

# PROJECT SPECIFICATIONS

Appleton International Airport  
Concourse Basement Remodel  
Greenville, Wisconsin



May 30, 2024

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### SECTION 011000 - SUMMARY

#### PART 1 - GENERAL

##### 1.1 SUMMARY

###### A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Contractor's use of site and premises.
4. Coordination with occupants.
5. Work restrictions.
6. Specification and Drawing conventions.

###### B. Related Requirements:

1. Section 015000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

##### 1.2 PROJECT INFORMATION

###### A. Project Identification: ATW Concourse Basement Remodel, 3000051-18PSE.

1. Project Location: W6390 Challenger Drive, Appleton, WI.

###### B. Owner: Appleton International Airport and Outagamie County.

1. Owner's Representatives:
  - a. Scott Volberding, Airport Director of Operations, 920-832-5176 (office)
  - b. Luke Bettis, Airport Landside Supervisor, 920-585-5971 (cell)

###### C. Project/Construction Manager: Westwood Professional Services, Inc.

1. Representative: Cari Bodoh, PE, 920-830-6130 (office), 920-252-1805 (cell), [cari.bodoh@westwoodps.com](mailto:cari.bodoh@westwoodps.com).

###### D. Architect: RMA Architects.

1. Architect's Representative: Timothy Maertz, AIA, 920-450-3149, [tmaertz@rmaarchitectsinc.com](mailto:tmaertz@rmaarchitectsinc.com).

###### E. Design Consultants: the following design professionals, who have prepared designated portions of the Contract Documents:

1. Electrical, Communications, Security: Powrtek Engineering, Inc.
  - a. Representative: Greg Sadowski, PE, 262-827-9575, [gregs@powrtek.com](mailto:gregs@powrtek.com)

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2. Mechanical: MSA Professional Services, Inc.
  - a. Timothy Wendt, PE, 608-242-6616, twendt@msa-ps.com

- F. Web-Based Project Software: Project software will be used for purposes of managing communication and documents during the construction stage.
  1. See Section 013100 "Project Management and Coordination." for requirements for using web-based Project software.

### 1.3 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of Project is defined by the Contract Documents and consists of the following:
  1. Remodel of two existing rooms in the basement of the concourse including construction of new stud walls, electrical, data, replacement of the existing HVAC supply duct to the rooms on the north side of the corridor, and other Work indicated in the Contract Documents.
- B. Type of Contract:
  1. Project will be constructed under a single prime contract.

### 1.4 CONTRACTOR'S USE OF SITE AND PREMISES

- A. Limits on Use of Site: Limit use of Project site to Work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
  1. Driveways, Walkways, and Entrances: Keep driveways loading areas, and entrances serving premises clear and available to Owner, Owner's employees, airport patrons, and emergency vehicles at all times. Do not use these areas for parking or for storage of materials.
- B. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.
- C. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout construction period. Repair damage caused by construction operations.

### 1.5 COORDINATION WITH OCCUPANTS

- A. Full Owner Occupancy: Owner will occupy site and existing adjacent areas 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 Owner's day-to-day operations. Maintain existing exits unless otherwise indicated.
- B. Owner Limited Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to

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Substantial Completion of the Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.

### 1.6 WORK RESTRICTIONS

- A. Comply with restrictions on construction operations.
  - 1. Comply with limitations on use of public streets, work on public streets, rights of way, and other requirements of authorities having jurisdiction.
- B. On-Site Work Hours: Coordinate work hours with ATW, especially during replacement of the ductwork and enlarging the existing holes through the concrete walls, unless otherwise indicated.
- C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:
  - 1. Notify Construction Manager and Owner not less than 72-hours in advance of proposed utility interruptions.
  - 2. Obtain Owner's written permission before proceeding with utility interruptions.
- D. Noise, Vibration, Dust, and Odors: Coordinate operations that may result in high levels of noise and vibration, dust, odors, or other disruption to Owner occupancy with Owner.
  - 1. Notify Construction Manager and Owner not less than 72-hours in advance of proposed disruptive operations.
  - 2. Obtain Owner's written permission before proceeding with disruptive operations.
- E. Smoking and Controlled Substance Restrictions: Use of tobacco products, alcoholic beverages, and other controlled substances on Owner's property is not permitted.
- F. Employee Identification: Provide identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times.
- G. Employee Screening: Comply with Owner's requirements for drug and background screening of Contractor personnel working on Project site.
  - 1. Maintain list of approved screened personnel with Owner's representative.

### 1.7 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
  - 1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

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2. Text Color: Text used in the Specifications, including units of measure, manufacturer and product names, and other text may appear in multiple colors or underlined as part of a hyperlink; no emphasis is implied by text with these characteristics.
  3. Hypertext: Text used in the Specifications may contain hyperlinks. Hyperlinks may allow for access to linked information that is not residing in the Specifications. Unless otherwise indicated, linked information is not part of the Contract Documents.
  4. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 00 Contracting Requirements: General provisions of the Contract, including General and Supplementary Conditions, apply to all Sections of the Specifications.
- C. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

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### SECTION 012300 - ALTERNATES

#### PART 1 - GENERAL

##### 1.1 SUMMARY

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

##### 1.2 DEFINITIONS

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

##### 1.3 PROCEDURES

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

#### PART 2 - PRODUCTS (Not Used)

#### PART 3 - EXECUTION

##### 3.1 SCHEDULE OF ALTERNATES

- A. Alternate No. 1: Room 92 Ceiling.

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1. Base Bid: the precast ceiling will remain exposed, and lights will be hanging fixtures. HVAC ductwork will be exposed. Owner will paint the underside of the precast plank ceiling. Review and modify existing fire suppression system to meet code for occupied space and to miss new lights.
  2. Alternate: provide and install acoustic ceiling tile and grid. Install lights and mechanical as shown on plans. Modify existing fire protection to extend through new ceiling.
- B. Alternate No. 2: Room 91 Build-Out.
1. Base Bid: No work in Room 91.
  2. Alternate: Build-out the existing storage room 91 for office space including wall studs, gypsum, taping/finishes leaving the existing precast plank ceiling exposed. Provide and install electrical, data, mechanical, and review existing fire suppression system. Owner will provide and install the carpet tile, vinyl base, and paint.
- C. Alternate No. 3: Room 91 Ceiling.
1. Base Bid: the precast ceiling will remain exposed, and lights will be hanging fixtures. HVAC ductwork will be exposed. Owner will paint the underside of the precast plank ceiling. Review and modify existing fire suppression system to meet code for occupied space and to miss new lights.
  2. Alternate: provide and install acoustic ceiling tile and grid. Install lights and mechanical as shown on plans. Modify existing fire protection to extend through new ceiling.

END OF SECTION 012300

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
  - 1. Administrative and procedural requirements for submittals.

1.2 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Construction Manager's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
- B. Informational Submittals: Written and graphic information and physical samples that do not require Construction Manager's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

1.3 SUBMITTAL FORMATS

- A. Submittal Information: Include the following information in each submittal:
  - 1. Project name.
  - 2. Date.
  - 3. Name of Architect.
  - 4. Name of Construction Manager.
  - 5. Name of Contractor.
  - 6. Name of firm or entity that prepared submittal.
  - 7. Names of subcontractor, manufacturer, and supplier.
  - 8. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier; and alphanumeric suffix for resubmittals.
  - 9. Category and type of submittal.
  - 10. Submittal purpose and description.
  - 11. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
  - 12. Drawing number and detail references, as appropriate.
  - 13. Indication of full or partial submittal.
  - 14. Location(s) where product is to be installed, as appropriate.
  - 15. Other necessary identification.
  - 16. Remarks.
  - 17. Signature of transmitter.
- B. Options: Identify options requiring selection by Architect.

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- C. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by Construction Manager on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.
- D. Paper Submittals:
  - 1. Place a permanent label or title block on each submittal item for identification; include name of firm or entity that prepared submittal.
  - 2. Transmittal for Submittals: Assemble each submittal individually and appropriately for transmittal and handling.
    - a. Provide a space on transmittal with samples to record Contractor's review and approval markings and action taken by Construction Manager.
- E. Electronic Submittals: Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number.
- F. Submittals for Utilizing Web-Based Project Management Software: Prepare submittals as PDF files, or other format indicated by Project management software.

### 1.4 SUBMITTAL PROCEDURES

- A. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
  - 1. Email: Prepare submittals as PDF package and transmit to Construction Manager by sending via email. Include PDF transmittal form. Include information in email subject line.
  - 2. Web-Based Project Management Software: Prepare submittals in PDF form, and upload to web-based Project management software website. Enter required data in web-based software site to fully identify submittal.
  - 3. Paper: Prepare submittals in paper form and deliver to Construction Manager.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
  - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
  - 2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
  - 3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
- C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Construction Manager's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

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1. Initial Review: Allow 7 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Construction Manager will advise Contractor when a submittal being processed must be delayed for coordination.
  2. Resubmittal Review: Allow 7 days for review of each resubmittal.
- D. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
- E. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- F. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Construction Manager's action stamp.

### 1.5 SUBMITTAL REQUIREMENTS

- A. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard published data are unsuitable for use, submit as Shop Drawings, not as Product Data.
  2. Mark each copy of each submittal to show which products and options are applicable.
  3. Include the following information, as applicable:
    - a. Manufacturer's catalog cuts.
    - b. Manufacturer's product specifications.
    - c. Standard color charts.
    - d. Statement of compliance with specified referenced standards.
    - e. Testing by recognized testing agency.
    - f. Application of testing agency labels and seals.
    - g. Notation of coordination requirements.
    - h. Availability and delivery time information.
  4. For equipment, include the following in addition to the above, as applicable:
    - a. Wiring diagrams that show factory-installed wiring.
    - b. Printed performance curves.
    - c. Operational range diagrams.
    - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
  5. Submit Product Data before Shop Drawings, and before or concurrent with Samples.
- B. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data unless submittal based on Architect's digital data drawing files is otherwise permitted.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

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- a. Identification of products.
  - b. Schedules.
  - c. Compliance with specified standards.
  - d. Notation of coordination requirements.
  - e. Notation of dimensions established by field measurement.
  - f. Relationship and attachment to adjoining construction clearly indicated.
  - g. Seal and signature of professional engineer if specified.
- C. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other materials.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
  2. Identification: Permanently attach label on unexposed side of Samples that includes the following:
    - a. Project name and submittal number.
    - b. Generic description of Sample.
    - c. Product name and name of manufacturer.
    - d. Sample source.
    - e. Number and title of applicable Specification Section.
    - f. Specification paragraph number and generic name of each item.
  3. Email Transmittal: Provide PDF transmittal. Include digital image file illustrating Sample characteristics, and identification information for record.
  4. Web-Based Project Management Software: Prepare submittals in PDF form, and upload to web-based Project software website. Enter required data in web-based software site to fully identify submittal.
  5. Paper Transmittal: Include paper transmittal including complete submittal information indicated.
  6. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
    - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
  7. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
    - a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect, through Construction Manager, will return submittal with options selected.
  8. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or

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containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

- a. Number of Samples: Submit two sets of Samples. Samples will be retained by Construction Manager.
  - 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
  - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.
- D. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location.
- E. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
- F. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.
- G. Certificates:
  1. Certificates and Certifications Submittals: Submit a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity. Provide a notarized signature where indicated.
  2. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
  3. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
  4. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
  5. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.
- H. Test and Research Reports:
  1. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for substrate preparation and primers required.

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2. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
3. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
4. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
5. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
6. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
  - a. Name of evaluation organization.
  - b. Date of evaluation.
  - c. Time period when report is in effect.
  - d. Product and manufacturers' names.
  - e. Description of product.
  - f. Test procedures and results.
  - g. Limitations of use.

### 1.6 DELEGATED DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
  1. If criteria indicated are insufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF file of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
  1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

### 1.7 CONTRACTOR'S REVIEW

- A. Action Submittals and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents.

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Note corrections and field dimensions. Mark with approval stamp before submitting to Construction Manager.

- B. Contractor's Approval: Indicate Contractor's approval for each submittal with a uniform approval stamp. Include name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.
  - 1. Construction Manager will not review submittals received from Contractor that do not have Contractor's review and approval.

### 1.8 ARCHITECT'S AND CONSTRUCTION MANAGER'S REVIEW

- A. Action Submittals: Architect and Construction Manager will review each submittal, indicate corrections or revisions required, and return it.
  - 1. PDF Submittals: Architect and Construction Manager will indicate, via markup on each submittal, the appropriate action.
  - 2. Paper Submittals: Architect and Construction Manager will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.
  - 3. Submittals by Web-Based Project Management Software: Construction Manager will indicate, on Project management software website, the appropriate action.
- B. Informational Submittals: Architect and Construction Manager will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect and Construction Manager will forward each submittal to appropriate party.
- C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect and Construction Manager.
- D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- E. Construction Manager will return without review submittals received from sources other than Contractor.
- F. Submittals not required by the Contract Documents will be returned by Architect without action.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013300

SECTION 013516 - ALTERATION PROJECT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes special procedures for alteration work.

1.2 DEFINITIONS

- A. Alteration Work: This term includes remodeling, renovation, repair, and maintenance work performed within existing spaces or on existing surfaces as part of the Project.
- B. Consolidate: To strengthen loose or deteriorated materials in place.
- C. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.
- D. Match: To blend with adjacent construction and manifest no apparent difference in material type, species, cut, form, detail, color, grain, texture, or finish; as approved by Architect.
- E. Refinish: To remove existing finishes to base material and apply new finish to match original, or as otherwise indicated.
- F. Repair: To correct damage and defects, retaining existing materials, features, and finishes. This includes patching, piecing-in, splicing, consolidating, or otherwise reinforcing or upgrading materials.
- G. Replace: To remove, duplicate, and reinstall entire item with new material. The original item is the pattern for creating duplicates unless otherwise indicated.
- H. Replicate: To reproduce in exact detail, materials, and finish unless otherwise indicated.
- I. Reproduce: To fabricate a new item, accurate in detail to the original, and from either the same or a similar material as the original, unless otherwise indicated.
- J. Retain: To keep an element or detail secure and intact.
- K. Strip: To remove existing finish down to base material unless otherwise indicated.

1.3 PROJECT MEETINGS FOR ALTERATION WORK

- A. Preliminary Conference for Alteration Work: Before starting alteration work, Construction Manager will conduct conference at airport.

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1. Attendees: In addition to representatives of Owner, Construction Manager, Architect, and Contractor, testing service representative, and chemical-cleaner manufacturer(s) shall be represented at the meeting.
2. Agenda: Discuss items of significance that could affect progress of alteration work, including review of the following:
  - a. Fire-prevention plan.
  - b. Governing regulations.
  - c. Areas where existing construction is to remain and the required protection.
  - d. Hauling routes.
  - e. Sequence of alteration work operations.
  - f. Storage, protection, and accounting for salvaged and specially fabricated items.
  - g. Existing conditions, staging, and structural loading limitations of areas where materials are stored.
3. Reporting: Construction Manager will record conference results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from conference.

B. Coordination Meetings: Conduct coordination meetings specifically for alteration work at weekly intervals. Coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.

1. Agenda: Review and correct or approve minutes of previous coordination meeting. Review other items of significance that could affect progress of alteration work. Include topics for discussion as appropriate to status of Project.
2. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

### 1.4 STORAGE AND HANDLING OF SALVAGED MATERIALS

A. Salvaged Materials for Reinstallation:

1. Repair and clean items for reuse as indicated.
2. Pack or crate items after cleaning and repairing; cushion against damage during handling. Label contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment unless otherwise indicated. Provide connections, supports, and miscellaneous materials to make items functional for use indicated.

B. Existing Materials to Remain: Protect construction indicated to remain against damage and soiling from construction work. Where permitted by Architect, items may be dismantled and taken to a suitable, protected storage location during construction work and reinstalled in their original locations after alteration and other construction work in the vicinity is complete.

C. Storage: Catalog and store items within a weathertight enclosure where they are protected from moisture, weather, condensation, and freezing temperatures.

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1. Identify each item for reinstallation with a nonpermanent mark to document its original location. Indicate original locations on plans, elevations, sections, or photographs by annotating the identifying marks.
2. Secure stored materials to protect from theft.
3. Control humidity so that it does not exceed 85 percent. Maintain temperatures 5 deg F or more above the dew point.

### PART 2 - PRODUCTS - (Not Used)

### PART 3 - EXECUTION

#### 3.1 PROTECTION

- A. Protect persons, motor vehicles, surrounding surfaces of building, building site, plants, and surrounding buildings from harm resulting from alteration work.
1. Use only proven protection methods, appropriate to each area and surface being protected.
  2. Provide temporary barricades, barriers, and directional signage to exclude the public from areas where alteration work is being performed.
  3. Erect temporary barriers to form and maintain fire-egress routes.
  4. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during alteration work.
  5. Contain dust and debris generated by alteration work, and prevent it from reaching the public or adjacent surfaces.
  6. Provide shoring, bracing, and supports as necessary. Do not overload structural elements.
  7. Protect floors and other surfaces along hauling routes from damage, wear, and staining.
  8. Provide supplemental sound-control treatment to isolate demolition work from other areas of the building.
- B. Temporary Protection of Materials to Remain:
1. Protect existing materials with temporary protections and construction. Do not remove existing materials unless otherwise indicated.
  2. Do not attach temporary protection to existing surfaces except as indicated as part of the alteration work program.
- C. Comply with each product manufacturer's written instructions for protections and precautions. Protect against adverse effects of products and procedures on people and adjacent materials, components, and vegetation.
- D. Utility and Communications Services:
1. Notify Owner, Architect, authorities having jurisdiction, and entities owning or controlling wires, conduits, pipes, and other services affected by alteration work before commencing operations.
  2. Disconnect and cap pipes and services as required by authorities having jurisdiction, as required for alteration work.
  3. Maintain existing services unless otherwise indicated; keep in service, and protect against damage during operations. Provide temporary services during interruptions to existing utilities.

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- E. Existing Drains: Prior to the start of work in an area, test drainage system to ensure that it is functioning properly. Notify Architect immediately of inadequate drainage or blockage. Do not begin work in an area until the drainage system is functioning properly.
  - 1. Prevent solids such as adhesive or mortar residue or other debris from entering the drainage system. Clean out drains and drain lines that become sluggish or blocked by sand or other materials resulting from alteration work.
  - 2. Protect drains from pollutants. Block drains or filter out sediments, allowing only clean water to pass.

### 3.2 PROTECTION FROM FIRE

- A. General: Follow fire-prevention plan and the following:

- 1. Comply with NFPA 241 requirements unless otherwise indicated.
- 2. Remove and keep area free of combustibles, including rubbish, paper, waste, and chemicals, unless necessary for the immediate work.
  - a. If combustible material cannot be removed, provide fire blankets to cover such materials.

- B. Heat-Generating Equipment and Combustible Materials: Comply with the following procedures while performing work with heat-generating equipment or combustible materials, including welding, torch-cutting, soldering, brazing, removing paint with heat, or other operations where open flames or implements using high heat or combustible solvents and chemicals are anticipated:

- 1. Obtain Owner's approval for operations involving use of welding or other high-heat equipment. Use of open-flame equipment is not permitted. Notify Owner at least 72 hours before each occurrence, indicating location of such work.
- 2. As far as practicable, restrict heat-generating equipment to shop areas or outside the building.
- 3. Do not perform work with heat-generating equipment in or near rooms or in areas where flammable liquids or explosive vapors are present or thought to be present. Use a combustible gas indicator test to ensure that the area is safe.
- 4. Use fireproof baffles to prevent flames, sparks, hot gases, or other high-temperature material from reaching surrounding combustible material.
- 5. Prevent the spread of sparks and particles of hot metal through open windows, doors, holes, and cracks in floors, walls, ceilings, roofs, and other openings.
- 6. Fire Watch: Before working with heat-generating equipment or combustible materials, station personnel to serve as a fire watch at each location where such work is performed. Fire-watch personnel shall have the authority to enforce fire safety. Station fire watch according to NFPA 51B, NFPA 241, and as follows:
  - a. Train each fire watch in the proper operation of fire-control equipment and alarms.
  - b. Prohibit fire-watch personnel from other work that would be a distraction from fire-watch duties.
  - c. Cease work with heat-generating equipment whenever fire-watch personnel are not present.
  - d. Have fire-watch personnel perform final fire-safety inspection each day beginning no sooner than 30 minutes after conclusion of work in each area to detect hidden or smoldering fires and to ensure that proper fire prevention is maintained.

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- C. Fire-Control Devices: Provide and maintain fire extinguishers, fire blankets, and rag buckets for disposal of rags with combustible liquids. Maintain each as suitable for the type of fire risk in each work area. Ensure that nearby personnel and the fire-watch personnel are trained in fire-extinguisher and blanket use.
- D. Sprinklers: Where sprinkler protection exists and is functional, maintain it without interruption while operations are being performed. If operations are performed close to sprinklers, shield them temporarily with guards.
  - 1. Remove temporary guards at the end of work shifts, whenever operations are paused, and when nearby work is complete.

### 3.3 PROTECTION DURING APPLICATION OF CHEMICALS

- A. Protect motor vehicles, surrounding surfaces of building, building site, plants, and surrounding buildings from harm or spillage resulting from applications of chemicals and adhesives.
- B. Cover adjacent surfaces with protective materials that are proven to resist chemicals selected for Project unless chemicals being used will not damage adjacent surfaces as indicated in alteration work program. Use covering materials and masking agents that are waterproof and UV resistant and that will not stain or leave residue on surfaces to which they are applied. Apply protective materials according to manufacturer's written instructions. Do not apply liquid masking agents or adhesives to painted or porous surfaces. When no longer needed, promptly remove protective materials.
- C. Do not apply chemicals during winds of sufficient force to spread them to unprotected surfaces.
- D. Neutralize alkaline and acid wastes and legally dispose of off Owner's property.
- E. Collect and dispose of runoff from chemical operations by legal means and in a manner that prevents soil contamination, soil erosion, undermining of paving and foundations, damage to landscaping, or water penetration into building interior.

### 3.4 GENERAL ALTERATION WORK

- A. Record existing work before each procedure (preconstruction), and record progress during the work. Use digital preconstruction documentation photographs or video recordings.
- B. Perform surveys of Project site as the Work progresses to detect hazards resulting from alterations.
- C. Notify Construction Manager of visible changes in the integrity of material or components whether from environmental causes including biological attack, UV degradation, freezing, or thawing or from structural defects including cracks, movement, or distortion.
  - 1. Do not proceed with the work in question until directed by Construction Manager.

END OF SECTION 013516

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
  - 1. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
  - 2. Requirements for Contractor to provide quality-assurance and quality-control services required by Architect, Owner, Construction Manager, or authorities having jurisdiction are not limited by provisions of this Section.

1.2 DEFINITIONS

- A. Experienced: When used with an entity or individual, "experienced" unless otherwise further described means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.
- B. Field Quality-Control Tests and Inspections: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- C. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, assembly, and similar operations.
  - 1. Use of trade-specific terminology in referring to a Work result does not require that certain construction activities specified apply exclusively to specific trade(s).
- D. Product Tests: Tests and inspections that are performed by a nationally recognized testing laboratory (NRTL) in accordance with 29 CFR 1910.7, by a testing agency accredited in accordance with NIST's National Voluntary Laboratory Accreditation Program (NVLAP), or by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
- E. Source Quality-Control Tests and Inspections: Tests and inspections that are performed at the source; for example, plant, mill, factory, or shop.
- F. Testing Agency: An entity engaged to perform specific tests, inspections, or both. The term "testing laboratory" has the same meaning as the term "testing agency."

1.3 CONFLICTING REQUIREMENTS

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

1.4 INFORMATIONAL SUBMITTALS

- A. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- B. Permits, Licenses, and Certificates: For Owner's record, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents established for compliance with standards and regulations bearing on performance of the Work.

1.5 REPORTS AND DOCUMENTS

- A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
  - 1. Date of issue.
  - 2. Project title and number.
  - 3. Name, address, telephone number, and email address of testing agency.
  - 4. Dates and locations of samples and tests or inspections.
  - 5. Names of individuals making tests and inspections.
  - 6. Description of the Work and test and inspection method.
  - 7. Identification of product and Specification Section.
  - 8. Complete test or inspection data.
  - 9. Test and inspection results and an interpretation of test results.
  - 10. Record of temperature and weather conditions at time of sample taking and testing and inspection.
  - 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
  - 12. Name and signature of laboratory inspector.
  - 13. Recommendations on retesting and reinspecting.

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### 1.6 QUALITY ASSURANCE

- A. Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.
- C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Installer Qualifications: A firm or individual experienced in installing, erecting, applying, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- E. Testing and Inspecting Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspection indicated, as documented in accordance with ASTM E329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.

### 1.7 QUALITY CONTROL

- A. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities, whether specified or not, to verify and document that the Work complies with requirements.
  - 1. Engage a qualified testing agency to perform quality-control services.
  - 2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspection will be performed.
  - 3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
  - 4. Testing and inspection requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
  - 5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- B. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- C. Testing Agency Responsibilities: Cooperate with Architect, Construction Manager, and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

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1. Notify Construction Manager and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
  2. Determine the locations from which test samples will be taken and in which in-situ tests are conducted.
  3. Conduct and interpret tests and inspections and state in each report whether tested and inspected Work complies with or deviates from requirements.
  4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
  5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
  6. Do not perform duties of Contractor.
- D. Contractor's Associated Requirements and Services: Cooperate with agencies and representatives performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
  2. Incidental labor and facilities necessary to facilitate tests and inspections.
  3. Adequate quantities of representative samples of materials that require testing and inspection. Assist agency in obtaining samples.
  4. Facilities for storage and field curing of test samples.
  5. Preliminary design mix proposed for use for material mixes that require control by testing agency.
  6. Security and protection for samples and for testing and inspection equipment at Project site.
- E. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.

### PART 2 - PRODUCTS (Not Used)

### PART 3 - EXECUTION

#### 3.1 TEST AND INSPECTION LOG

- A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
1. Date test or inspection was conducted.
  2. Description of the Work tested or inspected.
  3. Date test or inspection results were transmitted to Architect.
  4. Identification of testing agency or special inspector conducting test or inspection.

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- B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's and Construction Manager's and authorities' having jurisdiction reference during normal working hours.
  - 1. Submit log at Project closeout as part of Project Record Documents.

### 3.2 REPAIR AND PROTECTION

- A. General: On completion of testing, inspection, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
  - 1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 "Execution."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Requirements:
  - 1. Section 011000 "Summary" for work restrictions and limitations on utility interruptions.

1.2 USE CHARGES

- A. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.
- B. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

1.3 INFORMATIONAL SUBMITTALS

- A. Site Utilization Plan: Show temporary facilities, temporary utility lines and connections, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel.
- B. Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, typestyles, graphic elements, and message content.
- C. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.
- D. Moisture- and Mold-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage and mold. Describe delivery, handling, storage, installation, and protection provisions for materials subject to water absorption or water damage.
  - 1. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and requirements for replacing water-damaged Work.
  - 2. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these

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operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.

3. Indicate methods to be used to avoid trapping water in finished work.

### 1.4 QUALITY ASSURANCE

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

### 1.5 PROJECT CONDITIONS

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

## PART 2 - PRODUCTS

### 2.1 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. Air-Filtration Units: Primary and secondary HEPA-filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

## PART 3 - EXECUTION

### 3.1 TEMPORARY FACILITIES, GENERAL

- A. Conservation: Coordinate construction and use of temporary facilities with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

### 3.2 INSTALLATION, GENERAL

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

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- C. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.

### 3.3 SUPPORT FACILITIES INSTALLATION

- A. Parking: Use designated areas of Owner's existing parking areas for construction personnel.
- B. Storage and Staging: Use designated areas of Project site for storage and staging needs.
- C. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
  - 1. Identification Signs: Provide Project identification signs as indicated on Drawings.
  - 2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
    - a. Provide temporary, directional signs for construction personnel and visitors.
  - 3. Maintain and touch up signs so they are legible at all times.
- D. Waste Disposal Facilities: Provide covered waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 017300 "Execution."
- E. Existing Stair Usage: Use of Owner's existing stairs will be permitted, provided stairs are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore stairs to condition existing before initial use.
  - 1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If stairs become damaged, restore damaged areas so no evidence remains of correction work.

### 3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
  - 1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain written permission from adjacent property owner to access property for that purpose.
- B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
- C. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.

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1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.
- D. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner and tenants from fumes and noise.
1. Construct dustproof partitions with gypsum wallboard with joints taped on occupied side, and fire-retardant-treated plywood on construction operations side.
  2. Where fire-resistance-rated temporary partitions are indicated or are required by authorities having jurisdiction, construct partitions according to the rated assemblies.
  3. Provide walk-off mats at each entrance through temporary partition.
- E. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.
1. Prohibit smoking in construction areas. Comply with additional limits on smoking specified in other Sections.
  2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition in accordance with requirements of authorities having jurisdiction.
  3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
  4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

### 3.5 MOISTURE AND MOLD CONTROL

- A. Moisture and Mold Protection: Protect stored materials and installed Work in accordance with Moisture and Mold Protection Plan.
- B. Exposed Construction Period: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:
1. Protect porous materials from water damage.
  2. Protect stored and installed material from flowing or standing water.
  3. Keep porous and organic materials from coming into prolonged contact with concrete.
  4. Remove standing water from decks.
  5. Keep deck openings covered or dammed.
- C. Partially Enclosed Construction Period: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
  2. Keep interior spaces reasonably clean and protected from water damage.
  3. Periodically collect and remove waste containing cellulose or other organic matter.
  4. Discard or replace water-damaged material.

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5. Do not install material that is wet.
  6. Discard and replace stored or installed material that begins to grow mold.
  7. Perform work in a sequence that allows wet materials adequate time to dry before enclosing the material in gypsum board or other interior finishes.
- D. Controlled Construction Period: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
  2. Use temporary or permanent HVAC system to control humidity within ranges specified for installed and stored materials.
  3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.

### 3.6 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
  2. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION 015000

SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work, including, but not limited to, the following:
  - 1. Construction layout.
  - 2. Field engineering.
  - 3. Installation.
  - 4. Cutting and patching.
  - 5. Coordination of Owner's portion of the Work.
  - 6. Progress cleaning.
  - 7. Starting and adjusting.
  - 8. Protection of installed construction.
  - 9. Correction of the Work.
  
- B. Related Requirements:
  - 1. Section 017700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, replacing defective work, and final cleaning.
  - 2. Section 024119 "Selective Demolition" for demolition and removal of selected portions of the building.

1.2 DEFINITIONS

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

1.3 QUALITY ASSURANCE

- A. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
  - 1. Structural Elements: When cutting and patching structural elements, or when encountering the need for cutting and patching of elements whose structural function is not known, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.

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

### PART 2 - PRODUCTS

#### 2.1 MATERIALS

- A. Comply with requirements specified in other Sections.
- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials. Use materials that are not considered hazardous.
- C. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, electrical systems, and other construction affecting the Work.
1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, gas service piping, and water-service piping; underground electrical services; and other utilities.
  2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

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- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
  - 1. Examine roughing-in for electrical systems to verify actual locations of connections before equipment and fixture installation.
  - 2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
  - 3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
  - 1. Description of the Work, including Specification Section number and paragraph, and Drawing sheet number and detail, where applicable.
  - 2. List of detrimental conditions, including substrates.
  - 3. List of unacceptable installation tolerances.
  - 4. Recommended corrections.
- D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

### 3.2 PREPARATION

- A. Existing Utility Information: Furnish information to local utility and Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect through Construction Manager in accordance with requirements in Section 013100 "Project Management and Coordination."

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### 3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks and existing conditions. If discrepancies are discovered, notify Construction Manager promptly.
- B. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.
- C. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

### 3.4 FIELD ENGINEERING

- A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
  - 1. Do not change or relocate existing benchmarks or control points. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Construction Manager before proceeding.
  - 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

### 3.5 INSTALLATION

- A. Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
  - 1. Make vertical work plumb and make horizontal work level.
  - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
  - 3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
  - 4. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces, unless otherwise indicated on Drawings.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure satisfactory results as judged by Architect. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations, so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy of type expected for Project.

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- E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on-site and placement in permanent locations.
- F. Tools and Equipment: Select tools or equipment that minimize production of excessive noise levels.
- G. Templates: Obtain and distribute to the parties involved templates for Work specified to be factory prepared and field installed. Check Shop Drawings of other portions of the Work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions with manufacturer.
  - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
  - 2. Allow for building movement, including thermal expansion and contraction.
  - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- I. Joints: Make joints of uniform width. Where joint locations in exposed Work are not indicated, arrange joints for the best visual effect, as judged by Architect. Fit exposed connections together to form hairline joints.

### 3.6 CUTTING AND PATCHING

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
  - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.
- C. Temporary Support: Provide temporary support of Work to be cut.
- D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching in accordance with requirements in Section 011000 "Summary."

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- F. Existing Utility Services and Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.
- G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
  2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
  3. Concrete: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
  4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
  5. Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
  6. Proceed with patching after construction operations requiring cutting are complete.
- H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as practicable, as judged by Architect. Provide materials and comply with installation requirements specified in other Sections, where applicable.
1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
  2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
    - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
    - b. Restore damaged pipe covering to its original condition.
  3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
    - a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch, corner to corner of wall and edge to edge of ceiling. Provide additional coats until patch blends with adjacent surfaces.
  4. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

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- I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

### 3.7 PROGRESS CLEANING

- A. Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
  - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
  - 2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
  - 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, in accordance with regulations.
    - a. Use containers intended for holding waste materials of type to be stored.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where Work is in progress to the level of cleanliness necessary for proper execution of the Work.
  - 1. Remove liquid spills promptly.
  - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces in accordance with written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls."
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

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- J. Limiting Exposures: Supervise construction operations to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

### 3.8 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

### 3.9 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Protection of Existing Items: Provide protection and ensure that existing items to remain undisturbed by construction are maintained in condition that existed at commencement of the Work.
- C. Comply with manufacturer's written instructions for temperature and relative humidity.

### 3.10 CORRECTION OF THE WORK

- A. Repair or remove and replace damaged, defective, or nonconforming Work. Restore damaged substrates and finishes.
  - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Repair Work previously completed and subsequently damaged during construction period. Repair to like-new condition.
- C. Restore permanent facilities used during construction to their specified condition.
- D. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- E. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

END OF SECTION 017300

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for Contract closeout, including, but not limited to, the following:
  - 1. Substantial Completion procedures.
  - 2. Final Completion procedures.
  - 3. List of incomplete items.
  - 4. Submittal of Project warranties.
  - 5. Final cleaning.
- B. Related Requirements:
  - 1. Section 017839 "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.

1.2 ACTION SUBMITTALS

- A. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

1.3 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.

1.4 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's "punch list"), indicating the value of each item on the list and reasons why the Work is incomplete.
- B. Submittals Prior to Substantial Completion: Complete the following a minimum of 7 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
  - 1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction, permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
  - 2. Submit closeout submittals specified in other Division 01 Sections, including Project Record Documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.

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3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
  4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Construction Manager. Label with manufacturer's name and model number.
  5. Submit testing, adjusting, and balancing records.
  6. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
- C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Advise Owner of pending insurance changeover requirements.
  2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
  3. Complete startup and testing of systems and equipment.
  4. Perform preventive maintenance on equipment used prior to Substantial Completion.
  5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
  6. Advise Owner of changeover in utility services.
  7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
  8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
  9. Complete final cleaning requirements.
  10. Touch up paint and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect and Construction Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

### 1.5 FINAL COMPLETION PROCEDURES

- A. Submittals Prior to Final Completion: Before requesting final inspection for determining Final Completion, complete the following:
1. Submit a final Application for Payment in accordance with Section 012900 "Payment Procedures."
  2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list will state that each item has been completed or otherwise resolved for acceptance.
  3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.

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### 1.6 LIST OF INCOMPLETE ITEMS

- A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
  - 1. Organize list of spaces in sequential order listed by room or space number.
  - 2. Organize items applying to each space by major element, including categories for ceilings, individual walls, floors, equipment, and building systems.
  - 3. Include the following information at the top of each page:
    - a. Project name.
    - b. Date.
    - c. Name of Architect and Construction Manager.
    - d. Name of Contractor.
    - e. Page number.

### 1.7 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where warranties are indicated to commence on dates other than date of Substantial Completion, or when delay in submittal of warranties might limit Owner's rights under warranty.
- B. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
- C. Warranty Electronic File: Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
  - 1. Submit by email to Construction Manager.
- D. Provide additional copies of each warranty to include in operation and maintenance manuals.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

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

## PART 3 - EXECUTION

### 3.1 FINAL CLEANING

- A. Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

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- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
    - a. Clean Project site of rubbish, waste material, litter, and other foreign substances.
    - b. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
    - c. Remove debris and surface dust from limited-access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
    - d. Clean flooring, removing debris, dirt, and staining; clean in accordance with manufacturer's instructions.
    - e. Vacuum and mop concrete.
    - f. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean in accordance with manufacturer's instructions if visible soil or stains remain.
    - g. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
    - h. Remove labels that are not permanent.
    - i. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
    - j. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
    - k. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
    - l. Clean luminaires, lamps, globes, and reflectors to function with full efficiency.
    - m. Clean strainers.
    - n. Leave Project clean and ready for occupancy.
- C. Construction Waste Disposal: Comply with waste-disposal requirements in Section 015000 "Temporary Facilities and Controls."

### 3.2 CORRECTION OF THE WORK

- A. Complete repair and restoration operations required by "Correction of the Work" Article in Section 017300 "Execution" before requesting inspection for determination of Substantial Completion.

END OF SECTION 017700

SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for Project Record Documents, including the following:
  - 1. Record Drawings.
  - 2. Record Product Data.
- B. Related Requirements:
  - 1. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.2 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
  - 1. Number of Copies: Submit one set(s) of marked-up record prints.
  - 2. Number of Copies: Submit copies of Record Drawings as follows:
    - a. Final Submittal:
      - 1) Submit PDF electronic files of scanned record prints.
      - 2) Submit Record Digital Data Files.
      - 3) Construction Manager will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
- B. Record Product Data: Submit annotated PDF electronic files and directories of each submittal.
  - 1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.

1.3 RECORD DRAWINGS

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

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- b. Accurately record information in an acceptable drawing technique.
  - c. Record data as soon as possible after obtaining it.
  - d. Record and check the markup before enclosing concealed installations.
  - e. Cross-reference record prints to corresponding photographic documentation.
2. Content: Types of items requiring marking include, but are not limited to, the following:
- a. Dimensional changes to Drawings.
  - b. Revisions to details shown on Drawings.
  - c. Depths of foundations.
  - d. Locations and depths of underground utilities.
  - e. Revisions to routing of piping and conduits.
  - f. Revisions to electrical circuitry.
  - g. Actual equipment locations.
  - h. Duct size and routing.
  - i. Locations of concealed internal utilities.
  - j. Changes made by Change Order or Construction Change Directive.
  - k. Changes made following Architect's written orders.
  - l. Details not on the original Contract Drawings.
  - m. Field records for variable and concealed conditions.
  - n. Record information on the Work that is shown only schematically.
3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
4. Mark record prints with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Construction Manager. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:
1. Format: Annotated PDF electronic file.
  2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
  3. Refer instances of uncertainty to Architect through Construction Manager for resolution.
  4. Architect will furnish Contractor with one set of digital data files of the Contract Drawings for use in recording information.
- C. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Format: Annotated PDF electronic file.
  2. Identification: As follows:
    - a. Project name.
    - b. Date.
    - c. Designation "PROJECT RECORD DRAWINGS."
    - d. Name of Architect and Construction Manager.
    - e. Name of Contractor.

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### 1.4 RECORD PRODUCT DATA

- A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and revisions to Project Record Documents as they occur; do not wait until end of Project.
- B. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
  - 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
  - 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
  - 3. Note related Change Orders and Record Drawings where applicable.
- C. Format: Submit Record Product Data as annotated PDF electronic file or scanned PDF electronic file(s) of marked-up paper copy of Product Data.
  - 1. Include Record Product Data directory organized by Specification Section number and title, electronically linked to each item of Record Product Data.

### 1.5 MAINTENANCE OF RECORD DOCUMENTS

- A. Maintenance of Record Documents: Store Record Documents in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Construction Manager's reference during normal working hours.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 017839

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### SECTION 024119 - SELECTIVE DEMOLITION

#### PART 1 - GENERAL

##### 1.1 SUMMARY

###### A. The Work of this Section Includes:

1. Demolition and removal of selected portions of exterior or interior of building or structure and site elements.
2. Removal and salvage of existing items for delivery to Owner and removal of existing items for reinstallation.

###### B. Related Requirements:

1. Section 011000 "Summary" for restrictions on use of the premises, Owner-occupancy requirements, and phasing requirements.
2. Section 017300 "Execution" for cutting and patching procedures.
3. Section 013516 "Alteration Project Procedures" for general protection and work procedures for alteration projects.

##### 1.2 MATERIALS OWNERSHIP

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

##### 1.3 PREINSTALLATION MEETINGS

- ###### A. Predemolition Conference: Conduct conference at ATW.

##### 1.4 INFORMATIONAL SUBMITTALS

- ###### A. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and, for noise control. Indicate proposed locations and construction of barriers.
- ###### B. Schedule of selective demolition activities with starting and ending dates for each activity.

##### 1.5 FIELD CONDITIONS

- ###### A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
- ###### B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

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- C. Notify Construction Manager of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- D. Hazardous Materials:
  - 1. It is not expected that hazardous materials will be encountered in the Work.
    - a. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Construction Manager and Owner.
- E. On-site sale of removed items or materials is not permitted.

### 1.6 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials and using approved contractors so as not to void existing warranties.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

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

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
- B. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs or video.
  - 1. Inventory and record the condition of items to be removed for salvage or reinstallation. Photograph or video conditions that might be misconstrued as damage caused by removal.
  - 2. Photograph or video existing conditions of adjoining construction including finish surfaces, that might be misconstrued as damage caused by selective demolition operations or removal of items for salvage or reinstallation.

### 3.2 PREPARATION

- A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

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

### 3.3 UTILITY SERVICES AND BUILDING SYSTEMS

- A. Existing Services/Systems to Remain: Maintain utilities and building systems and equipment to remain and protect against damage during selective demolition operations.
- B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utilities and building systems serving areas to be selectively demolished.
  - 1. Owner will arrange to shut off indicated utilities when requested by Contractor.
  - 2. If disconnection of utilities and building systems will affect adjacent occupied parts of the building, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to those parts of the building.
  - 3. Demolish and remove existing building systems, equipment, and components indicated on Drawings to be removed.
    - a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
    - b. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
    - c. Equipment to Be Removed: Disconnect and cap services and remove equipment and components.
  - 4. Abandon existing building systems, equipment, and components indicated on Drawings to be abandoned in place.
    - a. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
    - b. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.
  - 5. Remove and reinstall/salvage existing building systems, equipment, and components indicated on drawings to be removed and reinstalled or removed and salvaged:
    - a. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment and components; when appropriate, reinstall, reconnect, and make equipment operational.
    - b. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and components and deliver to Owner.

### 3.4 SALVAGE/REINSTALL

- A. Removed and Reinstalled Items:
  - 1. Clean and repair items to functional condition adequate for intended reuse.

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

### 3.5 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
1. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
  2. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
  3. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
  4. Maintain fire watch during and for at least two-hours after flame-cutting operations.
  5. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
- B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

### 3.6 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.
1. Do not allow demolished materials to accumulate on-site.
  2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Burning: Do not burn demolished materials.

### 3.7 CLEANING

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

END OF SECTION 024119

SECTION 051200 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Structural steel.

1.2 DEFINITIONS

- A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in ANSI/AISC 303.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at ATW.

1.4 ACTION SUBMITTALS

A. Product Data:

1. Structural-steel materials.
2. Threaded rods.
3. Shop primer.

- B. Shop Drawings: Show fabrication of structural-steel components.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Comply with applicable provisions of the following specifications and documents:

1. ANSI/AISC 303.
2. ANSI/AISC 360.

- B. Connection Design Information:

1. Option 1: Connection designs have been completed and connections indicated on the Drawings.

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### 2.2 STRUCTURAL-STEEL MATERIALS

- A. Channels, Angles: ASTM A36/A36M.
- B. Plate and Bar: ASTM A36/A36M.
- C. Welding Electrodes: Comply with AWS requirements.

### 2.3 RODS

- A. Unheaded Anchor Rods: ASTM F1554, Grade 36.
  - 1. Configuration: Straight.
  - 2. Finish: Hot-dip zinc coating, ASTM A153/A153M, Class C.
- B. Threaded Rods: ASTM A36/A36M.
  - 1. Finish: Hot-dip zinc coating, ASTM A153/A153M, Class C.

### 2.4 PRIMER

- A. Steel Primer:
  - 1. Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.

### 2.5 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate in accordance with ANSI/AISC 303 and to ANSI/AISC 360.

### 2.6 SHOP PRIMING

- A. Shop prime steel surfaces, except the following:
  - 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
  - 2. Surfaces to be field welded.
  - 3. Surfaces of high-strength bolted, slip-critical connections.
- B. Surface Preparation of Steel: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces in accordance with the following specifications and standards:
  - 1. SSPC-SP 3.
- C. Priming: Immediately after surface preparation, apply primer in accordance with manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

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### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and in accordance with ANSI/AISC 303 and ANSI/AISC 360.
- B. Clean concrete- and masonry-bearing surfaces of bond-reducing materials and roughen surfaces prior to setting plates. Clean bottom surface of plates.
  - 1. Set plates for structural members on wedges, shims, or setting nuts as required.
  - 2. Promptly pack shrinkage-resistant grout solidly between bearing surfaces and plates, so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for grouting.
- C. Maintain erection tolerances of structural steel within ANSI/AISC 303.

END OF SECTION 051200

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
  - 1. Nonstaining silicone joint sealants.
  - 2. Urethane joint sealants.
  - 3. Butyl Joint sealants.
  - 4. Latex joint sealants.

1.2 PREINSTALLATION MEETINGS

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

1.3 ACTION SUBMITTALS

- A. Product data.
- B. Samples: Manufacturer's standard color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- C. Joint-sealant schedule.

1.4 INFORMATIONAL SUBMITTALS

- A. Field Quality-Control Reports: For field-adhesion-test reports, for each sealant application tested.
- B. Sample warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Warranty Documentation:
  - 1. Manufacturers' special warranties.
  - 2. Installer's special warranties.

1.6 WARRANTY

- A. Warranty Period: Two years from date of Substantial Completion.
  - 1. Warranty Period: Five years from date of Substantial Completion.

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### PART 2 - PRODUCTS

#### 2.1 JOINT SEALANTS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

#### 2.2 NONSTAINING SILICONE JOINT SEALANTS

- A. Nonstaining Joint Sealants: No staining of substrates when tested in accordance with ASTM C1248.
- B. Silicone, Nonstaining, S, NS, 50, NT: Nonstaining, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 50, Use NT.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the work include, but not limited to, the following:
    - a. GE Construction Sealants; Momentive Performance Materials Inc
    - b. Pecora Corporation
    - c. Sika Corporation; Joint Sealants.
    - d. The Dow Chemical Company.
    - e. Tremco Incorporated.

#### 2.3 URETHANE JOINT SEALANTS

- A. Urethane, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, urethane joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the work include, but not limited to, the following:
    - a. Bostik, Inc.
    - b. Pecora Corporation
    - c. Sika Corporation; Joint Sealants.
- B. Urethane, S, NS, 25, T, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type S, Grade NS, Class 25, Uses T and NT.

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1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the work include, but not limited to, the following:
  - a. BASF Corporation
  - b. Pecora Corporation
  - c. Polymeric Systems, Inc.

### 2.4 BUTYL JOINT SEALANTS

- A. Butyl-Rubber-Based Joint Sealants: ASTM C1311.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the work include, but not limited to, the following:
  - a. Bostik, Inc.

### 2.5 LATEX JOINT SEALANTS

- A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C834, Type OP, Grade NF.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the work include, but not limited to, the following:
  - a. Pecora Corporation
  - b. Tremco Incorporated.

### 2.6 JOINT-SEALANT BACKING

- A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C1330, Type C closed-cell material with a surface skin or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

### 2.7 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

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- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

### PART 3 - EXECUTION

#### 3.1 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
  - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
  - 2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
    - a. Concrete.
  - 3. Remove laitance and form-release agents from concrete.
  - 4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
    - a. Metal.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

#### 3.2 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

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- B. Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
  - 1. Do not leave gaps between ends of sealant backings.
  - 2. Do not stretch, twist, puncture, or tear sealant backings.
  - 3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
  - 1. Place sealants so they directly contact and fully wet joint substrates.
  - 2. Completely fill recesses in each joint configuration.
  - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants in accordance with requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
  - 1. Remove excess sealant from surfaces adjacent to joints.
  - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
  - 3. Provide concave joint profile in accordance with Figure 8A in ASTM C1193 unless otherwise indicated.
    - a. Use masking tape to protect surfaces adjacent to recessed tooled joints.
- G. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.
- H. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION 079200

SECTION 092216 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
  - 1. Framing systems.

1.2 ACTION SUBMITTALS

- A. Product Data: For each product.

1.3 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of code-compliance certification for studs and tracks.

1.4 QUALITY ASSURANCE

- A. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Certified Steel Stud Association.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, in accordance with ASTM E119 by an independent testing agency.

2.2 FRAMING SYSTEMS

- 1. Steel Sheet Components: Comply with ASTM C645 requirements for metal unless otherwise indicated
- B. Studs and Track: ASTM C645.
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide The Mill Steel Co; ProStud & ProTRAK (ClarkDietrich licensed design) or comparable product by one of the following:

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2. Minimum Base-Steel Thickness: As required by performance requirements for horizontal deflection or 0.0296 inch min.
  3. Depth: 3-5/8 inches.
- C. Slip-Type Head Joints: Where indicated, provide the following:
1. Deflection Track: Steel sheet top track manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
- D. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
1. Minimum Base-Steel Thickness: **0.0269 inch**.

### 2.3 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
1. Fasteners for Steel Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- B. Isolation Strip at Exterior Walls: Provide the following:
1. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C754.
1. Gypsum Board Assemblies: Also comply with requirements in ASTM C840 that apply to framing installation.
- B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.
- C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- D. Install bracing at terminations in assemblies.
- E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

### 3.2 INSTALLATION OF FRAMING SYSTEMS

- A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

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- B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- C. Install studs so flanges within framing system point in same direction.
- D. Install tracks at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.
  - 1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
  - 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install track section (for cripple studs) at head and secure to jamb studs.
    - a. Install two studs at each jamb unless otherwise indicated.
    - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
    - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
  - 3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
  - 4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
- E. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

### 3.3 FIELD QUALITY CONTROL

- A. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 092216

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior gypsum board.

1.2 ACTION SUBMITTALS

A. Product data.

- B. Shop Drawings: Show locations and installation of control and expansion joints, including plans, elevations, sections, details of components, and attachments to other work.

C. Samples: For each texture finish indicated on same backing indicated for Work.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated in accordance with ASTM E119 by an independent testing agency.

- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated in accordance with ASTM E90 and classified in accordance with ASTM E413 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

- A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

A. Gypsum Wallboard, ASTM C1396/C1396M.

1. Basis-of-Design Product: Subject to compliance with requirements, provide USG Corporation; USG Sheetrock® Brand Gypsum Panels or a comparable product by one of the following:

- a. American Gypsum.
- b. CertainTeed Corporation.

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- c. Continental Building Products, LLC.
- d. Georgia-Pacific Building Products.
- e. National Gypsum Company.

- 2. Thickness: 5/8 inch.
- 3. Long Edges: Tapered for prefilling.

### 2.4 TRIM ACCESSORIES

- A. Interior Trim: ASTM C1047.
  - 1. Material: Galvanized or aluminum-coated steel sheet.
  - 2. Shapes:
    - a. Cornerbead.
    - b. Bullnose bead.
    - c. LC-Bead: J-shaped; exposed long flange receives joint compound.
    - d. L-Bead: L-shaped; exposed long flange receives joint compound.
    - e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
    - f. Expansion (control) joint.

### 2.5 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C475/C475M.
- B. Joint Tape:
  - 1. Interior Gypsum Board: Paper.
- C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.
  - 1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
  - 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use all-purpose compound.
  - 3. Fill Coat: For second coat, use sandable topping compound.
  - 4. Finish Coat: For third coat, use, sandable topping compound.

### 2.6 AUXILIARY MATERIALS

- A. Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.
- B. Steel Drill Screws: ASTM C1002 unless otherwise indicated.

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1. Use screws complying with ASTM C954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
  - C. Sound-Attenuation Blankets: ASTM C665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
    1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
  - D. Acoustical Sealant: As specified in Section 079219 "Acoustical Joint Sealants."
  - E. Vapor Retarder: As specified in Section 072600 "Vapor Retarders."
- 2.7 TEXTURE FINISHES
- A. Primer: As recommended by textured finish manufacturer.
  - B. Non-Aggregate Finish: Premixed, vinyl texture finish for spray application.
    1. Basis-of-Design Product: Subject to compliance with requirements, provide USG Corporation; USG Sheetrock® Brand Wall and Ceiling Spray Texture (Unaggregated) or a comparable product by one of the following:
      - a. CertainTeed Corporation.
      - b. National Gypsum Company.
    2. Texture: Orange peel.

## PART 3 - EXECUTION

### 3.1 INSTALLATION OF PANELS

- A. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- B. Comply with ASTM C840.
- C. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch-wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- D. For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

### 3.2 FINISHING OF GYPSUM BOARD

- A. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- B. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

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- C. Gypsum Board Finish Levels: Finish panels to levels indicated below and in accordance with ASTM C840:
  - 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
  - 2. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
    - a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."

### 3.3 APPLICATION OF TEXTURE FINISHES

- A. Surface Preparation and Primer: Prepare and apply primer to gypsum panels and other surfaces receiving texture finishes. Apply primer to surfaces that are clean, dry, and smooth.
- B. Texture Finish Application: Mix and apply finish using powered spray equipment, to produce a uniform texture matching approved mockup and free of starved spots or other evidence of thin application or of application patterns.

### 3.4 PROTECTION

- A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- B. Remove and replace panels that are wet, moisture damaged, and mold damaged.

END OF SECTION 092900

SECTION 095123 - ACOUSTICAL TILE CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
  - 1. Acoustical tiles.
  - 2. Metal suspension system.
  - 3. Accessories.
  - 4. Metal edge moldings and trim.

1.2 PREINSTALLATION MEETINGS

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

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans, drawn to scale, and coordinated with each other, using input from installers of the items involved.
- B. Product test reports.
- C. Research reports.
- D. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance data.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

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1. Flame-Spread Index: Class A in accordance with ASTM E1264.
2. Smoke-Developed Index: 50 or less.

### 2.2 ACOUSTICAL TILES

- A. Basis-of-Design Product: Subject to compliance with requirements, provide USG Corporation; USG or comparable product by one of the following:
  1. Armstrong World Industries, Inc.
  2. CertainTeed Corporation.
- B. Acoustical Tile Standard: Manufacturer's standard tiles of configuration indicated that comply with ASTM E1264.
- C. Classification: Class A – Equal to USG Mars Healthcare Acoustical Panels – Climaplus Performance.
- D. Color: White.
- E. Light Reflectance (LR): Not less than 0.90.
- F. Ceiling Attenuation Class (CAC): Not less than 35.
- G. Noise Reduction Coefficient (NRC): Not less than 0.80.
- H. Edge/Joint Detail: Square SLT.
- I. Thickness: 7/8 inch.
- J. Modular Size: 24 by 24 inches 600 by 600 mm.

### 2.3 METAL SUSPENSION SYSTEM

- A. Basis-of-Design Product: Subject to compliance with requirements, provide USG Corporation; DX/DXL concealed suspension system or comparable product by one of the following:
- B. Armstrong World Industries, Inc
- C. Metal Suspension-System Standard: Manufacturer's standard, direct-hung, fully concealed, metal suspension system that complies with applicable requirements in ASTM C635/C635M.
- D. Direct-Hung, Double-Web Suspension System: Main and cross runners roll formed from and capped with cold-rolled steel sheet, prepainted, electrolytically zinc coated, or hot-dip galvanized, G30 coating designation.
  1. Structural Classification: Intermediate-duty system.
  2. Access: Upward and end pivoted or side pivoted, with initial access openings of size indicated below and located throughout ceiling within each module formed by main and cross runners, with additional access available by progressively removing remaining acoustical tiles.
    - a. Initial Access Opening: In each module, 24 by 24 inches.

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### 2.4 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. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing in accordance with ASTM E488/E488M or ASTM E1512 as applicable, conducted by a qualified testing and inspecting agency.
    - a. Type: Post installed expansion anchors.
    - b. Corrosion Protection: Carbon-steel components zinc plated in accordance with ASTM B633, Class SC 1 (mild) service condition.
    - c. Corrosion Protection: Stainless steel components complying with ASTM F593 and ASTM F594, Group 1 Alloy 304 or 316.
  - 2. 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.

## PART 3 - EXECUTION

### 3.1 PREPARATION

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

### 3.2 INSTALLATION OF SUSPENDED ACOUSTICAL TILE CEILINGS

- A. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical tiles.
  - 1. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- B. Arrange directionally patterned acoustical tiles as indicated on reflected ceiling plans.

### 3.3 FIELD QUALITY CONTROL

END OF SECTION 095123

SECTION 096513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
  - 1. Vinyl base.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

2.2 VINYL BASE (B1)

- A. Johnsonite by Tarkett
- B. Product Standard: ASTM F1861, Type TV (vinyl, thermoplastic).
  - 1. Group: I solid, homogeneous.
  - 2. Style and Location:
    - a. Style B, Cove:
- C. Minimum Thickness: 0.125 inch.
- D. Height: 4 inches.
- E. Lengths: Coils in manufacturer's standard length.
- F. Outside Corners: Job formed.
- G. Inside Corners: Job formed.
- H. Colors and Patterns: 71 'Storm Cloud' w/toe.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates for Resilient Stair Accessories: Prepare horizontal surfaces according to ASTM F710.
  - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.

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2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
    - a. Relative Humidity Test: Using in-situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
  - C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
  - D. Do not install resilient products until materials are the same temperature as space where they are to be installed.
  - E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.
- 3.2 RESILIENT BASE INSTALLATION
- A. Comply with manufacturer's written instructions for installing resilient base.
  - B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
  - C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.
  - D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
  - E. Do not stretch resilient base during installation.
  - F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
  - G. Job-Formed Corners:
    1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.
      - a. Form without producing discoloration (whitening) at bends.
    2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.
      - a. Miter or cope corners to minimize open joints.

## 3.3 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.

END OF SECTION 096513

SECTION 096813 - TILE CARPETING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Carpet tile.

1.2 PREINSTALLATION MEETINGS

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

1.3 ACTION SUBMITTALS

- A. Product data.

- B. Shop Drawings: For carpet tile installation.

- C. Samples: Manufacturer's standard color sheets, showing full range of available colors for each type of carpet tile.

1.4 INFORMATIONAL SUBMITTALS

- A. Product test reports.

- B. Sample warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.6 QUALITY ASSURANCE

1.7 WARRANTY

- A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 15 years from date of Substantial Completion.

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### PART 2 - PRODUCTS

#### 2.1 CARPET TILE (F1)

- A. Interface Inc.
- B. Color: 105771 Granite.
- C. Pattern: Non-Directional.
- D. Fiber Content: Post customer content nylon.
- E. Fiber Type: Universal.
- F. Pile Characteristic: Tufted Texture loop pile.
- G. Yarn Count: 9.00/in.
- H. Pile Thickness: .07 for finished carpet tile in accordance with ASTM D6859.
- I. Gage: 1/12 inch.
- J. Surface Pile Weight: 17 oz./sq. yd.
- K. Backing System: 'Glasblac'
- L. Size: 19.69 inches by 19.69 inches. 50cm x 50 cm
- M. Applied Treatments:
  - 1. Soil-Resistance Treatment: 'Protekt'.
  - 2. Antimicrobial Treatment: Manufacturer's standard treatment that protects carpet tiles as follows:
    - a. Antimicrobial Activity: Not less than 2 mm halo of inhibition for gram-positive bacteria, not less than 1 mm halo of inhibition for gram-negative bacteria, and no fungal growth, in accordance with AATCC 174.
- N. Performance Characteristics:
  - 1. Texture Appearance Retention Rating (TARR): Heavy traffic, 3.0 minimum in accordance with ASTM D7330.
  - 2. Dimensional Tolerance: Within 1/32 inch of specified size dimensions, as determined by physical measurement.
  - 3. Colorfastness to Crocking: Not less than 4, wet and dry, in accordance with AATCC 165.
  - 4. Colorfastness to Light: Not less than 4 after 60 AFU (AATCC fading units) in accordance with AATCC 16.3 Option 3.
  - 5. Electrostatic Propensity: Less than 3.5 kV in accordance with AATCC 134.

#### 2.2 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended in writing by carpet tile manufacturer.
- B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive types to suit products and subfloor conditions indicated, that comply with flammability requirements for installed carpet tile, and that are recommended in writing by carpet tile manufacturer for releasable installation.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance.
- B. Examine carpet tile for type, color, pattern, and potential defects.
- C. Concrete Slabs: Verify that finishes comply with requirements specified in Section 033000 "Cast-in-Place Concrete" and that surfaces are free of cracks, ridges, depressions, scale, and foreign deposits.
  - 1. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft., and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
    - a. Relative Humidity Test: Using in situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
    - b. Perform additional moisture tests recommended in writing by adhesive and carpet tile manufacturers. Proceed with installation only after substrates pass testing.
- D. Painted Subfloors: Perform bond test recommended in writing by adhesive manufacturer. Verify the following:
  - 1. Underlayment surface is flat, smooth, evenly planed, tightly jointed, and free of irregularities, gaps greater than 1/8 inch, protrusions more than 1/32 inch, and substances that may interfere with adhesive bond or show through surface.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with CRI 104 and with carpet tile manufacturer's written installation instructions for preparing substrates.
- B. Use trowelable leveling and patching compounds, in accordance with manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider, and protrusions more than 1/32 inch unless more stringent requirements are required by manufacturer's written instructions.
- C. Concrete Substrates: Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by adhesive and carpet tile manufacturers.
- D. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

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### 3.3 INSTALLATION

- A. General: Comply with CRI 104, Section 10, "Carpet Tile," and with carpet tile manufacturer's written installation instructions.
- B. Installation Method: As recommended in writing by carpet tile manufacturer.
- C. Maintain dye-lot integrity. Do not mix dye lots in same area.
- D. Maintain pile-direction patterns recommended in writing by carpet tile manufacturer.
- E. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended in writing by carpet tile manufacturer.
- F. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- G. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on carpet tile as marked on subfloor. Use nonpermanent, nonstaining marking device.
- H. Install pattern parallel to walls and borders.

### 3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after installing carpet tile:
  - 1. Remove excess adhesive and other surface blemishes using cleaner recommended by carpet tile manufacturer.
  - 2. Remove yarns that protrude from carpet tile surface.
  - 3. Vacuum carpet tile using commercial machine with face-beater element.
- B. Protect installed carpet tile to comply with CRI 104, Section 13.7.

END OF SECTION 096813

## ATW Concourse Basement Renovation

### SECTION 099123 - INTERIOR PAINTING

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

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

##### 1.2 SUMMARY

- A. Section includes surface preparation and the application of paint systems on interior substrates.

##### 1.3 DEFINITIONS

- A. MPI Gloss level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D523.

##### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
- B. Samples for Initial Selection: For each type of topcoat product.

##### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg. F.
  - 1. Maintain containers in clean condition, free of foreign materials and residue.
  - 2. Remove rags and waste from storage areas daily.

##### 1.6 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg. F.
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

## ATW Concourse Basement Renovation

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products List."

#### 2.2 PAINT PRODUCTS, GENERAL

##### A. Material Compatibility:

1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

- B. Colors: As selected by Architect from manufacturer's full range.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- B. Proceed with coating application only after unsatisfactory conditions have been corrected.
  1. Application of coating indicates acceptance of surfaces and conditions.

#### 3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
- C. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

#### 3.3 INSTALLATION

- A. Apply paints according to manufacturer's written instructions.

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- B. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- C. Painting Fire-Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
  - 1. Paint the following work where exposed in equipment rooms:
    - a. Uninsulated metal piping.
    - b. Pipe hangers and supports.
    - c. Metal conduit.
    - d. Plastic conduit.
    - e. Tanks that do not have factory-applied final finishes.
    - f. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
  - 2. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

### 3.4 CLEANING AND PROTECTION

- A. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- B. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- C. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

### 3.5 INTERIOR PAINTING SCHEDULE

- A. Concrete Substrates, Nontraffic Surfaces:
  - 1. Latex System
    - a. Prime Coat: water-based primer Matching topcoat.
    - b. Intermediate Coat: Matching topcoat.
    - c. Topcoat: Interior latex paint, eggshell.
- B. Concrete Substrates, Traffic Surfaces:
  - 1. Water-Based Concrete Floor Sealer System:
    - a. First Coat: Matching topcoat.
    - b. Topcoat: Water-based concrete floor sealer.
- C. Steel Substrates:
  - 1. Water-Based Light-Industrial Coating System:
    - a. Prime Coat: Primer, rust-inhibitive, water based.

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- b. Intermediate Coat: Matching topcoat.
- c. Topcoat: Interior, water-based, light-industrial coating, eggshell.

D. Exposed Wood Framing:

- 1. Latex over Latex Primer System:
  - a. Prime Coat: Interior latex primer for wood.
  - b. Intermediate Coat: Matching topcoat.
  - c. Topcoat: Interior, latex, eggshell.

E. Gypsum Board Substrates:

- 1. Latex over Latex Sealer System:
  - a. Prime Coat: Interior latex primer sealer.
  - b. Intermediate Coat: Matching topcoat.
  - c. Topcoat: Interior, latex, eggshell.

END OF SECTION 099123

**SECTION 26 05 00  
COMMON WORK RESULTS FOR ELECTRICAL**

**PART 1 – GENERAL**

**1.1 RELATED REQUIREMENTS**

- A. Applicable provisions of Division 1 shall govern work under this section.

**1.2 WORK INCLUDED IN THE ELECTRICAL CONTRACT**

- A. The mention of any Article, operation or method required that the Contractor shall provide same and perform each operation in complete accordance with the conditions stated. The Contractor shall provide all material, labor, equipment and transportation as necessary to complete the project in compliance with the Contract Documents. In general, this work includes everything essential for a complete electrical system in operating order as shown on the drawings and indicated in the specifications.
- B. All work shall be installed in accordance with all State and Local Inspection Authorities having jurisdiction together with the recommendations of the manufacturer whose equipment is to be supplied and installed under this Contract.
- C. Before submitting a bid, each bidder shall examine the drawings relating to their work and shall become fully informed as to the extent and character of the work required and its relation to other work in the building.
- D. The Contractor, in conjunction with the Architect's representative, shall establish exact locations of all materials and equipment to be installed. Consideration shall be given to construction features, equipment of other trades and requirements of the equipment proper.
- E. The Contractor shall furnish all scaffolding, rigging, hoisting and services necessary for deliver, erection and installation of all equipment and apparatus required to be installed by the Contractor. All such equipment shall be removed by the Contractor upon completion of the project.
- F. The Contractor shall provide all necessary temporary lighting, distribution and electrical service as required for project.
- G. The Contractor shall be responsible for all work identified on the plans and in Divisions 26, 27 & 28 and include all costs in bid.
- H. **Materials and equipment shall have United States as location of manufacture and/or assembly where possible, unless not available for a specific product. This may be an option as part of manufacturer's catalog numbering system, but shall be provided whether specifically identified or not on the project documents.**

**1.3 DEFINITIONS**

- A. The Owner: The individual who the Owner selects as the project representative.
- B. The Architect: RMA Architects, Appleton, Wisconsin.

- C. The Engineer: Powrtek Engineering, Inc., Burlington, Wisconsin.
- D. This Contractor: The Electrical Contractor, also referred to as "The Contractor".
- E. Provide: Furnish, install and wire complete and ready for service.
- F. Exposed: Exposed to view in any room, corridor or stairway.
- G. Code: National, State and Local Electrical codes including OSHA requirements.
- H. Equals: Manufacturers or methods listed by name in the specifications, on the drawings or in an addendum are considered to be equals.
- I. Substitution: Any manufacturer or method other than those listed by name in these specifications, on the drawings, or in an addendum.
- J. NEC: National Electrical Code.
- K. Signal Voltage: NEC class 1, 2, or 3 remote control, signaling or power limited circuits.
- L. Low Voltage: 50 to 600 volts.
- M. Medium Voltage: 601 to 35,000 volts.
- N. High Voltage: 35,001 volts and greater.

#### **1.4 PERMITS AND LICENSES**

- A. The Contractor shall prepare and submit all applications and working drawings, as required, to authorities having jurisdiction over the project. All licenses and permits required shall be secured and paid for by the Contractor.
- B. Pay for all fees incident thereto.
- C. Comply with local ordinances, laws, regulations and codes in effect at job site.
- D. Pay all applicable taxes associated with electrical work.

#### **1.5 STANDARDS AND CODES**

- A. All work shall be installed in accordance with National, State and Local codes, ordinances, laws and regulations. Comply with applicable OSHA regulations.
- B. All materials shall have a UL or ETL label where a UL or ETL Standard and/or test exist.

#### **1.6 DIMENSIONS AND DEFINITE LOCATIONS**

- A. The drawings depicting electric work are diagrammatic and show, in their approximate location, symbols representing electrical equipment and devices. The exact location of such equipment and devices shall be established in the field in accordance with instructions from the Architect and/or established by manufacturer's installation drawings and details.

1. Any adjustments for device or equipment locations beyond 2-feet of what is identified on the plans is not allowed unless approved by the Engineer.
2. The Contractor shall refer to shop drawings and submittal drawings for all equipment requiring electrical connections to verify rough-in and connection locations.
3. Unless specifically stated to the contrary, no measurement of an electric drawing derived by scaling shall be used as a dimension to work by. Dimensions noted on the electric drawings are subject to measurements of adjacent and previously completed work. All measurements shall be performed prior to the actual installation of equipment.

## **1.7 PROJECT DOCUMENTS**

- A. The drawings and specifications are schematic and scope in nature. All required light fixtures, devices, conduit, wiring, supports, etc., shall be included in the base bid to accommodate actual field conditions. Final locations of all electrical work shall be coordinated in the field and installed where directed by the Engineer. The Contractor shall follow the intent of the plans and specifications when bidding and completing the design of the required building electrical systems.
- B. In the event of a conflict between the drawings and specifications, this Contractor shall base their bid on the greater quantity, cost or quality of the item in question, unless such conflict is resolved by an addendum. The Contractor shall be responsible for all existing field conditions, review existing field conditions prior to bid and shall take into account in bid proposal. No additional compensation will be allowed due to Contractor's failure to include all necessary work in the bid proposal.
- C. Provide 100 percent complete and operational electrical systems and subsystems as specified herein and as shown on the drawings. Electrical systems shall include all materials, labor, taxes, mark-ups, overhead, profit, equipment, accessories and incidentals. All materials shall be new and not discontinued.

## **1.9 MATERIALS AND EQUIPMENT**

- A. All materials and equipment required shall be new.
- B. All equipment supplied shall be based on materials and equipment of manufacturers specified. No substitutions will be allowed except as permitted in this specification.
- C. All items specified shall be the latest type or model produced by the manufacturer specified. If descriptive specification or model number is obsolete, substitute the current product.

## **1.10 COORDINATION BETWEEN TRADES**

- A. Coordination Meetings: Attend coordination meetings with the construction manager and all other trades for the purpose of coordinating the locations of all fire protection, plumbing, HVAC, kitchen, equipment and electrical work for the entire project. The goal of these meetings is to avoid conflicts between trades in the field and to assure that all necessary power and control requirements are accounted for.

- B. Conflicts Between Trades: Resolve all conflicts between trades at no additional cost to the Owner or Architect.
- C. Ceiling Heights: Maintain all ceiling heights indicated on the architectural drawings. Ceiling heights will not be lowered to accommodate installation of fire protection, HVAC or electrical work. Install all work so that there is at least eight (8) inches clearance above the ceiling grid, in all areas, to facilitate installation of light fixtures. If installed work does not comply with the ceiling height requirements stated above, then the contractor shall remove and re-install work to comply with the stated requirements above at no additional cost to the Owner or Architect.
- D. Ceiling Grid Priority: Lighting fixture locations take priority over diffuser and sprinkler head locations.

#### **1.11 ELECTRICAL INSTALLATIONS**

- A. General: Sequence, coordinate and integrate the various elements of electrical systems, materials and equipment. Comply with the following requirements:
- B. Coordinate electrical systems, equipment and materials installation with other building components, including transferring of 'overlay' plans to verify clearances, etc.
- C. Verify all dimensions by field measurements.
- D. Arrange for chases, slots and openings in other building components during progress of construction, to allow for electrical installations.
- E. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed. All pipes passing through cast-in-place concrete walls and floors shall be sleeved.
- F. Sequence, coordinate and integrate installations of electrical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing in the building.
- G. Where mounting heights are not detailed or dimensioned, install systems, materials and equipment to provide the maximum headroom possible.
- H. Coordinate connection of electrical systems with exterior underground utilities and services. Comply with requirements of governing regulations, franchised service companies and controlling agencies. Provide required connection for each service.
- I. Install systems, materials and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the Architect.
- J. Install systems, materials and equipment level and plumb, parallel and perpendicular to other building systems and components, where installed exposed in finished spaces.

- K. Install electrical equipment to facilitate servicing, maintenance and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.
- L. Units concealed behind finished surfaces shall be installed behind an access panel or door as required.
- M. Install systems, materials and equipment giving right-of-way priority to systems required to be installed at a specified slope.

#### **1.12 CUTTING AND PATCHING**

- A. General: Perform cutting and patching in accordance with Division 1 Section "CUTTING AND PATCHING." In addition to the requirements specified in Division 1, the following requirements apply:
  - 1. Perform cutting, fitting and patching of electrical equipment and materials required to:
    - a. Uncover Work to provide for installation of ill-timed Work.
    - b. Remove and replace defective Work.
    - c. Remove and replace Work not conforming to requirements of the Contract Documents.
    - d. Remove samples of installed Work as specified for testing.
    - e. Install equipment and materials in existing structures.
    - f. Upon written instructions from the Architect, uncover and restore Work to provide for Architect observation of concealed Work.
  - 2. Cut, remove and legally dispose of selected electrical equipment, components and materials as indicated, including but not limited to removal of electrical items indicated to be removed and items made obsolete by the new Work.
  - 3. Protection of Installed Work: During cutting and patching operations, protect adjacent installations.
  - 4. Patch existing finished surfaces and building components using new materials matching existing materials and experienced Installers. Installer's qualifications refer to the materials and methods required for the surface and building components being patched.
  - 5. Patch finished surfaces and building components using new materials specified for the original installation and experienced Installers. Installers' qualifications refer to the materials and methods required for the surface and building components being patched.

#### **1.13 SUBSTITUTIONS**

- A. In any case where the Contractor wishes to use equipment or methods other than those listed by name, such equipment shall be considered a substitution and must be approved by the Engineer. To gain approval for substitutions, the Contractor shall submit the following to the Engineer for his review.
  - 1. Documentation from the equipment manufacturer indicating where this equipment meets and does not meet the specifications or drawings as written. This documentation shall state all exceptions taken to the specification and the reasons for such exceptions. All documentation

- relative to the request for substitution shall be submitted on the manufacturer's letterhead and signed by a representative of the manufacturer.
2. **Manufacturer's Cut Sheets:** Cut sheets shall be originals as are contained in the manufacturer's catalog. Photocopies of these sheets will not be accepted for review (Furnish 3 copies).
  3. **Lighting Fixtures:** Request for substitutions shall include photometric test reports performed by an independent testing laboratory, as well as a summary of energy loading. Calculations indicating lighting levels based on plan layout, including emergency levels/uniformities shall be included in request. No substitution request will be considered if calculations are not submitted.
  4. The Contractor shall provide samples of the proposed equipment for the Engineer's review, if requested by the Engineer.
  5. The Contractor shall furnish any other information or materials as requested by the Architect/Engineer to establish equality.
  6. The Contractor shall acknowledge that they have reviewed the submission criteria for the request for substitution by stamping the submission with a review stamp or acknowledgment by an accompanying letter.
  7. Equipment and materials submitted for review without proper documentation will be rejected without review.
  8. Substitutions are subject to potential review fees.
- B. Any substitution submittal, including samples, shall be received in the Engineer's office a minimum of ten days prior to the Bid due date to allow adequate time for review.
- C. Materials, equipment or methods of installation other than those named, will be accepted only if such articles are in accordance with the general requirements and are similar in composition, dimension, construction, capacity, aesthetics, finish and performance.

#### **1.14 SHOP DRAWINGS AND EQUIPMENT BROCHURES**

- A. Submit to Engineer for review, the manufacturer's shop drawings and/or equipment brochures electronically in PDF format for the following:
1. Section 26 05 19 – Low-Voltage Electrical Power Conductors and Cables
  2. Section 26 05 33 – Raceways, special boxes only
  3. Section 26 09 43 – Network Lighting Controls
  4. Section 26 24 16 – Panelboards (Include panelboard overcurrent devices with this submittal)
  5. Section 26 27 26 – Wiring Devices
  6. Section 26 50 00 – Lighting Fixtures
  7. Section 28 31 00 – Fire Detection and Alarm
- B. Shop drawings shall be submitted in advance of construction and installation so as to not cause delay in other Contractor's work.
- C. All data submitted for Engineer's review shall be numbered consecutively, shall be noted to correlate with the electrical drawings and shall bear:
1. The name and location of the project.
  2. The name of the Electrical Contractor and any applicable sub-contractor.
  3. The date of submittal.

4. The date of the drawings and the date of each correction and revision.
  5. If more than one type of lighting fixture (or other material) is on a submitted sheet, the proposed equipment shall be conspicuously checked with red pen by the Electrical Contractor.
- B. **Shop drawings for different systems and equipment shall be submitted separately by specification section. Submittals which contain different systems (i.e. different spec sections) together shall be returned un-reviewed and require re-submittal – this will also apply (i.e. count) as being a submittal toward the two-submittal limit (before additional fees) for each of the sections submitted together.**
- C. The Contractor shall examine shop drawings and equipment brochures prior to submission. The Contractor shall verify that the materials and equipment depicted will properly fit into the construction. The Contractor shall also review all previously completed work related to the installation of the equipment depicted to ensure that it has been properly installed.
- D. The contractor is allowed up to two submittals for approval. If additional submittals are required for approval the contractor will be subject to potential review fees to cover additional engineering time and mailing costs.
- G. No materials or equipment subject to prior review by the Engineer shall be fabricated or installed by the Contractor, without approval. The Engineer's review of shop drawings shall not relieve the Contractor of responsibility for deviations from the requirements of the drawings and specifications, unless prior approval for such deviations has been granted.
- H. As needed for submittals, the engineer will make available to the Contractor a complete set of electronic AutoCad or REVIT files as requested (based on what platform the documents were created in). Contractor shall submit a completed and Contractor signed AIA Document C106 Digital Data Licensing Agreement with request for electronic files; signed C106 document and electronic files will then be transmitted to Contractor.

#### 1.15 RECORD DRAWINGS

- A. As Built Drawings – See General Requirements – Division 1.
1. The contractor shall provide final as-built (record) drawings at completion of project to the Engineer (electronic copy only) and Owner (full size hardcopy and electronic copy).
  2. The contractor shall continuously during the installation process document the installation, identifying device locations, equipment locations, circuits, significant junction box locations, routing of feeders and branch circuits, routing of data cabling, significant dimensions, as well as exterior (building and ground mounted) lights and devices, underground conduit/cabling routes and pull boxes of the installed system using Bluebeam or equivalent method.
  3. **Un-submitted, incomplete, inaccurate or otherwise poorly completed record drawings shall be cause for holding any remaining monies due till record drawings are properly completed and submitted.**

#### 1.16 MAINTENANCE MANUALS

- A. The contractor shall provide final Operation and Maintenance Manuals (O&Ms) at completion of project to the Engineer (emailed electronic copy only) and to the Owner (hard copies and electronic copies) for divisions 26, 27 & 28. Owner's electronic copy to be on a memory stick in each binder.
- B. Each manual (up to 3) shall consist of a loose-leaf bound volume instructing the Owner's personnel in the use, operation and maintenance of the system in question. The manual shall cover all phases of operation of the equipment and shall be illustrated with photographs, drawings, wiring diagrams, etc. Manuals shall accurately describe the operation, construction and adjustable features of the complete system and its component parts. The manual shall be complete with an equipment parts listing to facilitate the ordering of spare and replacement parts.
- C. Each manual shall include normal and emergency hour contacts for contractor and all suppliers, warranty(ies), as well as contain final shop drawings depicting equipment as installed.

#### **1.17 CLEANING AND PAINTING**

- A. All rubbish resulting from this work shall be removed and disposed of on a daily basis in such manner as to be acceptable to the Architect.
- B. The Contractor shall clean all exposed iron work, the interior and exterior of cabinets and pull boxes, etc., and remove all rubbish and debris resulting from the work.
- C. Where painted surfaces of equipment have been damaged or rusted during construction, the Contractor shall paint same to match final.
- D. Clean other equipment as indicated in other sections of the specification for specific equipment.

#### **1.18 TESTS AND ACCEPTANCE**

- A. The operation of the equipment and electrical systems does not constitute an acceptance of the work by the Owner. The final acceptance is to be made after the Contractor has adjusted his equipment and demonstrated that it fulfills the requirements of the drawings and the specifications.
- B. After the work is completed and prior to acceptance, the Contractor shall conduct the following tests, tabulate data, date, sign and submit to the Engineer.
  - 1. Standard megger insulation test on each feeder.
  - 2. Ground resistance test.
  - 3. Clamp ammeter test on each feeder conductor with all utilization equipment energized. The load current in each phase conductor of the feeder or the portion thereof supplying the panel shall not differ from the average connected load currents in the feeder conductors by more than 7½ %. If the load currents in the feeder conductors by more than 7½ %, the Contractor shall change phase loading to same or receive written approval from the Engineer that this is not required due to the nature of the load.
- C. Upon completion of the installation, the Contractor shall furnish certificates of approval from all authorities having jurisdiction. The Contractor shall demonstrate that all work is complete and in perfect operating condition, with

race way and conduit system properly grounded, all wiring free from grounds, shorts, and that the entire installation is free from any physical defects.

- D. In the presence of the Engineer and the Owner, the Contractor shall demonstrate the proper operation of all miscellaneous systems.
- E. Perform other test as specifically directed in other sections of the specifications for specific equipment.

**1.19 GUARANTEE**

- A. All work shall be provided with a one-year materials and labor warranty. Warranty period shall begin after the Owner's final acceptance of the work.
- B. See other Division 26 specification sections for equipment with extended warranties.
- C. See General Conditions.

**1.20 ACCESS PANELS**

- A. All access panels required by code or otherwise to electrical service equipment shall be supplied and installed by Electrical Contractor.

**1.21 OWNER TRAINING**

- A. The contractor shall give the owner's personnel verbal and written operating instructions for all electrical systems.

**PART 2 – PRODUCTS**

Not Used.

**PART 3 – EXECUTION**

Not Used.

END OF SECTION

**SECTION 26 05 19**  
**LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES**

**PART 1 – GENERAL**

**1.1 RELATED REQUIREMENTS**

- A. Applicable provisions of Division 1 shall govern work under this section.

**1.2 SCOPE**

- A. Provide conductors and connectors as specified herein.

**1.3 RELATED WORK**

- A. Section 26 05 26 – Grounding and Bonding for Electrical Systems
- B. Section 26 05 33 – Raceway and Boxes for Electrical Systems
- C. Section 26 05 53 – Identification for Electrical Systems
- D. Section 26 27 26 – Wiring Devices

**1.4 QUALITY ASSURANCE**

- A. Reference Standards of the following associations:
  - 1. National Electrical Contractor's Association (NECA) – Standard of Installation.
  - 2. Insulated Cable Engineers Association (ICEA).
  - 3. National Fire Protection Association (NFPA) 70 – National Electrical Code (NEC) and Wisconsin amendments thereto.

**1.5 SUBMITTALS**

- A. See Section 26 05 00 for general shop drawing requirements.

**PART 2 – PRODUCTS**

**2.1 CONDUCTORS**

- A. Copper Conductor only.
- B. Insulated with 600 V insulation and color code conductors for low voltage (secondary feeders and branch circuits) as required by code.
- C. Type THHN Solid or Stranded: Single conductor No. 10 AWG and smaller, No. 12 AWG minimum.
- D. Type THHN Stranded: Single conductor No. 8 AWG and larger. Conductor triple rated for use as types THHN, THWN and MTW is approved.
- E. Conductors installed in exterior wet locations and areas with high humidity shall be type XHHW.

- F. Conductors shall not be installed at temperatures below the manufacturer's minimum installation temperature.
- G. Conductors shall have colored insulation as follows:

	<u>120/208V</u>	<u>277/480V</u>
Phase A	Black	Brown
Phase B	Red	Orange
Phase C	Blue	Yellow
Neutral	White	Gray
Ground	Green	Green

## 2.2 JOINTS, TAPS AND SPLICES

- A. Interior Conductors No. 10 AWG and Smaller: Standard wire connectors.
- B. Interior Conductors No. 8 AWG and Larger: NSI Polaris or equal Insulated multi-cable connector blocks.
- C. Exterior Conductors No. 10 AWG and Smaller: King Silicon Filled ProLine Underground/direct bury rated wire connectors.
- D. Exterior Conductors No. 8 AWG and Larger:
  1. Non-underground (light pole) locations: Splices shall accept (4) #14-#2 conductors, be underground/overhead rated and include gel filled hinged splice closure. Utilize NSI Easy-Splice Gel Tap Splice Kit series connectors (ESGTS-2) or equal. Provide two layers of electrical tape around closure.
  2. Underground (pull box) locations: Splices shall accept quantity and size of conductors required at individual pull boxes (which may be of differing configurations), be direct burial and submersible rated. Utilize multi-cable compression connectors with the splice encased in a Scotchcast 85 series multi-mold compound or equal. Split bolts are not allowed. No splices are allowed in pull boxes, unless indicated on the plans.

## 2.3 CABLE ASSEMBLIES

- A. Pre-manufactured cable assemblies shall consist of metal clad (MC) flexible cable system consisting of UL Listed lightweight aluminum interlocking armor with 600V 90°C copper THHN/THWN insulated color-coded conductors. A green insulated grounding conductor shall be included.

## PART 3 – EXECUTION

### 3.1 INSTALLATION

- A. Run conductors in conduit unless otherwise indicated on drawings.
- B. Install in accordance with manufacturer's written instructions and in accordance with recognized industry practices.

- C. **Neutral conductors shall NOT be shared for 120V or 277V circuits. An individual neutral conductor shall be routed with each circuit phase conductor.**

### **3.2 INSPECTION**

- A. Examine areas and conditions under which feeders and branch circuits are to be installed and notify Engineer, in writing, of conditions detrimental to proper and timely completion of work.
- B. Do not proceed with work until unsatisfactory conditions have been corrected.

### **3.3 JOINTS, TAPS AND SPLICES**

- A. Cable splices shall be made only in distribution and junction boxes.

### **3.4 FIXTURE OUTLETS**

- A. Use conductor with insulation suitable for current, voltage and temperature to which conductor will be subjected.
- B. Insulation suitable for operation at 90° C. minimum for lighting fixtures with integral ballast, mogul base sockets, quartz lamps or otherwise where subject to excessive temperatures.
- C. Fixture wiring shall be continuous wiring system to lampholder or to ballast and from ballast to lampholder.

### **3.5 FEEDER CIRCUITS**

- A. Extend feeders at full capacity from origin to termination.
- B. Each conduit raceway shall contain only those conductors constituting a single feeder circuit.
- C. Where feeder conductors are run in parallel, conductors shall be of same length, same material, circular-mil area, insulation type and terminated in same manner.
- D. Where parallel feeder conductors shall be run in separate raceways, each raceway shall have same physical characteristics.
- E. Feeders shall follow most accessible routes, concealed in construction in finished areas, exposed to the minimum temperature gradient and to minimum temperature fluctuation.
- F. Confine feeders to insulated portions of building, unless otherwise specified.
- G. Trapped feeder runs without facilities for continuous drainage are not acceptable.
- H. Do not draw conductors into conduits until building is enclosed and watertight, and until work which may cause conductor damage has been completed.
- I. Feeder conduits shall not be routed in concrete floor slabs.

### **3.6 BRANCH CIRCUITS**

- A. Conductors shall be size 12 AWG minimum (unless otherwise noted) for branch circuit wiring, including motor circuits.
- B. Size 120V branch circuits for length of run on following basis:
  - 1. 0 to 75 feet run from panelboard to first outlet: No. 12 AWG minimum.
  - 2. 75 to 125 feet run: increase one wire size, i.e. No. 12 AWG becomes No. 10 AWG.
  - 3. 126 to 200 feet run: increase two wire sizes, i.e. No. 12 AWG becomes No. 8 AWG.
  - 4. 201 and above: wiring to be sized for 3% maximum voltage drop.
- C. Size 277V branch circuits for length of run on following basis:
  - 1. 0 to 100 feet run from panelboard to first fixture or outlet: No. 12 AWG minimum.
  - 2. 101 to 200 feet run: increase one wire size, i.e. No. 12 AWG becomes No. 10 AWG.
  - 3. 201 and above: wiring to be sized for 3% maximum voltage drop.
- D. Voltage drop for branch circuits and feeder circuit combined shall not exceed requirements of NEC Article 215.
- E. Route branch circuits and switch legs as dictated by construction, these specifications, or instructions from the Engineer.
- F. Size conduit, outlet boxes and other raceway system components in accordance with NEC requirements as minimum.
- G. Do not draw conductor into conduits until building is enclosed and watertight, and work which may cause conductor damage has been completed.

### **3.7 MOTOR AND EQUIPMENT WIRING**

- A. Furnish and install motor circuits in accordance with schedules on drawings and code requirements, from source of supply to associated motor starter, and from starter to motor terminal box, including necessary and required intermediate connections.
- B. Conductor and conduit size for motor branch circuits, if shown on drawings, are sized for motor requirement only.
- C. Motors shall have proper feeders as per NEC and nameplate ratings. Contractor is responsible for verification of ratings of motors and installing proper branch circuits.
- D. Obtain manufacturer's wiring diagrams and shop drawings for equipment requiring electrical connections.
- E. Check drawings and specifications of other divisions of work for equipment and work which shall be included in order to provide a complete electrical installation.
- F. Motor connections shall be made by compression type connectors using proper tools and fittings to assure good electrical continuity and low resistance joint.

### **3.8 CABLE ASSEMBLY INSTALLATION**

- A. Cable assemblies shall only be allowed in concealed locations (i.e. stud walls). Assemblies shall transition to a conduit system in an appropriate manner (i.e. wireway, junction box, etc.) when entering exposed locations. The cable assembly shall not be exposed greater than 6-inches, and shall be installed in a workman like manner (i.e. trained straight, single row, etc.).
- B. Cable assemblies shall only be used for individual branch circuits 50A and less; not allowed for feeders.

END OF SECTION

**SECTION 26 05 26**  
**GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS**

**PART 1 – GENERAL**

**1.1 RELATED REQUIREMENTS**

- A. Applicable provisions of Division 1 shall govern work under this section.

**1.2 SCOPE**

- A. Provide all material, labor and incidentals necessary for the completion of this section of the work.

**1.3 RELATED WORK**

- A. Section 26 05 00 – Common Work Results for Electrical
- B. Section 26 05 19 – Low-Voltage Electrical Power Conductors and Cables

**1.4 QUALITY ASSURANCE**

- A. Follow the requirements of the following regulatory agencies:
  - 1. National Fire Protection Association (NFPA, NFPA-70 - National Electrical Code (NEC) and Wisconsin amendments thereto.
  - 2. Local Codes and Ordinances

**1.5 REFERENCE STANDARDS**

- A. Conform to the standards of the National Electrical Contractors Association (NECA), Standard of Installation.

**PART 2 – PRODUCTS**

**2.1 GROUND WIRES**

- A. Copper only.
- B. Size as shown on drawings, or as required by NEC.

**PART 3 – EXECUTION**

**3.1 GENERAL**

- A. Ground electrical systems and equipment as required by code, utility, local ordinances and to requirements herein.
- B. Install separate code rated grounding conductors to special equipment and activity areas as required by code.
- C. Bond all metallic piping systems and service equipment as required by NEC.

- D. Cable connections and joints shall be thermo-welded or irreversible compression connectors.

### **3.2 EQUIPMENT GROUND**

- A. Bond metallic conduits, supports, cabinets and other equipment so ground will be electrically continuous from service to outlet boxes.
- B. Install grounding conductor in nonmetallic and flexible conduit to complete equipment ground continuity. Ground wire shall be bonded at equipment and at first junction box of conduit system on line side of flexible conduit to the system.
- C. Install grounding conductors to permit shortest and most direct path from equipment to ground. When grounding conductor runs through metallic conduit, bond to conduit at entrance and exit with a bolted clamp.
- D. Ground neutral at service only.
- E. Install an insulated equipment grounding conductor in each conduit. Conduit will not be relied upon as the grounding path.
- F. Provide an insulated dedicated green equipment grounding conductor (in addition to equipment grounding conductor) with all circuits serving isolated ground receptacles (connected to isolated ground terminal on device).
- G. Green ground bar in panels, where required to be similar to neutral bar, except tinted green and isolated from panel tub.
- H. Connections shall be accessible for inspection and checking. No insulation shall be installed over ground connections.
- I. Ground connection surfaces shall be cleaned and all connections shall be made so that it is impossible to move them.
- J. Attach grounds permanently before permanent building service is energized.
- K. Ground metal lighting poles. Install a ground lug on wall of pole directly across from handhole.
- L. Attach ground wire neatly and firmly to walls.

### **3.4 FIELD QUALITY CONTROL**

- A. Contractor shall make ground resistance measurements. Measure in normally dry conditions, not less than 48 hours after rainfall.

END OF SECTION

**SECTION 26 05 29  
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS**

**PART 1 – GENERAL**

**1.1 RELATED REQUIREMENTS**

- A. Applicable requirements of Division 1 shall govern work under this section.

**1.2 SCOPE**

- A. Provide equipment for the support of electrical equipment as detailed or indicated on the drawings and as specified herein.

**1.3 QUALITY ASSURANCE**

Reference standards of the following agencies:

- A. National Electrical Contractors Association (NECA), Standard of Installation.
- B. National Electrical Manufacturers Association (NEMA).
- C. American National Standards Institute (ANSI).

**PART 2 – PRODUCTS**

**2.1 ACCEPTABLE MANUFACTURERS**

- A. Kindorf
- B. Elcen Co.
- C. Steel City
- D. Unistrut
- E. B-Line

**2.2 GENERAL**

- A. Metal supporting devices shall be hot galvanized steel, unless otherwise indicated on the plans.
- B. Drilled expansion insert type anchors suitable for load and application requirements such as sleeve anchors, lag shields, hammer-screws, concrete screws, and toggle bolts.
- C. Plastic anchors are not acceptable.

**2.3 LIGHTING FIXTURE SUPPORT**

- A. Items such as stems, hickies, bar hangers and clips required to securely attach fixtures to ceilings or walls.

- B. Studs and unistrut support for fixture outlet and ceiling support.
- C. Fixture grid hangers for mounting surface fluorescent units to exposed grid ceiling.
- D. Provide auxiliary supports so that fixtures can be drawn up tightly, cannot be tilted or rotated and will not be affected by vibrations.

## **2.4 SUPPORTING STRUCTURES**

- A. Rack supports of galvanized steel channel sections with adequate feet to allow secure mounting.
- B. Weld sections, do not use bolts.

## **2.5 MOUNTING PANELS**

- A. Size mounting panels to mount necessary equipment, of  $\frac{3}{4}$ " fire rated grade plywood as specified on drawings. Panels shall be painted gray all sides/edges.
- B. Provide mounting panels for all surface mounted electrical cabinets and enclosures.
- C. Provide uniform mounting panels as far as practical. Preferred sizes being 12" X 18", 18" X 24", 18" X 30", 24" X 30", etc.

## **2.6 CONDUIT SUPPORTS**

- A. One- or two-hole galvanized steel straps.
- B. Continuous slot or T-slot galvanized steel concrete insert channel.

# **PART 3 – EXECUTION**

## **3.1 PREPARATION**

- A. Install hangers, supports and anchors only after structural work, where work is to be installed, has been completed. Correct inadequacies such as proper placement of inserts, anchors and other building structural attachments.
- B. Examine areas and conditions under which equipment and associated components are to be installed and notify Architect, in writing, of conditions detrimental to proper and timely completion of work. Do not proceed with work until unsatisfactory conditions have been corrected.

## **3.2 LIGHTING FIXTURES**

- A. Install channel supports across main grid runners or grid supports, securely tied down or anchored for fixtures and devices mounted in suspended ceiling systems so as not to cause tile to sag and so that fixture or device cannot be lifted, rotated or displaced. Provide additional support of ceiling grid or tees at those locations where tiles and ceiling grid sags.
- B. Install grid troffer support clips in accordance with NEC 410-16(c).

### **3.3 INSTALLATION OF BUILDING ATTACHMENTS**

- A. Install building attachments at required locations within concrete or on to structural steel or raceway and equipment support.
- B. Install additional building attachments where support is required for additional concentrated loads.
- C. Install concrete inserts before concrete is placed

### **3.4 INSTALLATION OF ANCHORS**

- A. Install anchors at proper locations to prevent stresses from exceeding those permitted by ANSI B31 and to prevent the transfer of loading and stresses to connected equipment.
- B. Installation methods shall conform with the manufacturer's recommendations for maximum holding power, but in no case shall the depth of hole be less than four bolt diameters. Minimum distance between the center of any expansion anchor and an edge of exterior corner of concrete shall be not less than 4½ times the diameter of the hole in which it is installed.

### **3.5 SUPPORT OF CONDUIT**

- A. Fasten conduit to structural parts of building in a manner acceptable to Engineer.
- B. Do not use perforated hanger iron.
- C. Install concrete insert channel as required, with spacings as recommended by manufacturer. Install with anchor and caps, insert joiner clips and closer seals as required.
- D. Support conduit as follows:
  - 1. Single Conduit Runs
    - a. Vertical Surfaces: Galvanized, heavy duty, sheet steel straps; back straps to be provided for all exposed conduit and conduit on exterior walls.
    - b. Horizontal Surfaces: Galvanized, heavy duty, steel, one-hole straps for conduits 1-inch and smaller and two-hole straps for larger conduits.
  - 2. Multiple Conduit Runs
    - a. Vertical Surfaces: Horizontal or vertical rack channel with conduit straps as required.
    - b. Horizontal Surfaces: Single or double rack channel trapeze, complete with conduit straps as required; all supported with threaded hanger rods.
  - 3. Passing Between Floors and Through Roof
    - a. 1¼ " and larger conduit runs passing through floors shall be supported at each floor with riser pipe clamps.
    - b. Conduit extending through roof shall pass through a ceiling box at roof lines.
    - c. Provide 14 ga minimum copper box complete with watertight soldered seams and flanged to serve as pitch pocket for each conduit.

- d. Conduit and pitch pocket shall be installed in advance of roofing work.

### **3.6 VERTICAL CABLE SUPPORT**

- A. Conductors in vertical raceways shall be supported using suitable cable supports. Locate supports so that each 25 ft.-0 in. length of conductor in a vertical raceway will be complete with support.

END OF SECTION

**SECTION 26 05 33  
RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS**

**PART 1 – GENERAL**

**1.1 RELATED REQUIREMENTS**

- A. Applicable provisions of Division 1 shall govern work under this section.

**1.2 SCOPE**

- A. Provide conduit systems, boxes and fittings for all power wiring and communication systems as specified.

**1.3 RELATED WORK AND REQUIREMENTS**

- A. Section 26 05 19 – Low-Voltage Electrical Power Conductors and Cables
- B. Section 26 05 26 – Grounding and Bonding for Electrical Systems
- C. Section 26 05 29 - Hangers and Supports for Electrical Systems
- D. Section 26 27 26 – Wiring Devices.

**1.4 QUALITY ASSURANCE**

- A. National Electrical Contractor's Association (NECA) Standard of Installation
- B. National Electrical Code (NEC) including State of Wisconsin and local supplements.

**1.5 SUBMITTALS**

- A. See Section 26 05 00 for general shop drawing requirements.

**PART 2 – PRODUCTS**

**2.1 GALVANIZED RIGID CONDUIT (GRC) AND INTERMEDIATE METAL CONDUIT (IMC)**

- A. Manufactured lengths, full weight, heavy wall, rigid steel conduit, protected inside and out by hot-dipped galvanized or electro-galvanized coating.
- B. Minimum conduit size shall be ½ inch.
- C. Connectors and Couplings
  1. Threaded.
  2. Liquid tight.
  3. Insulated throat.

**2.2 ELECTRICAL METALLIC TUBING (EMT)**

- A. Standard lengths and sizes.
- B. Minimum conduit size shall be ½ inch.

- C. Connectors and Couplings
  1. Threaded with insulated throat for box connections.
  2. Gland compression on conduit connections.
  3. Steel.
  
- D. Colors (factory finished):
  1. Red – Fire Alarm Systems
  2. Green – Emergency power systems.
  3. Purple - Security
  4. Blue - Telecommunications
  5. White - HVAC Controls
  6. Standard Silver (no special finish) - Normal power systems

## **2.2 LIQUIDTIGHT FLEXIBLE METAL CONDUIT**

- A. Galvanized spiral strip flexible steel.
- B. Standard conduit sizes.
- C. Heavy wall sunlight resistant PVC jacket.
- D. Minimum size ½ inch.
- E. Connectors and Couplings
  1. Liquid-tight.
  2. Suitable for grounding.
  3. Suitable for wet locations.
  4. Tapered threaded hub.
  5. Non-metallic materials.

## **2.3 FLEXIBLE METAL CONDUIT**

- A. Galvanized spiral strip flexible steel.
- B. Standard conduit sizes.
- C. Minimum size ½” with the exception that 3/8” diameter may be used to serve individual lighting fixtures installed in a suspended accessible ceiling system.
- D. Connectors and Couplings
  1. Threaded.
  2. Grounding type.
  3. Insulated throat.
  4. Two screw clamp type with locknuts.
  5. Externally secured.

## **2.4 EXPANSION FITTINGS**

- A. Expansion fittings: Internal copper bonding jumper, Crouse-Hinds Type XJG series, O.Z./Gedney AXB series or equal.
- B. Deflection fittings: Internal copper bonding jumper, Crouse-Hinds Type XD series, O.Z./Gedney DX series or equal.

- C. Expansion/deflection fittings: Internal copper bonding jumper, Crouse-Hinds Type XJDG series, O.Z./Gedney AXB & DX series or equal.

## **2.5 CONDUIT BODIES**

- A. Galvanized or cadmium plated.
- B. Threaded hubs.
- C. Removable cover with gasket.
- D. Corrosion-resistant screws.

## **2.6 SEALS**

- A. Wall entrance seals: Link seal type as manufactured by Thunderline Corporation or O.Z./Gedney.
- B. Internal conduit/conductor seals:
  - 1. Removable: O.Z./Gedney or PSI Kompakt.
  - 2. Permanent: Polywater.FST system

## **2.7 INTERIOR WALL OUTLET BOXES – FLUSH MOUNTED**

- A. Stud wall construction. Stamped steel, four-inch square, 2-1/8" deep, with square corners. Provide with raised device rings, height as required for wall finish thickness. Mounting accessories as required. Larger width boxes as required for ganging requirements indicated on plans.
- B. Masonry wall construction. Stamped steel. Face of box flush with wall, 3-1/2" deep box minimum. Width as required for ganging requirements shown on plans.

## **2.8 INTERIOR WALL OUTLET BOXES – SURFACE MOUNTED – DRY LOCATION**

- A. In public areas: Cast malleable aluminum with threaded conduit hubs. Two inches deep minimum. Internal mounting ears. Boxes shall be coated with electroplated zinc, a dichromate coating and an aluminum polymer enamel finish.
- B. Other areas: Stamped steel, four-inch square, 2-1/8" deep, with round corners. Provide rounded corner raised box covers with openings as required for devices being installed.

## **2.9 INTERIOR WALL OUTLET BOXES-SURFACE MOUNTED-DAMP OR WET LOCATION**

- A. Cast malleable aluminum with threaded conduit hubs. Two inches deep minimum. Internal mounting ears. Boxes shall be coated with electroplated zinc, a dichromate coating and an aluminum polymer enamel finish.

## **2.10 CEILING BOXES - FLUSH MOUNTED - FOR SURFACE AND PENDANT LIGHT FIXTURES**

- A. Dropped ceiling construction. Stamped steel four-inch octagon box set flush with finished surface, complete with 3/8" fixture stud.

- B. Cast in place concrete construction. Stamped steel four-inch octagonal, galvanized concrete boxes, having a minimum depth of 3", complete with 3/8" fixture stud.

#### **2.11 ELECTRICAL BOXES IN CORROSIVE LOCATIONS**

- A. PVC coated cast steel boxes compatible with conduit system installed. Coating shall cover both interior and exterior surfaces. See floor plans for identification of corrosive areas.

#### **2.12 SPECIAL BOXES**

- A. Provide special boxes fabricated by the manufacturer of fixtures and other devices where standard outlets are not applicable.

#### **2.13 INTERIOR GENERAL PURPOSE JUNCTION AND PULL BOXES**

- A. Fabricated from code gauge galvanized steel with covers held in place by corrosion resistant machine screws.
- B. Size as required by code for number of conduits and conductors entering and leaving box.
- C. Provide with welded seams, where applicable and equip with corrosion-resistant nuts, bolts, screws and washer.

#### **2.14 ACCESS PANELS**

- A. Furnish type necessary for the particular wall or ceiling construction in which they occur.
- B. Panels to be completed with screwdriver cam locking device.

#### **2.15 BETWEEN STUD BOX SUPPORT BRACKETS**

- A. Stamped and fabricated steel bracket designed to support 4" or 4-11/16" electrical boxes between wall studs.
- B. Manufactured by Erico, RBS series or equivalent.

### **PART 3 – EXECUTION**

#### **3.1 GENERAL**

- A. Interior conduits for wiring systems rated 0 to 600 volts shall be electrical metallic tubing (EMT). Exceptions to the requirements stated above are as follows.
  1. Motor connection: Flexible conduit of appropriate type.
  2. Hazardous locations: GRC.
  3. Where otherwise stated in these specifications or on the floor plans.

#### **3.2 PROCEDURES AND PRACTICES**

- A. All conduits shall be routed concealed in finished spaces and shall not be visible at any point within the finished space or from the building's exterior. This

requirement also applies to new conduits installed in existing construction. Exposed raceway may be used only where physically impossible to route concealed in construction. In such cases where exposed raceway is allowed it shall be surface type in public areas as dictated by the wiring quantities. In each case the specific raceway type and routing shall be submitted to the Architect for approval. Where allowed, the general installation requirements are as follows:

1. Raceways shall be routed horizontally along the corners of walls and ceilings, directly above edges of base molding at floors, or along the tops of window and door frames.
  2. Raceways shall be routed vertically along corners of adjacent walls and along the edges of window and door frames.
  3. Raceways shall not be routed down or across open wall surfaces except in portions of runs not exceeding 12" in length.
  4. Raceways shall be painted to match wall finishes. EC is responsible for painting of all raceways.
  5. Fittings and boxes used with raceways shall be specifically designed and approved for use with the raceways.
- B. Cut joints shall be square, reamed smooth and drawn up tight.
- C. Keep conduit plugged, clean and dry during construction.
- D. Cap spare conduits.
- E. Provide riser clamps around all conduits 1-1/4" or larger that are routed between floors. Provide conductor support in vertical risers greater than 20' as appropriate.
- F. Provide a watertight conduit system where installed in wet locations such as underground, or where embedded in concrete.
- G. Route conduit runs above suspended acoustical ceilings so as not to interfere with ceiling tile removal. Conduit supports shall be attached to building structural elements. Conduits shall not be supported by or attached to the suspension systems for dropped ceiling systems unless specifically detailed on the drawings.
- H. Conduits may be routed exposed in mechanical equipment rooms and utility rooms.
- I. Route all conduits (including conduits routed above ceilings) parallel to or at right angles with lines of the building construction and structural members except conduit runs routed concealed in pour-in-place concrete floor slabs may be run in direct line from source load.
- J. Make bends and offsets without kinking or destroying smooth bore of conduit. Arrange bends and offsets in parallel conduits to present a neat symmetrical appearance.
- K. Secure conduits in place with malleable corrosion-proof alloy straps or hangers. Conduit straps used in corrosive areas shall be PVC coated.
- L. The use of perforated strapping as a conduit hanging method is not approved.
- M. Conduit runs that extend through areas of different temperature or atmospheric conditions shall be sealed, drained and installed in a manner that will prevent

drainage of condensed or entrapped moisture into cabinets and equipment enclosures.

- N. Route conduits within poured concrete construction parallel to each other and spaced on center of at least three times conduit trade diameter with minimum two (2) inches of concrete covering. Conduits over 1¼" may not be installed in slab without the approval of the Architect. Conduits embedded in a structural frame slab shall comply with applicable provisions of American Concrete Institute (ACI), Standard 318. Conduits used for feeders shall not be embedded in concrete floor slabs.
- O. In areas constructed of pre-cast concrete, run conduits in insulation space or in floor topping slabs without crossing other conduits, using ¾" maximum conduit size.
- P. Install flexible steel conduit whips from an independent junction box mounted above ceiling to recessed ceiling mounted lighting fixtures. Allow for positioning of equipment to tile increments.
- Q. Connections to Motors and Equipment Subject to Vibration:
  - 1. Flexible steel conduit not over three (3) feet long for connection to motorized equipment.
  - 2. Liquid-tight flexible conduit not over three (3) feet long where exposed to moisture, dirt, fumes, oil, corrosive atmosphere with connectors to assure a liquid-tight, permanently grounded connection. Locate so it is least subject to physical abuse. Corrosive areas are identified on the floor plans.
  - 3. Use double locknuts and insulated bushings with threads fully engaged.
- R. Install bushings with ground lugs and integral plastic linings at equipment with open bottom conduit entrances.
- S. Install conduit expansion fittings where conduits cross expansion joints.
- T. Install No. 12 pull wire in empty conduit.
- U. All wiring in raceways shall be provided with a separate green grounding conductor.
- V. All conduits that terminate in free air (no connection to equipment or box) shall be provided with an insulated bushing.
- W. All wiring in walls shall have a raceway within the wall with an enclosed outlet box regardless if the remaining portion of the particular system is installed in raceway or free-air.

### **3.3 FIRE STOPS AND PENETRATION SEALS**

- A. All penetrations through fire rated floors and walls due to the electrical installation shall be sealed with CHASE-FOAM PR-855 Fire Resistant Foam Sealant, to prevent the spread of smoke, fire, toxic gas or water through the penetration either before, during or after a fire. The fire rating of the penetration seal shall be at least that of the floor or wall into which it is installed, so that the original fire rating of the floor or wall is maintained as required by Article 300-21 of the

National Electrical Code. Equivalent foam sealant manufactured by Dow Corning approved.

- B. The sealant shall remain soft and pliable to allow for the removal and/or addition of cables without the necessity of drilling holes. It shall adhere to itself perfectly to allow any all repairs to be made with the same material. It shall permit the vibration, expansion and/or contraction of anything going through the penetration without the seal cracking or crumbling.
- C. When damming materials are to be left in place after the seal is complete then all such materials shall be non-flammable.
- D. When sealant is injected into a penetration, the foam shall expand to surround all the items within the penetration and maintain pressure against the walls of the penetration. The foam shall cure with in five minutes and be fire resistant at that time. No heat shall be required to further expand the foam to block the passage of fire and smoke or water.
- E. All wall or floor penetrations openings shall be as small as possible.
- F. The foam sealant shall meet all fire test and hose stream test requirements of ASTM E119-73 and shall be UL Classified as a Wall Opening Protective Device.
- G. All penetrations through non-fire rated walls shall be sealed with an appropriate sealant.

#### **3.4 CUTTING AND PATCHING**

- A. Provisions for opening, holes and clearances through walls, floors, ceilings and partitions shall be made in advance of construction.
- B. Provide cutting, patching and painting necessary for the installation of electrical systems.
- C. Where conduits need to penetrate concrete or masonry construction below grade, the EC shall install PVC sleeves with integral waterstop, one (1) inch larger in diameter than the conduit being installed. Install sleeves before walls and/or slabs are poured or constructed.
- D. Where conduits need to penetrate concrete or masonry construction above grade, the EC shall install 22 gauge galvanized steel pipe sleeves, one (1) inch larger in diameter than the conduit being installed. Sleeves shall extend 2" above and below the floor slab penetrated. Install sleeves before walls and/or slabs are poured or constructed.
- E. The Electrical Contractor shall prepare drawings indicating size and location of all anticipated floor sleeves for the installation of electrical conduits. Such drawings shall be made available to the General Contractor 10 days prior to any scheduled concrete work.

#### **3.5 RESTRICTIONS**

- A. Conduits routed parallel to steam lines, hot water pipes, high temperature piping or ducts shall be routed at least 12" from such and shall be a minimum of 12" clear when crossing same.

- B. Do not route conduit over boiler, incinerator or other high temperature equipment.
- C. Where conduits must cross or follow the same path as water, steam or other fluid piping, run electrical conduits above such piping wherever possible.

### **3.6 ADJUSTMENT AND CLEANING**

- A. Restore damaged areas on PVC jacketed, rigid conduit with spray type touch-up coating compound or as directed by manufacturer.
- B. Pull cleaning plug through conduits to clear of dirt, oil and moisture.

### **3.7 CONDUIT SYSTEMS**

- A. Where raceways are required, separate raceway systems shall be provided for each wiring system as follows:
  - 1. 208 volt normal power wiring systems.
  - 2. 208 volt code required emergency power wiring systems.
  - 3. Lightning protection systems.
  - 4. Fire alarm systems.
  - 5. Voice/data communications raceway systems.
  - 6. Lighting control systems.

### **3.8 CONDUIT FITTINGS**

- A. Install electrical fittings in accordance with the manufacturer's written instructions and with recognized industry practices to ensure that fittings serve intended purposes.
- B. Rigidly secure connectors at cabinets and boxes with galvanized lock nut and bushing.
- C. Seal conduits that run through different temperature or atmospheric conditions to prevent condensation or moisture from entering electrical equipment and devices.
- D. Install wall entrance seal where conduits or direct burial conductors pass through foundation walls below grade.
- E. Install conduit expansion fittings complete with bonding jumper in following locations:
  - 1. Conduit runs which cross a structural expansion joint.
  - 2. Conduit runs where movement perpendicular to axis of conduit may be encountered.
- F. Locate conduit bodies so as to assure accessibility of electrical wiring.
- G. Install fittings designed for use with flexible liquid-tight conduit to ensure continuity of ground throughout the fittings and conduit, and prevent entrance of moisture.
- H. Exposed PVC runs, subject to temperature changes of more than 20 degrees, and longer than 10 feet shall have an expansion fitting (long or short type as appropriate) installed in middle of run.

### **3.9 BOX INSTALLATION**

- A. Install electrical boxes as indicated in compliance with NEC requirements, in accordance with the manufacturer's written instructions and with recognized industry practices to ensure that the boxes serve the intended purposes.
- B. Seal conduit at entrance to weatherproof boxes for interior and exterior locations exposed to weather or moisture.
- C. Install knockout closures to cap unused knockout holes where blanks have been removed.
- D. Locate boxes so as to assure accessibility of electrical wiring. Relocate boxes rendered inaccessible by the installation of work by other trades.
- E. Secure boxes rigidly to the substrate upon which they are being mounted or solidly embed boxes in concrete or masonry. Do not support from conduit.
- F. Set boxes, in concealed conduit runs, flush with wall surfaces, with or without covers, as required.
- G. Do not install boxes back to back or through wall. Offset outlet boxes on opposite sides of wall a minimum of 12 inches.
- H. Set outlet boxes parallel to construction, securely mounted and adjusted to set true and flush with the finished surface.
- I. Do not burn conduit holes, use knock-out punches or hole saws.
- J. Provide appropriate ganged device box(es) where devices are logically installed together (i.e. light switches, etc.).
- K. Boxes shall be sized per code to accommodate the number and size of conduit entrances to the box and to accommodate the number of conductors, splices, fittings, etc., within the box. Do not use box extensions to create additional volume to meet NEC requirements for the number of conductors contained in a box.

### **3.10 EXPOSED OUTLET AND JUNCTION BOXES**

- A. Install non-rusting metal weatherproof cover on recessed junction box in new walls or non-rusting surface mounted metal junction boxes on existing walls outdoors and in any area where drawings show weatherproof (WP) or weatherproof-while-in-use (WPIU) wiring devices. Provide non-rusting metal WPIU covers anywhere required by code, even if not indicated on plans.

### **3.11 INTERIOR OUTLET BOX ACCESSORIES**

- A. Provide outlet box accessories as required for each installation, such as mounting brackets, wallboard hangers, extension rings, fixture studs, cable clamps and metal straps for supporting outlet boxes, compatible with outlet boxes being used and meeting requirements of individual wiring situations.
- B. Devices shown to be for/behind TV's and/or monitors shall be installed in a recessed box as specified.

### 3.12 LIGHTING FIXTURE OUTLET BOXES

- A. Securely mount with approved type bar hangers spanning structural members to support weight of fixture.
- B. Do not support from conduit.
- C. Equip with 3/8" fixture studs and tapped fixture ears for surface mounted or pendant mounted lighting fixtures. Fixture studs shall be provided for mounting of all lighting fixtures exceeding 25 lbs in weight. Fixture studs shall be attached through knockouts at the top of the box.
- D. Provide additional attachments from structure for outlet boxes supporting lighting fixtures weighting in excess of 25 lbs.

### 3.13 OUTLET BOX LOCATIONS

- A. Locate flush mounted wall boxes in corner of nearest brick or block to keep cutting to a minimum.
- B. Location of outlets and equipment as shown on drawings is approximate, and exact location is to be verified and shall be determined by:
  - 1. Construction or code requirements
  - 2. Conflict with equipment of other trades.
  - 3. Equipment manufacturer's drawings.
- C. Where receptacles and communication outlets are shown grouped next to each other on the drawings, the boxes for these outlets shall be mounted next to each other and shall not be located according to stud spacings. The Contractor shall utilize between stud box supports to assist in mounting boxes proximal to one another on a consistent spacing between wall studs.
- D. Minor modification in the location of outlets and equipment is considered incidental up to a distance of 10 feet, provided the change in location is requested prior to rough-in. **Outlets shall not have their locations significantly altered from that shown on the plans unless approved by the engineer – relocations necessary to relocate and install in the intended position due to unapproved relocations shall be at the sole cost to the electrical contractor.**
- E. Mounting heights for devices and equipment to be measured from finished floor to center line of device.

END OF SECTION

**SECTION 26 05 53  
IDENTIFICATION FOR ELECTRICAL SYSTEMS**

**PART 1 – GENERAL**

**1.1 RELATED REQUIREMENTS**

- A. Applicable provisions of Division 1 shall govern work under this section.

**1.2 SECTION INCLUDES**

- A. Nameplates
- B. Labels

**1.3 RELATED WORK**

- A. Section 26 05 00 – Common Work Results for Electrical

**PART 2 – PRODUCTS**

**2.1 MATERIALS**

- A. Nameplates:
  - 1. Engraved heavy duty multi-layer laminated plastic
  - 2. Colors:
    - a. Normal Power: White letters on a black background.
    - b. Emergency (NEC 700) system: White letters on a red background.
    - c. Legally Required (NEC 701) system: White letters on a blue background.
    - d. Optional (NEC 702) system: White letters on a yellow background.
- B. Tape (phase identification only):
  - 1. Scotch #35 tape in appropriate colors for system voltage and phase.
- C. Adhesive type labels shall be typed with black text on white background for boxes in non-public areas and black text on clear background for wiring device faceplates.
- D. EXTERIOR LOCATIONS: Shall be permanent embossed 304 stainless steel tag with 3/16" characters (Panduit MEHT187 system, Dymo Rhino M1011 metal tape embosser, ShortOrderProducts Hand Held Embosser system or approved equal) banded to conductor using black outdoor rated nylon ties.
- E. Embossed tape is not permitted.

**PART 3 – EXECUTION**

**3.1 GENERAL**

- A. Where mixed voltages are used in one building (e.g. 4160 volt, 480 volt, 208 volt) each switch, switchboard, junction box, equipment, etc., on each system shall be labeled for voltage in addition to the other requirements listed herein.
- B. All branch circuit and power panels shall be identified with the same name used at the main distribution panel.
- C. Handwriting is not acceptable for any identification, including any additional identification required by inspectors or other code officials.

### 3.2 INSTALLATION

- A. Clean and degrease surfaces to receive labels or nameplates.
- B. Install nameplates parallel to equipment lines.
- C. Secure nameplates to equipment using screws, rivets or adhesive.
- D. Provide nameplate for each switchboard, panelboard, contactor, telephone cabinet, time switch, motor starter, transformer, fire alarm panel or disconnect switch.
  - 1. Identification shall be on the exterior of the unit, except for flush equipment in public areas which shall have the identification inside the door or cover.
- E. Label each end of empty conduit runs to indicate the use of the conduit and the location of opposite end and plug conduit ends. Use room numbers that are permanently assigned.

### 3.3 EQUIPMENT IDENTIFICATION

#### A. TYPICAL EQUIPMENT

- 1. Identify using nameplates for motor starters, disconnect switches, timeclocks, contactors, fire alarm panels, lighting control panels, SPD's and transformers: ½ inch: identify equipment designation (upper line); ¼ inch: identify voltage rating and source (lower lines).

Transformer Example:

**T/H1**  
30KVA, 480V Pri. - 208Y/120V Sec.  
Fed from Panel A in room #100

SPD Example:

**SPD**  
200KA, 208Y/120V  
Fed from MSB in room #071

Motor Starter/Disconnect Example:

**AC-1**  
200A, 208V, 3PH, 3W  
Fed from Panel P Circuits #1/3/5 in room #200

Other Equipment Example:

## **FIRE ALARM CONTROL PANEL**

Fed from Panel EM Circuit #21 in room #072

### **B. PANELBOARD IDENTIFICATION**

1. Provide an identification nameplate mounted at the top of the main section. Nameplate shall include in 1" text the switchboard or power type panel designation as shown on the plans and in 1/2" text the switchboard voltage, interrupting rating and bus rating. Equipment downstream of main panel shall indicate source.

Main Equipment Example:

### **MSB-1**

1200A, 208Y/120V, 3PH, 4W  
52,000AIC

2. Provide an identification nameplate mounted at the top of the main section. Nameplate shall include in 1/2" text for the panel designation as shown on the plans and in 1/4" text the panelboard voltage, interrupting rating and bus rating. Panels downstream of main panel shall indicate source.

Downstream Panelboard Example:

### **DP-1**

600A, 208Y/120V, 3PH, 4W  
33,000AIC  
Fed from MSB-1 in room #071

### **3.4 JUNCTION BOX/PULL BOX IDENTIFICATION**

#### **A. Junction Boxes and Pull Boxes for power distribution systems:**

1. Cover shall indicate voltage using 1/2" text; source(s) and circuit(s) contained within using 1/2" text. Identification shall be by means of adhesive labels.

#### **B. Junction boxes for communications, signal and control systems: Identify system source and equipment serviced, labeled with 1/2" text in black on cover or engraved nameplates as follows:**

1. Voice/Data Communications – V/D
2. Building Public Address System – PA
3. Closed Circuit TV – CCTV
4. Security System – SEC
5. Cable TV – CATV
6. Intercom – IC

#### **C. Junction boxes for Fire Alarm System: Junction box covers shall be painted red with "FA" labeled with 1" text in black on cover.**

### **3.5 CONDUCTOR IDENTIFICATION**

- A. Install label tags on conductors in junction boxes, pull boxes, wireways, pole handholes and wiring gutters of panels.
- B. Line voltage conductors shall be identified by panel and circuit number using sleeve type adhesive markers.
- C. Each phase conductor of each feeder shall be identified at both ends and at all accessible locations with colored plastic tape, as well as typed identification labeling. Each phase shall be identified by a different color per industry standards. Painted identification is not acceptable.
- D. Where wires of different system junction in a common box each cable shall be grouped with its own system and identified using tags or identification strips.

### **3.6 BRANCH CIRCUIT IDENTIFICATION**

- A. Each distribution and lighting panel shall be equipped with a typewritten directory describing the loads served. Directory **shall be** contained in a steel frame mounted on the inside face of the panel's door and shall be covered with a sheet of clear plastic. Multiple frames shall be provided if needed to view entire circuit directory for panel.
- B. Circuit descriptions shall be complete and include device/equipment type and relative location.
- C. Minimum font size shall be 10pt.

### **3.7 WIRING DEVICE IDENTIFICATION**

- A. Each receptacle and light switch faceplate shall indicate circuit (source and circuit number) using 1/4" text. Identification shall be by means of adhesive labels located on bottom of faceplate.

END OF SECTION

**SECTION 26 09 43  
NETWORK LIGHTING CONTROL**

**PART 1 – GENERAL**

**1.1 RELATED REQUIREMENTS**

- A. Applicable requirements of Division 1 shall govern work in this section.
- B. Contractor shall coordinate all of the work in this section with all the trades covered in the other sections of the specification to provide a complete and operative system.

**1.2 DESCRIPTION OF WORK**

- A. The lighting control system specified in this section shall provide time-based, sensor-based (both occupancy and daylight), and manual lighting control.
- B. The system shall be capable of turning lighting loads on/off as well as dimming lights (if lighting load is capable of being dimmed)
- C. All system devices shall be networked together enabling digital communication and shall be individually addressable.
- D. The system architecture shall be capable of enabling stand-alone groups (rooms) of devices to function in some default capacity even if network connectivity to the greater system is lost.
- E. The system architecture shall facilitate remote operation via a computer connection.
- F. The system shall not require any centrally hardwired switching equipment.
- G. The system shall be capable of wireless, wired, or hybrid wireless/wired architectures.
- H. The exact devices needed for the project shall be based on the intent of the plans, as indicated herein and per manufacturer's representative as coordinated with Engineer. Not all devices indicated herein will necessarily be needed.
- I. Any installed wireless communications devices shall be powered directly or through power pack (with wireless communications) – no batteries are allowed.

**1.3 QUALITY ASSURANCE**

- A. All steps in sensor manufacturing process shall occur in the USA; including population of all electronic components on circuit boards, soldering, programming, wiring, and housing.
- B. All components and the manufacturing facility where product was manufactured must be ROHS compliant.
- C. In high humidity or cold environments, the sensors shall be conformably coated and rated for condensing humidity and -40 degree Fahrenheit (and Celsius) operation.

- D. All applicable products must be UL / CUL Listed or other acceptable national testing organization.

#### **1.4 SUBMITTALS**

- A. See Section 26 05 00 for general shop drawing requirements.
- B. Product Datasheets (general device descriptions, dimensions, wiring details, nomenclature).
- C. Riser Diagrams – typical per room type (detailed drawings showing device interconnectivity of devices).
- D. Other Diagrams – as needed for special operation or interaction with other system(s).
- E. Example Contractor Startup/Commissioning Worksheet – must be completed prior to factory start-up.
- F. Hardware and Software Operation Manuals.
- G. Other operational descriptions as needed.

#### **1.5 COORDINATION**

- A. Coordinate lighting control components to form an integrated interconnection of compatible components.
- B. Coordinate lighting controls with BAS (if necessary) either through IP based intercommunication of system or hardwired auxiliary relay outputs.
- C. The installing contractor shall be responsible for a complete and functional system in accordance with all applicable local and national codes.

#### **1.6 SUBSTITUTIONS**

- A. Substitutions are permitted as voluntary alternates. Base bid must reflect the specified equipment.
- B. A product must go through the substitution process.

#### **1.7 WARRANTY**

- A. All devices in lighting control system shall have a 5-year warranty.

### **PART 2 – PRODUCTS**

#### **2.1 MANUFACTURERS**

- A. This specification is based on the Acuity Controls nLight® Wired/Wireless Network Control System.

## 2.2 SYSTEM REQUIREMENTS

- A. System shall have an architecture that is based upon three main concepts; 1) intelligent lighting control devices 2) standalone lighting control zones 3) network backbone for remote or time-based operation.
- B. Intelligent lighting control devices shall consist of one or more basic lighting control components; occupancy sensors, photocell sensors, relays, dimming outputs, manual switch stations, and manual dimming stations. Combining one or more of these components into a single device enclosure should be permissible so as to minimize overall device count of system.
- C. System must interface directly with intelligent LED luminaires such that only CAT-5 cabling is required to interconnect luminaires with control components such as sensors and switches.
- D. Intelligent lighting control devices shall communicate digitally, require <4 mA of current to function (Graphic wall stations excluded), and possess RJ-45 style connectors.
- E. Lighting control zones shall consist of one or more intelligent lighting control components, be capable of stand-alone operation, and be capable of being connected to a higher level network backbone.
- F. Devices within a lighting control zone shall be connected with CAT-5e low voltage cabling in any order.
- G. Lighting control zone shall be capable of automatically configuring itself for default operation without any start-up labor required.
- H. Individual lighting zones must continue to provide a user defined default level of lighting control in the event of a system communication failure with the backbone network or the management software becoming unavailable.
- I. Power for devices within a lighting control zone shall come from either resident devices already present for switching (relay device) or dimming purposes, or from the network backbone. Standalone "bus power supplies" shall not be required in all cases.
- J. All switching and dimming for a specific lighting zone shall take place within the devices located in the zone itself (i.e. not in a remotely located devices such as panels) to facilitate system robustness and minimize wiring requirements. Specific applications that require centralized or remote switching shall be capable of being accommodated.
- K. System shall have one or more primary wall mounted network control "gateway" devices that are capable of accessing and controlling connected system devices and linking into an Ethernet LAN.
- L. System shall use "bridge" devices that route communication and distribute power for up to 8 directly connected lighting zones together for purposes of decreasing system wiring requirements.
- M. System shall be capable of wirelessly connecting a lighting zone to a WiFi (802.11n) wireless data network for purposes of eliminating the "bridge" devices and all cabling that connects zones to bridge devices.
- N. WiFi enabled devices shall be able to detect when WiFi network is down and revert to a user directed default state.
- O. WiFi-enabled devices shall be capable of current monitoring
- P. WiFi-enabled devices shall utilize WPA2 AES encryption

- Q. WiFi-enabled devices shall be able to connect to 802.11b/g/n WiFi networks
- R. WiFi-enabled devices shall have at least one local RJ-45 port for communicating with nonWiFi-enabled system devices
- S. System shall have a web-based software management program that enables remote system control, status monitoring, and creation of lighting control profiles.
- T. Individual lighting zones shall be capable of being segmented into several "local" channels of occupancy, photocell, and switch functionality for more advanced configurations and sequences of operation.
- U. Devices located in different lighting zones shall be able to communicate occupancy, photocell, and switch information via either the wired or WiFi backbone.
- V. System shall be capable of operating a lighting control zone according to several sequences of operation. System shall be able to change a spaces sequence of operation according to a time schedule so as to enable customized time-of-day, day-of-week utilization of a space. Note operating modes should be utilized only in manners consistent with local energy codes.
  - a. Auto-On / Auto-Off (via occupancy sensors)
    - Zones with occupancy sensors automatically turn lights on when occupant is detected.
    - Zones with occupancy and/or photocell sensors turn lights off when vacancy or sufficient daylight is detected.
    - Pressing a switch will turn lights off. The lights will remain off regardless of occupancy until switch is pressed again, restoring the sensor to Automatic On functionality.
  - b. Manual-On / Auto-Off (also called Semi-Automatic)
    - Pushing a switch will turn lights on.
    - Zones with occupancy and/or photocell sensors turn lights off when vacancy or sufficient daylight is detected.
  - c. Manual-On to Auto-On/Auto-Off
    - Pushing a switch will turn lights on.
    - After initial lights on, zones with occupancy and/or photocell sensors turn lights on/off according to occupancy/vacancy and/or daylight conditions.
    - Sequence can be reset via scheduled (ex. daily each morning) events
  - d. Auto-to-Override On
    - Zones with occupancy sensors automatically turn lights on when occupant is detected.
    - Zone lighting then goes into an override on state for a set amount of time or until the next time event returns the lighting to an auto-off style of control.
    - Sequence can be reset via scheduled (ex. daily each morning) events
  - e. Manual-to-Override On
    - Pushing a switch will turn lights on.
    - Zone lighting then goes into an override on state for a set amount of time or until the next time event returns the lighting to an auto-off style of control.
    - Sequence can be reset via scheduled (ex. daily each morning) events
  - f. Auto On / Predictive Off
    - Zones with occupancy sensors automatically turn lights on when occupant is detected.
    - Zones with occupancy and/or photocell sensors turn lights off when vacancy or sufficient daylight is detected.

- If switch is pressed, lights turn off and a short “exit timer” begins. After timer expires, sensor scans the room to detect whether occupant is still present. If no occupancy is detected, zone returns to auto-on. If occupancy is detected, lights must be turned on via the switch.
- g. Multi-Level Operation (multiple lighting levels per manual button press)
- Operating mode designed specifically for bi-level applications
  - Enables the user to cycle through the up to four potential on/off lighting states using only a single button.
  - Eliminates user confusion as to which of two buttons controls which load
  - Three different transition sequences are available in order to comply with energy codes or user preference)
  - Mode available as a setting on all nLight devices that have single manual on/off switch.
  - Depending on the sequence selected, every button push steps through relays states according to below table
  - In addition to achieving bi-level lighting control by switching loads with relays, the ability to command dimming outputs to “step” in a sequence that achieves bi-level operation is present.
- W. A taskbar style desktop application shall be available for personal lighting control.
- X. An application that runs on “smart” handheld devices (such as an Apple® iPhone®) shall be available for personal lighting control.
- Y. Control software shall enable logging of system performance data and presenting useful information in a web-based graphical format and downloadable to .CSV files.
- Z. Control software shall enable integration with a BMS via BACnet IP.
- AA. System shall provide the option of having pre-terminated plenum rated CAT-5 cabling supplied with hardware.

## 2.3 INDIVIDUAL DEVICES REQUIREMENTS

### A. Control Module (Gateway)

- a. Control module shall be a device that facilitates communication and time-based control of downstream network devices and linking into an Ethernet.
- b. Devices shall have a user interface that is capable of wall mounting, powered by low voltage, and have a touch screen.
- c. Control device shall have three RJ-45 ports for connection to other backbone devices (bridges) or directly to lighting control devices.
- d. Device shall automatically detect all devices downstream of it.
- e. Device shall have a standard and astronomical internal time clock.
- f. Device shall have one RJ-45 10/100 BaseT Ethernet connection.
- g. Device shall have a USB port
- h. Each control gateway device shall be capable of linking 1500 devices to the management software.
- i. Device shall be capable of using a dedicated or DHCP assigned IP address.

### B. Networked System Occupancy Sensors

- a. Occupancy sensors system shall sense the presence of human activity within the desired space and fully control the on/off function of the lights.
- b. 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. Ultrasonic or Microwave based sensing technologies shall not be accepted.

- c. For applications where a second method of sensing is necessary to adequately detect maintained occupancy (such as in rooms with obstructions), a sensor with an additional “dual” technology shall be used.
- d. Dual technology sensors shall have one of its two technologies not require motion to detect occupancy. Acceptable dual technology includes PIR/Microphonics (also known as Passive Dual Technology or PDT) which both looks for occupant motion and listens for sounds indicating occupants. Sensors where both technologies detect motion (PIR/Ultrasonic) shall not be acceptable.
- e. All sensing technologies shall be acoustically passive meaning they do not transmit sounds waves of any frequency (for example in the Ultrasonic range), as these technologies have the potential for interference with other electronic devices within the space (such as electronic white board readers). Acceptable detection technologies include Passive Infrared (PIR), and/or Microphonics technology. Ultrasonic or Microwave based sensing technologies shall not be accepted.
- f. Sensors shall be available with zero, one, or two integrated Class 1 switching relays, and up to one 0-10 VDC dimming output. Sensors shall be capable of switching 120 / 277 / 347 VAC. Load ratings shall be 800 W @ 120 VAC, 1200 W @ 277 VAC, 1500 W @ 347 VAC, and ¼ HP motor. Relays shall be dry contacts.
- g. Sensors shall be available with one or two occupancy “poles”, each of which provides a programmable time delay.
- h. Sensors shall be available in multiple lens options which are customized for specific applications.
- i. Communication and Class 2 low voltage power shall be delivered to each device via standard CAT-5 low voltage cabling with RJ-45 connectors.
- j. All sensors shall have two RJ-45 ports or capable of utilizing a splitter.
- k. All sensors shall have the ability to detect when it is not receiving valid communication (via CAT-5 connections) and blink its LED in a pattern to visually indicate of a potential wiring issue
- l. Every sensor parameter shall be available and configurable remotely from the software and locally via the device push-button.
- m. Sensors shall be able to function together with other sensors in order to provide expanded coverage areas by simply daisy-chain wiring together the units with CAT-5 cabling.
- n. 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.
- o. Wall switch sensors shall recess into single-gang switch box and fit a standard GFI opening.
- p. Wall switch sensors must meet NEC grounding requirements by providing a dedicated ground connection and grounding to mounting strap. Line and load wire connections shall be interchangeable. Sensor shall not allow current to pass to the load when sensor is in the unoccupied (Off) condition.
- q. Wall switch sensors shall have optional features for photocell/daylight override, vandal resistant lens, and low temperature/high humidity operation.
- r. Wall switch sensors shall be available in four standard colors (Ivory, White, Light Almond, Gray)
- s. Wall switch sensors shall be available with optional raise/lower dimming adjustment controls

- t. Network system shall have sensors that can be embedded into luminaire such that only the lens shows on luminaire face.
- u. Embedded sensors shall be capable of both PIR and Dual Technology occupancy detection
- v. Embedded sensors shall have an optional photocell
- w. Network system shall also have ceiling, fixture, recessed, & corner mounted sensors available.
- x. Fixture mount sensors shall be capable of powering themselves via a line power feed.
- y. Sensors shall have optional features for photocell/daylight override, dimming control, and low temperature/high humidity operation.
- z. Sensors with dimming can control 0 to 10 VDC dimmable ballasts by sinking up to 20 mA of Class 2 current (typically 40 or more ballasts).
- aa. Sensors shall be appropriate for the ceiling height and anticipated (worst case) motion in a space and the supplier is responsible for supplying proper type.
- bb. System shall have WiFi enabled fixture mountable sensors available.
- cc. Embedded sensors shall have an optional photocell and 0-10 VDC dimming output

**C. Networked System Daylight (Photocell and or Dimming) Sensors**

- a. 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.
- b. Photocell and dimming sensor's set-point and deadband shall be automatically calibrated through the sensor's microprocessor by initiating an "Automatic Set-point Programming" procedure. Min and max dim settings as well as set-point may be manually entered.
- c. 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).
- d. Dimming sensors shall control 0 to 10 VDC dimmable ballasts by sinking up to 20 mA of class 2 current (typically 40 or more ballasts).
- e. Photocell and 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.)
- f. Combination units that have all features of on/off photocell and dimming sensors shall also be available.
- g. A dual zone option shall be available for On/Off Photocell, Automatic Dimming Control Photocell, or Combination units. The second zone shall be capable of being controlled as an "offset" from the primary zone.
- h. Line voltage versions of the above described photocell and combination photocell/dimming sensors shall be capable of switching both 120 VAC, 277 VAC, and 347 VAC. Load ratings shall be 800 W @ 120 VAC, 1200 W @ 277 VAC, 1500 W @ 347 VAC, and ¼ HP motor load. Relays shall be dry contacts.
- i. Network system shall have dimming photocells that can be embedded into luminaire such that only the lens shows on luminaire face.

**D. Networked System Power (Relay) Packs**

- a. Power Pack shall incorporate one or more Class 1 relays and contribute low voltage power to the rest of the system. Secondary Packs shall incorporate the relay(s), shall have an optional 2<sup>nd</sup> relay, 0-10 VDC dimming output, or line voltage dimming output, but shall not be required to contribute system

power. Power Supplies shall provide system power only, but are not required to switch line voltage circuit. Auxiliary Relay Packs shall switch low voltage circuits only.

- b. Power Packs shall accept 120 or 277 VAC (or optionally 347 VAC), be plenum rated, and provide Class 2 power to the system.
- c. All devices shall have two RJ-45 ports.
- d. Every Power Pack parameter shall be available and configurable remotely from the software and locally via the device push-button.
- e. Power Pack shall securely mount to junction location through a threaded ½ inch chase nipple or be capable of being secured within a luminaire ballast channel. Plastic clips into junction box shall not be accepted. All Class 1 wiring shall pass through chase nipple into adjacent junction box without any exposure of wire leads. Note: UL Listing under Energy Management or Industrial Control Equipment automatically meets this requirement, whereas Appliance Control Listing does not meet this safety requirement.
- f. When required by local code, Power Pack must install inside standard electrical enclosure and provide UL recognized support to junction box. All Class 1 wiring is to pass through chase nipple into adjacent junction box without any exposure of wire leads.
- g. Power Packs and Power Supplies shall be available that are WiFi enabled.
- h. Power (Secondary) Packs shall be available that provide up to 16 Amp switching of all lighting load types.
- i. Power (Secondary) Packs shall be available that provide up to 5 Amps switching of all lighting load types as well as 0-10 VDC dimming or fluorescent ballasts/LED drivers.
- j. Specific Secondary Packs shall be available that provide up to 5 Amps of switching as well as 0-10 VDC dimming of fluorescent ballasts/LED drivers.
- k. Specific Secondary Packs shall be available that provide up to 5 Amps of switching and can dim 120 VAC incandescent lighting loads or 120/277 VAC line voltage dimmable fluorescent ballasts (2-wire and 3-wire versions).
- l. Specific Secondary Packs shall be available that provide up to 5 Amps of switching and can dim 120/277 VAC magnetic low voltage transformers.
- m. Specific Secondary Packs shall be available that provide up to 4 Amps of switching and can dim 120 VAC electronic low voltage transformers.
- n. Specific Secondary Packs shall be available that provide up to 5 Amps of switching of dual phase (208/240/480 VAC) lighting loads.
- o. Specific Secondary Packs shall be available that require a manual switch signal (via a networked Wall Station) in order to close its relay.
- p. Specific Power/Secondary Packs shall be available that are UL924 listed for switching of Emergency Power circuits.
- q. Specific Secondary Packs shall be available that control louver/damper motors for skylights.
- r. Specific Secondary Packs shall be available that provide a pulse on/pulse off signal for purposes of controlling shade systems via relay inputs.

**E. Networked System Relay & Dimming Panels**

- a. Panels shall incorporate up to 48 field configurable relays capable of switching 120/277 VAC or 208/240/480 VAC loads.
- b. Relays shall be rated to switch up to a 30A ballast load at 277 VAC.
- c. Panels shall provide one 0-10VDC dimming output paired with each relay.
- d. Panels shall power itself from an integrated 120/277 VAC supply.
- e. Panels shall be capable of operating as either two networked devices or as one.
- f. Panels shall supply current limited low voltage power to other networked devices connected via CAT-5.
- g. Panel shall provide auxiliary low voltage device power connected wired directly to a dedicated terminal connection.

- h. Panel shall be UL924 listed for use for emergency lighting. Provide barrier(s) between normal and emergency relays as required.

**F. Networked Auxiliary Input / Output (I/O) Devices**

- a. Devices shall be plenum rated and be inline wired, screw mountable, or have an extended chase nipple for mounting to a ½" knockout.
- b. Devices shall have two RJ-45 ports
- c. Communication and low voltage power shall be delivered to each device via standard CAT-5 low voltage cabling with RJ-45 connectors.
- d. Specific I/O devices shall have a dimming control output that can control 0-10 VDC dimmable ballasts or LED drivers by sinking up to 20 mA of current (typically 40 or more ballasts).
- e. Specific I/O devices shall have an input that read a 0-10 VDC signal from an external device.
- f. Specific I/O devices shall have a switch input that can interface with either a maintained or momentary switch and run a switch event, run a local/remote control profile, or raise/lower a dimming output
- g. Specific I/O devices shall sense state of low voltage outdoor photocells
- h. Specific I/O devices shall enable RS-232 communication between lighting control system and Touch Screen based A/V control systems.
- i. Specific I/O devices shall sense.

**G. Networked System Wall Switches & Dimmers**

- a. Devices shall recess into single-gang switch box and fit a standard GFI opening.
- b. Devices shall be available with zero or one integrated Class 1 switching relay.
- c. Communication and low voltage power shall be delivered to each device via standard CAT-5 low voltage cabling with RJ-45 connectors.
- d. All sensors shall have two RJ-45 ports.
- e. All devices shall provide toggle switch control. Dimming control and low temperature/high humidity operation are available options.
- f. Devices shall be available in four colors (Ivory, White, Light Almond, Gray).
- g. Devices with dimming control outputs can control 0-10 VDC dimmable ballasts by sinking up to 20 mA of current (typically 40 or more ballasts).
- h. Devices with capacitive touch buttons shall provide audible user feedback with different sounds for on/off, raise/lower, start-up, and communication offline.
- i. Devices with mechanical push-buttons shall provide tactile and LED user feedback.
- j. Devices with mechanical push-buttons shall be made available with custom button labeling
- k. Devices with a single on button shall be capable of selecting all possible lighting combinations for a bi-level lighting zone such that the user confusion as to which of two buttons (as is present in multi-button scenarios) controls which load is eliminated.

**H. Networked System Graphic Wall Station**

- a. Device shall have a 3.5" full color touch screen for selecting up to 8 programmable lighting control presets or acting as up to 16 on/off/dim control switches.
- b. Device shall enable configuration of lighting presets, switched, and dimmers via password protected setup screens.

- c. Device shall enable user supplied .jpg screen saver image to be uploaded.
- d. Device shall surface mount to single-gang switch box
- e. Device shall have a micro-USB style connector for local computer connectivity.
- f. Device shall have two RJ-45 ports for communication

**J. Networked System Scene Controllers**

- a. Device shall have two to four buttons for selecting programmable lighting control profiles or acting as on/off switches.
- b. Device shall recess into single-gang switch box and fit a standard GFI opening.
- c. Devices shall provide LED user feedback.
- d. Communication and Class 2 low voltage power shall be delivered to each device via standard CAT-5 low voltage cabling with RJ-45 connectors.
- e. All sensors shall have two RJ-45 ports.
- f. Device shall be capable of reprogramming other devices in its zone so as to implement user selected lighting scene.
- g. Device shall be capable of selecting a lighting profile be run by the system's upstream Gateway so as to implement selected lighting profile across multiple zones (and not just its local zone).
- h. Device shall have LEDs indicating current selection.

**K. Communication Bridges**

- a. Device shall surface mount to a standard 4" x 4" square junction box.
- b. Device shall have 8 RJ-45 ports.
- c. Device shall be capable of aggregating communication from multiple lighting control zones for purposes of minimizing backbone wiring requirements back to Control Gateway.
- d. Device shall be powered with Class 2 low voltage supplied locally via a directly wired power supply or delivered via a CAT-5 cabled connection.
- e. Device shall be careful of redistributing power from its local supply and connect lighting control zones with excess power to lighting control zones with insufficient local power. This architecture also enables loss of power to a particular area to be less impactful on network lighting control system.

**L. Wired/Wireless Interface**

- a. Device shall provide an interface between wired components and wireless components.
- b. Device shall allow configuration of both wired and wireless systems.
- c. Device shall have native BACnet/IP and WiFi capabilities.
- d. Device shall include enclosure and power supply.
- e. Configuration software shall be free.
- f. Device shall be the following model number:

**2.4 LIGHTING CONTROL PROFILES**

- A. Changes to the operation of the system shall be capable of being made in real-time or scheduled via lighting control profiles. These profiles are outlines of settings that direct how a collection of devices function for a defined time period.
- B. Lighting control profiles shall be capable of being created and applied to a single device, zone of devices, or customized group of zones.

- C. All relays and dimming outputs shall be capable of being scheduled to track or ignore information regarding occupancy, daylight, and local user switches via lighting control profiles.
- D. Every device parameter (e.g. sensor time delay and photocell set-point) shall be configurable via a lighting control profile.
- E. All lighting control profiles shall be stored on the network control gateway device and on the software's host server.
- F. Lighting control profiles shall be capable of being scheduled to run according to the following calendar options: start date/hour/minute, end date/hour/minute, and sunrise/sunset +/- timed offsets.
- G. Sunrise/sunset times shall be automatically derived from location information using an astronomical clock.
- H. Daylight savings time adjustments shall be capable of being performed automatically, if desired.
- I. Lighting control profile schedules shall be capable of being given the following recurrence settings: daily, weekday, weekend, weekly, monthly, and yearly.
- K. Software shall provide a graphical tool for easily viewing scheduled lighting control profiles.

## **2.5 MANAGEMENT SOFTWARE**

- A. Every device parameter (e.g. sensor time delay and photocell set-point) shall be available and configurable remotely from the software
- B. The following status monitoring information shall be made available from the software for all devices for which it is applicable: current occupancy status, current PIR Status, current Microphonics Status, remaining occupancy time delay(s), current photocell reading, current photocell inhibiting state, photocell transitions time remaining, current dim level, device temperature, and device relay state(s).
- C. The following device identification information shall be made available from the software: model number, model description, serial number, manufacturing date code, custom label(s), and parent network device.
- D. A printable network inventory report shall be available via the software.
- E. A printable report detailing all system profiles shall be available via the software.
- F. Software shall require all users to login with a User Name and Password.
- G. Software shall provide at least three permission levels for users.
- H. All sensitive stored information and privileged communication by the software shall be encrypted.
- I. All device firmware and system software updates must be available for automatic download and installation via the internet.
- J. Software shall be capable of managing systems interconnected via a WAN (wide area network)

## **2.6 BMS COMPATIBILITY**

- A. Where an Eclipse controller is indicated on the plans, the system shall provide a BACnet IP gateway as a downloadable software plug-in to its management software. No additional hardware shall be required.
- B. BACnet IP gateway software shall communicate information gathered by networked system to other building management systems.
- C. BACnet IP gateway software shall translate and forward lighting relay and other select control commands from BMS system to networked control devices.

## **2.7 SYSTEM ENERGY ANALYSIS AND REPOSTING SOFTWARE**

- A. System shall be capable of reporting lighting system events and performance data back to the management software for display and analysis.
- B. Intuitive graphical screens shall be displayed in order to facilitate simple viewing of system energy performance.
- C. An “Energy Scorecard” shall be display that shows calculated energy savings in dollars, KWHr, or CO<sub>2</sub>.
- D. Software shall calculate the allocation of energy savings to different control measures (occupancy sensors, photocells, manual switching, etc).
- E. Energy savings data shall be calculated for the system as a whole or for individual zones.
- F. A time scaled graph showing all relay transitions shall be presented.
- G. A time scaled graph showing a zones occupancy time delay shall be presented
- H. A time scaled graph showing the total light level shall be presented.
- I. User shall be able to customize the baseline run-time hours for a space.
- J. User shall be able to customize up to four time-of-day billing rates and schedules.
- K. Data shall be made available via a .CSV file

## **2.8 START-UP AND SUPPORT FEATURES**

- A. To facilitate start-up, all devices daisy-chained together (using CAT-5) shall automatically be grouped together into a functional lighting control zone.
- B. All lighting control zones shall be able to function according to default settings once adequate power is applied and before any system software is installed.
- C. Once software is installed, system shall be able to auto-discover all system devices without requiring any commissioning.
- D. All system devices shall be capable of being given user defined names.
- E. All devices within the network shall be able to have their firmware reprogrammed remotely and without being physically uninstalled for purposes of upgrading functionality at a later date.
- F. All sensor devices shall have the ability to detect improper communication wiring and blink its LED in a specific cadence as to alert installation/startup personnel.

## **PART 3 – EXECUTION**

### **3.1 EQUIPMENT INSTALLATION**

- A. Mount relay control cabinets adjacent to respective lighting panelboard. Cabinet shall be surface or flush mount, per plans. Wiring between relay control cabinet and panelboards to be per local codes and acceptable industry standards. Under no circumstances will any extra be authorized for payment to the EC or GC due to the EC's lack of knowledge or understanding of any and all prevailing codes or specified manufacturer's installation requirements. Neatly lace and rack wiring in cabinets. During construction process, protect all interior components of each relay panel and each digital switch from dust and debris. Any damage done to electronic components due to non-protection shall be the sole responsibility of the installing contractor.
- B. Switches: Provide outlet boxes, single or multi-gang, as shown on the plans for the low voltage digital switches. Mount switches as per plans. Supply faceplates per plans and specifications. EC is specifically responsible to supply and install the required low voltage cable, Category 5, 4 twisted pair, with RJ45 connectors and snagless boots (commonly referred to as Cat 5 patch cable) between all switches and panels. Field-test all Cat 5 patch cable with a recognized cable tester.
- C. Manufacturer to provide on all systems of more than 2 panels a crimping kit with sufficient approved EZ Brand RJ 45 connectors to populate the whole system. A simple manual that shows all the pitfalls of crimping RJ 45s and how to do it right must be both provided and read by the installing contractor.
- D. Wiring
  - 1. Do not mix low voltage and high voltage conductors in the same conduit. No exceptions. All wiring to be installed in conduit.
  - 2. Ensure low voltage conduits or control wires do not run parallel to current carrying conduits.
  - 3. Place manufacturer supplied "terminators" at each end of the system bus per manufacturers instructions.
  - 4. Neatly lace and rack wiring in cabinets.
  - 5. Use Category 5 cable for all system low voltage connections.
  - 6. The specified lighting control system shall be installed by the electrical contractor who shall make all necessary wiring connections to external devices and equipment, to include photocell. EC to wire per manufacturer instructions.

### **3.2 INSTALLATION AND SETUP**

- A. Verify that conduit for line voltage wires enters panel in line voltage areas and conduit for low-voltage control wires enters panel on low-voltage areas. Refer to manufacturer's plans and approved shop drawings for location of line and low-voltage areas. It is the responsibility of the contractor to verify with lighting control manufacturer all catalog information and specific product acceptability.
- B. Contractor to test all low voltage cable for integrity and proper operation prior to turn over. Verify with system manufacturer all wiring and testing requirements.

- C. Before Substantial Completion, arrange and provide a one-day Owner instruction period to designated Owner personnel. Set-up, commissioning of the lighting control system and Owner instruction includes:
  - 1. Confirmation of entire system operation and communication to each device.
  - 2. Confirmation of operation of individual relays, switches, occupancy sensors and daylight sensors
  - 3. Confirmation of system Programming, photocell settings, override settings, etc.
  - 4. Provide training to cover installation, maintenance, troubleshooting, programming, and repair and operation of the lighting control system.
- D. Devices and panels shall be located so that they are readily accessible and not exposed to physical damage.
- E. Equipment locations shall be furnished with sufficient working space around panels to comply with the National Electric Electrical Code.
- F. Panels shall be securely fastened to the mounting surface by at least 4 points.
- G. Unused openings in the cabinet shall be effectively closed.
- H. Cabinets shall be grounded as specified in the National Electrical Code.
- I. Lugs shall be suitable and listed for installation with the conductor being connected.
- J. Before energizing devices/equipment, the following steps shall be taken:
  - 1. Retighten connections to the manufacturer's torque specifications. Verify that required connections have been furnished.
  - 2. Remove shipping blocks from component devices and the panel interior.
  - 3. Verify no shorts existing in system.
  - 4. Test network cabling.
- K. Follow manufacturers' instructions for installation and all low voltage wiring.
- L. Service and Operation Manuals:
  - 1. Submit operation and service manuals. Complete manuals shall be bound in flexible binders and data shall be typewritten or drafted.
  - 2. Manuals shall include instructions necessary for proper operation and servicing of system and shall include complete wiring circuit diagrams of system, wiring destination schedules for circuits and replacement part numbers. Manuals shall include as-built cable Project site plot plans and floor plans indicating cables, both underground and in each building with conduit, and as-built coding used on cables. Programming forms of systems shall be submitted with complete information.
- M. Comply with energy code lighting control system "Acceptance Requirements". Acceptance tests are used to verify that lighting controls were installed and calibrated correctly. These tests may require that a responsible party certify that controls are installed and calibrated properly. This is the installing contractor's responsibility. Verify requirements with building authority.

### **3.3 DOCUMENTATION**

- A. Each relay shall have an identification label indicating the originating branch circuit number and panelboard name as indicated on the drawings. Each line side branch circuit conductor shall have an identification tag indicating the branch circuit number.
- B. Provide a point-to-point wiring diagram for the entire lighting control system. Diagram must indicate exact mounting location of each system device. This accurate "as built" shall indicate the loads controlled by each relay and the identification number for that relay, placement of switches and location of photocell. Original to be given to owner, copies placed inside the door of each LCP.
- C. OPERATION AND SERVICE MANUALS
  - 1. The factory shall supply all operation and service manuals.

### **3.4 PRODUCT SUPPORT AND SERVICE**

- A. Start Up: EC shall contact manufacturer's representative at least 7 days before turnover of project to complete any software programming with Owner's input.
- B. Support to correct operating issues and minor system programming adjustments shall be available at no additional cost to the Owner during the warranty period.
- C. Any costs for the above shall be included in the bid.

### **3.5 SYSTEM DELIVERY AND ACCEPTANCE**

- A. DELIVERY
  - 1. The contractor is responsible for complete installation of the entire system according to strict factory standards and requirements. The following items shall constitute factory standards and requirements.
    - a. All system equipment shall operate in accordance with specification and industrial standard procedures.
    - b. An operational user program shall exist in the control system. The program shall execute and perform all functions required to effectively operate the site according to the requirements.
    - c. Demonstration of program integrity during normal operation and pursuant to a power outage.
    - d. An authorized manufacturer technician or representative shall provide a minimum of eight training hours on the operation and use of the control system. Additional support services shall be negotiated between the contractor and the building owner.

### **3.6 CLEANING**

- A. Division 1 - Execution Requirements: Final cleaning.
- B. Clean devices as recommended by manufacturer.

END OF SECTION

**SECTION 26 24 16  
PANELBOARDS**

**PART 1 – GENERAL**

**1.1 RELATED REQUIREMENTS**

- A. Applicable provisions of Division 1 shall govern work under this section.

**1.2 SCOPE**

- A. Provide panelboards as indicated in the panel schedule, as noted on the drawings and as specified herein.

**1.3 RELATED WORK**

- A. Section 26 05 00 – Common Work Results for Electrical
- B. Section 26 05 53 – Identification for Electrical Systems
- C. Plans - Panel Schedules

**1.4 SUBMITTALS**

- A. See Section 26 05 00 for general shop drawing requirements.
- B. Panelboard shop drawings shall include:
  - 1. Cabinet dimensions, nameplate nomenclature, electrical ratings and breaker type listing.
  - 2. Product data sheets with installation instructions.
  - 3. Field quality control test results.
  - 4. Operating and maintenance data.

**1.5 PRODUCT DELIVERY, STORAGE AND HANDLING**

- A. Do not store panelboards exposed to weather.
- B. Protect panelboards against damage from work of other trades.

**PART 2 – PRODUCTS**

**2.1 ACCEPTABLE MANUFACTURES**

- A. Square D (Matching existing manufacturer in building)

**2.2 PANELBOARD RATINGS**

- A. UL listed short circuit rating (integral equipment rating):
  - 1. 208Y/120V Lighting Panels: 10,000 RMS symmetrical amperes minimum or higher as specified on the drawings. Equivalent to Square D type NQ. Panelboards with AIC ratings of 22,000 RMS symmetrical amperes or lower shall be fully rated.

### **2.3 PANEL CONSTRUCTION**

- A. Main breaker or main lugs only, per panelboard schedule.

### **2.4 BUSSING**

- A. Plated copper phase bussing.
- B. Plated copper neutral bus with terminals.
- C. Copper equipment grounding bus with terminals.
- D. Distributed phase sequence type.
- E. Ratings per panelboard schedule, 100 amp minimum.

### **2.5 PANEL CABINETS**

- A. Code gauge galvanized steel.
- B. Minimum 20" wide.
- C. Minimum 5<sup>3</sup>/<sub>4</sub> " deep.
- D. Height as required to accommodate breakers and spaces indicated on plans and code required gutter space.
- E. Gutters adequate for wire size used, 4 inches minimum.

### **2.6 PANEL FRONTS**

- A. Dead front safety type.
- B. Concealed adjustable trim clamps.
- C. Code gauge steel with rust inhibiting primer and baked enamel finish.
- D. Panel front cover shall have piano hinge to allow access to wiring gutters without removal of panel trim. Hinged trim held in place with screw fasteners. Door shall be built into trim which allows access to breakers as well as to hinged trim screw fasteners. Breakers access door shall have the following features:
  - 1. Concealed piano hinge.
  - 2. Flush stainless steel cylinder tumbler type locks with spring loaded door pulls.
  - 3. Locks for all job panels keyed alike.
- E. Steel frame circuit directory holder with directory cards on inside face.
  - 1. Suitable for complete descriptions.
  - 2. Clear plastic cover.
  - 3. Typewritten descriptions.

## 2.7 BRANCH BREAKER DETAILS

- A. Thermal Magnetic type.
- B. UL Class A ground fault circuit protection (GFI) as indicated on drawings.
- C. UL listed terminals for type and temperature rating of wire utilized. Anti-turn solderless type.
- D. Circuit breaker construction for NQOD and NF panels shall bolt on to panel bussing.
- E. Circuit breaker construction for I-Line panels shall plug on to panel bussing but breaker cases shall bolt to panel cabinet.

## PART 3 – EXECUTION

### 3.1 INSPECTION

- A. Examine area to receive panelboard to assure adequate clearance for panelboard installation.
- B. Start work only after unsatisfactory conditions are corrected.

### 3.2 INSTALLATION

- A. Install in accordance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation," and in accordance with recognized industry practices.
- B. Flush mount or surface mount as specified on drawings and schedules.
- C. Support panel cabinets independently to structure with no weight bearing on conduits.
- D. Install recessed panelboards to allow cover to be drawn tight against wall to provide neat appearance.
- E. Install panelboards so top breaker is not higher than 6 ft-0 in. above floor.
- F. Adjacent panel cabinets shall be of same size and mounted in horizontal alignment.
- G. Install in each panelboard a typewritten directory accurately indication rooms and/or equipment being served.
- H. Attach nameplates. Nameplates for panels in public areas shall be attached to the inside face of the cover. Nameplates for panels in equipment rooms and other nonpublic areas shall be attached to the outside face of the cover.
- I. **Recessed panelboards shall include four (4) spare 1" conduits from panel up to above ceiling on floor of panel AND down to above ceiling of floor below (if a building level exists below).**

**3.3 FIELD QUALITY CONTROL**

- A. Balanced load among feeder conductors.
- B. Unbalance shall not exceed  $\pm 7\frac{1}{2}$  % of computed average load per phase.
- C. Energize each circuit and check for complete and correct function.
- D. The contractor shall verify that selective coordination is achieved on the emergency system between the fusible panelboard and upstream protective devices, making adjustments to devices as appropriate.

**3.4 ADJUSTMENT AND CLEANING**

- A. Adjust doors and operating mechanisms for free mechanical movement.
- B. Tighten lugs and bus connections.
- C. Sand, prime and paint scratched or marred surfaces to match original finish.

END OF SECTION

**SECTION 26 27 26  
WIRING DEVICES**

**PART 1 – GENERAL**

**1.1 RELATED REQUIREMENTS**

- A. Applicable provisions of Division 1 shall govern work under this section.

**1.2 SCOPE**

- A. Provide wiring devices generally consisting of switches, receptacles and occupancy sensors as indicated on the drawings and as specified herein.

**1.3 RELATED WORK**

- A. Section 26 05 19 – Low-Voltage Electrical Power Conductors and Cables
- B. Section 26 05 33 – Raceway and Boxes for Electrical Systems

**1.4 SUBMITTALS**

- A. See Section 26 05 00 for general shop drawing requirements.
- B. Wiring device shop drawings shall include:
  - 1. Listing of brand names and types of materials proposed for use.
  - 2. Nameplate nomenclature.
  - 3. Electrical ratings.

**PART 2 – PRODUCTS**

**2.1 ACCEPTABLE MANUFACTURERS**

- A. Use of a manufacturer's name and model or catalog number is for purpose of establishing standard of quality and general configuration desired only.
- B. Cooper
- C. Hubbell Wiring Device Div.
- D. Pass and Seymour, Inc.
- E. Leviton
- F. LVS, Inc.
- G. WattStopper
- H. SensorSwitch

## **2.2 GENERAL**

- A. Provide factory-fabricated, NEMA specification grade wiring devices in type, color and electrical rating for service indicated.
- B. Provide wiring devices of one manufacturer.
- C. See Symbol Schedule on drawings for identification of device type.
- D. Wiring devices for use with stranded conductor shall have a clamping type terminal that can be physically tightened. The clamping device shall not be a spring type of clamp.

## **2.3 SWITCHES**

- A. General use lighting switches: 20 amp toggle type. Equal to Pass and Seymour CS20AC Series.
- B. Switch color shall be as selected by the architect; multiple colors may be required. Switch color shall be red where it controls an emergency circuit.
- C. Keyed switches shall be AC key lock power type, equal to Leviton 1221-2KL (1-pole), 1223-2KL (3-way) Series.
- D. Switches that utilize a "pigtail" connector are acceptable in place of side wired devices.

## **2.4 RECEPTACLES**

- A. Typical use duplex receptacles: NEMA type 5-15R, grounding type, 15-amp, 120-volt rating, impact resistant face and body, side wired, heavy duty specification grade rated. Provide internal shutter tamper resistant "TR" type and/or switched upper half (with identification) where required on plans. Equal to Pass and Seymour 5262 Series.
- B. Where a single duplex receptacle is wired to a dedicated 20 ampere, 120-volt circuit, provide NEMA type 5-20R grounding type 20 ampere receptacles, impact resistant face and body, side wired, heavy duty specification grade rated. Provide internal shutter tamper resistant "TR" type and/or switched upper half (with identification) where required on plans. Equal to Pass and Seymour 5362 Series.
- C. Special purpose receptacles: As shown on drawings and schedules.
- D. Dead front ground fault circuit interrupter: Auto-testing, test and reset buttons shall match device color, LED trip indicator. Device shall meet UL 2015 requirements. Equal to Pass & Seymour 2087 series.
- E. Ground fault circuit interrupter duplex receptacles: Auto-testing, test and reset buttons shall match device color, LED trip indicator. Device shall meet UL requirements. Provide weather resistant "WR" type for all outdoor locations. Provide internal shutter tamper resistant "TR" type where required on plans. Equal to Pass & Seymour 1597 or 2097 series.
- F. Isolated ground type duplex receptacle. NEMA type 5-20R, grounding type, 20-amp, 120-volt rating, heavy duty specification grade. Equal to Pass & Seymour 5262 or 5362 series.

- G. Transient voltage surge suppression receptacles shall comply with UL 1449 for both category "A" and "B", and with ANSI/IEEE C62.41. Device shall suppress transients in 3 modes. Device shall contain a led indicator to indicate failure of protective circuitry. Three MOVs will each be rated 500 volts and 210 joules. Commercial specification grade. Equal to Pass & Seymour 5262 or 5362 series.
- H. USB integrated charging ports (2) with duplex receptacle, Fed. spec. grade. Equal to Pass & Seymour TR5262USB (15A) or TR5362USB (20A).
- I. Receptacles with controlled plug(s). The portion(s) controlled shall be PERMANENTLY imprinted with NEC required symbol and "CONTROLLED" text.
- J. Receptacle color shall be as selected by the architect; multiple colors may be required. Receptacle color shall be red where served from an emergency circuit.
- K. Receptacles that utilize a "pigtail" connector are acceptable in place of side wired devices.

## **2.5 WIRING DEVICE PLATES AND COVERS**

- A. Provide wall plates for wiring devices with ganging and cutouts as indicated and with metal screws for securing plates to devices, screw heads colored to match finish of plate.
- B. Plates for flush mounted devices: Stainless steel 302/304 with stainless steel screws.
- C. Device plates for surface mounted Type FS or FD boxes: Type FSK galvanized steel covers.
- D. Device plates for surface mounted, 4 inch square boxes in mechanical, janitorial, electrical spaces: ½" raised, galvanized steel covers.

## **PART 3 – EXECUTION**

### **3.1 INSPECTION**

- A. Examine areas and conditions under which wiring devices are to be installed and notify Engineer, in writing, of conditions detrimental to proper and timely completion of work.
- B. Do not proceed with work until unsatisfactory conditions have been corrected.

### **3.2 INSTALLATION**

- A. Install in accordance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation," and in accordance with recognized industry practices.
- B. Do not install devices until wiring is complete.
- C. Before installing receptacles and switches, clean electrical boxes of dirt and debris.

- D. Do not use terminals on wiring devices (hot or neutral) for feed-through connections, looped or otherwise. Make circuit connections via wire connectors and pigtails.
- E. Install gasket plates for devices or system components having light emitting features, such as switches with pilot lights. Where installed on rough textured surfaces, seal plates with black self-adhesive poly-foam.
- F. Ground receptacles with an insulated green ground wire from device ground screw to a bolted outlet box connection. Route a continuous green equipment grounding conductor with branch circuit conductors serving isolated ground receptacles. Terminate the equipment ground on the ground bus in panelboards.
- G. Install emergency switches which occur adjacent to normal light switches in separate boxes to maintain systems isolation in accordance with the NEC. Provide red wiring devices and cover plates for devices wired to emergency power circuits.
- H. Stranded conductor terminating on wiring devices shall be terminated in a clamping terminal and not on the screw terminal.
- I. Provide a layer of electrical tape around the perimeter sides of each wiring device so that the terminations are insulated.
- J. Gang switches together when located at the same location.

### **3.3 FIELD QUALITY CONTROL**

- A. Provide operational testing for all devices.
- B. Test receptacles with Hubbell 5200, Woodhead 1750 or equal, for correct polarity, proper ground connection and wiring faults.

END OF SECTION

**SECTION 26 50 00  
LIGHTING**

**PART 1 – GENERAL**

**1.1 RELATED REQUIREMENTS**

- A. Applicable provisions of Division 1 shall govern work under this section.

**1.2 SCOPE**

- A. Provide and install lighting fixtures, emergency lighting inverters and related accessories as indicated on the drawings and as specified herein.

**1.3 RELATED WORK**

- A. Section 26 05 26 – Grounding and Bonding for Electrical Systems
- B. Section 26 05 19 – Low-Voltage Electrical Power Conductors and Cables
- C. Section 26 05 29 – Hangers and Supports for Electrical Systems

**1.4 QUALITY ASSURANCE**

- A. Comply with the requirements of the following regulatory agencies:
  - 1. National Fire Protection Association (NFPA) Chapter 70 - National Electrical Code (NEC) and Wisconsin Amendments thereto.
  - 2. Underwriters Laboratories (UL) Approval
- B. Conform to the standards of the following agencies:
  - 1. National Electrical Manufacturers Association (NEMA)
  - 2. Certified Ballast Manufacturers Association (CBM)
  - 3. American National Standards Institute (ANSI), ANSI C82.1.
- C. Drivers/Ballasts shall have the following approvals/certifications:
  - 1. Certified Ballast Manufacturer's (CBM) Approval
  - 2. Underwriters Laboratories (UL) Approval
  - 3. Electrical Testing Laboratory (ETL) Certified

**1.5 SUBMITTALS**

- A. See Section 26 05 00 for general shop drawing requirements.
- B. Shop drawings shall include:
  - 1. Manufacturer's printed data on lighting fixtures.
  - 2. An index and a separate sheet for each fixture, assembled in luminaire "type" in alphabetical order, with specified fixture and accessories clearly indicated on each sheet.
  - 3. Submit copy of UL test report if requested by Engineer.
  - 4. The following information as a minimum:
    - a. Dimensional informational.

- b. Description of the fixture construction.
- c. Recommended lamps for use in that particular fixture.
- d. Photometric test reports.
- e. Any warnings regarding special requirements regarding the use of the lighting fixture.

## **1.6 WARRANTY**

- A. All LED luminaires shall have a minimum of five (5) year guarantee after date of final acceptance.

## **PART 2 – PRODUCTS**

### **2.1 GENERAL**

- A. Provide lighting fixtures of the size, type and rating indicated in "Lighting Fixture Schedule" complete with LEDs, reflectors, drivers, power supplies, wiring and other equipment required for a complete working installation.
- B. Fixture catalog numbers do not necessarily include all accessories required to complete the installation. Catalog numbers used in the Lighting Fixture Schedule are used to designate the fixture series, size and lamping requirements. Refer to the lighting fixture schedule notes for additional requirements.
- C. Gasketing material for use in lighting fixtures shall be vinyl, neoprene or other non-aging type material as approved by Engineer.
- D. Provide proper trim for each fixture as required for the various types of ceiling being installed throughout project. Provide the necessary plaster frames, fixture ends, caps, suspension units, mounting brackets, and/or other auxiliary parts required to complete the fixture installation.
- E. All fixtures in unheated or exterior areas shall operate to -20 deg. F.
- F. Drivers shall comply with UL requirements with regards to thermal protection. Each driver shall be equipped with thermal sensitive devices that will de-activate the ballast in the event higher than normal operating temperatures occur within the ballast. Internal protective devices shall be automatic resetting.
- G. All remote mounted drivers/power supplies shall be installed in individual enclosures designed to adequately dissipate generated heat in an ambient temperature of 100 deg. F (measured outside of the enclosure).

### **2.2 FIXTURES**

- A. Fabricate of sheet steel, die-formed to provide rigidity.
- B. The color finish of each surface or pendant mounted lighting fixture is to be verified with the Architect at the time of shop drawing review.
- C. Lens panels for troffers shall be framed and be equipped with hinge and latch. Equip frames and louvers with retaining means to support frame during relamping.
- D. Plastic fixture lenses and diffusers, 100% virgin acrylic material. Lenses minimum .125 average thickness.

### **2.3 LED DRIVERS**

- A. Dimming drivers shall use constant current regulation (CCR) type dimming. Pulse Width Modulation (PWM) dimming methods will not be allowed.
- B. All drivers are to be universal 120-277V input.

### **2.4 LED LIGHTING FIXTURES AND COMPONENTS**

- A. Product Testing: Comply with U.L. 1598 and 8750. Test according to IES LM-79 and LM-80.
- B. LED package is expected to achieve L70 at 100,000 hrs. (min.).
- C. LED lamps and fixtures shall fall under Design Lights Consortium (DLC).

### **2.5 SUSPENSION**

- A. Fixtures identified for pendant mounted shall be provided with aircraft cable suspension, unless indicated to have rigid pendants or chain hangers.
- B. Where stems are furnished by fixture manufacturer, they shall verify length prior to releasing for shipment.
- C. Where stems are furnished by Contractor, he shall verify length prior to installation.
- D. Where power feeds are furnished by the Contractor, he shall use appropriately sized cords (length and number of conductors). Verify color with Architect. Information shall be included with shop drawing submittal.
- E. Suspended fixtures shall have swivel type aligner hangers in ceiling outlet boxes to ensure plumb suspension.
- F. Aircraft Cable suspension shall consist of appropriate hangers compatible with fixture with galvanized steel cable by Gripple, Rize Enterprises or approved equal. Wet, hazardous or corrosive locations shall use stainless steel cable.

## **PART 3 – EXECUTION**

### **3.1 INSPECTION**

- A. Install lighting fixtures of type indicated where shown on drawings and at indicated heights.
- B. Install in accordance with manufacturer's written instructions.
- C. Fasten fixtures securely to indicate structural support members.
- D. Install equipment and pendant fixtures plumb.
- E. Provide proper bushing for wire entrances. Ground fixture chassis to conduit system.

- F. Coordinate with trades so lighting fixtures are properly aligned with items such as diffusers, grilles and speakers. If necessary, relocate fixtures as directed so there will be no conflict with other equipment.
- G. Mount stem mounted fixtures with swivel aligners and stem lengths as required. Verify stem lengths.
- H. Make fixture holes for wire entrance with knock-out punches or hole saw, remove burrs. Do not cut holes with tin snip.
- I. Special care shall be taken to assure light-tight joints between recessed fixtures and ceiling.
- J. Recessed lighting fixtures which are installed in a rough textured ceiling surface whereby light may be emitted between fixture frame and ceiling surface shall have black self-adhesive polyfoam gasketing installed around inside edges of frame to prevent leaks.
- K. Care shall be taken in placement of outlets and surface-mounted fixtures to maintain alignment, spacing, layout and general arrangement shown on drawings. Contractor may vary these dimensions slightly in order to clear obstructions. Any major changes in the arrangement must be approved by Engineer.
- L. Install tandem fixtures in continuous rows providing that finished appearance conforms to appearance of individual units.
- M. Align and plumb rows of light fixtures.
- N. Provide additional trim as required for neat plumbing of recessed fluorescent lights mounted in patterns.
- O. Mount wall and ceiling fixtures independent and secure so that they are not dependent on finish for support and cannot be rotated or displaced.
- P. Maintain clearances as required in Section 410.116 of the NEC. Notify Engineer of any conflict, prior to rough-in.
- Q. Install equipment plaque on emergency lighting inverter.

### **3.2 FIXTURE SUPPORTS**

- A. See Section 26 05 29 for fixture support items such as device procedures and retaining clips.
- B. Surface or pendant mounted lighting fixtures weighing in excess of 25 pounds shall be securely supported to the outlet box through the use of a fixture stud. The stud shall attach to the box through a knockout in the top of the box. Fixture support shall not be solely dependant on the ears of the box.
- C. Securely attach outlet boxes to the building structure either directly to the structure or through the use of a threaded rod or steel channel.
- D. The contractor is required to determine and provide all necessary mounting hardware, plates, supports, etc. as required, and finished in a color per architect's requirements to install fixtures in locations as indicated on the plans.

### **3.3 ADJUST, CLEAN AND LUBRICATE**

- A. Clean lighting fixtures of dirt and debris prior to acceptance. Cleaning shall include lamps, reflectors, lenses, louvers and exposed trims and housing.
- B. Protect installed fixtures from damage during the construction period.
- C. Remove conspicuous trade labels.
- D. Aim adjustable fixtures to satisfaction of Engineer. Adjustable exterior lighting fixtures, such as floodlights, shall be aimed after dark.

### **3.4 FIELD QUALITY CONTROL**

- A. All lamps shall be new and delivered to the job site in sealed cartons.
- B. At time of Substantial Completion, replace lamps in lighting fixtures which are observed to be noticeably dimmed after Contractor's use and testing, as judged by the Engineer.

### **3.5 PRODUCT STORAGE AND HANDLING**

- A. Handle lighting fixtures carefully to prevent breakage, denting and scoring finish.
- B. Do not install damaged lighting fixtures.
- C. Do not repair damaged fixtures; replace and return damaged units to equipment manufacturer for repair.
- D. Store lighting fixtures in a clean, dry space. Store in original cartons and protect from dirt, physical damage, weather and construction traffic.

### **3.6 JOB CONDITIONS**

- A. Contractor shall determine that ceiling suspension system is adequately supported to receive and support the lighting fixtures. Where deemed inadequate, do not install fixtures until additional support has been provided.
- B. Verify local codes and ordinances that may pertain to installation and aiming of exterior fixtures. Notify Engineer prior to Bid time if problems are encountered.

END OF SECTION

**SECTION 27 05 00  
COMMON WORK RESULTS FOR COMMUNICATIONS**

**PART 1 – GENERAL**

**1.1 RELATED REQUIREMENTS**

- A. Applicable requirements of Division 1 shall govern work in this section.

**1.2 SCOPE**

- A. Provide rough in for communications outlets consisting of outlet boxes, conduits, surface raceway, sleeves and communication backboards.

**1.3 RELATED WORK**

- A. Section 26 05 33 – Raceway and Boxes for Electrical Systems

**1.4 DESCRIPTION**

- A. Provide a raceway system for data, telephone and television communications cabling as directed. All conduits shall be complete with fish wire by Electrical Contractor.
- B. Data, telephone and television instruments, switching equipment, cabling, terminal blocks and other accessories are covered under Section 27 00 00.

**PART 2 – PRODUCTS**

**2.1 EQUIPMENT**

- A. Concealed outlet boxes shall be 4-11/16" square, 2-1/8" deep with extension ring for a one gang device. Covers shall be full sized blank plastic plates.
- B. Surface outlet boxes and cover shall be part of surface raceway as specified in Section 26 05 33.

**PART 3 – EXECUTION**

**3.1 GENERAL**

- A. Provide a 1" empty conduit from each concealed outlet to the nearest accessible corridor ceiling cavity space. Provide bushings at corridor end of each conduit.
- B. Provide surface raceway, as specified in Section 26 05 33, for each surface mounted outlet. Surface raceway shall extend up to above finished ceiling elevation. Transition to a 3/4" empty conduit from surface raceway to nearest accessible corridor ceiling cavity space and/or cable tray. Provide bushings at corridor end of conduit.
- C. Provide blank covers over all unused system outlet boxes.

END OF SECTION

**SECTION 28 31 00  
FIRE DETECTION AND ALARM**

**PART 1 – GENERAL**

**1.1 DESCRIPTION**

- A. This section of the specification includes the furnishing, installation, connection and testing of the microprocessor controlled, intelligent reporting fire alarm equipment required to form a complete, operative, coordinated system. It shall include, but not be limited to, alarm initiating devices, alarm notification appliances, auxiliary control devices, annunciators and wiring as shown on the drawings and specified herein.
- B. The fire alarm system shall comply with requirements of NFPA Standard 72 for Protected Premises Signaling Systems except as modified and supplemented by this specification. The system shall be electrically supervised and monitor the integrity of all conductors.
- C. The fire alarm system shall be manufactured by an ISO 9001 certified company and meet the requirements of BS EN9001: ANSI/ASQC Q9001.
- D. The FACP and peripheral devices shall be manufactured 100% by a single U.S. manufacturer (or division thereof).
- E. The system and its components shall be Underwriters Laboratories, Inc. listed as a complete system under the appropriate UL testing standard as listed herein for fire alarm applications and the installation shall be in compliance with the UL listing.
- F. The installing company shall employ NICET (minimum Level II Fire Alarm Technology) technicians on site to guide the final check-out and to ensure the systems integrity.

**1.2 SCOPE**

- A. Modifications and additions to existing Simplex Fire Alarm System.

**1.3 SUBMITTALS**

- A. See Section 26 05 00 for general shop drawing requirements.
- B. Fire Detection and Alarm Shop Drawings:
  - 1. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
  - 2. Include manufacturer's name(s), model numbers, ratings, power requirements, equipment layout, device arrangement, complete wiring point-to-point diagrams and conduit layouts.
  - 3. Show annunciator layout, configurations and terminations.
- C. Software Modifications:

1. Provide the services of a factory trained and authorized technician to perform all system software modifications, upgrades or changes. Response time of the technician to the site shall not exceed 4 hours.
2. Provide all hardware, software, programming tools and documentation necessary to modify the fire alarm system on site. Modification includes addition and deletion of devices, circuits, zones and changes to system operation and custom label changes for devices or zones. The system structure and software shall place no limit on the type or extent of software modifications on-site. Modification of software shall not require power-down of the system or loss of system fire protection while modifications are being made.

D. Certifications:

1. Together with the shop drawing submittal, submit a certification from the major equipment manufacturer indicating that the proposed supervisor of the installation and the proposed performer of contract maintenance is an authorized representative of the major equipment manufacturer. Include names and addresses in the certification.

**1.4 GUARANTY**

- A. All work performed and all material and equipment furnished under this contract shall be free from defects and shall remain so for a period of at least one (1) year from the date of acceptance. The full cost of maintenance, labor and materials required to correct any defect during this one-year period shall be included in the submittal bid.

**1.5 APPLICABLE STANDARDS AND SPECIFICATIONS**

The specifications and standards listed below form a part of this specification. The system shall fully comply with the latest issue of these standards, if applicable.

A. National Fire Protection Association (NFPA) - USA:

- |         |                                          |
|---------|------------------------------------------|
| No. 12  | CO2 Extinguishing Systems (low and high) |
| No. 12B | Halon 1211 Extinguishing Systems         |
| No. 13  | Sprinkler Systems                        |
| No. 13A | Halon 1301 Extinguishing Systems         |
| No. 15  | Water Spray Systems                      |
| No. 16  | Foam/Water Deluge and Spray Systems      |
| No. 17  | Dry Chemical Extinguishing Systems       |
| No. 17A | Wet Chemical Extinguishing Systems       |
|         | Clean Agent Extinguishing Systems        |
| No. 72  | National Fire Alarm and Signaling Code   |
| No. 101 | Life Safety Code                         |

B. Underwriters Laboratories, Inc. (UL) - USA:

- |          |                                                            |
|----------|------------------------------------------------------------|
| No. 268  | Smoke Detectors for Fire Protective Signaling Systems      |
| No. 864  | Control Units for Fire Protective Signaling Systems        |
| No. 268A | Smoke Detectors for Duct Applications                      |
| No. 521  | Heat Detectors for Fire Protective Signaling Systems       |
| No. 464  | Audible Signaling Appliances                               |
| No. 38   | Manually Actuated Signaling Boxes                          |
| No. 346  | Waterflow Indicators for Fire Protective Signaling Systems |

- No. 1076 Control Units for Burglar Alarm Proprietary Protective Signaling Systems
- No. 1971 Visual Notification Appliances

- C. Local and State Building Codes.
- D. All requirements of the Authority Having Jurisdiction (AHJ).
- E. The Video Display Terminal (VDT) shall comply with Swedish magnetic emission and X-radiation guidelines MPR 1990:10.

## **1.6 APPROVALS**

- A. The system shall have proper listing and/or approval from the following nationally recognized agencies:
  - UL Underwriters Laboratories, Inc.
  - FM Factory Mutual
- B. The fire alarm control panel shall meet UL Standard 864 (Control Units) and UL Standard 1076 (Proprietary Burglar Alarm Systems).
- C. The system shall be listed by the national agencies as suitable for extinguishing release applications. The system shall support release of high- and low-pressure CO<sub>2</sub>.

## **PART 2 – PRODUCTS**

### **2.1 ACCEPTABLE MANUFACTURERS**

- A. Simplex (matching existing system)

### **2.2 EQUIPMENT AND MATERIAL, GENERAL**

- A. All equipment and components shall be new, and the manufacturer's current model. The materials, appliances, equipment and devices shall be tested and listed by a nationally recognized approvals agency for use as part of a protective signaling system, meeting the National Fire Alarm Code.
- B. All equipment and components shall be installed in strict compliance with manufacturer's recommendations. Consult the manufacturer's installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc., before beginning system installation.
- C. All equipment back boxes shall be attached to walls and ceiling/floor assemblies and shall be held firmly in place (e.g. detectors shall not be supported solely by suspended ceilings). Fasteners and supports shall be adequate to support the required load.

### **2.3 CONDUIT AND WIRE**

- A. Conduit:

1. Conduit shall be in accordance with The National Electrical Code (NEC), local and state requirements.
2. All wiring shall be installed in conduit or raceway. Conduit fill shall not exceed 40 percent or interior cross-sectional area where three or more cables are contained within a single conduit.
3. Cable must be separated from any open conductors of power, or Class 1 circuits and shall not be placed in any conduit, junction box or raceway containing these conductors, per NEC Article 760-29.
4. Wiring for 24-volt DC control, alarm notification, emergency communication and similar power-limited auxiliary functions may be run in the same conduit as initiating and signaling line circuits. All circuits shall be provided with transient suppression devices and the system shall be designed to permit simultaneous operation of all circuits without interference or loss of signals.
5. Conduit shall not enter the fire alarm control panel, or any other remotely mounted control panel equipment or backboxes, except where conduit entry is specified by the FACP manufacturer.

B. Wire:

1. All fire alarm system wiring shall be new.
2. Wiring shall be in accordance with local, state and national codes (e.g., NEC Article 760) and as recommended by the manufacturer of the fire alarm system manufacturer, but not less than 18 AWG (1.02 mm) for Initiating Device Circuits and Signaling Line Circuits, and 14 AWG (1.63 mm) for Notification Appliance Circuits.
3. All wire and cable shall be listed and/or approved by a recognized testing agency for use with a protective signaling system.
4. Wire and cable shall have a fire resistance rating suitable for the installation as indicated in NFPA 70.
5. Wiring used for the multiplex communication circuit (SLC) shall be twisted and shielded and support a minimum wiring distance of 10,000 feet. In certain applications, the system shall support up to two (2) SLC's with up to 1,000 feet of untwisted, unshielded wire. The design of the system shall permit use of IDC and NAC wiring in the same conduit with the SLC communication circuit.
6. All field wiring shall be electrically supervised for open circuit and ground fault.
7. The fire alarm control panel shall be capable of t-tapping Class B (NFPA Style 4) Signaling Line Circuits (SLC's). Systems which do not allow or have restrictions in, for example, the number of t-taps, length of t-taps etc., are not acceptable.

C. Terminal Boxes, Junction Boxes and Cabinets:

1. All boxes and cabinets shall be UL listed for their use and purpose.

D. Initiating circuits shall be arranged to serve like categories (manual, smoke, waterflow). Mixed category circuitry shall not be permitted except on signaling line circuits connected to intelligent reporting devices.

E. The fire alarm control panel shall be connected to a separate dedicated branch circuit, maximum 20 amperes. This circuit shall be labeled at the main power distribution panel as FIRE ALARM. Fire alarm control panel primary power shall be 12 AWG.

## 2.4 SYSTEMS COMPONENTS

- A. Horns and/or Strobes:
1. Shall be low profile, operate on 24 VDC nominal and include "FIRE" identification.
  2. Horns shall have multi-selectable settings. Horns shall provide slow whoop, continuous or interrupted tones with an output sound level of at least 82 dBA measured at 10 feet from the device per ANSI/UL 464.
  3. Strobes shall have a maximum pulse duration of 2/10 of one second. The flash rate and strobe intensity shall meet the requirements of UL 1971 and be synchronized.
  4. Strobes shall have multi-selectable candela settings.
  5. Shall be flush mounted in public areas.
  6. Provide ceiling or wall mount as appropriate.
  7. Outdoor units shall be rated NEMA 4X.
  8. Device color shall match existing.

## 2.5 SYSTEM COMPONENTS - ADDRESSABLE DEVICES

- A. Addressable Devices - General
1. Addressable devices shall used simple to install and maintain decade (numbered 0 to 9) type address switches.
  2. Addressable devices will use a binary-coded address setting method, such as a DIP switch.
  3. Detectors shall be intelligent (analog) and addressable and shall connect with two wires to the fire alarm control panel signaling line circuits.
  4. Addressable smoke and thermal detectors shall provide dual alarm and power/polling LEDs. Both LEDs shall flash under normal conditions, indicating that the detector is operational and in regular communication with the control panel, indicating that an alarm condition has been detected. If required, the LED flash shall have the ability to be removed from the system program. An output connection shall also be provided in the base to connect an external remote alarm LED.
  5. The fire alarm control panel shall permit detector sensitivity adjustment through field programming of the system. Sensitivity shall be automatically adjusted by the panel on a time-of-day basis.
  6. Using software in the FACP, detectors shall automatically compensate for dust accumulation and other slow environmental changes that may affect their performance. The detectors shall be listed by UL as meeting the calibrated sensitivity test requirements of NFPA Standard 72, Chapter 7.
  7. The detectors shall be ceiling-mount and shall include a separate twist-lock base with tamper proof feature. Where shown on plans, bases shall include a built-in (local) sounder rated at 85 DBA minimum.
  8. The detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the detector itself (by activating a magnetic switch) or initiated remotely on command from the control panel.
  9. Detectors shall also store an internal identifying type code that the control panel shall use to identify the type of device (ION, PHOTO, THERMAL).
  10. Detectors will operate in an analog fashion, where the detector simply measures its designed environment variable and transmits an analog value to the FACP based on real-timed measured values. The FACP

software, not the detector, shall make the alarm/normal decision, thereby allowing the sensitivity of each detector to be set in the FACP program and allowing the system operator to view the current analog value of each detector.

11. Detectors shall provide address-setting means using decimal switches and shall also store an internal identifying code that the control panel shall use to identify the type of device. LEDs shall be provided that shall flash under normal conditions, indicating that the device is operational and is in regular communication with the control panel.
12. Addressable devices shall provide address-setting means using decimal switches and shall also store an internal identifying code that the control panel shall use to identify the type of device. LED(s) shall be provided that shall flash under normal conditions, indicating that the device is operational and is in regular communication with the control panel.
13. A magnetic test switch shall be provided to test detectors and modules. Detectors shall report an indication of an analog value reaching 100% of the alarm threshold.

B. Addressable Pull Box (manual station)

1. Addressable pull boxes shall, on command from the control panel, send data to the panel representing the state of the manual switch and the addressable communication module status. They shall use a key operated test-reset lock, and shall be designed so that after actual emergency operation, they cannot be restored to normal use except by the use of a key.
2. All operated stations shall have a positive, visual indication of operation and utilize a key type reset.
3. Manual stations shall be double action, non-breakglass, constructed of Lexan with clearly visible operating instructions provided on the cover. The word FIRE shall appear on the front of the stations in raised letters, 1.75 inches (44mm) or larger. They shall be of modern design appearance.

C. Intelligent Photoelectric Smoke Detector

1. The detectors shall use the photoelectric (light-scattering) principal to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog level of smoke density.

D. Intelligent Duct Smoke Detector

1. The smoke detector housing shall accommodate an intelligent photoelectric detector, of that provides continuous analog monitoring and alarm verification from the panel.
2. When sufficient smoke is sensed, an alarm signal is initiated at the FACP, and appropriate action taken to change over air handling systems to help prevent the rapid distribution of toxic smoke and fire gases throughout the areas served by the duct system.
3. A remote indicator/test station shall be provided for each duct detector (regardless if shown or not on the plans). The location shall in a visible location in the room or ceiling and have an engraved plaque identifying the location of the detector (i.e. RTU-2 Return).

E. Addressable Dry Contact Monitor Module

1. Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional alarm initiating devices (any N.O. dry contact device) to one of the fire alarm control panel SLCs.
2. The monitor module shall mount in a 4-inch square (101.6 mm square), 2-1/8 inch (54 mm) deep electrical box.
3. The IDC zone shall be suitable for Style D or Style B operation. A LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.
4. For difficult to reach areas, the monitor module shall be available in a miniature package and shall be no larger than 2-3/4 inch (70 mm) x 1-1/4 inch (31.7 mm) x 1/2 inch (12.7 mm). This version need not include Style D or an LED.

F. Two Wire Detector Monitor Module

1. Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional two-wire smoke detectors or alarm initiating devices (any N.O. dry contact device).
2. The two-wire monitor module shall mount in a 4-inch square (101.6 mm square), 2-1/8 inch (54 mm) deep electrical box or with an optional surface backbox.
3. The IDC zone may be wired for Class A or B (Style D or Style B) operation. A LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.

G. Addressable Control Module

1. Addressable control modules shall be provided to supervise and control the operation of one conventional NACs of compatible, 24 VDC powered, polarized audio/visual notification appliances. For fan shutdown and other auxiliary control functions, the control module may be set to operate as a dry contract relay.
2. The control module shall mount in a standard 4-inch square, 2-1/8 inch deep electrical box, or to a surface mounted backbox.
3. The isolator module shall not require any address-setting, and its operations shall be totally automatic. It shall not be necessary to replace or reset an isolator module after its normal operation.
4. The isolator module shall mount in a standard 4-inch (101.6 mm) deep electrical box or in a surface mounted backbox. It shall provide a single LED that shall flash to indicate that the isolator is operational and shall illuminate steadily to indicate that a short circuit condition has been detected and isolated.

## 2.7 BATTERIES

- A. The batteries shall be sealed Gel Cell type, 12-volt nominal.
- B. The battery shall have sufficient capacity to power the fire alarm system for not less than **twenty-four hours plus 15 minutes of alarm** upon a normal AC power failure.

- C. The batteries are to be completely maintenance free. No liquids are required. Fluid level checks for refilling, spills and leakage shall not be required.
- D. If necessary, to meet standby requirements, external battery and charger systems may be used.

## **PART 3 – EXECUTION**

### **3.1 INSTALLATION**

- A. Installation shall be in accordance with the NEC, NFPA 72, local and state codes, as shown on the drawings, and as recommended by the major equipment manufacturer.
- B. All conduit, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas. Smoke detectors shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect smoke detectors from contamination and physical damage.
- C. All fire detection and alarm system devices, control panels and remote annunciators shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.
- D. Manual pull stations shall be suitable for surface mounting or semi-flush mounting as shown on the plans, and shall be installed not less than 42 inches (1067 mm), nor more than 48 inches (122 mm) above the finished floor.

### **3.2 TEST**

The service of competent, factory-trained engineer or technician authorized by the manufacturer of the fire alarm equipment shall be provided to technically supervise and participate during all of the adjustments and tests for the system. All testing shall be in accordance with NFPA 72, Chapter 7.

1. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity and insulation.
2. Waterflow and tamper switches shall be tested along with the sprinkler contractor.
3. Open initiating device circuits and verify that the trouble signal actuates.
4. Open and sort signaling line circuits and verify that the trouble signal actuates.
5. Open and short notification appliance circuits and verify that trouble signal actuates.
6. Ground all circuits and verify response of trouble signals.
7. Check presence and audibility of tone at all alarm notification devices.
8. Check installation, supervision and operation of all intelligent smoke detectors using the walk test.
9. Each of the alarm conditions that the system is required to detect should be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.
10. When the system is equipped with optional features, the manufacturer's manual shall be consulted to determine the proper testing procedures. This is intended to address such items as verifying control performed by

individually addressed or grouped devices, sensitivity monitoring, verification functionality and similar.

**3.3 FINAL INSPECTION**

- A. At the final inspection, a factory trained representative of the manufacturer of the major equipment shall demonstrate that the system functions properly in every respect.

**3.4 INSTRUCTION**

- A. Instruction shall be provided as required for operating the system. Hands-on demonstrations of the operation of all system components and the entire system including program changes and functions shall be provided.
- B. The contractor and/or the systems manufacturer's representatives shall provide a typewritten "Sequence of Operation."

END OF SECTION