to the "General Completion, Electrical" specification for details and requirements.

PART 2 – PRODUCTS

2.1 MANUFACTURERS:

- A. Refer to the light fixture symbol schedule on the drawings.
- B. Fixtures of other manufacturers may be acceptable provided they offer equal or superior performance and quality and are approved for substitution. Contractors seeking substitutions shall be in a position to furnish samples of both specified and alternate equipment for comparison, if required.

2.2 STANDARD FEATURES:

- A. Luminaries shall be wired as per the National Electrical Code. No splice or tap shall be located within arm, stem, or chain. Wire shall be continuous from splice in outlet box of the building wiring system to lamp socket or ballast terminals. All fluorescent ballasts, as indicated, shall be of the high-power-factor Class P Type and their design and construction shall conform to Certified Ballast Manufacturer's Standards. Provide regulating, HPF ballasts in H.I.D. lighting fixtures.
- B. Catalog numbers given are not necessarily total fixture specification. The general description, type and number of lamps, and pertinent details are to be considered in determining the appearance, performance and quality intended. Any major discrepancies in any particular fixture specification should be reported to the Architect prior to submitting a proposal.
- C. Exterior light poles shall be furnished with hand hold covers and mounting bolt covers secured with stainless-steel tamper-proof fasteners.

2.3 LAMPS:

- A. Lamps shall be furnished and installed by the electrical contractor for all fixtures throughout the project, whether or not furnished by the manufacturer.

2.4 ADDITIONAL FIXTURES:

- A. If indicated elsewhere on the drawings, additional fixtures shall be furnished in the quantities listed below, and installed in locations as directed by the engineer. Fixtures not installed shall be given to the owner for use as spares. Additional fixtures shall match those installed in every way.
  - 1. Emergency lights – 2% of the number of fixtures shown on the lighting plans.

2. Exit Signs – 2% of the number of fixtures shown on the lighting plans.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. For installations in which occupancy sensors are specified, the following shall apply.
  1. Upon completion of the installation, the system shall be completely commissioned by the manufacturer's factory authorized technician who will verify all adjustments and sensor placement to ensure a trouble-free occupancy-based lighting control system. Labor and materials necessary to adjust the sensor locations shall be by the electrical contractor.
  2. The commissioning shall be scheduled prior to occupancy but after mechanical units are in operation and, whenever possible, after furniture has been installed. The electrical contractor shall provide both the manufacturer and the electrical engineer with ten working days written notice of the desired commissioning date.
  3. At the time of the system commissioning, the factory authorized technician shall provide the proper training to the owner's personnel in the adjustment and maintenance of the sensors.
- B. Connect recessed lighting fixtures to outlet boxes by means of a 6 foot piece of flexible metal conduit, 1/2 inches minimum. Branch circuit shall be routed to tap box above fixture with flexible metal conduit down to fixture. Routing from fixture end to fixture end will not be accepted. Boxes above fixtures shall be no more than 24" above the fixture. Whips shall not be resting on the ceiling tiles or ceiling grid. Support wires used to keep whips off the grid or tiles shall be orange in color.
- C. Light fixtures shall be supported independently from building structure. Fixtures shall not utilize ceiling system for support. Provide four (4) hanger wire supports per lay in fixture. Contractor may use chain or 9 gauge galvanized hanger wire.
- D. Electrical contractor shall clean all light fixture lenses and replace any spent lamps prior to substantial completion. Labor and materials shall be the responsibility of the electrical contractor.
- E. Where wall mounted emergency lights are used, the electrical contractor shall furnish and install phenolic label on each emergency light. The label shall have a unique number to identify the emergency light to facilitate maintenance record keeping.
- F. Electrical contractor shall grout under exterior light poles after leveling.
- G. Surface mounted fixtures weighing less than 10 lbs in spaces with suspended acoustical ceilings shall have a junction box installed by the electrical contractor. The junction box shall be recessed flush with the bottom of the ceiling plane and

supported by a Caddy 512 hanger with seismic support wire to the structure above. Other support means shall be permitted if submitted in accordance with specification 260548.

- H. Surface mounted fixtures weighing less than 10 lbs and pendant fixtures in spaces with suspended acoustical ceilings shall have a junction box installed by the electrical contractor. The junction box shall be recessed flush with the bottom of the ceiling plane and supported by all tread rods from the structure above. Other support means shall be permitted if submitted in accordance with specification 260548.

### 3.2 LABELING

- A. Electrical contractor shall furnish and install unique numeric label on each wall mounted emergency light unit to facilitate maintenance and record keeping of the unit. Labels shall be phenolic and comply with the nameplate requirements of the general completion specifications.

### 3.3 WARRANTY:

- A. All fixtures and ballasts shall be warranted for 1 year from the date of substantial completion. During this period, the electrical contractor shall furnish labor and materials necessary to replace failed fixtures.
- B. All lamps with a published average rated life in excess of 10,000 hours shall be included in the warranty requirements of section 3.02 A.

END OF SECTION 265100

