

# Nick H. Barnard Architect LLC

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**ADDENDUM NO. ONE**

**TO: Bidders**

**DATE: March 15, 2024**

**RE: Arches  
Building Addition  
1800 Bench Road  
Pocatello, Idaho**

This Addendum forms a part of the Contract Documents and modifies the original Bidding Drawings dated **February 2024**, as noted below. Acknowledge receipt of this Addendum in the space provided on the Bid Form. Failure to do so may subject the Bidder to disqualification. The following information is being issued to General Contractors only. It is the obligation of the Contractor to notify his Subcontractors and suppliers of items relating to their bids prior to bid opening. This Addendum consists of **80** page(s) and **no** drawing(s).

**I - CHANGES TO PRIOR ADDENDA: NONE**

**II - CHANGES TO BIDDING REQUIREMENTS:**

**Item II-1.** Instruction to Bidders. Article 3.4.3, change "four days" to 48 hours.

**Item II-2.** Bid Form. Bid Form Attachment No. 1 – Alternate Bids, add the following as Alternate Number 1: Add 17'x48' Portion of Building. All work associated with the installation of the additional 816 SF Portion of Building including but not limited to Classroom 130, enlarged Classroom 129 (sheet A1.2), and all affected plumbing, mechanical, and electrical systems shown on the drawings.

**Item II-3.** Bid Form. Bid Form Attachment No. 2 – Alternate Bids, add the following as Alternate Number 2: Roof: All work associated with the installation of the complete roofing system shown on sheet A4.1.

**III - CHANGES TO CONDITIONS OF THE CONTRACT:**

**Item III-1.** Supplementary Conditions, Article 2.2.2. No plan review will be required by Division of Building Safety.

**Item III-2.** Supplementary Conditions, Article 2.2.5. Change 10 copies to five (5) copies.

**Item III-3.** Supplementary Conditions, Article 3.7. In addition to all other fees paid by the Contractor for this work, Contractor shall provide an allowance for Building Permit Fees as required by the City of Pocatello (see Item V-1 below). Plumbing, mechanical and electrical permit fees are determined by the respective bid amounts and shall be obtained by the subcontractors responsible for the work and shall be a part of their total bid price. Contact City of Pocatello at 208-234-6158 and ask for assistance to secure permit amounts.

**Item III-4.** Supplementary Conditions. Article 8: Time. 8.1.1.1. Add the following: One Hundred (100) consecutive calendar days shall be defined as construction to start on or about June 3, 2024, and shall be substantially complete no later than September 11, 2024. The Schedule may be adjusted as long as the owner is not interrupted in the existing building. The summer schedule is from June 3 to August 21 (80 days). The contractor is encouraged to order long lead items as soon as a contract has been executed.

**IV - CHANGES TO AGREEMENT & OTHER CONTRACT FORMS: NONE**

**V - CHANGES TO SPECIFICATIONS:**

**Item V-1.** Section 01200 Price & Payment Procedures. Article 1.3 Allowances, delete paragraph A and revise to read as follows; add Articles B, C and D.

A. Whenever cash allowances are called for, Contractor shall include in his proposal cash amounts shown, based on following conditions.

1. Cash allowance will represent Contractor's net purchase price of materials or equipment to FOB site before taking any cash discounts for prompt payment or net subcontract price, if item includes labor and materials. Price will include applicable sales and use taxes.
2. Overhead, profit, and handling charges shall be included in Contractor's regular bid

- and not in cash allowance.
3. Owner's Representative will review bids on items included in cash allowances and will give written instructions to Contractor as to selected vendor and purchase price.
  4. Order will be placed and delivery received by Contractor.
  5. Contractor will make prompt payment to vendor. Any cash discount for prompt payment will accrue to Contractor.
  6. In case authorized purchase price exceeds cash allowance, difference will be allowed as an extra to Contract amount. If purchase price is less than cash allowance, difference will be deducted from Contract amount. The adjustment will be made by change order.
- B. Allowance Items -
1. **Building Permit Fee.** Allow \$ 15,000.
- C. Allowance Adjustment - Base each Change Order Proposal Request for allowance cost adjustment solely on difference between actual purchase amount and allowance, multiplied by final measurement of work-in-place, with reasonable allowances, where applicable, for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.
1. Include installation costs in purchase amount only where specified as part of allowance.
  2. When requested, prepare explanations and documentation to substantiate margins claimed.
  3. Submit substantiation of change in scope of work claimed in Modifications related to unit-cost allowances.
  4. Owner reserves right to establish actual quantity of work-in-place by independent quantity survey, measure, or count.
- D. Submit claims for increased costs because of change in scope or nature of allowance described in Contract Documents, whether for purchase order amount or Contractor's handling, labor, installation, overhead, and profit, within 20 days of receipt of change order or construction change directive authorizing work to proceed. Claims submitted later than 20 days will be rejected.
1. Change Order cost amount shall not include Contractor's or Subcontractor's indirect expense unless it is clearly shown that either nature or scope of work required was changed from that which could have been foreseen from description of allowance and other information in Contract Documents.
  2. No change to Contractor's indirect expense will be allowed for selection of higher or lower priced materials or systems of same scope and nature as those originally specified.

**Item V-2.** Section 09 5116 Acoustical Tile Ceiling. Add entire section, 8 pages attached.

**Item V-3.** Section 09 3013 Ceramic Tiling. Article 2.1, B, 1, b Colors. Delete reference to VS and Provide Quartetto porcelain by Daltilo. 1) Field color: Talco QU01. 2) Accent colors: Pomice QU03, Cadmio QU08, Ocra QU07 as directed by Architect.

**Item V-4.** Storm Water Pollution Prevention Plan (SWPPP). The contractor is responsible for the project SWPPP. This item is considered incidental to the work and no pay item will be established for this work.

**Item V-5.** Permits. Unless otherwise provided in the Contract Documents, Contractor shall obtain and pay for all construction permits and licenses.

**Item V-6.** Section 230 000 HVAC. Controls by owner. Provide a thermostat box for the owner's preferred system and coordinate with the owner as required by new work. EC shall run control wiring to the T-stat box for owner connection to control system.

**Item V-7.** Section 01300. Add missing page three, 1 page attached.

**Item V-8.** Section 08 5113 Aluminum Projected Windows. Delete from the Table of Contents, and add 08 5313 Aluminum Windows.

**Item V-9.** Section 08 5313 Aluminum Windows. Provide stick framed units using Kawneer 451T frames or equal. Install 1" insulating fixed Solar Ban glass units in the frame.

**Item V-10.** Section 07 2116 Blanket Insulation. Article 2.1, B, 1, c, 2. 2x6 wall construction shall be R22 blown-in fiberglass instead of that shown. Provide system adjustments as necessary.

**Item V-11.** Section 32 1216. Article 2.4, A. Add item: 2. Mixture type SP3, Asphalt grade PG 58-28,

aggregate size ½". Mix shall contain no more than 7% RAP.

**Item V-12.** Section 12 3216. Add entire section, 2 pages attached.

**Item V-13.** Section 26 0000. Replace entire Electrical specification, 66 pages attached.

**VI - CHANGES TO DRAWINGS:**

**Item VI-1.** Sheet A5.1. All interior signs shall be by owner.

**Item VI-3.** Sheet A6.1. Provide a one-hour fire rated attic access door (08 3110) in the Room 123 as directed by the Architect.

**END of ADDENDUM**

- 7) Name of manufacturer.
  - 8) Number and title of appropriate Specification Section.
  - 9) Drawing number and detail references, as appropriate.
3. Package each submittal appropriately for transmittal and handling. Transmit each submittal from Contractor to Architect using transmittal letter. On transmittal, record relevant information and requests for data. Include Contractor's certification that information complies with Contract Document requirements, or, on form or separate sheet, record deviations from Contract Document requirements, including minor variations and limitations.
  4. Submittals received from sources other than Contractor or not marked with Contractor's approval will be returned without action.
- B. Submittal Schedule
1. Within 10 days after receipt of Notice to Proceed, furnish submittal schedule listing items specified to be furnished for review to Architect including product data, shop drawings, samples, and quality assurance / control submittals.
    - a. Coordinate submittal schedule with list of Subcontractors, schedule of values, and Contractor's construction schedule.
    - b. Prepare schedule in chronological order, including submittals required during first 90 days of construction. Provide following information -
      - 1) Scheduled date for first submittal.
      - 2) Related Section number.
      - 3) Submittal category.
      - 4) Name of Subcontractor.
      - 5) Description of part of the Work covered.
      - 6) Scheduled date for resubmittal
      - 7) Scheduled date for Architect's final release or approval.
    - c. Schedule shall show 14 days minimum after receipt for review by Architect. If resubmittal is required, an additional 10 days will be allowed for after receipt.
  2. Following response to initial submittal, print and distribute copies to Architect, Owner, Subcontractors, and other parties required to comply with submittal dates shown. Post copies in Project meeting room and field office. When revisions are made, distribute to same parties and post in same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in submittal activities.
  3. Revise schedule after each meeting or activity, where revisions have been recognized or made. Issue updated schedule concurrently with minutes of each meeting.
  4. Furnishing of submittal schedule or revision thereto shall not be interpreted as relieving Contractor of his obligation to comply with Contract Document requirements for items on schedule.
- C. Product Data
1. Collect Product Data, as required by individual Sections, into separate submittals. Where Product Data must be specially prepared because standard printed data is not suitable for use, submit as Shop Drawing.
  2. Mark each copy to show choices and options used on Project. Where printed Product Data includes information on products which are not required for Project, mark copies to indicate information relating to Project.
  3. Do not submit Product Data until compliance with requirements of Contract Documents has been confirmed.
  4. Submit preliminary single copy of Product Data where selection of options by Architect is required.
  5. Submit five copies minimum of each required submittal. Architect will retain two and return others marked with action taken and with corrections or modifications required. Unless noncompliance with Contract Document provisions is observed, submittal may serve as final submittal. Insert one marked copy in three-ring binders used to become Operations And Maintenance Manuals specified in Section 01700.
  6. Furnish copies of final submittal to Subcontractors and others as required for performance of construction activities. Show distribution on transmittal forms.
    1. Do not proceed with installation until applicable copy of Product Data is in

**SECTION 12 3216****MANUFACTURED PLASTIC LAMINATE-FACED CASEWORK****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Furnished But Not Installed Under This Section:
  - 1. Cabinetry throughout project.
- B. Related Requirements:
  - 1. Section 06 2001: Installation.
  - 2. Section 22 4200: Plumbing fixtures and connections.

**1.2 REFERENCES**

- A. Reference Standards:
  - 1. National Electrical Manufacturer's Association, American National Standards Institute:
    - a. NEMA / ANSI LD 3-2005, 'High Pressure Decorative Laminates.'

**1.3 SUBMITTALS**

- A. Action Submittals:
  - 1. Product Data: Manufacturer's literature.

**PART 2 - PRODUCTS****2.1 MANUFACTURED UNITS**

- A. Manufacturers:
  - 1. Type One Acceptable Manufacturers:
    - a. Any manufactured cabinetry or product of millwork shop meeting requirements of AWI custom grade and this Section are approved upon approval of Architect before installation.
- B. Materials:
  - 1. Cabinets:
    - a. Construct cabinetry from 45 lb/sq ft density pre-finished flakeboard and 1/4 inch thick pre-finished wood fiber hardboard.
      - 1) Finish exposed exterior surfaces with high-pressure laminate.
      - 2) Finish exposed interior surfaces with high-pressure laminate or polyester balancing sheet, matte finish.
    - b. Edge Finish: Finish edges on ends, standards, shelves, doors, drawers, and drawer box with extruded barbed 'Tee' shape polyethylene edging matching laminate color.
    - c. Hardware: Casework Manufacturer's best standard in all cases where there is an option.
  - 2. Plastic Laminates:
    - a. Quality:
      - 1) Laminates shall meet requirements of NEMA LD 3:
        - a) Vertical Applications: GP 28.
        - b) Horizontal: GP 38.
      - 2) Balancing Material: BK 20.
      - 3) AWI Quality Grade: Premium.
    - b. Assemblies:

- 1) Adhesives for other than post-formed types shall be spray grade, high heat resistant, neoprene contact adhesive.

**PART 3 - EXECUTION: Not Used**

**END OF SECTION**

## SECTION 09 5116

### ACOUSTICAL TILE CEILINGS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Includes But Not Limited To:
  - 1. Furnish and install acoustical tile on backerboard as described in Contract Documents.
- B. Related Requirements:
  - 1. Section 09 2226: 'Metal Suspension System: Gypsum Board'.
  - 2. Section 09 2900: 'Gypsum Board'.

##### 1.2 REFERENCES

- A. Association Publications:
  - 1. The Ceilings & Interior Systems Construction Association (CISCA), 405 Illinois Avenue, 2B, St Charles IL. [www.cisca.org](http://www.cisca.org).
    - a. *'Ceiling Systems Handbook'*: Recommendations for direct hung acoustical tile installation.
    - b. *'Production Guide'*: Practical reference for ceiling systems and estimating costs.
- B. Definitions:
  - 1. Acoustical Tile: Prefinished material with various surface finishes installed in concealed suspension system or adhered to ceiling surface to provide improved sound absorption qualities.
  - 2. Acoustical Cement/Adhesive: Special type of adhesive or mastic used to stick up or adhere 12 inch x 12 inch (305 mm x 305 mm) acoustical tile to concrete or gypsum board.
  - 3. Absorption: Materials that have capacity to absorb sound. Absorption is the opposite of reflection.
  - 4. Bevel Edge: Acoustical tile is considered bevel edge when face of tile camfered at approximately 45 degree for 1/8 inch (3 mm) to 1/4 inch (6.4 mm) around the perimeter of tile.
  - 5. Ceiling Attenuation Class (CAC): Rates ceiling's efficiency as barrier to airborne sound transmission between adjacent closed offices. Shown as minimum value, previously expressed as CSTC (Ceiling Sound Transmission Class). Single-figure rating derived from normalized ceiling attenuation values in accordance with classification ASTM E413, except that resultant rating shall be designated ceiling attenuation class. (Defined in ASTM E1414.) Acoustical unit with high CAC may have low NRC.
  - 6. Center Line: Line indicating midpoint of surface in either direction. Used as guide in starting ceiling.
  - 7. Class A: Fire classification for product with flame spread rating of no more than 25 and smoke developed rating not exceeding 50, when tested in accordance with ASTM E84 or UL 723.
  - 8. Flame Spread: The propagation of flame over a surface.
  - 9. Flame Spread Index: Comparative measure, expressed as a dimensionless number, derived from visual measurements of the spread of flame versus time for a material tested in accordance with ASTM E84 or UL 723.
  - 10. Interior Finish: Interior finish includes interior wall and ceiling finish and interior floor finish.
  - 11. Leveling Spline 3 inch (76 mm) fiber strip inserted into kerf at intersection of four (4) adhesively applied acoustical tiles.
  - 12. Kerf: Slit cut into midpoint of edge of tiles.
  - 13. Light Reflectance (LR): Percentage of light a surface reflected by ceiling surface expressed in decimal form.
  - 14. Mineral Base: Ceilings composed principally of mineral materials such as fibers manufactured from rock or slab, with or without binders.

15. **Noise Reduction Coefficient (NRC):** Average sound absorption coefficient measured at four frequencies: 250, 500, 1,000 and 2,000 Hertz expressed to the nearest integral multiple of 0.05. Rates ability of ceiling or wall panel or other construction to absorb sound. NRC is fraction of sound energy, averaged over all angles of direction and from low to high sound frequencies that is absorbed and not reflected.
16. **Smoke-Developed Index:** Comparative measure, expressed as a dimensionless number, derived from visual measurements of smoke obscuration versus time for a material tested in accordance with ASTM E84 or UL 723.
17. **Sound Absorption:** Property possessed by materials and objects, including air, of converting sound energy into heat energy. Sound wave reflected by surface always loses part of its energy. Fraction of energy that is not reflected is called sound absorption coefficient of reflecting surface. For instance, if material reflects 80 percent of sound energy, then sound absorption coefficient would be 20 percent (0.20).
18. **Surface Burning Characteristic:** Rating of interior and surface finish material providing indexes for flame spread and smoke developed, based on testing conducted according to ASTM Standard E84 or UL 723.
19. **Textured Pattern:** Granular or raised (fine, coarse, or a blend), felted or matted surface as an integral part of the basic product or superimposed on the product surface.
20. **Tile:** Acoustical ceiling board, usually 12 inch x 12 inch (305 mm x 305 mm), which is stapled, cemented, or suspended by concealed grid system. Edges are often kerfed and cut back.

**C. Reference Standards:**

1. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRA):
  - a. ASHRAE Standard 62.1-2010, 'Ventilation for Acceptable Indoor Air Quality'.
2. ASTM International;
  - a. ASTM E84-11, 'Standard Test Method for Surface Burning Characteristics of Building Materials.'
  - b. ASTM E795-05, 'Standard Practices for Mounting Test Specimens During Sound Absorption Tests.'
  - c. ASTM E1264-08e1, 'Standard Classification for Acoustical Ceiling Products.'
  - d. ASTM E1414/E1414-11, 'Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum.'
  - e. ASTM E1477 - 98a(2008), 'Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers'.
3. International Building Code (IBC) (2009 Edition):
  - a. Chapter 8, 'Interior Finishes':
    - 1) Section 803, 'Wall And Ceiling Finishes':
      - a) 803.1.1, 'Interior Wall and Ceiling Finish Materials'.
      - b) 803.1.2, 'Room Corner Test for Interior Wall or Ceiling Finish Materials'.
4. National Fire Protection Association:
  - a. NFPA 101: 'Life Safety Code'.
  - b. NFPA 265: 'Standard Methods of Fire Tests for Evaluating Room Fire Growth Contribution of Textile Coverings on Full Height Panels and Walls', 2007 Edition.'
5. Underwriters Laboratories Inc.:
  - a. UL 723, 'Standard for Safety Test for Surface Burning Characteristics of Building Materials; Tenth Edition September 10 2008.' (Revision: September 13, 2010).

### **1.3 ADMINISTRATIVE REQUIREMENTS**

**A. Pre-Installation Conferences:**

1. Participate in pre-installation conference specified in Section 09 2900 to review finish requirements for gypsum wallboard ceilings.
2. Schedule acoustical tile ceiling pre-installation conference after installation of gypsum wallboard but before beginning installation of tile.
3. In addition to items specified in Section 01 3100, review following:
  - a. Verify that tile comes from same dye lot and has same dye lot code.
  - b. Review requirements of acceptable and non acceptable tile.



## 1.4 SUBMITTALS

- A. Action Submittals:
  - 1. Samples:
    - a. One sample of each variant of specified tile series.
- B. Informational Submittals:
  - 1. Test And Evaluation Reports:
    - a. If requested by Owner, provide copies of Quality Assurance requirements for 'Class A' flame spread rating and 'Room-Corner Test.'
  - 2. Manufacturer Installations:
    - a. Published installation recommendations.
- C. Closeout Submittals:
  - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
    - a. Warranty Documentation:
      - 1) Include final, executed copy of warranty.
    - b. Record Documentation:
      - 1) Manufacturers Documentation:
        - a) Manufacturer's literature on tile and adhesive.
        - b) Color and pattern selection.
- D. Maintenance Material Submittals:
  - 1. Extra Stock Materials:
    - a. Provide Owner with six (6) cartons of each type of tile with same dye lot code.

## 1.5 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
  - 1. Fire-Test-Response Characteristics: As determined by testing identical ceiling tile applied with identical adhesives to substrates according to test method indicated below by qualified testing agency. Identify products with appropriate markings of applicable testing agency.
    - a. Surface-Burning Characteristics:
      - 1) Ceiling tile shall have Class A flame spread rating in accordance with ASTM E84 or UL 723 Type 1.
        - a) Class A (Flame spread index 0-25; Smoke-developed index 0-450).
        - b) Flash point: None.
  - 2. Passage of 'Room-Corner Test' as recognized by AHJ, is required for system. Adhesive cited in test literature is required for installation of ceiling tile on Project.
    - a. Room Corner Tests:
      - 1) ASTM E84, 'Standard Test Method for Surface Burning Characteristics of Building Materials.'
      - 2) IBC 803.2.1, 'Room Corner Test for Interior Wall or Ceiling Finish Materials'.
      - 3) NFPA 265: 'Room Corner Test for Interior Wall or Ceiling Finish Materials'.
      - 4) UL 723, 'Standard for Safety Test for Surface Burning Characteristics of Building Materials.'

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Delivery and Acceptance Requirements:
  - 1. Materials shall be delivered in original, unopened packages with labels intact.
- B. Storage And Handling Requirements:
  - 1. Store materials where protected from moisture, direct sunlight, surface contamination, and damage.
  - 2. Store acoustic tile in cool, dry location, out of direct sunlight and weather, and at temperatures between 32 deg F (0 deg C) and 86 deg F (30 deg C).

3. Store adhesive on site at installation temperature, between 65 and 90 deg F (18 and 32 deg C), for one week before installation.
4. Handle acoustical ceiling tiles carefully to avoid chipping edges or damage. Use no soiled, scratched, or broken material in the Work.

## 1.7 FIELD CONDITIONS

### A. Ambient Conditions:

1. Building shall be enclosed, mechanical system operating with proper filters in place, and temperature and humidity conditions stabilized within limits under which Project will operate before, during, and after installation until Substantial Completion.
2. Temperature at time of setting tile shall be 50 deg F (10 deg C) minimum and 100 deg F (38 deg C) maximum.

## 1.8 WARRANTY

### A. Manufacturer Warranty:

1. Provide Manufacturer's ten (10) year limited system warranty for the following:
  - a. Manufacturer's warranty to be free from defects in materials and factory workmanship.
  - b. Manufacturer's warranty against sagging and warping.
  - c. Manufacturer's warranty against mold/mildew, and bacterial growth.

## PART 2 - PRODUCTS

### 2.1 SYSTEM

#### A. Manufacturers:

1. Manufacturer Contact List:
  - a. Armstrong World Industries, Strategic Accounts, Lancaster, PA [www.ceilings.com](http://www.ceilings.com).
    - 1) For pricing and ordering of tile, contact Sherry Brunt, Phyllis Miller, or Beth Rinehart at (800) 442-4212, FAX 800-233-5598, or [bpo\\_strategic\\_accounts@armstrong.com](mailto:bpo_strategic_accounts@armstrong.com).
    - 2) For Strategic Account information, contact Randy Lay at (303) 775-1409 [ralay@armstrong.com](mailto:ralay@armstrong.com).
  - b. Franklin International, Inc., Columbus, OH [www.titebond.com](http://www.titebond.com).
  - c. TACC International Corp, Rockland, MA [www.itwtacc.com](http://www.itwtacc.com).

#### B. Materials:

1. Description:
  - a. Size: 3/4 inch (19 mm) thick minimum by 12 inches (300 mm) square.
  - b. Color: White.
  - c. Grid Face: Tile glue-up.
  - d. Surface Finish: Factory-applied.
  - e. Wet-formed high density mineral fiber.
2. Design Criteria:
  - a. Meet requirements of ASTM E1264, Type III (mineral base with painted finish), Form 2 (water felted), Pattern CE (perforated, small holes – lightly textured), Fire Class A.
  - b. Acoustics:
    - 1) Noise Reduction Coefficient (Rating expressed according to ASTM E1284 requirements:
      - a) NRC rating: 60 minimum.
    - 2) CAC rating: 35 minimum.
  - c. Anti Mold / Mildew:
    - 1) Resistance against growth of mold/mildew.
  - d. Durable:
    - 1) Impact-resistant.

- 2) Scratch-resistant.
  - e. Edge Profile: Beveled K4C4.
  - f. Finish:
    - 1) Abuse-resistant/durable, factory applied vinyl latex paint.
  - g. Fire Performance:
    - 1) Panels meet ASTM E84 or UL 723 Type 1 surface burning characteristics.
  - h. High Recycled Content (HRC): Classified as containing greater than 50 percent total recycled content.
  - i. Light Reflectance (LR): 0.86 Average (Range of 0.84 to 0.88).
  - j. Sag Resistance:
    - 1) Resistance to sagging in high humidity conditions up to, but not including, standing water and outdoor applications.
  - k. Texture: Embossed texture with fine fissuring and small perforations with natural variation in texture and color appearance between tile.
  - l. VOC Emissions:
    - 1) Low formaldehyde: Contributing less than 13.5 ppb in typical conditions per ASHRAE Standard 62, 'Ventilation for Acceptable Indoor Air Quality'.
  - 3. Acoustic Tile:
    - a. Category Three National Account Approved Product. See Section 01 6200 for definitions of Categories:
      - 1) DuraTile Item No. MN80375 by Armstrong.
- C. Materials:
- 1. Description:
    - a. Size: 3/4 inch (19 mm) thick minimum by 12 inches (305 mm) square.
    - b. Color: White.
    - c. Grid Face: Tile glue-up.
    - d. Surface Finish: Factory-applied.
    - e. Wet-formed high density mineral fiber.
  - 2. Design Criteria:
    - a. Armstrong:
      - 1) Meet requirements of ASTM E1264, Type III (mineral base with painted finish), Form 2 (water felted), Pattern CE (perforated, small holes – lightly textured), Fire Class A.
      - 2) Meet requirements of ASTM E1264, Type III (mineral base with painted finish), Form 1 (nodular), Pattern E (lightly textured) or Pattern F (heavily textured), Fire Class A.
    - b. USG:
      - 1) Meet requirements of ASTM E1264, Type III (mineral base with painted finish), Form 4 (cast or molded), Pattern D (Fissured), Fire Class A.
    - c. Acoustics:
      - 1) Noise Reduction Coefficient (Rating expressed according to ASTM E1284 requirements:
        - a) NRC rating: 60 minimum.
      - 2) CAC rating:
        - a) Armstrong: 35 minimum.
        - b) USG: 25 minimum.
    - d. Anti Mold / Mildew:
      - 1) Resistance against growth of mold/mildew.
    - e. Durable:
      - 1) Impact-resistant.
      - 2) Scratch-resistant.
    - f. Finish:
      - 1) Abuse-resistant/durable, factory applied vinyl latex paint.
    - g. Fire Performance:
      - 1) Panels meet ASTM E84 or UL 723 Type 1 surface burning characteristics.
    - h. High Recycled Content (HRC): Classified as containing greater than 50 percent total recycled content.
    - i. Light Reflectance (LR): 0.79 minimum.
    - j. VOC Requirements:
      - 1) Armstrong:

- a) Low formaldehyde: Contributing less than 13.5 ppb in typical conditions per ASHRAE Standard 62, 'Ventilation for Acceptable Indoor Air Quality'.
    - 2) USG:
      - a) Zero.
  - 3. Acoustic Tile:
    - a. Category Three National Account Approved Product. See Section 01 6200 for definitions of Categories:
      - 1) DuraTile Item No. MN80375 by Armstrong.
    - b. Category Four Approved Product. See Section 01 6200 for definitions of Categories.
      - 1) 'F' Fissured by USG.
- D. Accessories:
- 1. Adhesive:
    - a. Non-staining type suitable for work.
    - b. Type Two Acceptable Products:
      - 1) ATA5495 Acoustical Tile Adhesive by TACC International Corp.
      - 2) Titebond No. 2704 Solvent Free Acoustical Ceiling Tile Adhesive by Franklin International.
      - 3) Highest quality of adhesive from manufacturer recommended by Tile Manufacturer as approved by Architect before use. See Section 01 6200.
  - 2. Edge Molding:
    - a. Steel 'U' molding with baked enamel finish.
    - b. Type Two Acceptable Products:
      - 1) 7843 Series by Armstrong.
      - 2) Equal as approved by Architect before installation. See Section 01 6200.
    - c. Type Two Acceptable Products:
      - 1) US 12 RWS 14 by USG Interiors.
      - 2) Equal as approved by Architect before installation. See Section 01 6200.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Verification Of Conditions:
  - 1. Inspect for defects in backing and support that are not acceptable.
    - a. Examine areas around HVAC diffusers and light fixtures for tile installation problems.
    - b. Examine ceiling for levelness. Cisca 'Code of Practice' requires ceiling to be free of irregularities and be level to within 1/4 inch (6 mm) in 12 foot (305 mm).
    - c. Examine substrate for any problems that will compromise adhesion of ceiling tile.
  - 2. Notify Architect in writing of unacceptable conditions.
  - 3. Do not apply ceiling tile until defects in backing and support are corrected.

### **3.2 PREPARATION**

- A. Surface Preparation:
  - 1. Follow Manufacturer recommendations for surface preparation:
    - a. Substrate must be clean, free of grease and dirt, sound, smooth, even and level before applying tile to surface.
      - 1) Do not install new ceiling tile over old glue globs or bad substrate with any surface finish that is incompatible with tile adhesive.
    - b. Painted Surfaces: Avoid applying tile to newly painted ceiling.
    - c. Materials shall be dry and clean at time of application.

### 3.3 INSTALLATION

#### A. Special Techniques:

1. Installation shall be in accordance with Manufacturer's recommendations:
  - a. Do not install tile when room temperature exceeds or below recommended ambient conditions.
  - b. Tile is directional tile and must be installed in same direction of pattern running parallel to long dimension of each room.
  - c. Remove loose dust from back of tile and ceiling where adhesive is to be applied.
  - d. Prime 3 inch (75 mm) minimum circle near each corner by buttering very thin coat of adhesive.
  - e. Apply daub of adhesive to each corner. Daubs will be of sufficient size to form a circle 2-1/2 to 3 inches (63 to 75 mm) in diameter and 1/8 to 1/4 inch (3 to 6 mm) thick when tile is pressed firmly in place. Do not apply daubs so far in advance of installation that adhesive skins over.
  - f. Install splines in kerfs at corners.
  - g. Do not bend tile during installation.
2. Tile Layout:
  - a. Lay out tile symmetrically about center lines of room.
  - b. Lay out so tiles at room perimeters are at least 1/2 full tile size.
  - c. Leave tile in true plane with straight, even joints.
  - d. Tile joints shall be straight and in alignment, and exposed surface flush and level.
  - e. Furnish and install specified molding wherever tile has exposed edges or abuts walls, columns, and other vertical surfaces, except at curves of 3 inch (75 mm) radius or smaller.
  - f. Cut around penetrations that are not to receive moldings cleanly with sharp knife and at a slight angle away from cutout.
3. Ceiling mounted items:
  - a. Locate light fixtures, speakers, and mechanical diffusers and grilles symmetrically in room and centered on tile centers or tile joints insofar as possible, unless shown otherwise.
  - b. Keep method of locating ceiling mounted items as consistent as possible throughout building.
  - c. Ceiling mounted item location method within each room shall always be consistent.

### 3.4 FIELD QUALITY CONTROL

#### A. Non-Conforming Work:

1. Acoustical Tile. The following have been identified by the Manufacturer as tile defects, should not be installed, and will be replaced at no charge to Owner. Manufacturer will replace any material that does not meet product specifications. Installer to call 1 (800) 442-4212 immediately to report any tile discrepancies:
  - a. Obvious Tile Defects:
    - 1) Gross surface defects or damage.
    - 2) Gross damage to edges and corners.
    - 3) Bevels without paint.
  - b. Size Measurement:
    - 1) Tiles measure 12 inches (305 mm), plus or minus 1/32 inch (0.8 mm), measured across center of two (2) parallel sides.
  - c. Squareness Measurement:
    - 1) Measure two (2) diagonals of an individual ceiling tile.
    - 2) Diagonal measurements needs to be within 1/16 inch (1.6 mm) of each other. No more than 1/16 inch (1.6 mm) difference.
  - d. Warp:
    - 1) Tiles specification is plus or minus 0.050 inch (1.27 mm) as measured in the center of tile.
2. Installer:
  - a. Substrate preparation and installation of ceiling tile not following CISCA Code of Practice will be unacceptable and considered defective and subject to replacement at no cost to Owner.

**3.5 ADJUSTING**

- A. 'Touch-up' minor abraded surfaces.

**3.6 CLEANING**

- A. Remove from site debris connected with work of this Section.

**END OF SECTION**

## SECTION 260501 - COMMON ELECTRICAL REQUIREMENTS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division - 01 Specification sections, apply to work of this section.
- B. This is Division 26 of the project specifications; this coupled with the drawings are to be used in the construction of this project. Each section recorded hereafter makes reference to the electrical systems, equipment, materials, connections, etc., and apply to all the work making reference and/or titled Electrical and/or Electrical Contract Documents.
- C. Architectural, Structural, Fire Sprinkling, Plumbing, Mechanical and other applicable and related documents are considered a part of the electrical documents insofar as they apply as if referred to in full.

#### 1.2 SCOPE OF WORK

- A. The scope of this project is to construct a complete electrical system for the Century Athletic Facility. Each area shall be developed electrically to give proper illumination, power utilization, auxiliary networks, etc. When the project is complete all systems integrate into a total electrical network making the building a usable facility.
- B. This project includes renovation and updating the electrical distribution system, i.e., consolidation of the multiple electric service to a single utility company provided transformer and reworking/expanding the existing electrical power distribution system.
- C. Extent of electrical work is indicated on drawings and/or specified in Division 26 sections of the specification. Provide all labor, materials, equipment, supervision and service necessary for a complete electrical system. Work includes, but is not necessarily limited to, the following items:

- 1. 260508 - Basic Electrical Materials and Methods
- 2. 260515 - Electric Service Connection
- 3. 260519 - Low Voltage Electrical Power Conductors and Cables
- 4. 260520 - Electrical Wiring Connections
- 5. 260526 - Grounding and Bonding
- 6. 260529 - Concrete Platforms and Bases
- 7. 260533 - Raceways for Electrical System
- 8. 260534 - Boxes, Pull Boxes, Conduit Bodies and Fittings
- 9. 260548 - Electrical Supports and Seismic Restraints
- 10. 260553 - Electrical Identification
- 11. 262413 - Electrical Service and Distribution Switchboards
- 12. 262416 - Panelboards
- 13. 262726 - Wiring Devices
- 14. 262816 - Enclosed Switches and Circuit Breakers
- 15. 262910 - Overcurrent Protective Devices
- 16. 262913 - Enclosed Controllers and Starters
- 17. 265100 - Interior Lighting
- 18. 265600 - Exterior Lighting

- D. Use of standard industry symbols together with the special symbols, notes, and instructions indicated on the drawings describe the work, materials, apparatus, and systems required as a portion of this work.

### 1.3 CONTRACT DOCUMENTS AND EXAMINATION OF THE SITE

- A. Each bidder shall study the construction documents (plans and specifications), visit the site of the proposed work to fully acquaint himself with the conditions relating to the construction, so that he understands the difficulties and restrictions attending the execution of the work to be placed under contract. From all the above information, together with the cost of equipment, materials, labor, etc., the bidder shall then assemble and submit his cost to complete the project. The failure or omission of any bidder to receive or examine any contract documents, form, instrument, addendum or other document or to visit the site and acquaint their self with existing conditions shall in no way relieve any bidder from obligations with respect to his bid or to the contract. Written addendums (formally issued) become a part and parcel to the construction documents. The submission of a bid shall be taken as prima facie evidence of compliance with this section.

### 1.4 INTERPRETATION OF DRAWINGS AND SPECIFICATIONS

- A. Any person contemplating submitting a bid shall familiarize himself with the drawings, specifications and project site. If for any reason, the bidder of the proposed contract, is in doubt as to the true meaning of any part of the drawings, specifications, or other contract documents, or finds discrepancies in, or omissions from, the drawings and specifications he shall submit a written request for an interpretation, correction and/or clarification to Architect/Engineer. The person submitting the request shall be responsible for its prompt delivery. **Any interpretation or correction of the contract documents prior to bid shall be made only by addenda duly issued.** An oral statement by anyone on any provision in the contract documents prior to the bidding is declared invalid.
- B. After acceptance of the contract, the Contractor shall meet the intent, purpose and function of the contract documents and **no changes shall be made to the contract documents, except it be in writing and/or a drawing, over the signature of the engineer and/or his representative.** Any costs of materials, labor and equipment arising therefrom, shall be made known to the owner's representative (Project Manager and/or the General Contractor) within 24 hours or the costs become the responsibility of the Contractor.

### 1.5 LAW AND REGULATION

- A. The bidder's attention is directed to the fact of all applicable laws, ordinances and rules and regulations of all authorities having jurisdiction over construction of the project shall apply to contract throughout, and they shall be deemed to be included in the contract of the same as though here written out in full.



## 1.6 CONSTRUCTION OBSERVATIONS:

- A. During the course of construction of this project, the engineer shall visit the project site periodically on an as-needed basis. The construction observation intervals may vary depending on the progress and/or stage of construction and to observe the electrical conduit rough-in above or below grade, setting of the main and branch panels, auxiliary units and panels, surface mounted items, setting of equipment, equipment connections, etc. However, written field questions are encouraged and welcomed throughout the course of construction and shall be answered promptly in writing, to keep the project construction on schedule. The project foreman should have the building plans, construction schedules, etc., affixed in mind, so the electrical systems being assembled, the setting of equipment, of parts and pieces, related to the project are anticipated, to prevent delays or emergencies.
- B. The engineer shall make one (1) final inspection. The contractor shall notify the engineer that the installation is complete, i.e., the systems are operating and have been tested and balanced, and everything is complete and operational, all equipment connections have been made and the owner's representatives have been trained. At this time the engineer, the contractor, and the owner's representative shall schedule a time to walk the project for evaluation, and record in writing the items found to be incomplete. The contractor shall make the corrections within one (1) week after this inspection. If at the conclusion of the observation tour the owner and engineer determine that additional visits are required to complete the project, **the contractor shall reimburse the engineer at the rate of \$600 for each site visit required, plus out of pocket expenses, until all items are acceptable to the engineer and owner. The contractor shall pay the engineer in advance of each inspection.**
- C. Before scheduling an additional visit, the contractor shall report to the engineer that all systems are complete, and the project is ready for the owner's acceptance.

## 1.7 OFFICIAL, AGENT AND EMPLOYEES OF THE OWNER NOT PERSONALLY LIABLE

- A. It is agreed, by and between the parties hereto that in no event shall any official, officer, employee, or agent of the Owner in any way be personally liable or responsible for any covenant or agreement herein contained whether expressed or implied, nor for any statement, representation or warranty made herein or in any connection with this agreement.

## 1.8 SUBLETTING AND SUBCONTRACTING

- A. This Bidder is responsible for the construction stated or defined in this Contract and, as such, shall abide by the Subletting and Subcontracting Fair Practices Act as set forth and outlined in the General Conditions, Designation of Subcontractors.

## 1.9 CONTRACTOR COORDINATION

- A. In the course of installing the systems defined in the contract documents, the contractor shall closely follow the plans, details and specifications (contract documents). The system design has been a careful and laborious undertaking, with the intent purpose of producing a system and/or systems that will serve the owner well with minimum maintenance. The contractor shall adhere as close as possible to the plans, details, and specifications for each system. Questions and suggestions are encouraged as the project is being assembled. If for any reason, the contractor desires to deviate from the defined information, because he discovers a way to improve the system, make the system more easily assembled, make it operate more efficiently, etc., the contractor shall present the changes to the engineer. Systems are designed to perform a specific function; the smallest change in assembly may change the function. If the engineer agrees with the change he will authorize the contractor to proceed. Contractor cooperation and coordination is appreciated. If the contractor proceeds with construction without the designer's authorization, it shall be reworked, in accordance to plans and specifications, at the contractor's expense.

## 1.10 QUALITY ASSURANCE

- A. Comply with the requirements of State and Local Ordinances. If a conflict occurs between these requirements and the contract documents, the most stringent requirements shall govern. The contractor accepts this responsibility upon submitting his bid, and no extra charge will be allowed after the contract is awarded. This shall not be construed as relieving the Contractor from complying with any requirements of the contract documents which may be in excess of the aforementioned requirements, and not contrary to same.
- B. Obtain all permits, inspections, etc. required by authority having jurisdiction. Include all fees in bid. Furnish a certificate of approval to the Owner's Representative from the Inspection Authority at completion of the work.
- C. Employ only qualified craftsmen with at least three years of experience (in power equipment, conduit work, high voltage equipment, etc.). Workmanship shall be neat, have a good mechanical appearance and conform to best electrical construction practices (Media Standards of Installation). Provide a competent superintendent to direct the work at all times. Any person found incompetent by the General Contractor, Engineer, Architect, or Owner, shall be discharged from the project and replaced by satisfactory personnel.
- D. Contractor shall have a current state contracting license applicable to type of work to be performed under this contract.

## 1.11 MATERIALS AND WORKMANSHIP

- A. All materials and equipment furnished and installed shall be first quality, new and meet the standards of NEMA, IPCEA, LS, UL, NFPA, UBC, OSHA, NEC, and shall bear their label wherever standards have been established and label service is available. Where materials and equipment are specified by manufacturer's name, the type and quality required is thereby denoted. The Architect shall be afforded every facility deemed necessary to inspect and examine the materials and apparatus being installed to prove the material quality and skill/competency of workmanship.

#### 1.12 DEMOLITION, PATCH AND REPAIR

- A. The Contractor is responsible for all block-outs, demolition, patching and repair of all finished interior surfaces pertaining to the installation of this particular phase of work. All repaired surfaces shall be finished (painted, etc.) to match the adjacent materials, finished and color.
- B. When conduit passes through a ceiling and/or floor, block-out as required and/or core drill - do not break out with a hammer of any type. The hole shall not be larger than ½" more than the diameter of the conduit.
- C. When conduit is indicated to be installed below an existing concrete slab, cut the slab with a diamond saw and/or cutting tool. Do not just rip up the surface unless the entire section is removed.
- D. When conduit is to be installed below asphalt, concrete, lawn, etc. the surface shall be cut, not ripped up, with a back-hoe or other equipment (i.e., mechanically cut then remove material).
- E. Seal around all electrical equipment penetrating outside walls, roofs, unheated spaces, air plenums, cold boxes, etc., with Dow Corning Silicone RTV foam.
- F. All salvageable electrical equipment and materials that cannot be integrated into the new electrical network become the property of the Contractor and shall be removed from the premise.
- G. Hard Surfaces: whenever demolition or excavation is required for the installation of the electrical system, it is the responsibility of the Contractor to make repairs and/or replacement of hard finish surfaces such as concrete, asphalt, etc.
- H. The method of patching and repair shall follow good construction practices. All finished surfaces shall match materials, and finish (surface texture and finish - paint, etc.) wherein the demolition occurred.
- I. Lawn replacement resulting from excavation is to be included in the bid.

#### 1.13 EXCAVATION, BACKFILL AND BORING

- A. The Electrical Contractor is responsible for all excavation and backfill related to the installation for Division 26. All work shall comply with the conditions stated herein and those noted in the Architectural Section under Earthwork.
- B. When conduit is indicated to be installed below an existing concrete slab, cut the slab with a diamond saw and/or cutting tool. Do not just rip up the surface unless the entire section is removed.
- C. Backfill: The Contractor shall backfill the excavated areas with the material removed provided it does not contain rocks larger than 0.15" in diameter. If the excavated material is larger than indicated, the excavated area shall be filled with sand.
- D. Backfill materials shall be put in place in 4" lifts and compacted to 98% of the maximum dry density of ASTM 698 over the entire area of the fill.
- E. After the backfill is complete the finished surface shall match the adjacent surfaces, depth, quality finish, etc. (concrete, etc.).

- F. Boring, or Auging - The contractor shall employ a firm skilled in installing underground utilities - piping, conduit, etc. for at least five (5) years, with care and concern the contractor shall drive the boring tool under the bleachers with care and concern. Any damage to the existing facility shall be repaired at the expense of the Boring Contractor. The installation shall follow and comply with the intent and details shown on the plans.

#### 1.14 PROGRESS AND COORDINATION OF WORK

- A. The electrical work shall be laid out in advance of construction to eliminate unnecessary cutting, drilling, channeling, etc. Perform necessary cutting, drilling, or channeling with care. Use skilled mechanics of the trades involved and repair damage to building or equipment at no additional cost to the Owner. Cutting, drilling, or channeling through work performed by other trades shall only be done with the consent of the General Contractor. Cutting, drilling, or channeling through structural members shall only be done with the approval of the Architect.
- B. Cooperate with other trades to coordinate locations of electrical outlets and apparatus.
- C. Perform for other trades, the electrical wiring and connections for all devices or apparatus where not specified herein or indicated on the drawings. Consult the Architectural and Mechanical drawings to avoid hiding switches, outlets and other equipment behind doors, cabinets, counters, heating equipment, etc. Buried electrical devices and/or connections shall be relocated as directed by Engineer and/or authority having jurisdiction, at no additional cost to the Owner.
- D. Where conduit, outlets or apparatus are to be cast in concrete or encased, it must be located and secured by a journeyman or foreman present at the point of installation. He shall check the locations of the electrical items before and after the concrete and masonry installation and shall relocate displaced items.
- E. No changes shall be made in the design or location of apparatus unless specifically approved in writing.

#### 1.15 COORDINATION WITH CEILING AND MECHANICAL SUBCONTRACTORS

- A. Meet at least twice with the Ceiling Contractor. The first meeting shall accomplish coordination of all ceiling types with the specified light fixtures. The second meeting shall be held at the project site prior to installing the ceiling to coordinate the fixture layout in each area, and to determine if the depth will allow the installation of the fixture. If a conflict occurs with the layout or depth, the Engineer shall be contacted immediately so the conditions can be adjusted. A letter confirming the second meeting shall be sent to the Engineer with a copy to the Architect.
- B. Meet at least once with the Mechanical Contractor prior to fabrication and installation of the ductwork to coordinate the depth and location of light fixtures and ductwork in all areas. All conflicts must be resolved before light fixtures are released for shipment. A letter confirming this meeting shall be sent to the Engineer with a copy to the Architect.

## 1.16 WIRING DIAGRAMS

- A. As soon as possible after the contract to proceed is signed, one print of the control diagrams shown on the contract documents shall be developed (utilize the information on the contract documents) and Control Subcontractors, showing all necessary connections required for the equipment and devices proposed for installation. These prints shall be reviewed and approved by the Mechanical, Electrical, and Controls Subcontractor, and then submitted to the Architect/Engineer for approval. The prints shall indicate all components that are to be wired into the control power circuit by the Electrical Subcontractor, with all terminals for external connections of the components identified and labeled to correspond to the manufacturer's designations. Internal or factory installed wiring or package-type components need not be shown. The shop drawings for the Control System to be installed by the Controls Subcontractor shall be prepared as a separate and complete submittal and need not be entirely repeated on the indicated prints except for the related electric connection. Color coding designations shall be indicated on the control power circuit wiring to be installed in the field by the Electrical Contractor.
- B. Revised Drawings: After the Architect has approved the submitted copy of the control diagrams, the contract drawings will be revised, and the Contractor will be issued ten revised prints. The revised control diagrams shall be certified in writing as being acceptable to the Mechanical Design Engineer, Electrical Design Engineer, Mechanical Contractor, Electrical Contractor, and the Controls Contractor. The contract drawings will be revised by one of the two following procedures:
1. If the revisions to the controls diagram shown on the contract drawings are minor in the opinion of the Architect, the contract drawings will be revised and re-issued by and at the expense of the Architect.
  2. If the revisions to the control diagrams shown on the contract drawings are ruled major in the opinion of the Architect/Engineer, the Prime Contractor shall prepare and submit a complete set of reproducible drawings of the control diagrams proposed for installation. These drawings shall be prepared on the same size sheets as the contract drawings and shall follow the same general format and quality of drafting as the contract drawings. After these reproducible drawings have been reviewed, approved and certified by the Architect/Engineer, the revised prints will be re-issued to the Contractor at the expense of the Design Engineers.
- C. Changes During Construction: The complete responsibility and costs for changes to the approved control diagrams during construction and the resultant changes to the installation requirements not covered by contract change orders, shall be assigned to the respective section of these specifications under which the equipment is furnished.

## 1.17 SUBMITTALS OF EQUIPMENT FOR APPROVAL

- A. SHOP DRAWINGS AND PRODUCT DATA BEING INSTALLED IN THE PROJECT: After the contract is awarded, but prior to manufacture or installation of any equipment, prepare complete Shop Drawings and Brochures for materials and equipment as required by each section of this specification. A brief submittal description of equipment that is approved for installation (bid documents or addendums), is given below. Refer to identified sections for detailed submittal requirements.
- 1 Conductors and Cables (Section 260519)
  - 2 Metallic and Non-Metallic Conduit (Section 260533)
  - 3 Main Service Disconnect and Distribution Switchboards (Section 262413)
  - 4 Branch Panelboards (Section 262416)

- 5 Receptacles, Switches, Low Voltage Switching, Coverplates, Cord Caps, Cord Connectors, Phone Jacks and Plates, Phone/Data Jacks and Plates, and Power Poles (Section 262726)
- 6 Motor and Circuit Disconnect Switches (Section 262816)
- 7 Overcurrent Protective Devices (Section 262910)
- 8 Motor Controllers and Starters (Section 262913)
- 9 Interior Building Light Fixtures, Ballasts, etc. (Section 265100)
- 10 Exterior Building Lighting (Section 265600)

This list is not all inclusive. The contractor shall submit product information for all items being installed on the project, contained in the drawings or elsewhere in this specification.

- B. The electrical foreman, to acquaint himself with the project, is asked to review the shop drawings prior to submission to confirm size, voltages, loads, etc. **This cooperative effort** will prevent problems from occurring during the course of construction. Any problems that may arise shall be phoned to the engineer and noted in writing and submitted with the shop drawings.
- C. Submit project information in electronic format per architectural submission requirements.
- D. A minimum period of two weeks, exclusive of transmittal time, will be required each time a Shop Drawing and/or Brochure is submitted or resubmitted for review. This period shall be considered by the Contractor when scheduling submittal data.
- E. Review of Shop Drawings and Brochures shall not relieve the Contractor of responsibility for dimensions and/or errors that may be contained therein, or deviations from the Contract Document's requirements. It shall be clearly understood that the noting of some errors but overlooking others does not grant the Contractor permission to proceed in error. Regardless of any information contained in the Shop Drawings and Brochures, the requirements of the Contract Documents shall govern and are not waived or superseded in any way by the review of the Shop Drawings and Brochures.
- F. Certifications shall be written or in the form of rubber stamp impressions as follows:

I hereby certify that this Shop Drawing and/or Brochure has been checked prior to submittal and that it complies in all respects with the requirements of the Contract Drawings and Specifications for this Project.

(Name of Electrical Subcontractor)

Signed \_\_\_\_\_

Position \_\_\_\_\_ Date \_\_\_\_\_

Observe the following rules when submitting Shop Drawings and Brochures.

- 1. Each Shop Drawing shall indicate in the lower right hand corner, and each Brochure shall indicate on the front cover the following: Title of the sheet or brochure, name and location of the building; names of the Architect and Electrical Engineer, Contractor, Subcontractors, Manufacturer, Supplier/Vendor, etc., date of submittal, and the date of correction and revision. Unless the above information is included, the submittal will be returned for re-submittal.

2. Shop Drawings shall be done in an easily legible scale and shall contain sufficient plans, elevations, sections, and isometrics to clearly describe the equipment or apparatus, and its location. Drawings shall be prepared by an Engineer/Drafter skilled in this type of work. Shop Drawings shall be drawn to at least ¼"-1-0" scale.
3. Brochures to be submitted shall be published by the Manufacturers and shall contain complete and detailed engineering and dimensional information. Brochures submitted shall contain only information relevant to the particular equipment or materials to be furnished. The Contractor shall not submit catalogs which describe several different items in addition to those items to be used, unless all irrelevant information is marked out, or unless relevant information is clearly marked. Brochures from each manufacturer shall be identified and submitted separately.

#### 1.18 OPERATION AND MAINTENANCE MANUALS

- A. Provide operating instructions and maintenance data books for all equipment and materials furnished under this Division.
- B. Submit operating and maintenance data books for review at least four weeks before final review of the project. Assemble all data in a completely indexed volume or volumes and identify the size, model, and features indicated for each item. Comply with architectural submission requirements.
- C. Include complete cleaning and servicing data compiled in clearly and easily understandable form. Show serial numbers of each piece of equipment, complete list of replacement parts, motor ratings, etc. Each unit shall have its own individual sheet. (Example: If two items of equipment A and D appear on the same sheet, an individual sheet shall be provided for each unit specified.)
- D. Include the following information where applicable:
  1. Identifying name and mark number.
  2. Certified outline Drawings and Shop Drawings.
  3. Parts list.
  4. Performance curves and data.
  5. Wiring diagrams.
  6. Manufacturer's recommended operating and maintenance instructions.
  7. Vendor's name and address for each item.

#### 1.19 RECORD DRAWINGS

- A. Maintain at the job site, on a daily basis, a complete set of "Record Drawings", reflecting an accurate dimensional record of all buried or concealed work. Mark "Record Drawings" to show the precise location of concealed work and equipment, including concealed or embedded conduit and junction boxes and all changes and deviations in the work from that shown on the Contract Documents. This requirement shall not be construed as authorization for the Contractor to make changes in the layout or work without definite authorization for such changes. The "Record Drawings" for daily recording shall consist of a set of blue line prints of the Contract Drawings.
- B. Record dimensions clearly and accurately, delineating the work as installed; identify locations by at least two dimensions to permanent reference points.

- C. Certify the "Record Drawings" for correctness by placing and signing the following certifications on the first sheet:

"CERTIFIED CORRECT (3/8" high letters)

By \_\_\_\_\_ Date \_\_\_\_\_  
(Name of General Contractor)

By \_\_\_\_\_ Date \_\_\_\_\_  
(Name of Electrical Contractor)

- D. GUARANTEE: Ensure that electrical system installed under this contract is in proper working order and in compliance with drawings, specifications and/or authorized changes. Without additional charge, replace any work or materials which develop defects, except from ordinary wear and tear, within one year from the date of substantial completion. Exception: Incandescent and fluorescent lamps shall be guaranteed for a period of two months from the date of substantial completion.

1.20 CLEAN-UP

- A. Clean up all equipment, conduit, fittings, packing cartons and other debris that is a direct result of the installation of the work of this Division.
- B. Clean luminaires, interiors and exteriors of all equipment, and raceways. Replace all filters in electrical equipment upon request for Substantial Completion.

1.21 POWER OUTAGE

- A. All power outages required for execution of this work shall occur during non-standard working hours and/or at the convenience of the Owner. Include all costs or overtime work in the base bid.
- B. Submit written request at least 7 days in advance of scheduled outage and proceed with outage only after receiving authorization from the Owner's Representative.
- C. Keep all outages to an absolute minimum.

1.22 STORAGE AND PROTECTION OF MATERIALS

- A. Provide storage space for storage of materials and apparatus and assume complete responsibility for all losses due to any cause whatsoever. In no case shall storage interfere with traffic conditions in any public thoroughfare or constitute a hazard to persons in the vicinity. Protect completed work, work under way, and apparatus against loss or damage.

1.23 CONCRETE PADS AND ASPHALT

- A. The Electrical Contractor shall provide the concrete (5-bag mix) and/or asphalt except as noted in the contract documents. This may also include that which is needed to replace any and all removed through demolition. It shall match the existing as to type, quality, and thickness.



## 1.24 ELECTRICAL-MECHANICAL COORDINATION

- A. General - All disconnect means, motor controllers, electrical controls, signal devices, etc., for mechanical equipment as noted in Division 23 & 24 of the specifications shall be furnished, installed, wired, and connected under Division 26. All pressure switches, thermostats, solenoid valves, damper motors, smoke duct detectors, etc. shall be supplied and installed under the Mechanical Division for electrical connection under this Division. Connection diagrams will be supplied as hereafter explained.
- B. If the substitution of equipment in Division 23 results in a change to the contract documents and/or changes to the installation requirements (not covered by the contract change orders), then the Division 23 contractor shall reimburse the Division 26 contractor for additional work required.
- C. If the substitution of equipment in Division 26 results in a change to the contract documents and/or changes to the installation requirements (not covered by the contract change orders), the complete responsibility for costs shall be assigned to the section of these specifications under which the equipment is furnished.
- D. Provide all control conduit (See Section 260533-2.1-G(2)) with pull cord for mechanical system.

## 1.25 EQUIPMENT CONNECTION DIAGRAM

- A. Submittal data for each individual electrically operated or electrically controlled item of equipment or device furnished under Division 23 & 24 and/or 26 of the contract documents shall include complete electrical wiring diagrams and elementary control diagrams (ladder form) showing all internal and external wiring connections and services. The submittal data shall itemize all electrical characteristics that are of a special nature or critical to the electrical installation or control system. Such equipment and devices will not be considered for approval until these requirements are met.

## PART 2 - PRODUCTS

### 2.1 GENERAL

- A. PRODUCTS are specified by Manufacturer name, description, and/or catalog number and shall be supplied as such.
- B. DISCREPANCIES between equipment specified and the intended function of equipment shall be brought to the attention of the Engineer in writing prior to bidding. Failure to report any conflict, including catalog numbers, discontinued products, etc., does not relieve the Contractor from meeting the intent of the contract documents, nor shall it change the contract cost. If the Contractor is unable to interpret any part of the plans and/or specifications, or should he find discrepancies therein, he shall bring this to the attention of the Engineer, who will issue interpretation and/or additional instructions to Bidders before the project is bid.
- C. MANUFACTURERS AND SUBSTITUTE ITEMS: Provide products of manufacturers specified. Manufacturer's catalog numbers and descriptions establish the quality of product required.
- D. Provide only equipment specified in the contract documents or approved by addendum.

## 2.2 LISTED EQUIPMENT

- A. Provide and install materials, devices, appliances, equipment, etc. that conforms to applicable standards or is indicated to be acceptable by the established standards of the Underwriter's laboratories, Inc., or other electrical product testing laboratories which are accredited by the department.
- B. The statement in Item "A" above is being interpreted by the State Electrical Inspector as follows: It is understood that many specialty items such as power panels, light fixtures, devices and other building components are not available with a UL label covering the entire piece of equipment. The State will impose no requirement that an item of equipment be UL labeled unless it is available as a UL labeled item from at least two manufacturers. Electrical components of unlabeled equipment, such as motors, shall be labeled if they are available from at least two manufacturers.
- C. If any building component is available with a UL label from at least two manufacturers, an identical or similar unlabeled component shall not be acceptable for installation. Should any such component be installed, it shall be replaced with a UL labeled component, before the building will be accepted by the Electrical Engineer.
- D. Consequently, it shall be the sole responsibility of the Contractor (through project suppliers and equipment manufactures) to purchase and install only equipment bearing the UL label whenever the equipment so labeled is available. The Contractor (should any equipment be installed without the proper UL label) shall bear the entire cost of correction to the satisfaction of the authority having jurisdiction.

## 2.3 SUBSTITUTIONS AND SUBSTITUTE EQUIPMENT

- A. Substitute equipment is encouraged if it is truly an equal to the specified items.
  - 1. The designer has taken time and effort to analyze, evaluate and prove to himself that the specified unit will perform the function needed, wherein it is placed. This means the responsibility for the function of the specified equipment rests with the designer, who knows and understands what is to be accomplished.
  - 2. If a **supplier** and/or the **contractor** desire to substitute equipment in place of specified item, he may do so, but he takes upon himself or herself the **full responsibility** that the substituted equipment will equal all of the performing characteristics, functions, etc., and/or exceed the performance of the specified item. The substitute equipment shall be of such a physical size and weight that it will mount in the designated location without alterations to the building and the structure will carry the load. If for any reason the substituted equipment requires alterations or modification, in any form to the building and/or the structure, the costs shall be paid by the contractor and/or those requesting the substitutions.
  - 3. Those interested in requesting a substitution shall state the Manufacturer's catalog numbers and descriptions establish the quality of product required. **Substitutions will be considered if a written application is at the office of the Engineer eight (8) working days prior to day of bidding. The application shall include the following: 1) A statement certifying that the equipment proposed is equal to that specified; that it has the same electrical and physical characteristics, compatible dimensions, and meets the functional intent of the contract documents; 2) The specified and submittal catalog numbers of the equipment under consideration; 3) A pictorial and specification brochure.**

4. Because of the short bidding period, (from issuance of drawing to bid date), between the substitution request and the bid date, the designer does not have adequate time to make a full evaluation of substitute equipment. Therefore, **those requesting the substitution** must accept **full responsibility** for the items being submitted for substitution (operating characteristics, physical size, weight, output, not increase the load, etc.). If at any time during the course of construction, **even up into the final completion**, if the designer finds the equipment does not meet the design criteria, comply with the performance, etc., **those requesting the substitution and the contractor have the responsibility to remove the substituted equipment and install the specified item at their expense.** There shall be no cost assessed to the owner and/or the designer and **the replacement will not delay the completion of the project.**
- B. **Discrepancies** between equipment specified and the intended function of equipment shall be brought to the attention of the Engineer in writing prior to bidding. Failure to report any conflict, including catalog numbers, discontinued products, etc., does not relieve the Contractor from meeting the intent of the contract documents, nor shall it change the contract cost. If the Contractor is unable to interpret any part of the plans and/or specification, or should he find discrepancies therein, he shall bring this to the attention of the Engineer, who will issue interpretation and/or additional instruction to Bidders before the project is bid.
- C. Any **conflict** arising from the use of **substituted equipment shall be the responsibility of the contractor**, who shall bear all costs required to make the equipment comply with the intent of the contract documents.
- D. **Samples** may be required for non-standard or substituted items before installation during construction. Provide all samples as required.
- E. **No materials or apparatus** may be substituted after the bid opening, except where the equipment specified has been discontinued. This substitution may be made by a change order.
- F. Approved equipment shall be so noted, in writing in a formally issued **Project Addendum**.

#### 2.4 INCENTIVE BIDS AND UNIT PRICES

- A. Suppliers of materials, equipment, and systems are encouraged to submit incentive bids by grouping several products under one bid. However, at the request of the Architect and/or Engineer, the supplier shall submit a unit price to add or delete a particular unit, (panel, luminaire, fire alarm panel, etc.) from his quotation so that other components might be considered in the bid.

#### 2.5 SPARE PARTS

- A. Provide spare parts (fuses, overload heaters, diffusers, lamps, etc.) as specified. Transmit a list indicating all spare parts to Owner's Representative prior to substantial completion. Submit copy of transmittal letter to Engineer.
- B. Fuses: Provide one spare set of fuses for each size and one spare set of each additional group of five.
- C. Thermal Overloads: Provide one spare set of thermal overload heaters of each type used in the magnetic starters.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Layout electrical work in advance of construction to eliminate unnecessary cutting, drilling, channeling, etc. Where such cutting, drilling, or channeling becomes necessary for proper installation; perform with care. Use skilled mechanics of the trades involved. Repair damage to building and equipment at no additional cost to the contract. Cutting work of other Contractors shall be done only with the consent of that Contractor. Cutting structural members shall not be permitted.
- B. Since the drawings of floor, wall, and ceiling installation are made at small scale, outlets, devices, equipment, etc., are indicated only in their approximate location unless dimensioned. Locate outlets and apparatus symmetrically on floors, walls and ceilings where not dimensioned, and coordinate such locations with work of other trades to prevent interferences. Verify all dimensions on the job. Do not scale the electrical drawings but refer to the architectural and mechanical shop drawings and project drawings for dimensions as applicable.
- C. Perform for other trades, the electrical wiring and connection for all devices, equipment, or apparatus. Consult Architectural, Mechanical, and other applicable drawings, and all applicable shop drawings to avoid switches, outlets, and other equipment from being hidden behind doors, cabinets, counters, heating equipment, etc. Relocate buried electrical devices and/or connections as directed at no additional cost.
- D. All electrical networks, power, auxiliary, etc., systems shall be installed in conduit; see Section 260533.
- E. Where conduit, outlets or apparatus are to be embedded in concrete, they shall be located and secured at the defined point. Check locations of the electrical items before and after concrete and/or masonry installation and relocate displaced items.
- F. Provide block-outs, sleeves, demolition work, excavation, etc., required for installation of work specified in this Division. Opening shall be core drilled and/or saw cut and shall be no longer than required. Seal around conduit and on equipment inside and out with a silicone compound.
- G. Roof Flashing: Where raceways penetrate roofing or similar area, provide 26 ga. galvanized iron roof jack, sized to fit tightly to raceway for weather tight seal, and with flange extending to a minimum of 9" under roofing on all sides. Coordinate all work with roofing contractor.
- H. Patching and Repair
  - 1. The Contractor is responsible for all block-outs, demolition, patching and repair of all finished interior and exterior surfaces pertaining to the installation of this particular phase of work. All surfaces shall be finished (textured, painted, etc.) to match the adjacent materials.
  - 2. Hard Surfaces: Whenever demolition or excavation is required for the installation of the electrical system, it should be the responsibility of the Contractor to make repairs and/or replacements of hard finish surfaces such as concrete, asphalt, etc.
  - 3. Lawn replacement is also included as a part of this section.
  - 4. The method of patching and repair should follow good construction practices. All surfaces shall match materials and finish wherein the demolition occurred when construction is complete.

- I. All electrically powered equipment specified on this project, whether specified in the architectural, mechanical, or electrical specification, shall be electrically connected and made operational. Confirm voltage, amperage, and phases.

### 3.2 COMPLETION OF WORK AND TESTING

- A. Before energizing any circuits, make megger ground tests on conductors, bus duct and fused disconnects with the distribution breakers open. These readings shall be recorded by circuit number identification and submitted in triplicate to the Owner's Representative before the system is energized.
- B. Before final inspection, but after the electrical installation is complete, the Electrical Contractor shall remove neutral grounding connection from main distribution panel and demonstrate to authority having jurisdiction and Owner's Representative, with an ohmmeter, that the electrical system neutral is grounded through main panel location only. Neutral shall be reconnected after the test is complete.
- C. Emergency Power System: In the presence of the Owner's Representative, test the emergency power system, in its entirety, by transferring from normal to emergency power no less than six times to prove proper operation of all equipment, devices, light fixtures, etc. that are powered by this system. If a power pack is used, the factory representative should be present during the test. Write a letter to the Owner's Representative confirming the conditions of this test.
- D. Test Equipotential grounding system throughout the building and report the results.

### 3.3 FINAL REVIEW

- A. At the time of final review, the project foreman shall accompany the reviewing party, and remove coverplates, panel covers and other access panels as requested, to allow review of the entire electrical system.

### 3.4 PROJECT FINALIZATION AND START-UP

- A. Upon completion of equipment and system installation, notify equipment Factory Representative and Subcontractors for system start-up.
- B. Each Factory Representative and Subcontractor shall assist in start-up to examine their respective system and remain at the site until the total system operation is accepted by the Owner's Representative.
- C. The Factory Representative and/or System Subcontractor shall give personal instruction on operation and maintenance of their equipment to the Owner's maintenance and/or operation personnel. To certify acceptance of operation and instruction by the Owner's Representative, the contractor shall prepare a written statement as follows:
  1. This is to certify that the Factory Representative and/or System Subcontractor for each of the systems installed below have performed start-up and final check out of their respective systems is satisfactory.

D. System Operating Report: After the facility has been in operation for 10 days, submit with a letter of guarantee a triplicate record of a voltage reading and ammeter reading on each phase of the feeder for the main and all branch panels, motors, outside lighting, etc. to the facility (these readings shall be taken with all equipment operating). A second report shall be made on equipment that has a load over 20 Amp 1-pole in the mechanical room, kitchen, shops, etc. when in operation.

1. This dated system operating report shall be submitted to the Owner's representative for distribution to the engineer and a copy placed in each maintenance manual.
  - a. Electrical Load Readings:  
Demand \_\_\_\_\_ kw  
Panel F \_\_\_\_\_ Amp  
etc. identify and record the load on each panel and motor loads  $\frac{3}{4}$  hp and larger.
2. If there are any abnormal conditions, they shall be brought to the attention of the Engineer in writing as a part of this submittal.
3. Submit with the load readings for the motors, a list of motors with the size of overload heaters used for each motor. This includes thermal switches.
4. As a part of this document, submit a copy of each Auxiliary Systems test reports (Telephone, Fire Alarm, Sound, Data, etc.) with the proper signatures (See 3.2F).

System  
(List Systems Included)

Factory Representative  
(List name and address of Factory Representative)

5. The Owner's Representative has received complete and thorough instruction in the operation and maintenance of each system (See 3.4C).

\_\_\_\_\_  
Owner's Representative Contractor or Electrical Foreman

6. Report that each emergency luminaire has proven operational by killing the circuit and visually confirming the luminaire illuminates (See 3.2C).
7. The Owner's Representative has received and accepted all spare parts as heretofore required by contract (See 2.5).
8. Submit meggar OHM, equipotential, and high potential test reports (See 3.2A and 3.2D,).
9. Send copy of acceptance to Architect/Engineer.

END OF SECTION 260501

## SECTION 260508 - BASIC ELECTRICAL MATERIALS AND METHODS

### PART 1 - GENERAL

#### 1.1 MATERIALS AND METHODS

- A. Materials and methods common to this project are listed below and shall be followed as closely as practicable using acceptable construction practices and specified products. This section indicates conditions and practices that should become a part of this project.
1. Materials: The materials installed on this project shall be new, noted in this specification and shall be installed in the course of construction, except, they be changed in writing over the signature of the designer.
  2. Method: The method of installation shall follow current acceptable electrical practices under the direction of a licensed journeyman electrician. This will be further explained in the body of the specification.
  3. Notes: The notes on the plans are a part of the contract documents; a conflict between the specification and the drawings, the specifications rule.

#### 1.2 EQUIPMENT CONNECTIONS

- A. The Contractor shall install an electric service to the subject project as shown on the plans and described herein.
- B. Extent of electrical connection for equipment includes final electrical connection of all equipment (supplied under this or any other division or by the owner) having electrical requirements. Make final connections for all owner furnished equipment. See other applicable Divisions of specification for building requirements, namely, mechanical, plumbing, temperature control wiring requirements, kitchen equipment, etc.
- C. Refer to Division-23 sections for motor starters and controls furnished integrally with equipment.
- D. Refer to Division-23 section for control system wiring; not work of this section, except as noted on the electrical plans.
- E. Refer to sections of other Divisions for specific individual equipment power requirements.

#### 1.3 QUALITY ASSURANCE

- A. CODE COMPLIANCE: Comply with applicable portions of NEC, state, and local codes as to type products used and installation of electrical power connections.
- B. UL LABELS: Provide electrical connection products and materials which have been UL-listed and labeled.

## PART 2 - PRODUCTS

### 2.1 GENERAL

- A. For each electrical connection indicated, provide complete assembly of materials, including but not necessarily limited to; raceways, conductors, cords, cord caps, wiring devices, pressure connectors, terminals (lugs), electrical insulating tape, heat-shrinkable insulating tubing, cable ties, solderless wire nuts, and other items and accessories as needed to complete splices, terminations, and connections as required. See Section 260533, Conduit Raceways; Section 262726, Wiring Devices; and Section 260519 Conductors and Cables for additional requirements. Provide final connections for equipment consistent with the following:
1. Permanently installed fixed equipment - flexible seal-tight conduit from branch circuit terminal equipment, or raceway; to equipment, control cabinet, terminal junction box or wiring terminals. Totally enclose all wiring in raceway.
  2. Movable and/or portable equipment - wiring device, cord cap, and multi-conductor cord suitable for the equipment and in accordance with NEC requirements (Article 400).
  3. Other methods as required by National Electrical Code and/or as required by special equipment of field conditions.

END OF SECTION 260508



## SECTION 260519 - CONDUCTORS AND CABLES

### PART 1 - GENERAL

#### 1.1 DESCRIPTION OF WORK

- A. Extent of electrical conductor and electrical cable work is indicated by drawings and schedules.
- B. Types of conductors and cables in this section include the following:
  - 1. Copper Conductors (600V)
- C. Applications for conductors and cables required for project include:
  - 1. Feeders
  - 2. Branch Circuits

#### 1.2 QUALITY ASSURANCE

- A. Comply with NEC as applicable to construction and installation of electrical conductors and cable. Comply with UL standards and provide electrical conductors and cables which have been UL-listed and labeled.
- B. Comply with applicable portions of NEMA/Insulated Cable Engineers Association standards pertaining to materials, construction and testing of conductors and cable.
- C. Comply with applicable portions of ANSI/ASTM and IEEE standards pertaining to construction of conductors and cable.
- D. Non-approved materials.
  - 1. AFC Cabling
  - 2. Non-metallic sheathed cable.
  - 3. Service entrance cable.

#### 1.3 SUBMITTALS

- A. **FIELD TEST DATA:** Submit test data in accordance with IEEE Standard 400-1980 showing ambient conditions, voltage levels, level durations, and conduction current for each step. Include effective insulation resistance in submittal.

### PART 2 - PRODUCTS

#### 2.1 COPPER CONDUCTORS (600V)

- A. All conductors shall be copper with 90% conductivity.
- B. Provide factory-fabricated conductors of sizes, ratings, materials, and types indicated for each service. Where not indicated provide.

C. Proper selection to comply with project's installation requirements and NEC standards. Provide conductors in accordance with the following:

1. Distribution and Panelboard Feeders; and other conductors, #2 AWG and larger shall be Copper; see drawings for size.
2. Conductors: All conductors shall be jacketed with THHN or XHHW insulation. Size all conductors in accordance with NEC; minimum size to be #12 AWG. Provide stranded conductors for #10 AWG and larger. Provide THHN insulated conductors (in dry areas) from outlets to luminaire, and in luminaire channels.
3. Conductor ampacity shall comply when local codes have a derating factor because of ambient temperature.
4. Provide color and coding of conductors as follows:
  - a. Conductors
    - 1) All conductors shall be stranded copper wire, #12 AWG & #14 AWG may be solid copper. Color code all 208 volt wiring using black for phase A, red for phase B, blue for phase C, white for neutral and green for equipment ground.
  - b. Motor Control
    - 1) Motor Feeders           Black
    - 2) Hot or Stop Lead       Red
    - 3) Start Lead               Blue
    - 4) Common                 White
    - 5) Indicating Light       Orange
    - 6) Interlock or Shunt     Brown
    - 7) Ground                 Green

## 2.2 AUXILIARY CABLES

A. The contractor shall provide and install a cable from each auxiliary system as noted below (before ordering this cable, check the specific auxiliary system 270000-280000 for exact cables). The cables shall be as noted in the specification for each specific system.

## 2.3 CONNECTING BLOCKS (Also see Section 260520)

- A. Taps made to conductors in wireways, switchgear, J-Boxes, etc. larger than #10 shall be made with an insulated connector. The connector block shall be an alloy that is completely compatible with copper, aluminum alloy 6061-T6 conductive plating for low contact resistance, excellent anti-pull out ability and set-screw for suring in place. The block shall be insulated with a molded high dielectric plastisol that will not support combustion, abrasive and chemical resistant. All connections shall comply with rated for 600 volt 90° C and comply with NEC 100. Torque each lug to the recommendations of the manufacturer.
- B. The unit shall be NSI Series NSZ (in and out same side), other types are: Series IPL (double row), Series IT (in and out), Series IPLD (pass through), etc. The contractor shall decide which type of connection is best suited for installation.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Provide #10 AWG conductors for all LED luminaire home runs.
- B. Conductor size noted in panels is for the home run. The conductor may be changed to code size after the first apparatus.

- C. Parking Lot conductors shall be installed of the size noted until a change is indicated. Minimum size #10.
- D. "G" in the Conduit symbol, denotes a #10 (or larger) green ground, which shall be installed in the conduit with other conductors. It shall connect to the ground bar in the panel.
- E. GENERAL: Install electrical conductors and cables as indicated, in compliance with manufacturer`s written instructions, applicable requirements of NEC and NECA's "Standards of Installation", and in accordance with recognized industry practices.
- F. Coordinate installation work with electrical raceway and equipment installation work, as necessary for proper interface.
- G. Use pulling compound or lubricant, where necessary; compounds must not deteriorate conductor or insulation.
- H. Keep conductor splices to minimum in a J-box.
- I. Install splices and taps which have mechanical strength and insulation rating equivalent-or-better than conductor.
- J. Use splice and tap connectors which are compatible with conductor material.
- K. The conductor ends shall be stripped at the ends to comply with the following chart:

1. Strip Length Chart

CONNECTOR SIZE	LENGTH (inches)
500	2
350	1.75
250	1.625
3/0	1.437
1/0	1.25
#4	0.875

- 2. All conductor connections on lugs, breakers, connection blocks, etc. of the set-screw type shall be set with a torque wrench in strict accordance with industry standards as recommended for each conductor size.

3. Lug Torque Chart

CONN SIZE	500	350	250	3/0	1/0	#4
AWG/MCM WIRE SIZE	TIGHTENING TORQUE, INCH POUNDS					
500	375					
400	325					
350	325	325				
250	325	325	325			
4/0	325	325	325			
3/0	250	250	250	250		
2/0	180	180	180	180		
1/0	180	180	180	180	180	
3-2-1	150	150	150	150	150	
#4 - #6	110	110	110	110	110	45
#8	75	75	75	75	75	40
#10 - #16	75	75	75	75	75	35

- L. **Vertical Support:** Conductors rising vertically shall be supported with conduit kellems grips or equal, in accordance with NEC section 300-19.

Cable Vertical Support Spacing	
Conductor Size	Minimum Distance - Feet
12 - 1/0	100
2/0 - 4/0	80
4/0 - 350 KCM	50
500 KCM	40

3.2 FIELD QUALITY CONTROL

- A. Prior to energization, test cable and wire for continuity of circuitry, and also for short circuits. Correct malfunctions when detected.
- B. Check and prove the proper phase rotation of all rotating equipment powered by this network.
- C. Subsequent to wire and cable connections, energize circuitry and demonstrate functioning in accordance with requirements. (SEE SECTION ON COMPLETION AND TESTING)

END OF SECTION 260519

## SECTION 260520 - ELECTRICAL WIRING CONNECTIONS

### PART 1 - GENERAL

The contractor shall make all electrical connections relating to the power, lighting, and auxiliary systems for this project. Each connection shall be made in such a manner that it will not generate heat and destroy the connecting and/or the insulation on the conductor. All connections shall be made in a skilled craftsman like manner.

#### 1.1 DESCRIPTION OF WORK (STANDARD CONNECTIONS)

- A. All connections shall be in compliance with the 75° NEC ratings.
- B. The conductors being connected shall be cut of sufficient length to conveniently make a splice - minimum 6".
- C. Conductors No. 8 and smaller can be connected with a spring wire connector after the conductors have been mechanically twisted two (2) turns.
- D. Conductors No. 6 and larger shall be connected with pressure type terminal lugs of a type hereafter noted.
- E. All connections made shall be set in compliance with the lug torque chart in Section 260519.
- F. All conductor connections No. 8 and smaller made below a point 24" above grade outside the building shall be made with a non-hardening sealant connector.
- G. All conductor connections No. 6 and larger shall be made with water tight connectors.

#### 1.2 PRODUCT DATA

- A. Conductors No. 8 and Smaller: Free spring wire connectors made from flame retardant thermo plastic rated at 105°C (221°F), UL Standard 486, CSA LR6541. Cu/Cy, 600V Intrgr. TSB, NSI.
- B. Conductors No. 8 and smaller outside building (ground j-box, pole base, etc.) water tight steel spring connectors with water-proof non-hardening sealant, same rating as "A".
- C. Conductors No. 8 and Larger (dry locations): Insulated copper rated connectors with Allen wrench set-screw, such as NSI "IT" Series (size to conductors).
- D. Multiple conductor connections No. 8 and Larger (dry locations: NSI Series IPL, IPLD, etc.
- E. Insulated terminal strips up to 30 Amp, 600V shall be a double terminal block such as NSI Series "TB", with appropriate mounting hardware.
- F. Terminal blocks (size to conductors) such as Square "D" No. CBA363106.

### PART 2 - EXECUTION:

#### 2.1 GENERAL

- A. All connectors shall be secure in place making a tight electrical connection.

2.2 FIXED EQUIPMENT

- A. Terminal strips, terminal blocks shall be firmly secured in place.

END OF SECTION 260520

## SECTION 260526 - GROUNDING AND BONDING

### PART 1 – GENERAL

#### 1.1 DESCRIPTION OF WORK

- A. Provide grounding as specified by NEC, as noted herein, and as indicated on drawings. Types of grounding in this section include the following:
  - 1. Underground metal water piping
  - 2. Grounding electrodes
  - 3. Concrete encased electrode (UFER)
  - 4. Service equipment
  - 5. Enclosures
  - 6. Systems
  - 7. Equipment
  - 8. Other items indicated on drawings.
- B. "G" in the conduit symbol denotes a green ground (to match indicated conductor sizes) which shall be installed in the conduit with other conductors. It shall connect to an insulated ground bar in the panel. (Exception: Main Panel terminations made on ground bar bonded to enclosure).
- C. "G" in all conduit, apparatus, equipment, etc. outside the building denotes a #10 bare ground interconnecting all outside equipment having an electrical connection.
- D. A green ground conductor shall be installed in all non-metallic conduit runs.
- E. Requirements of this section apply to electrical grounding work specified elsewhere in these specifications.

#### 1.2 QUALITY ASSURANCE

- A. Comply with NEC as applicable to electrical grounding and ground fault protection systems. Comply with applicable ANSI and IEEE requirements. Provide products which have been UL listed and labeled.

#### 1.3 SUBMITTALS

- A. None required.

### PART 2 - PRODUCTS

#### 2.1 MATERIALS AND COMPONENTS

- A. GENERAL: Except as otherwise indicated, provide each electrical grounding system as specified herein, and as shown on drawings, including but not necessarily limited to, cables/wires, connectors, terminals (solderless lugs), grounding rods/electrodes and plate electrodes, bonding jumper braid, and other items and accessories needed for complete installation.
- B. Where materials or components are not otherwise indicated, comply with NEC, NEMA and established industry standards for applications indicated.

- C. Install an insulated ground bar in branch panels.

## 2.2 ELECTRICAL GROUNDING CONDUCTORS

- A. Unless otherwise indicated, provide electrical grounding conductors for grounding connections matching power supply wiring materials and sized according to NEC.
- B. When conductor sizes are increased due to voltage drop (i.e., distance) the ground size shall be increased proportionately in size per NEC.

## 2.3 GROUND RODS

- A. GROUND RODS: Steel with copper welded exterior, 5/8" dia. x 8' (quantity as per Code).

## PART 3 - EXECUTION

### 3.1 INSTALLATION OF GROUNDING SYSTEMS

- A. Install electrical grounding systems in accordance with manufacturer's written instructions and with recognized industry practices to ensure grounding devices comply with requirements.
- B. Install braided type bonding jumpers with ground clamps on water meter piping to electrically bypass water meter.
- C. Install clamp-on connectors only. Thoroughly clean metallic contact surfaces, to ensure electrical conductivity and circuit integrity.
- D. Provide grounding for the entire raceway, enclosure, equipment, and device system in accordance with NEC. All non-metallic raceways shall include copper grounding conductor sized in accordance with NEC.
- E. Provide a continuous service entrance ground conductor that interconnects the major ground points, namely ground rods (quantity of two, driven exterior to building), by means of bonding to water main, and by means of bonding (**Cad-Weld**) to building structural steel. If the conductor is not continuous each joint shall be **Cad-Welded**. The **Cad-Weld** constitutes a continuous conductor.
- F. In addition to all cold water and ground rods provided to meet this specification, each location grounded to water main, or ground rod shall have a Concrete Encased Electrode (UFER) ground. A Concrete Encased Electrode (UFER) ground shall consist of a minimum of 20' of No. 4 AWG bare copper cable (or per local code) embedded in concrete (feeder encasement, footing, floor slab, etc.) so that all portions of the cable are between 2" and 4" from the earth and with the center of the cable bonded to the ground rod or pipe.
- G. Provide grounding conductors for dimming systems in accordance with manufacturer's requirement.
- H. See drawings for additional grounding requirements.

END OF SECTION 260526



## SECTION 260529 - CONCRETE PLATFORMS AND BASES

### PART 1 - GENERAL

#### 1.1 DESCRIPTION OF WORK

- A. This section relates to providing and installing concrete supports, bases, etc., as indicated for the service needed for the power conduits, panel bases, pole bases, service transformer pad, etc. as an electrical equipment.
- B. All code conditions related here to shall be enforced.
- C. Buried conducts shall be shrouded with “red” concrete and shall be placed on virgin and compacted fill to prevent settling. Conduit shall be grounded to allow conduit to drain to a low point. If the low point is at a vertical elbow drill a ½” (0.5”) diameter hole at the low point in the elbow to drain all water. At that point provide a 12x12x12 gravel bed to receive the water
- D. When stated install encase service conduit in a red 5-bag mix concrete. The concrete shall shroud the conduit a minimum of 2” on all sides. Depth of conduit shall be 48” or as per code.
- E. All service feeders shall be located by placing a plastic **High Voltage Ribbon** in the fill, 12” above (or as per code) the conduit run, for location at future excavation.
- F. Provide and install concrete bases as noted on the planes.
  - 1. Concrete bases below panels shall be of the size noted on the plans, to raise the panel off the floor to eliminate water problems. The concrete shall be 5-bag mix with a finished to match the floor.
  - 2. All concrete bases (light poles, bollards, etc.) shall be of a type and size to carry the load installed thereon. The concrete shall be 5-bag mix with rebar as indicated. The base shall have a smooth hand rub sand finish.

#### 1.2 EXECUTION

- A. The installation of each system and/or parts and pieces shall follow good journeyman practices and code conditions.

END OF SECTION 260529

## SECTION 260533 - RACEWAYS FOR ELECTRICAL SYSTEM

### PART 1 - GENERAL

#### 1.1 DESCRIPTION OF WORK

- A. Extent of raceways in indicated by drawings and schedules.
- B. Types of raceways in this section include the following:
  - 1. Electrical metallic tubing.
  - 2. Flexible metal conduit.
  - 3. Intermediate metal conduit.
  - 4. Liquid-Tight flexible metal conduit.
  - 5. Rigid metal conduit.
  - 6. Rigid non-metallic conduit. (below grade only w/RMC elbows)
- C. Prohibited Raceway Materials:
  - 1. Aluminum conduit.
  - 2. Electrical Nonmetallic Tubing (ENT) conduit.
  - 3. Armored cable type AC (BX) cable.
  - 4. Metal-clad cable type MC cable.
- D. Prohibited Fitting Materials:
  - 1. Crimp-on, tap-on, indenter type fittings.
  - 2. Cast set-screw fittings for EMT.
  - 3. Spray (aerosol) PVC cement.

#### 1.2 QUALITY ASSURANCE

- A. Manufacturers: Firms regularly engaged in the manufacture of raceway systems of types and sizes required, whose products have been in satisfactory use in similar service for not less than three (3) years.
- B. Standards: Comply with applicable portions of NEMA standards pertaining to raceways. Comply with applicable portions of UL safety standards pertaining to electrical raceway systems; and provide products and components which have been UL-listed and labeled. Comply with NEC requirements as applicable to construction and installation of raceway systems.
- C. Minimums: As a minimum, conduit sizes shall be as per NEC Tables 3A, 3B, and 3C or as shown on plans. Minimum conduit size shall be 3/4". Minimum home run size shall be 3/4". Electrical contractor shall not modify the wiring arrangement without prior approval from Engineer.

#### 1.3 SUBMITTALS

- A. Not required.

## PART 2 - PRODUCTS

### 2.1 METAL CONDUIT AND TUBING

- A. General: Provide metal conduit, tubing and fittings or types, grades, sizes and weights (wall thicknesses) as indicated; with minimum trade size of  $\frac{3}{4}$ ".
- B. **Auxiliary system conduit shall be installed as shown with  $\frac{3}{4}$ " being the minimum size.**
- C. Rigid Metal Conduit (RMC): FS WW-C-0581 and ANSI C80.1.
- D. Intermediate Steel Conduit (IMC): RS 22-C-581.
- E. PVC Externally Coated Rigid Steel Conduit: ANSI C08.1 and NEMA Std. Pub. No. RN1.
- F. Rigid and Intermediate Steel Conduit Fittings: Provide fully threaded malleable steel couplings; raintight and concrete tight where required by application. Provide double locknuts and metal bushings at conduit terminations, us OZ Type B bushing on conduits  $1\frac{1}{4}$ " and larger.
- G. Electrical Metallic Tubing (EMT): FS WW-C-563 and ANSI C80.3.
- H. EMT Fittings: Provide install set-screw type malleable steel fittings: connectors shall be insulated throat type, concrete tight where required by application. Install OZ Type B bushings on conduits  $1\frac{1}{4}$ " and larger.
- I. Flexible Metal Conduit: FS WW-C-566, of the following type:
  - 1. Zinc-coated steel.
- J. Flexible Metal Conduit Fittings: FS W-F-406, Type 1 Class 1, and Style A.
- K. Liquid-Tight Flexible Metal Conduit: Provide liquid-tight, flexible metal conduit; constructed of single strip, flexible, continuous interlocked, and double-wrapped steel; galvanized inside and outside; coated with liquid-tight jacket of flexible polyvinyl chloride (PVC). Type UA and/or NMLT-B non-metallic.
- L. Liquid-Tight Flexible Metal Conduit Fittings: FS W-F-406, Type 1, Class 3, Style G and/or fittings to match the specified non-metallic conduit noted above.
- M. Expansion Fitting: OZ Type AX, or equivalent of suit application.

### 2.2 NON-METALLIC CONDUIT AND DUCTS (Below grade only, shroud with concrete where indicated.

- A. General: Provide non-metallic conduit, ducts, and fittings of types, sizes and weights (wall thicknesses) as indicated shall not be installed inside the building, except it be encased in concrete and there it shall surface through a RMC elbow; with minimum trade size of  $\frac{3}{4}$ ". (In this specification, it is not permitted above grade for any reason.)
- B. Underground PVC Plastic Utilities Duct: ANSI/NEMA TC 6, Type 1 for encased burial in concrete, Type II for direct burial.
  - 1. PVC and ABS Plastic Utilities Duct Fittings: ANSI/NEMA TC9, match to duct type and material.

2. Conduit, Tubing, and Duct Accessories: Provide conduit, tubing and duct accessories of types, sizes, and materials, complying with manufacturer's published product information, which mate and match conduit and tubing.
- C. Sealing Bushings: Provide OZ Type FSK, or FSKA.
- D. Special Ground: To maintain the building ground continuity, a NEC size ground shall be installed in each non-metallic conduit run, where the system voltage is greater than 48-volts.

## PART 3 - EXECUTION

### 3.1 INSTALLATION OF ELECTRICAL RACEWAYS

- A. Install electrical raceways where indicated; in accordance with manufacturer's written instructions, applicable requirements of NEC and NECA "Standard of Installation", and in accordance with the following.
- B. Feeders Under 600 Volts: Install feeders to panels and motor control centers and individual equipment feeders rated 100 amps and greater, in rigid metal conduit (RMC), or intermediate metal conduit (IMC); except where buried below grade, install in non-metallic conduit or duct. Feeders 1½" round and larger shall be encased in concrete as a part of the floor. Not up in the floor, but just below the floor with the top of the conduit touching the bottom of the slab and the bottom of the conduit being covered with at least 1" of concrete.
- C. Feeders below grade shall be installed in RMC and/or PVC conduit shrouded with a minimum of 3" cover of red concrete with a #3 rebar in opposite corners. The top of the duct bank shall be set 48" below finish grade.
- D. Branch Circuits, Signal and Control Circuits, and Individual Equipment Circuits Rated Less Than 100 Amps: Install in electric metallic tubing (EMT); except in poured walls, floor slabs, below concrete slab-on-grade, or in earth fill, install in non-metallic plastic duct. Encase non-metallic plastic duct 1¼" and larger in concrete.
- E. Coordinate with other work, including metal and concrete deck work, as necessary to interface installation of electrical raceways and components.
- F. **When non-metallic conduit is used, it shall come to the surface in an RMC elbow or box.**
- G. Coordinate the campus ground equipment installation with existing structures, trees, lawn sprinkler systems, etc.
- H. Install raceway in accordance with the following:
1. Provide a minimum of 12" clearance from flues, steam, and hot water piping, etc.
  2. Conceal raceways in finished walls, ceilings, and floors (other than slab-on-grade). Where conduit is exposed in mechanical spaces, etc., install parallel with or at right angles to building or room structural lines.
  3. Where cutting raceway is necessary, remove all inside and outside burrs; make cuts smooth and square with raceway.
  4. **Flexible raceways shall not be concealed in construction and where installed the run shall be limited to 10' in length.**
  5. Comply with NEC for requirements for installation of pull boxes in long runs.
  6. All raceways shall terminate in a connection and/or bushing.

- I. Secure conduit per NEC.
- J. Install conduit in truss space per NEC.

### 3.2 NORMAL INSTALLATIONS

- A. Cap open ends of conduits and protect other raceways as required against accumulation of dirt and debris. Pull a mandril and swab through all conduit before installing conductors. Install a 200 lb. nylon pull cord in each empty conduit run.
- B. Replace all crushed, wrinkled, or deformed raceway before installing conductors.
- C. Provide rigid metal conduit (RMC) for all bends in buried conduit greater than 30°. Provide a protective coating for RMC bend as specified herein.
- D. Where raceways penetrate building or vault walls and floors below grade, install rigid metal conduit (RMC) for a minimum distance of 10' on the exterior side of the floor or wall. Provide OZ, Type FSK or WSK sealing bushings (with external membrane clamps as applicable) for all conduit penetrations entering building or vaults below grade.
- E. Install liquid-tight flexible conduit for connection of motors, transformers, and other electrical equipment where subject to movement and vibration.
- F. Install five spare ¾" conduit (capped) from each flush branch panelboard into the ceiling and floor space. Where the floor is not accessible run ten conduits into the ceiling space. Run conduits the required distance necessary to reach accessible ceiling space.
- G. Provide OZ expansion fittings on all conduits crossing building expansion joints, both in slab and suspended.
- H. Complete installation of electrical raceways before starting installation of cables/conductors within raceways.
- I. All conduit that penetrates the roof shall be flashed with a factory jack, see Section 260501 - 3.1(G).

### 3.3 GROUNDING

- A. All metal conduit terminations shall be equipped with a grounding bushing.
- B. To maintain the continuity of the building ground network, install a code size ground conductor in all non-metallic conduit.

### 3.4 FIRE PENETRATION SEALS

- A. All penetrations through fire rated floors and walls shall be sealed to prevent the spread of smoke, fire, toxic gas, or water through the penetration either before, during or after the 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. 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 to allow any and all repairs to be made with the same material. It shall permit the vibration, expansion and/or contraction of raceways and/or cables going through the penetration without the seal cracking or crumbling.

- B. When damming materials are to be left in place after the seal is complete, all such materials shall be non-flammable.
- C. When sealant is injected into a penetration, the foam shall expand to surround all items within the penetration and maintain pressure against the walls of the penetration. The foam shall cure within 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.
- D. All wall or floor penetration opening shall be as small as possible.
- E. The foam sealant shall meet all of the fire test and hose stream test requirements of ASTM E119-73 and shall be UL Classified as a Wall Opening Protective Device. The sealant shall be CHASE-FOAM CTC PR-585 Fire Resistant Foam Sealant from Chase Technology Corporation, Huntington Station, New York, 11746, or equals of 3-M and T & B.
- F. Escutcheon plates - when a conduit passes through a ceiling, wall and/or floor into a finished space, an escutcheon plate shall be installed on the conduit to cover the unfinished hole and sealant.
- G. See Details 12, 13, and 14/ED.03 for conduit and device installation.

### 3.5 PROHIBITED PROCEDURES

- A. Use of wooden plugs inserted in concrete or masonry units for mounting raceway, supports, boxes, cabinets, or other equipment.
- B. Installation of raceway which has been crushed or deformed.
- C. Use of torches for bending PVC.
- D. Spray applied PVC cement.
- E. Boring holes in truss members.
- F. Notching of structural members.
- G. Supporting raceway from ceiling system support wires.
- H. Nail drive straps for supporting raceway.

### 3.6 EXCAVATION AND BACKFILL

- A. Raceway installation below slab-on-grade, or below grade:
  1. The Electrical contractor is responsible for all excavation and backfill related to the electrical installation defined herein and/or as indicated on the plans.
- B. Underground raceway and conduit:
  1. Bury underground raceway installed outside building 24" deep minimum.
  2. Wrap buried galvanized rigid steel and galvanized IMC conduit and fittings with vinyl tape where in contact with earth or concrete.

3. Opening of finished surfaces asphalt concrete, grass, etc. shall be accomplished by first identifying the limits of the opening then cut within the limits preserving the undisturbed areas. Asphalt shall be cut with a wedging tool, concrete with a diamond saw and grass with a cutter.
4. Excavation shall be accomplished with the proper equipment; protective care shall be taken to not disturb the adjacent surfaces and materials. This contractor is responsible and shall protect all material objects and things adjacent to the excavation.
5. All materials not reinstalled in the installation shall be removed from the premise.
6. Backfill the first 6" layer over the installed subject (conduit, cable, etc.) shall be sand. Subsequent 6" layers shall be loan soil. Each layer shall be compacted to a 90% standard proctor test before the next layer is applied. (Refer to Section 260533, Part 3 for conduits required to be incased in concrete).
7. For slab-on-grade construction, install runs or rigid plastic conduit (PVC) below slab. Install RMC (with protective coating) for raceways passing vertically through slabs on grade. Slope raceways as required to drain away from electrical enclosures and to avoid collection of moisture in raceway low points.
8. Apply protective coating to metallic raceways in direct contact with earth or fill of any type; consisting of spirally wrapped PVC tape (½" minimum overlap of scotch wrap tape or equal); or factory applied vinyl cladding (minimum thickness .020"). Completely wrap and tape all field joints.
9. Mark all buried conduits which do not require concrete encasement by placing yellow plastic marker tape (minimum 6" wide) along entire length of run 12" below final grade. Where multiple small lines are buried in a common trench and do not exceed an overall width of 16", install a single line marker.
10. Conduits encased in concrete shall be shrouded with a 3" of Red concrete. Install a #3 rebar in opposite corners of the encasement except for two conduits or less where two #3 bars in opposite corners is acceptable.

C. Raceway installation in suspended slabs:

1. Install conduit as close to the middle of concrete slab as practicable without disturbing reinforcement. Do not install conduits of diameter greater than 1¼" of the slab thickness. Space conduits not less than 3 diameters on center (except at stub up locations). Provide OZ expansion fittings at all expansion joints. All raceways shall be installed with concrete tight fittings.
2. Install RMC in all hazardous locations as defined by NEC. Provide suitable fittings, seal-offs, boxes, etc. to comply with requirements.

END OF SECTION 260533

## SECTION 260534 - BOXES, PULL BOXES, CONDUIT BODIES AND FITTINGS

### PART 1 - GENERAL

#### 1.1 DESCRIPTION OF WORK

- A. Extent of electrical box and electrical fitting work is indicated by drawings and schedules.
- B. Types of electrical boxes, fittings, etc. in this section, or noted on the plans shall include the following:
  - 1. Outlet boxes
  - 2. Junction boxes
  - 3. Conduit bodies
  - 4. Bushings
  - 5. Locknuts
  - 6. Knockout closures
  - 7. Miscellaneous boxes and fittings

#### 1.2 QUALITY ASSURANCE

- A. Comply with NEC as applicable to construction and installation of electrical boxes and fittings. Comply with ANSI C 134.1 (NEMA Standards Pub. No. OS 1) as applicable to sheet-steel outlet boxes, device boxes, covers and box supports. Provide electrical boxes and fittings which have been UL-listed and labeled.

#### 1.3 SUBMITTALS

- A. None required.

### PART 2 - PRODUCTS

#### 2.1 FABRICATED MATERIALS

- A. Interior Outlet Boxes: Provide one piece, galvanized flat rolled sheet steel interior outlet wiring boxes, of types, shapes and sizes, including box depths, to suit each respective location and installation; construct with stamped knockouts in back and sides, and with threaded screw holes with corrosion-resistant screws for securing box covers and wiring devices; standard box shall be 4" square x 2-1/8" deep, (Raco 231) with 3/4" knock outs and tile or **masonry/type** box extensions (Raco 843).
- B. If the structure will not allow a 4 in<sup>2</sup> box use a 3" deep single gang unit (Raco 695).
- C. In spaces with restricted width, like between a door frame and window jam, use partition boxes (Raco 426).
- D. Interior Outlet Box Accessories: Provide outlet box accessories as required for each installation, including mounting brackets, hangers, masonry extension rings, fixture studs, cable clamps and metal straps for supporting outlet boxes, which are compatible with outlet boxes being used and fulfilling requirements of individual wiring applications. See the details on the plans.



- E. Weatherproof Outlet Boxes: Provide corrosion-resistant cast-metal weatherproof outlet wiring boxes, of types, shapes, and sizes (including depth) required, with threaded conduit ends, cast-metal face application, with face plate gaskets and corrosion-resistant fasteners.
- F. Junction and Pull Boxes: Provide code-gage sheet steel junction and pull boxes, with screw-on covers; of types, shapes and sizes to suit each respective location and installation; with welded seams and equipped with stainless steel nuts, bolts, screws and washers. J-box larger than 8 x 8 x 6 shall have a hinged cover.
- G. Condulet Bodies (Fittings): Provide galvanized cast-metal conduit bodies, of types, shapes, and sizes to suit respective locations and installation, construct with threaded-conduit-entrance ends, removable covers, and corrosion-resistant screws.
- H. Bushings, Knockout Closures and Locknuts: Provide corrosion-resistant punched-steel box knockout closures, conduit locknuts and malleable iron conduit bushings and offset connectors, or types and sizes to suit respective uses and installation.

## 2.3 FITTINGS

- A. The contractor shall provide **all sheet metallic** connectors, coupling, etc, a needed on this project.
- B. When installing non-metallic sheathed cable, all connections to boxes, cabinets, etc., shall be made with screw steel fittings with a locknut connection to the box.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Interface with other work.
- B. Coordinate location of outlet for water cooler with Division 22 & 23.
- C. Coordinate location of outlets adjacent to or in millwork with Division 06 before rough-in. Refer conflicts to Architect and locate outlet under his direction.
- D. Coordinate with Division 23 for installation of exposed raceway in mechanical equipment areas. Exact separation of responsibility is shown on Drawings.
- E. Mount switch boxes with long dimension vertical.
- F. **Mount receptacle boxes with long dimension vertical.**
- G. Boxes shall be accessible and installed with approved cover.
- H. Do not locate device boxes which are on opposite sides of framed walls in the same stud space. In other types of wall construction, do not install boxes back to back.
- I. Locate boxes so outlets are not obstructed by pipes, ducts, or other items.
- J. Install outlets flush with finished surface and level and plumb.

- K. Boxes for switches shall generally be located within 6" of door jamb.
- L. Properly center single outlets in each room. Where two or more outlets occur, space them uniformly and in straight lines with each other.
- M. Support switch boxes larger than two-gang with side brackets and steel bar hangers in framed walls.
- N. HVAC Instrumentation and Control System: Boxes installed by mechanical contractor.
- O. Install electrical boxes and fittings where indicated, complying with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation", and in compliance with recognized industry practices to ensure that products fulfill requirements.
- P. Minimum height of wall receptacles shall be 18". With the box arranged for vertical mounting of the receptacles (neutral slot at the left).
- Q. Coordinate installation of electrical boxes and fittings with wire/cable and raceway installation work.
- R. Provide coverplates for all boxes. See Section 260534, Wiring Devices.
- S. Provide weatherproof outlets for interior and exterior locations exposed to weather or moisture.
- T. Provide knockout closures or cap unused knockout holes where blanks have been removed.
- U. Install boxes and conduit bodies to ensure ready accessibility of electrical wiring. Install recessed boxes with face of box or ring flush with adjacent surface so the device mounting flange sets on the box mounting plate. This will cause the device and coverplate surfaces to match.
- V. Fasten boxes rigidly to substrates or structural surfaces to which attached, or solidly embed electrical boxes in concrete or masonry. Use bar hangers for stud construction. Use of nails for securing boxes is prohibited. Set boxes on opposite sides of common wall with minimum 10" of conduit between them.
- W. Provide electrical connections for installed boxes.

END OF SECTION 260534

## SECTION 26 0548 - ELECTRICAL SUPPORTS AND SEISMIC RESTRAINTS

### PART 1 - GENERAL

#### 1.1 DESCRIPTION OF WORK

- A. All electrical equipment, distribution panels, motor control centers, conduit, device boxes, apparatus, etc., shall be securely anchored and/or supported in place as specified herein and/or in accordance with state, local, and seismic codes.
1. Work of this section includes supports, anchors, sleeves, and seals required for a complete raceway support system, including but not limited to: clevis hangers, riser clamps, C-clamps, beam clamps, one and two hold conduit straps, offset conduit clamps, expansion anchors, toggle bolts, threaded rods, U-channel strut systems, and all associated accessories.
  2. Quality Assurance: Comply with NEC and local codes as applicable to construction and installation of electrical supporting devices. Comply with applicable requirements of ANSI/NEMA Std. Pub. No. FB 1, "Fittings and Supports for Conduit and Cable Assemblies". Provide electrical components which are UL-listed and labeled.
  3. Manufactured Supporting Devices and Raceways: Provide manufactured mounting brackets (such as Caddy #SDG or SDB - D - 16); complying with manufacturer's standard materials, design and construction in accordance with published product information, and as required for a complete installation; and as herein specified. See drawing details for additional requirements.
  4. Tie-wire is not acceptable.
  5. Supporting of equipment may be noted in other sections of the specifications.
- B. Wall supported equipment shall be mounted on an angle support bracket with anchors into or through the wall as perimeter (the latter mounting is preferred, but must be approved by the architect), with two ½" rods up to the structure from the outer most corners of the mounting frame tied-off to the building structure. This would be likened unto a transformer. Wall mounted electrical panels shall be mounted directly to the wall.
- C. For hanging of conduit, see Section 260533.
- D. Installation of Supporting Devices for all types of Raceways: Install hangers, anchors, sleeves, and seals as required, in accordance with manufacturer's written instructions and with recognized industry practices to ensure supporting devices comply with requirements. Comply with requirements of NECA, NEC and ANSI/NEMA for installation of supporting devices.
1. Coordinate with other electrical work, including raceway and wiring work, as necessary to interface installation of supporting devices with other work.
  2. Install hangers, supports, clamps and attachments to support piping properly from building structures. Arrange for grouping of parallel runs of horizontal conduits to be supported together on trapeze type hangers where possible.

3. Raceways (All Types): Support raceways which are rigidly attached to structure at intervals not to exceed 8' on center and within 12" of each junction box, outlet or fitting. Support raceway (as it is installed) in accordance with the following:

<u>NUMBER OF RUNS</u>	<u>MIN. ¾" TO 1½"</u>	<u>1½" &amp; LARGER</u>
1	Full straps, clamps or hangers.	Hanger
2	Full straps, clamps or hangers.	Mounting Channel
3	Mounting Channel	Mounting Channel

4. Support suspended raceways on trapeze hanger system, or individually by means of threaded rod and straps, clamps, or hangers suitable for the application. Do not use "tie wire" as a portion of any raceway support system; do not support raceway from ceiling support wires.
5. Install electrical raceways where indicated; in accordance with manufacturer's written instructions, applicable requirements of NEC and NECA "Standard of Installation", and in accordance with the following:
6. Coordinate with other work, including metal and concrete deck work, as necessary to interface installation of electrical raceways and components.
7. Coordinate the campus ground equipment installation with existing structures, trees, lawn sprinkler systems, etc.
8. Install raceway in accordance with the following:
  - a. Provide a minimum of 12" clearance from flues, steam, and hot water piping, etc.

E. Floor Mounted Equipment: Provide rigid attachment of all floor mounted equipment to the floor slab or structural system. Provide 5/8" bolts or expansion anchors at each 90° corner and at intervals not to exceed 48" on center along entire perimeter of the equipment. Provide rigid attachment for all floor mounted switchboards, panelboards, power and control equipment, motor control centers, dimmer cabinets, transformers, oil switches, battery packs and racks, and similar equipment furnished under Section 26.

F. Buried Conduit: Conduit installed in the earth shall be laid on undisturbed soil and/or compacted fill. The first 6" of cover shall be sand. See Excavation and Backfill -see Section 260533-3.6.

G. Concrete slabs, bases, curbs, etc., for electrical apparatus shall be provided and installed under this contract. The concrete shall be 5-bag mix, except as noted.

1. The contractor shall provide and install an 8 x 8 x 4 concrete base for the transformer (confirm size and depth with the service utility) at the indicated location.
2. Unless otherwise noted, provide a 4" high concrete base for all main panels, motor control centers, transformers, engine generators, etc. Extend base 4" beyond equipment or mounting rails on all sides or as shown on the drawings. Coordinate the pad dimension with the equipment to be located thereon.
3. Concrete pole bases (detailed on the plans) shall be provided under Division 26. Coordinate size and location of all bases and furnish all required anchor bolts, sleeves and templates as required to obtain a proper installation.
4. All concrete used on this project shall be 5-bag mix and/or as specified in the concrete section of the Architectural Section.

## PART 2 - SEISMIC BRACING

### 2.1 GENERAL

- A. The General Conditions, Supplementary General Conditions, Alternates and Addenda, Applicable Drawings and the Technical Specifications shall apply to all work under this division.
- B. This seismic bracing section shall conform to the conditions governing the area within the structure being built under local and/or state UBC Seismic Requirements.

### 2.2 SCOPE OF WORK

- A. The materials covered by these specifications consist of furnishing all labor, material, and equipment necessary to complete the seismic bracing for all work provided under section 260000.
- B. The work shall include all electrical isolated and non-isolated equipment, luminaires, raceways, etc.

### 2.3 CODES - REGULATIONS

- A. In the installation of this work, comply in every way with the requirements of the laws, ordinances and rules of the system design and installation shall be based on seismic zone III of the Uniform Building Code, current edition and other standards listed below.
- B. Reference Standards:
  - 1. Uniform Building Code current edition, especially Sec. 2336
  - 2. NFPA bulletin 90A, current edition
  - 3. UL Standard 181
  - 4. Tri-services manual, fagel etal 1978
- C. If a conflict occurs between these rules and this specification, the rules are to govern. Accept this condition upon submitting bid, and no extra charge will be allowed after the contract is awarded. This shall not be construed as relieving the contractor from complying with any requirements on the plans or specifications which may be in excess of requirements of the hereinbefore mentioned rules and not contrary to same. Contractor shall bear all costs arising from the installation of any materials or equipment which is in conflict with the above-mentioned codes or ordinances.
- D. Obtain approvals, inspections, etc., required by code. All fees shall be included in the contract price. The contractor shall furnish a certificate of approval to the Owner's Representative from the inspection authority at completion of the work.

## 2.4 MATERIALS AND WORKMANSHIP

- A. All materials and equipment furnished and installed shall be first quality, new and meet the standards of NEMA, IPCEA, LS, UL, NFPA, UBC, UOSH, NEC, and shall bear their label wherever standards have been established and label service is available. Where materials and equipment are specified by manufacturer's name, and type and quality required is thereby denoted. The Owner's Representative shall be afforded every facility, deemed necessary to inspect and examine the materials and apparatus being installed to provide their quality, skill and competency of workmanship.
- B. Workmanship shall be the best quality of its kind for the respective industries, trades, crafts, and practices and shall be acceptable in every respect to the Owner's Representative. Nothing contained herein shall relieve the contractor from making good and perfect work in all details of construction.
- C. The contractor shall work in harmony with the Owner's Representative and with other contractors, companies or individuals working in connection with this project. Imperfections or errors by other contractors shall not relieve responsibility of this contractor. Store materials orderly and clean up without interference.

## 2.5 QUALITY ASSURANCE

The contractor shall be held responsible for purchasing and installing vibrator isolators, flexible connections, rigid steel frames, concrete inertia bases, anchors, inserts, hangers, and attachments, seismic bracing and snubbers as required for seismic control and prevention of the transmission of vibration for both isolated and non-isolated systems.

- A. Manufacturers and suppliers approved for use by the contractors Mason Industries, Inc., Korfund, and Amber/Booth Company.
- B. The approved manufacturer or supplier shall be totally responsible for the fabrication and operation of the seismic bracing components specified herein for all isolated equipment, non-isolated equipment, luminaires, raceways, etc.

## 2.5 GUARANTEE

- A. The entire electrical system installed under this contract shall be left in proper working order and be in compliance with the drawings, specifications and/or authorized changes to the satisfaction of the Owner's Representative. Without additional charge, replace any work or materials which develop defects, except from ordinary wear, within one year from the date of substantial completion. A written guarantee covering the above provisions shall be signed and delivered to the architect after the project has final acceptance by the inspecting authority.

## PART 3 - PRODUCTS

### 3.1 ISOLATED EQUIPMENT

- A. All vibration isolated equipment shall be mounted on rigid steel frames or concrete bases. Each spring mounted base shall have a minimum of four all directional seismic snubbers that are double acting and located as close to the vibration isolators as possible to facilitate attachment both to the base and the structure. The snubbers shall consist of interlocking steel members restrained by shock absorbent rubber materials compounded to bridge bearing specifications.

- B. Elastomeric, 50 durometer, materials shall be replaceable and a minimum of 3/4" thick. Snubbers shall be manufactured with an air gap between hard and resilient materials of not less than 1/8" nor more than 1/4". Snubbers shall be installed with factory set clearances.
- C. The capacity of the seismic snubbers at 3/8" deflection shall be 3 to 4 times the load assigned to the mount grouping in its immediate area.

### 3.2 NON-ISOLATED EQUIPMENT, RACEWAYS, ETC.

- A. All non-isolated equipment shall be installed according to current Uniform Building Code Sec. 2312 (g): Cp Factor Table 23J, I Factor Table 23K. In addition, the vertical forces, restraint requirements shall be computed as .5g the value of the lateral forces.
- B. All non-isolated raceway shall be protected against seismic disturbances except as noted below:
  - 1. All electrical conduit less than 2" inside diameter.

## PART 4 - EXECUTION

### 4.1 SEISMIC REQUIREMENTS

- A. All electrical work shall be braced, snubbed, or supported to withstand seismic disturbances and remain operational. Furnish all labor, materials, and equipment to provide protection against seismic disturbances and remain in place.

### 4.2 SHOP DRAWING SUBMITTAL AND REVIEW

- A. Submit complete, bound submittal in a loose-leaf binder large enough for all items (8 copies) to architect after award of contract. All such submittals shall include, but are not necessarily limited to, the following:
  - 1. Complete engineering calculations and shop drawings, prepared and stamped by a licensed engineer (UBC 302-6) for all seismic requirements for all equipment that is to restrain raceways, etc.
  - 2. The type, size and deflection of each isolator proposed for items in this specification and on the drawings.
  - 3. Details for all the isolators and seismic bracing with snubber proposed for items in this specification and on the drawings.
  - 4. Details for steel frames and concrete inertia bases to be used in conjunction with the isolation of the items in this specification and drawings.
  - 5. Clearly outlined procedures for installing and adjusting the isolators, seismic bracing, and snubbers.
  - 6. The size, loading and location of raceway supports with either a plan or complete description of the system.
- B. All items must be submitted at the same time. Partial submittals will not be accepted. Binders and indexes will remain in possession of engineer, architect, contractor, and sub-contractor.

- C. Review is for assistance and interpreting the design concept. Changes in requirements will not be made in the review process. Review action does not exempt requirements to meet the intent of the contract documents. Any changes will be made by change order. Items not included in the submittal or incorrectly selected shall be in accordance with the contract requirements.

END OF SECTION 26 0548



## SECTION 260553 - ELECTRICAL IDENTIFICATION

### PART 1 - GENERAL

#### 1.1 DESCRIPTION OF WORK

- A. The Electrical Contractor is responsible for the labeling of all electrical equipment for this project. The labels shall be made on 1/8" laminated micarta and an engraving machine as stated below.
- B. Labeling and Engraving: Any and all electrical control equipment shall be labeled with an engraved black Micarta with white core labels, 1/16" thick, shall be bolted on the interior and the exterior of branch panels (panel name and voltage) and the exterior of disconnect switches, motor controls, major J-boxes (power and auxiliary), push buttons, thermal switches, time switches and similar equipment. The labels shall have 1/4" high engraved letters, such as 1½ HP FAN, PANEL - A. All main panel circuits shall be identified with Micarta labels. (RED MICARTA LABELS shall be used on emergency powered equipment.)
- C. The phase of each feeder conductor shall be **color coded** at each end in panels and junction boxes as stated in Section 260519 - 2.1. The feeder powers shall be attached to the bundle of cables with a tie-wrap.
- D. Conduit shall be installed as diagramed on the plan. Any deviation shall be authorized in writing prior to rough-in.
- E. **Write with a felt tip pen that contains permanent ink, on the inside of each device box and on the back of every plate, the circuit to which the device is connected. Example: Circuit "A-1".**
- F. Engraving device plates - see Wiring Devices.

END OF SECTION 260553

## SECTION 260800 - COMMISSIONING OF ELECTRICAL SYSTEMS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 26, 27, and 28 Specification Sections, apply to this Section.
- B. OPR and BoD documentation are included by reference for information only.

#### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. General requirements that apply to implementation of commissioning without regard to systems, subsystems, and equipment being commissioned.
- B. The goal of the commissioning process for the commissioning is to verify for the Owner's Representative that the commissioned systems function interactively and in compliance with the design intent, and to facilitate the orderly and efficient transfer of the systems to the Owner.
  - 1. Commissioning is the process for achieving, verifying, and documenting that the performance of a building and its various systems, meet the design intent and the Owner's Representatives operational needs.
  - 2. Commissioning tests the operation of the equipment and building systems to ensure that they operate as designed and can satisfactorily meet the needs of the building throughout the entire range of operating conditions.
  - 3. Commissioning is a cooperative effort that requires participation by the Owner's Representative, Contractor, Installers, Engineer, Commissioning Agent, and Code Authority.
- C. Test Procedures: Equipment test procedures of the specific manufacturer to be used in the commissioning process may be modified or expanded to accurately address equipment of the specific type used and manufacturer used for this project.
- D. Commissioning is not intended to be a testing or inspection function that is a substitute for the Contractor's obligations for startup, system adjustment, testing, proof of performance, or contract closeout.

#### 1.3 DEFINITIONS

- A. BoD: Basis of Design. A document that records concepts, calculations, decisions, and product selections used to meet the OPR and to satisfy applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process.
- B. Commissioning Plan: A document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process.
- C. CxA: Commissioning Authority.

- D. OPR: Owner's Project Requirements. A document that details the functional requirements of a project and the expectations of how it will be used and operated. These include Project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information.
- E. Systems, Subsystems, Equipment, and Components: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, equipment, and components.

#### 1.4 COMMISSIONING TEAM

- A. Members Appointed by Contractor(s): Individuals, each having the authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated action. The commissioning team shall consist of, but not be limited to, representatives of Contractor, including Project Superintendent and subcontractors, installers, suppliers, and specialists deemed appropriate by the CxA.
- B. Members Appointed by Owner:
  - 1. CxA: The designated person, company, or entity that plans, schedules, and coordinates the commissioning team to implement the commissioning process. Owner will engage the CxA under a separate contract.
  - 2. Representatives of the facility user and operation and maintenance personnel.
  - 3. Architect and engineering design professionals.

#### 1.5 OWNER'S RESPONSIBILITIES

- A. Provide the OPR documentation to the CxA and Contractor for information and use.
- B. Assign operation and maintenance personnel and schedule them to participate in commissioning team activities.
- C. Provide the BoD documentation, prepared by Architect and approved by Owner, to the CxA and Contractor for use in developing the commissioning plan, systems manual, and operation and maintenance training plan.

#### 1.6 CONTRACTOR'S RESPONSIBILITIES

- A. Contractor shall assign representatives with expertise and authority to act on its behalf and shall schedule them to participate in and perform commissioning process activities including, but not limited to, the following:
  - 1. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
  - 2. Cooperate with the CxA for resolution of issues recorded in the Issues Log.
  - 3. Attend commissioning team meetings to be held weekly.
  - 4. Integrate and coordinate commissioning process activities with construction schedule.
  - 5. Review and accept construction checklists provided by the CxA.
  - 6. Complete electronic construction checklists, as Work is completed, and provide to the Commissioning Authority weekly.
  - 7. Review and accept commissioning process test procedures provided by the Commissioning Authority.
  - 8. Complete commissioning process test procedures.

## 1.7 CxA'S RESPONSIBILITIES

- A. Organize and lead the commissioning team.
- B. Provide commissioning plan.
- C. Convene commissioning team meetings.
- D. Provide Project-specific construction checklists and commissioning process test procedures.
- E. Verify the execution of commissioning process activities using random sampling. The sampling rate may vary from 1% to 100%. Verification will include, but is not limited to, equipment submittals, construction checklists, training, operating and maintenance data, tests, and test reports to verify compliance with the OPR. When a random sample does not meet the requirement, the CxA will report the failure in the Issues Log.
- F. Prepare and maintain the Issues Log.
- G. Prepare and maintain completed construction checklist log.
- H. Witness systems, assemblies, equipment, and component startup.
- I. Compile test data, inspection reports, and certificates; include them in the systems manual and commissioning process report.

## 1.8 SYSTEMS TO BE COMMISSIONED:

- A. Lighting Control (265110)
  - 1. Lighting Control Systems by Room

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 260800

## SECTION 260923 - LIGHTING CONTROL DEVICES

### PART 1 - GENERAL

#### 1.1 DESCRIPTION OF WORK

- A. The Contractor shall provide and install the lighting controls as noted, which shall include the controls, accessories, boxes, etc., to make the installation complete and operable.

#### 1.2 MOTION DETECTORS

- A. The contractor shall provide and install adjustable timer (6-15 min.) motion detectors as noted on the plans. The detectors shall be complete with sensors, relays, (or power pack) enclosures, etc. for a complete installation.
  - 1. The small room wall detectors shall be of PIR technology. The unit shall cover a semi-circular area of 35' and shall be mounted 48" A.F.F. It shall be Watt Stopper WS-250-120/277 for 120 or 277-volts. Two-pole units shall be PW-200-W.
  - 2. The wall mounted detectors shall be a dual technology (PIR and ultrasonic) with an adjustable mounting bracket. The unit shall cover an area of 40' semi-circular area when set 9' A.F.F. The unit shall be such as a Watt Stopper DT- 200 with adjustable mounting bracket and power pack as needed.
  - 3. The ultrasonic detector shown in corridors is for controlling corridor luminaires. It shall have a 10' narrow beam for a range of 45' on either side of the center line or a range of 90' - see plan for layout. The unit shall be ceiling mounted (level with the bottom of any obstruction). It shall be Watt Stopper WT- 2255 with power pack. A power pack can serve up to 3 sensors.
  - 4. In lavatories, mount on the ceiling an advanced ultrasonic sensor that is omni-directional, Doppler technology. The unit shall control a power pack (double contact) that will control the luminaires and the exhaust fan. The unit shall be a Watt Stopper WT-1100. The detector shall provide a 28' x 44' coverage pattern.
  - 5. All detectors except small room detector (Item #1) require a power pack for power control. The contractor shall provide and install these components as a part of the contract. The power pack unit shall be Watt Stopper C120E-P or C277E-P (confirm voltage). Provide double-pole contact for motion sensors controlling exhaust fans. Install power pack in a J-box located in an accessible location. Note the final location of the power pack on the plans.
- B. The detector shall have been tested and completed 60,000 successful operations.
- C. Hubbell, Lutron, Leviton, Tork, or Sensor Switch are approved equals provided they meet the specifications and functions of the named units' criteria. If the substituted units do not perform all the functions, the contractor shall provide the named and/or specified equipment.
- D. Submission: The contractor shall coordinate exact sensor location with manufacturer by submitting to the manufacturer a layout of the sensors for his review and evaluation. After the manufacturer has approved and endorsed the submitted plan, it shall be issued to the engineer as a shop drawing. The manufacturer shall provide the sensors as needed to perform the function and intents of the design.

### 1.3 LED DIMMER

- A. Provide branch lighting solid-state AC dimmer controls for LED luminaires; wattage and voltage as indicated, 60 hertz, with 0-10V control. Provide dimmers manufactured by Lutron or as specified on drawings. Color as selected by Architect.

### 1.4 LED LIGHTING CONTROL SYSTEM

- A. Provide an LED lighting control system when shown and specified on the plans. LED luminaire shall be equipped with a driver approved for the control system. Daylight sensors, occupancy sensors, low voltage switches, WIFI programming modules, etc., shall be commissioned as required by the International Energy Conservation Code.
- B. The contractor shall operate the lamps for at least 100-hours before activating the dimmer equipment.

### 1.5 ELECTRONIC PHOTO CONTROL

- A. The contractor shall provide and install photo switches/relays as noted on the plans. The photo switch shall be located at the indicated point and/or a location that will read daylight and wired into the system so that it will control the operation wherein it is placed.

The photo-switch/relay shall be such as Intermatic #EK4236S, with equals of Paragon as being acceptable.

### 1.6 TIME SWITCHES

- A. The contractor shall provide and install a time-controlled switch of the type noted on the plans. The switches shall have two 40A switches for operation with a resistance or inductive load. The clocks shall operate on 120V AC with a 24-hour over-ride on power failure. The switches shall be as follows (with Tork and Paragon as an acceptable equal):

1. 24-hour timer shall be Intermatic #T173CR
2. Astronomical timer shall be Intermatic #ET90415CR
3. Elapse timer shall be Intermatic No. FF60MHC

- B. Photo-switch/relay shall be long life design per ANSI C136.10.11.7, such as Intermatic EK4246S, with equals of Tork, Paragon, as being acceptable.

### 1.7 LIGHTING CONTACTORS

- A. The contractor shall provide and install multi-pole lighting contactors as shown on the plans. The scheduler may indicate more than the 4-pole, 30A, specified herein. If that be the case, provide the number of poles specified. The contactors shall be mechanically held 120-Volt coils such as Square "D" No. 8903 LG 1000 V02 or as noted in the schedule on the plans.

END OF SECTION 260923

## SECTION 262416 - PANELBOARDS

### PART 1 - GENERAL

#### 1.1 DESCRIPTION OF WORK

- A. Extent of panelboard and enclosure work is indicated by drawings and schedules.
- B. Types of panelboards and enclosures in this section include lighting and appliance panelboards, and power distribution panelboards.

#### 1.2 QUALITY ASSURANCE

- A. Provide units which have been UL listed and labeled. Comply with NEC as applicable to installation of panelboards, cabinets, and cutout boxes. Comply with NEC pertaining to installation of wiring and equipment in hazardous locations. Comply with NEMA Stds. Pub. No. 250, "Enclosures for Electrical Equipment (1000 volt maximum)". Pub. No. 1, "Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less".

#### 1.3 SUBMITTALS

##### A. PRODUCT DATA

- 1. Submit manufacturer data including specifications, installation instructions and general recommendations, for each type of panelboard required.

##### B. SHOP DRAWINGS

- 1. Submit dimensioned drawings of panelboards and enclosures showing accurately scaled layouts of enclosures and required individual panelboard devices, including, but not necessarily limited to, circuit breakers, fusible switches, fuses, ground-fault circuit interrupters, and accessories.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Subject to compliance with requirements, provide products of one Square "D" Company - NQ, NF, or I-Line Type.
- B. Approved Manufacturers
  - 1. Square "D" Company
  - 2. General Electric Company
  - 3. Siemons
  - 4. Eaton

## 2.2 PANELBOARDS

### A. GENERAL

1. Except as otherwise indicated, provide panelboards, enclosures, and auxiliary components, of types, sizes, and ratings indicated. Equip with number of unit panelboard devices as required for complete installation. Fully equip "spaces" with hardware to receive breaker or switch of size indicated.

## 2.3 LIGHTING AND APPLIANCE PANELBOARDS

- A. Provide dead-front safety type lighting and appliance panelboards as indicated, with switching and protective devices in quantities, ratings, types, and arrangement shown, provide bolt-on thermal magnetic type branch breakers. Where multiple breakers are indicated, provide with common trip handle. Equip with aluminum bus bars full-sized neutral bus, ground bus and isolated ground bar when indicated.

## 2.4 PANELBOARD ENCLOSURES

- A. Provide galvanized sheet steel cabinet type enclosures, in sizes and NEMA types as indicated, code-gauge minimum 16-gauge thickness. Provide fronts with adjustable indicating trim clamps, and doors with flush locks and keys, all panelboard enclosures keyed alike, with concealed door hinges and door swings as indicated. Equip with interior circuit-directory frame, and card with clear plastic covering. Provide baked gray enamel finish over a rust inhibitor. Provide enclosures fabricated by same manufacturer as overcurrent devices contained therein. Bolt engraved Formica labels indicating panel name and voltage on the interior and exterior of panelboards.

## 2.5 FINISH

- A. Coat interior and exterior of surface with manufacturer's standard color; baked on enamel finish.

## 2.6 IDENTIFICATION

- A. Provide 1/16" thick black Formica labels with ¼" high lettering on the interior and exterior of each panelboard; include panelboard name and voltage - see Section 260553.

## 2.7 BRANCH CIRCUIT BREAKERS

- A. Provide and install branch circuit breakers of the size, type and amperage indicated, mounted in the position noted in the panel schedule.

The circuit breakers shall be as defined by NEMA as a device designed to carry electric current through a set of contacts and by automatic means open the contacts, interrupting the flow of current when the flow of current exceeds the labeled rating or on a high instantaneous inrush of current. The tripped breaker shall flag the interruption of the flow of current and be capable of being reset when returned to normal operating temperature. The breaker shall be a molded case unit that will open on an overload and/or short-circuit condition.

The unit shall be constructed as molded case units having a single handle operator for one, two or three pole units. For multiple pole units, and overload on any pole shall cause all terminals to open.



## PART 3 - EXECUTION

### 3.1 GENERAL

- A. Install panelboards and enclosures where indicated, in accordance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation", in compliance with recognized industry practices to ensure products fulfill requirements.
- B. Position the breakers in the panel to match the schedule on the plans.
- C. Coordinate installation of panelboards and enclosures with cable and raceway installation work. Anchor enclosure firmly to walls and structural surfaces, ensuring they are permanently and mechanically secure. Arrange conductors neatly within enclosure, and secure with suitable nylon ties.
- D. Fill out panelboard's circuit directory card upon completion of installation work. Utilize actual final building room numbers, not architectural numbers used on drawings. Identify individual lighting circuits and individual receptacle circuits by room served. Include room number with equipment circuit designations. All directories to be typewritten.
- E. Provide selective coordination of all breakers per NEC 700.27 and 701.27 using the definition in Article 100 (NEC2014).

END OF SECTION 262416

SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. The extent of wiring device work is indicated by drawings and schedules. Wiring devices are defined as a unit of an electrical system that carries or controls electric energy as its principal function.
- B. Types of electrical wiring devices in this section include the following:
  - 1. Switches
  - 2. Receptacles
  - 3. Cord caps and connectors
  - 4. Wiring device accessories

1.2 QUALITY ASSURANCE

- A. Comply with NEC and NEMA standards as applicable for construction and installation of electrical wiring devices. Provide electrical wiring devices which have been UL listed and labeled.

1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's data on electrical wiring devices.

PART 2 - PRODUCTS

2.1 FABRICATED WIRING DEVICES

- A. GENERAL: Provide factory-fabricated wiring devices, in types, and electrical ratings for applications indicated and complying with NEMA Stds. Pub. No. WD 1. The devices shall be white with white coverplates.
- B. Provide wiring devices (of proper voltage rating) as follows:

SWITCHES					(20A Continuous Rating)
MFGR.	1-Pole	3-Way	4-Way	W-Pilot	
Hubbell	DS120W	DS320W	DS420W	HBL1221PL	
P&S	2621W	2623W	2624W	PS20AC1RPL(7)	
Eaton	7622W-Box	7623W-Box	7624W-Box	AH1221PL	
Bryant	9901W	9903W	9904W	4901PLR(*)	

RECEPTACLES (20A Continuous Rating)					
MFGR.	C.O.'s	GFI (Weather-Resistant)	Controlled	Hospital (Green Dot)	IG (Orange)
Hubbell	SNAP5362W A/SNAP2RA	GFR5362SGW	SNAP5362CIW A	HBL2182WA	IG 2162
P&S	5362- AW/Plugtail	2097TRWRAW	5362CHW	26362HGW	IG 26362
Eaton	AH5362W	TWRSGF20W	5362CHW	8362W	IG8362RN

- C. Special devices as indicated on the plans, complete with matching coverplates shall be provided and installed where indicated.
- D. All weatherproof covers on receptacles (GFI) and/or switches shall be mounted on a recessed box. Cover shall be made of cast aluminum such as Arlington Industries #DSHBIBRC. Equals of T&B and TayMac are acceptable. GFI receptacle shall be weather resistant as indicated in schedule above.
- E. Provide devices in colors selected by Architect.
- F. Contractor shall provide and install tamper resistant receptacles where required by NEC 406. If P & S/Eaton do not have tamper resistant version of specified device, provide Hubbell tamper resistant version where required.

## 2.2 CORDS CAPS AND CONNECTORS

- A. Provide 3-wire grounding, cap plugs, and connectors of ampere and voltage rating required, for final equipment connection, and as indicated otherwise on drawings. Provide products of one of the following manufactures:
  1. Arrow Hart
  2. General Electric
  3. Hubbell
  4. Leviton
  5. Pass and Seymour
  6. Bryant

## 2.3 WIRING DEVICE ACCESSORIES

- A. WALL PLATES: Provide and install high impact, smooth, white nylon coverplates for all wiring devices. Provide galvanized steel plates in unfinished or kitchen areas. Engrave all receptacle plates other than those serving 120 volt, single phase devices. State voltage and amperage characteristics. Example: "208V, 30A".
- B. All switch banks shall have each switch identified as to its function with 1/8" thick laminated micarta engraved adhesive plate.
- C. Weatherproof coverplates shall be Arlington Industries #DSHBIBRC. Equals of T & B and TayMac are acceptable.
- D. Emergency power coverplate shall be "RED", engrave "Emergency Power" on coverplate.

## PART 3 - EXECUTION

### 3.1 GENERAL

- A. Install wiring devices as indicated, in compliance with manufacturer's written instructions, applicable requirements of NEC, NECA's "Standard of Installation", and in accordance with recognized industry practices to fulfill project requirements.
- B. Coordinate with other trades (including painting), the installation of electrical boxes and wiring. Install devices in boxes such that front of device is flush and square with coverplate. Drawings are small scale and, unless dimensioned, indicate approximate locations only of outlets, devices, equipment, etc. Locate outlets and apparatus symmetrically on floors, walls and ceilings where not dimensioned and coordinated with other work. Verify all dimensioned items on job site. Consult architectural cabinet, millwork, and equipment shop drawings prior to rough-in of electrical work.
- C. Receptacles: **The receptacles shall be mounted vertically** with the neutral terminal or slot at the left side.
- D. Install devices only in electrical boxes which are clean, free from excess building materials, dirt, and debris. Mark each box and the back of each device plate, with felt tip marker, indicating the circuit or port to which the device is connected. Example: "CKT A-1".
- E. Install blank plates on all boxes without devices.
- F. Delay installation of wiring devices until wiring work is completed. Delay installation of wall plates until after painting work is completed.
- G. Do not Edison or share neutral conductors between phases.

### 3.2 PROTECTION OF WALL PLATES AND RECEPTACLES

- A. At time of substantial completion, replace those items which have been damaged, including those stained, burned and scored.

### 3.3 GROUNDING

- A. Provide electrical continuous, tight grounding connections for wiring devices, unless otherwise indicated.

### 3.4 TESTING

- A. Prior to energizing circuitry, test with a hand test device that proves electrical connections: continuity, proper polarity, grounding, neutral connection, etc. Any irregularities shall be corrected.

END OF SECTION 262726

## SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

### PART 1 - GENERAL

#### 1.1 DESCRIPTION OF WORK

- A. Extent of motor and circuit disconnect switch and/or circuit breaker is indicated on the plans and schedules. Work includes complete installation and electrical connections.

#### 1.2 QUALITY ASSURANCE

- A. Provide motor and circuit disconnect switches, and/or circuit breaker (as noted), which have been UL listed and labeled. Comply with applicable requirements of NEMA Standards Pub. No. KS 1, and NEC.

#### 1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's data including specification, installation instructions and general recommendations, for each type of motor and circuit disconnect switch required.

### PART 2 - PRODUCTS

#### 2.1 ACCEPTABLE MANUFACTURERS

- A. Manufacturer: Subjects to compliance with requirements, provide products of one of the following (for each type of switch):
  1. Square D Company
  2. General Electric Co.
  3. Siemons
  4. Eaton Corp.

#### 2.2 FABRICATED SWITCHES

##### A. GENERAL

1. Provide heavy duty type disconnect and safety switches as indicated herein.
  - a. Heavy duty switches on 240 and/or 600 volt rated circuits.
  - b. HP rated switches on all motor circuits.

##### B. HEAVY DUTY SWITCHES

1. Provide heavy-duty type, sheet-steel enclosed switches, fusible or non-fusible as indicated of types, sizes and electrical characteristics indicated; rated 240 and/or 600 volts, 60 hertz; incorporating spring assisted, quick-make, quick-break switches which are so constructed that switch blades are visible in OFF position with door open. Provide single phase or three phase with solid neutral as required by applications. Equip with an **interlocked operating handle** which is capable of being padlocked in OFF position. Provide NEMA 1 or NEMA 3R as required by application, unless noted. Provide fusible switches with Class R rejection fuse clip kits.

C. FUSES

1. Where indicated, provide fuses for switches, as required of classes, types and ratings needed to fulfill electrical requirements for services indicated. Provide spare fuses amounting to one spare fuse for each 10 installed but not less than three of any one type and size. See Section 262813 for fuse types.

D. CIRCUIT BREAKERS

1. Provide and install circuit breakers of the size noted on the plans. They shall be installed in a NEMA 1 enclosure unless otherwise noted.

PART 3 - EXECUTION

3.1 INSTALLATION OF MOTOR AND CIRCUIT DISCONNECT SWITCHES

- A. Install motor and circuit disconnect switches where indicated, complying with manufacturer's written instructions, applicable requirements of NEC, NECA's "Standard of Installation" and in accordance with recognized industry practices to ensure that products fulfill requirement.
- B. Coordinate motor and circuit disconnect switch installation work with electrical raceway and cable work, as necessary for proper interface.
- C. Install disconnect switches with motor drive appliances, and motors and controllers within sight of controller position.

END OF SECTION 262816

## SECTION 262910 - OVERCURRENT PROTECTIVE DEVICES

### PART 1 - GENERAL

#### 1.1 DESCRIPTION OF WORK

- A. Extent of overcurrent protective device work is indicated by drawings and schedules. Overcurrent protective devices specified herein are for installation as individual components in separate enclosures, and for installation as integral components of switchboards and panelboards. See Section 262413, Switchgear and Switchboards, and Section 262416, Panelboards.
- B. Types of overcurrent protective devices in this section include the following for operation at 600 volts and above:
  - 1. Molded case circuit breakers
  - 2. Power circuit breakers
  - 3. Fusible switches
  - 4. Molded case systems breakers
- C. Refer to other Division-26 sections for cable/wire and connector work required in conjunction with overcurrent protective devices.

#### 1.2 QUALITY ASSURANCE

- A. Comply with NEC requirements and NEMA and ANSI standards as applicable to construction and installation of overcurrent protective devices.

#### 1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's data on overcurrent protective devices, including catalog cuts, time-current trip characteristic curves, and mounting requirements.
- B. Shop Drawings: Submit layout drawings of overcurrent protective devices, with layout of circuit breakers, including special relationships to proximate equipment.
- C. Maintenance Stock, Fuses: For types and ratings required, furnish additional fuses, amounting to one unit for every 5 installed units, but not less than two units of each size and type.

### PART 2 - PRODUCTS

#### 2.1 ACCEPTABLE MANUFACTURER'S (LOW VOLTAGE)

- A. Subject to compliance with requirements, provide products of one of the following (main and branch manufacturer must be same as panelboard and/or switchboard manufacturer):
  - 1. Circuit Breakers and Fusible Switches
    - a. Square "D" Co.
    - b. General Electric Co.
    - c. Siemons
    - d. Eaton Corp

## 2.2 MOLDED CASE CIRCUIT BREAKERS

- A. Provided factory-assembled, molded case circuit breakers for power distribution panelboards and switchboards; and for individual mounting, as indicated. Provide breakers and amperage, voltage and RMS interrupting rating shown, with permanent thermal trip and adjustable instantaneous magnetic trip in each pole. Construct breakers for mounting and operating in any physical position and in an ambient temperature of 40° C. Provide with mechanical screw type removable connector lugs, AL/CU rated.
- B. All breakers in the main distribution panel shall have sufficient interrupting capacity to safely interrupt the available short circuit current from the transformer bank. Circuit breakers shall be Square "D", Type FH, KH, LH, MH, or as noted on the plans.
- C. All breakers specified with motor starters shall be Square "D" Mag-Guard.

## 2.3 FUSIBLE SWITCHES

- A. Provide factory-assembled fusible switch units for power distribution panelboards and switchboards, and for individual mounting as indicated. Provide switch units of amperage, voltage, and RMS interrupting rating as shown, with quick-make, quick-break mechanisms, visible blades, and dual horsepower ratings. Equip with lockable handles with on-off indication. Interlock switch covers with handles to prevent opening in "ON" position. Provide switch with Class R rejection fuse clip kits.
- B. Acceptable Manufacturer
  - 1. Subject to compliance with requirements, provide ground-fault sensing and relaying equipment of one of the following (manufacturer must be same as panelboard and/or switchboard manufacturer):
    - a. Square D Co.
    - b. General Electric Co.
    - c. Siemens
    - d. Eaton

## PART 3 - EXECUTION

### 3.1 INSTALLATION OF OVERCURRENT PROTECTIVE DEVICES

- A. Install overcurrent protective devices as indicated, in accordance with the manufacturer's written instructions and with recognized industry practices to ensure that protective devices comply with requirements. Comply with NEC and NEMA standards for installation of overcurrent protective devices.
- B. Coordinate with other work as necessary to interface installation of overcurrent protective devices with other work.
- C. Provide a breaker coordination study. Set field-adjustable circuit breakers for trip settings recommended in study, subsequent to installation of devices.
- D. Install fuses in overcurrent protective devices.



- E. Field test all ground fault protective devices for proper operation; test to be performed by representative of the manufacturer. Include verification of complete time current trip characteristics.
- F. Provide selective coordination of all breakers per NEC 700.27 and 701.27 Using the definition in Article 100 (NEC2014).

### 3.2 FIELD QUALITY CONTROL

- A. Prior to energization of overcurrent protective devices, test devices for continuity of circuitry and for short-circuits. Correct malfunctioning units, and then demonstrate compliance with requirements.

END OF SECTION 262910

## SECTION 262913 - ENCLOSED CONTROLLERS AND STARTERS

### PART 1 - GENERAL

#### 1.1 DESCRIPTION OF WORK

- A. Extent of motor starter work is indicated by drawings and schedules.
- B. Types of motor starter in this section include the following:
  - 1. AC Fraction horsepower Manual Starters
  - 2. AC Line Voltage Manual Starters
  - 3. AC Non-Reversing Magnetic Starters
  - 4. AC Combination Non-Reversing Magnetic Starters

#### 1.2 QUALITY ASSURANCE

- A. Comply with NEC and NEMA Standards as applicable to wiring methods, construction, and installation of motor starters. Comply with applicable requirements of UL 508, "Electric Industrial Control Equipment", pertaining to electrical motor starters. Provide units which have been UL-listed and labeled.

#### 1.3 SUBMITTALS

- A. Product Data: Submit dimensioned drawings of motor starters showing accurately scaled equipment layouts.
- B. Motor Voltage/Current Report: After installation is complete, including water and air balancing, measure voltage (L-L and L-N) and full load current of each phase of each motor. Submit report showing field readings of voltage and amperage and thermal heater size installed for each motor.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURER

- A. Subject to compliance with requirements, provide products of one of the following (for each type and rating of motor starter):
  - 1. Allen-Bradley Co. 1
  - 2. Square D Co.
  - 3. General Electric Co.
  - 4. Eaton

#### 2.2 MAINTENANCE STOCK, FUSES

- A. For types and ratings required, furnish additional fuses, amounting to one unit for every 10 installed units, but not more than 5 units of each type, for both power and control circuit fuses.

## 2.3 MOTOR STARTERS

- A. General: Except as otherwise indicated, provide motor starters and ancillary components; of types, sizes, ratings, and electrical characteristics indicated which comply with manufacturer's standard materials, design and construction in accordance with published information, and as required for complete installations.
- B. Thermal Overload Units: Provide thermal overload units, sized in accordance with manufacturer's recommendations for full load current of motor controlled. Provide thermal heater units, sized to actual running full load current if actual full load current is less than 90% of motor nameplate full load current. Size heater for mechanical equipment after air and water balancing have been completed. Spare parts: Provide a spare set of each type and/or size.
- C. AC Fractional Hp Manual Starters (Equal to Square D Class 2510): Provide manual, single-phase, 1 and 2 pole, 300 volt AC max, fractional HP motor starters, of types, ratings and electrical characteristics indicated; equip with one piece thermal overload relay with field adjustment capability of plus or minus 10% of nominal overload heater rating; for protection of AC motors of 1 HP and less. (For manually controlled motors in excess of 1 HP, see Line Voltage Manual Starters specified herein.) Provide starter with quick-make, quick-break trip free toggle mechanisms, green pilot lights, and with lock-off toggle operated handle. Mount surface units in NEMA 1 enclosures, unless noted otherwise. Provide flush mounted units with coverplate to match wiring device coverplates.
- D. AC Line Voltage Manual Starters (Equal to Square D Class 2510): Provide line voltage manual starters, of types, ratings and electrical characteristics indicated; 2 or 3 pole, 600 volt AC max; equip with pushbutton operator, low voltage protection feature, and green pilot light. Provide starters with trip free mechanism such that contacts will open under load and remain open until thermal element has cooled, and unit is reset. Mount surface units in NEMA 1 enclosure, unless noted otherwise. Provide overlapping trim for flush mounted units.
- E. AC Non-Reversing Magnetic Starters (Equal to Square D Class 8536): Provide line voltage magnetic starters (nothing smaller than size 1 - typical all arrangements), to types, ratings and electrical characteristics indicated; 2 or 3 pole, 600 volt max, 120 volt control voltage with solid state current sensing protection with under voltage trip in all phases. Equip units with holding contact, 2 normally open, and 2 normally closed auxiliary contacts, unless noted otherwise. Provide fused control transformer in each starter. Mount hand-off-auto switch, red pilot light, and reset button in face of enclosure. Provide NEMA 1 enclosure unless noted otherwise. Equip all spare starters complete with items as specified herein.
- F. Control Contactor (Equal to Square D Class 8903 Type PB): Provide line voltage Contactor of the size indicated on the plans, to types, ratings and electrical characteristics indicated; 2 or 3 pole, 600 volt max, 120 volt control voltage or as noted. Equip units with holding contact, 1 normally open, and 1 normally closed auxiliary contacts, unless noted otherwise. Provide fuse control transformer in each Contactor. Mount a red pilot light, in face of enclosure. Provide NEMA 1 enclosure unless noted otherwise.

## 2.4 SOLID STATE OVERLOAD RELAY (Include as a part of all magnetic starters)

- A. The overload relay shall be a solid-state current sensing device that is ambient insensitive. The overload relay shall incorporate phase unbalance, phase loss and overload protection. The overload relay shall have a 3:1 current adjustment range. A visible trip indication and a trip test function shall be included. An LED shall indicate power to the device and there shall be a lockable tamper guard to protect the dial adjustment. The device shall be a Square D Class 9065 or approved equal.

- B. AC Combination Non-Reversing Breaker and Magnetic Starters (Equal To Square D Class 8538): Provide line voltage combination starters, of types, ratings and electrical characteristics and indicated for 8536; 2 or 3 pole, 600 volts max with non-reversing magnetic starters with solid state current sensing overload protection, as specified herein; in common cubicle or enclosure with motor circuit protector. (To include Solid State Overload Relay).
- C. Provide instantaneous trip circuit breaker as indicated and adjust to comply with manufacturer's recommendations. Provide combination starters for individual mounting, or for group mounting in motor control center as indicated. Provide NEMA 1 enclosures unless otherwise indicated.
- D. AC Combination Non-Reversing Fused Disconnect and Magnetic Starters (Equal To Square D Class 8539): Provide line voltage combination starters, of types, ratings, and electrical characteristics; 2 or 3 pole, 600 volt maximum with non-reversing magnetic starters as specified herein; in common cubicle or enclosure with fusible disconnect switch. Provide quick-make, quick-break, visible blade disconnect switch. Provide 2, 3, and 4; and visible blade, automatic circuit interrupters with push-to-trip feature and separate fuse clips for larger NEMA sizes. Fuse all starters with dual-element (time-delay) fuses equal to Bussman FRN/FRS. Provide combination starters for individual mounting, or for group mounting in motor control centers as indicated. Provide NEMA 1 enclosures unless otherwise indicated. (To include Solid State Overload Relay).

### PART 3 - EXECUTION

#### 3.1 INSTALLATION OF MOTOR STARTERS

- A. Install motor starters as indicated, in accordance with manufacturer's written instructions, applicable requirements of NEC, NEMA standards, and NECA's "Standards of Installation", and in compliance with recognized industry practices to ensure that products fulfill requirements.
- B. Install fuses in fusible disconnects, if any.

#### 3.2 ADJUST AND CLEAN

- A. Inspect operating mechanisms for malfunctioning and, where necessary, adjust units for free mechanical movement.
- B. Touch-up scratched or marred surfaces to match original finish.
- C. Each motor starter shall be equipped with lock out capabilities.

#### 3.3 FIELD QUALITY CONTROL

- A. Subsequent to wire/cable hook-up, energize motor starters and demonstrate functioning of equipment in accordance with requirements.

END OF SECTION 262913

## SECTION 265100 - INTERIOR LIGHTING

### PART 1 - GENERAL

#### 1.1 DESCRIPTION OF WORK

- A. Extent of interior and exterior luminaire work is indicated by drawings and schedules.
- B. The contractor shall provide the quantity of luminaires indicated on the plans. The drawn length (in standard increments) of the luminaire determines the quantity and the catalog number identifies the model or type. The catalog numbers have been carefully prepared to define the luminaire type but may not be completely accurate. At least four (4) days prior to bidding each manufacturer shall compare the catalog numbers shown with the description and requirements on the drawings and shall notify the Architect/Engineer of any discrepancies. Specifically included in the evaluation shall be the verifying of proper mounting kits or accessories to facilitate installation of the luminaire as shown at each location on the plans. No allowance or redress will be allowed for discrepancies that were not addressed to the indicated authorities for clarification prior to bidding. Reporting of ambiguities is the responsibility of the bidder.
- C. On all pendant mounted luminaires, provide a second set of pendants, of a different length, as directed by the Architect/Engineer, to be used at their discretion. Provide and install at no additional charge to the project.
- D. Types of light sources within the luminaires include the following:
  - 1. LED

#### 1.2 QUALITY ASSURANCE

- A. Comply with NEC (Article 410), NEMA and ANSI 132.1 as applicable to installation and construction of luminaires. Provide UL listed and labeled luminaires for installation on this project.

#### 1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's data on interior and exterior building luminaires. Submit the manufacturer's data on ballasts supplied with luminaires.
- B. Shop Drawings: Submit dimensioned drawings of luminaires and supplied ballasts. Submit luminaire shop drawings with ballasts in booklet form with separate sheet for each luminaire, assembled in "type" alphabetical order, with proposed luminaire/accessories clearly indicated on each sheet.
- C. Submit manufacturer's contact information for future LED module/driver replacement by owner.

## PART 2 - PRODUCTS

### 2.1 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with requirements, provide products of one of the following (for each luminaire):
  - 1. LED lamps

### 2.2 INTERIOR LUMINAIRES

- A. General: Provide luminaires, of sizes, types and ratings indicated. Luminaire shall be complete with, but not necessarily limited to, housings, lamps, lamp holders, reflectors, ballasts, starters and wiring. Label each luminaire with manufacturer's name and catalog number. Provide all enclosed luminaires with positive latch mechanisms, spring tension clips not acceptable. Provide all exterior luminaires with damp or wet location label as required by application.
- B. Support Requirements: Provide all pendant and stem mounted luminaires with flexible ball joint hangers at all points of support. Equipment hooks used to hang luminaires shall be supplied with safety latches. Provide all detachable luminaire parts, luminous ceiling accessories, louvers, diffusers, lenses, and reflectors with locking catches, screws, safety chain or safety cable.

Each hanger point shall be capable of supporting four times the luminaire weight. Backing supports shall be installed above (or behind) sheetrock, plaster and similar ceiling and wall materials. All surface mounted ceiling luminaires shall be supported from a structural channel. See plans for additional details.

### 2.3 LED DRIVERS/LAMPS

- A. 5-year warranty; lamps (4000-4500K). See additional information on Sheet E2.0.

## PART 3 - EXECUTION

### 3.1 INSTALLATION OF LUMINAIRES

- A. Install luminaires at locations and heights indicated, in accordance with luminaire manufacturer's written instructions, applicable requirements of NEC (Article 410), NECA's "Standard of Installation", NEMA standards, and with recognized industry practices to ensure that luminaires fulfill requirements.
- B. Coordinate with other work as appropriate to properly interface installation of luminaires. Consult architectural reflected ceiling plan for exact location of all luminaires.
- C. Provide all necessary supports, brackets, and miscellaneous equipment for mounting of luminaires. Support all ceiling mounted luminaires from the building structure; independent of the ceiling system, unless noted. Support each recessed luminaire from the building structure with #12 ga. steel wire attached to each luminaire corner (in addition to supports normally provided for attachment to the ceiling system). Provide backing supports above (or behind) sheetrock, plaster and similar ceiling and wall materials. Support ceiling mounted outlet boxes independent of the raceway system, and capable of supporting 200 pounds. See plans for additional details.

- D. Install emergency battery inside luminaire ballast channel with charging indicator light and test switch mounted on fixture end, or visible and accessible through lens. Wire so luminaire can be tested with lights on and lamps in normal mode are switched off with other lighting in area. Connect emergency battery to unswitched conductor.
- E. Clean luminaires of dirt and debris upon completion of installation.
- F. Protect installed luminaires from damage during remainder of construction period. Repair all nicks and scratches to appearance of original finish. If repair is not possible, replace damaged portion of luminaire.

### 3.2 FIELD QUALITY CONTROL

- A. Upon complete installation of luminaires, and after building circuitry has been energized, apply electrical energy to demonstrate capability and compliance with requirements. Where possible, correct malfunctioning luminaires on site, then reset to demonstrate compliance; otherwise remove and replace with new luminaires and proceed with retesting.
- B. At the time of Substantial Completion, replace lamps in interior luminaires which are observed to be noticeably dimmed after the Contractor's use and testing, as judged by Architect/Engineer. In addition, furnish replacement lamps amounting to 15% (but not less than one lamp) of each type and size used (Max. 48 of any one type). Deliver replacement stock with letter of transmittal as directed to Owner's storage space.
- C. Provide tight equipment grounding connections for each luminaire.

END OF SECTION 265100

## SECTION 265600 - EXTERIOR LIGHTING

### PART 1 - GENERAL

#### 1.1 DESCRIPTION OF WORK

- A. The contractor shall provide and install the exterior luminaires as noted in the luminaire schedule on the plans and located as indicated. The contractor shall reference the architectural and landscaping plans and coordinate the conduit/conductor installation and light pole location therewith. If a discrepancy or conflict, refer same to the engineer for clarification.
- B. The luminaires provided and installed in this section shall include the ballast of the type noted in Section 265100, except temperature-rated shall be provided, or of the type as noted in the luminaire schedule on the plans.
- C. The exterior luminaires being provided for this project shall be submitted for approval with those on Section 265100.
- D. The conduit/conductor installation shall comply with the specification relating to the respective section, but the conductor size shall be taken from the plans and shall comply therewith.
- E. When the installation is complete, the luminaire must be clean and the area free of debris.

END OF SECTION 265600