

## SECTION 26 00 00

### GENERAL ELECTRICAL REQUIREMENTS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for work under Division 26.
- B. Coordinate the work of this Section with the requirements of the Project.

##### 1.2 DEFINITIONS

- A. Following are definitions of terms and expressions used in the Electrical Sections in addition to definitions found in the Contract Conditions:
  - 1. "Wiring" includes wire, fittings, conduit, boxes and other accessories that comprise a system.

##### 1.3 QUALITY ASSURANCE

- A. Regulatory Requirements
  - 1. Work shall conform to the requirements of the codes, laws and ordinances of the local authority having jurisdiction, National Fire Protection Association, National Electrical Code (NEC), National Electrical Manufacturer's Association (NEMA) and other authorities having jurisdiction.
  - 2. The requirements of the authorities having jurisdiction shall take precedence over the Drawings and Specifications and changes required by the authorities shall be made after review by the Engineer.

##### 1.4 SUBMITTALS

- A. Shop drawings are required for the following:
  - 1. Lighting Fixtures (including lighting calculations where required by Specification 265000).
  - 2. Occupancy Sensor/Lighting Control Layout (Layout shall be specific to the project. Generic layouts will not be accepted).
  - 3. Wiring Devices
  - 4. Enclosed Switches/Circuit Breakers
  - 5. Fire Detection and Alarm Systems
  - 6. Motor Starters/Safety Switches
  - 7. Test and Inspection Reports
- B. Review of shop drawings does not relieve the Contractor of responsibility for complying with the Contract Documents.
- C. Shop drawings shall reflect manufacturer being provided for project. Shop drawings that contain multiple manufacturers for the same product will not be reviewed.
- D. Shop drawings shall be clearly marked to indicate product being provided for project. Shop drawings that do not indicate which product is being supplied will not be reviewed.

- E. Submit voltage drop calculations only when an alternate circuit routing, circuit loading, or conductor material is proposed compared to Drawings. Request maximum permissible voltage drop percentage from Engineer.
- 1.5 PROTECTION
  - A. Protect material and equipment from damage.
  - B. Cap or plug openings in equipment and conduits with proper caps and plugs.
- 1.6 VARIANCES
  - A. Where conflicts exist within the contract documents, request clarification prior to the submission of a bid. If clarification is not requested, provide the work representing the higher cost and quality.
- 1.7 WARRANTY
  - A. During the warranty period, make the proper adjustments of systems, equipment and devices installed and perform work necessary to ensure the efficient and proper functioning of the systems, equipment and devices.
  - B. Certain items of equipment shall be warranted for a longer time than the general warranty period. Provide for service or replacement required in connection with the warranty of these items.
- 1.8 TEMPORARY POWER AND LIGHT
  - A. Temporary electric service and lighting is not covered under this Division of the Specifications.

## PART 2 - PRODUCTS

### 2.1 PRODUCTS TO BE USED

- A. Items specified by designations such as trade name, manufacturer's name, and catalog number indicate the capacity and quality of the products or materials to be used on this project.
- B. Only products indicated on Contract Documents by name, series and/or model number have been coordinated with other trades. Coordinate items of other manufacturers listed with other trades, and make any necessary modifications required by use of the alternate product.

### 2.2 MATERIALS AND WORKMANSHIP

- A. Items shown and not specifically called for, or items specified and not specifically indicated or detailed on the Drawings, or items neither specified nor shown, but which are reasonably incidental to and commonly required to make a complete job, shall be provided.

### 2.3 FOUNDATIONS AND EQUIPMENT SUPPORTS

- A. Provide foundations, supports, curbs and bases for equipment, as indicated or necessary for satisfactory installation and operation of equipment. Furnish and set anchor bolts.
- B. Floor mounted stands, rods or legs, where required, shall be constructed of structural steel shapes (angles, channels) of Kindorf or Unistrut or steel pipe, and

fittings securely braced and fastened to flanges bolted to the floor. Minimum rod size shall be 3/8 inch diameter. Paint steel with rust inhibiting primer.

## 2.4 ROOF SUPPORTS AND CURBS

- A. Provide equipment supports and curbs for the equipment and piping installed on or through the roof. Roof curbs shall be approved for use by the National Roofing Contractors Association and shall be a minimum of 14 inches high. Curbs shall be sloping roof type suitable for pitch of the roof and shall set the equipment level. Curbs shall be double wall insulated type.
- B. Provide wood blocking to raise the level of the bottom of the curb to be level with the top of the roof insulation.
- C. Pipe curb assemblies shall be constructed of 18 gauge galvanized steel with base plate, raised cant, wood nailer strip and galvanized steel counter flashing. Top shall be provided with acrylic clad ABS plastic cover and graduated neoprene boots secured to cover and pipes by stainless steel band clamps. Pipe curbs shall be Pate Company PCA-5 or Thy Curb.
- D. Equipment supports shall be constructed of 18 gauge galvanized steel with base plate, raised cant, wood nailer strip and galvanized steel counter flashing. Equipment supports shall be Pate Company ES-5a or Thy Curb TEMS-1.
- E. Where conduits penetrate the roof to feed equipment specified under Division 20, route the conduits through pipe curbs provided under Division 20 or inside the roof curb provided under Division 20.
- F. Wherever possible, install conduits to stub up immediately below the rooftop equipment fed by the conduit. Where horizontal routing across rooftop is required, derate cable ampacity per the National Electrical Code.

## 2.5 HANGERS AND CONDUIT SUPPORTS

- A. Provide conduit hangers and supports to maintain required alignment for equipment and conduits.
- B. Conduits may not be supported from other conduits. Trapeze hangers may be used for parallel runs of conduit.
- C. Provide supports for equipment and materials under these Specifications. Supports shall be structural steel shapes (angles, channels) of Kindorf or Unistrut. Minimum rod size shall be 3/8 inch.
- D. For steel bar joist construction, hanger rods shall be supported from the top chord of the joists or from panel points of the lower chord of the joists. Where conduit runs parallel to joists or where hangers are required at other than joist locations, provide steel angles welded to joists to support hangers so that weight is supported from the top chord of the joists.
- E. For poured in place concrete construction, support hanger rods by drilled steel drop-in anchors, wedge anchor or expansion anchor. Zamac type nail in, spike or powder actuated type anchors shall not be used without written approval and permission from building's structural engineer.
- F. Expansion bolts or wood plugs will not be permitted in slag block walls. Equipment hung on such walls shall be supported by through bolts or approved anchor bolts set into masonry as the wall is laid up.

## 2.6 OPENINGS, CHASES, LINTELS AND SLEEVES

- A. Determine the location and size of chases, lintels and openings necessary for the proper installation of the work and provide them during the erection of the work in which such chases and openings occur.
- B. Provide sleeves through walls and floors for conduit. Sleeves through walls shall be flush with the walls.
- C. In case cutting of building construction is necessary, including cutting of structural members, such cutting shall be done and repaired to match original condition of the work. Do not cut structural members without Engineer's approval.
- D. Where non-combustible conduits pass through sleeves or openings in fire rated wall, floor-ceiling and ceiling-roof assemblies, seal openings with a UL classified firestop method. Firestop method shall be a one part, intumescent (expands with heat), latex elastomer capable of expanding a minimum of three times. Firestop materials shall be UL listed when tested in accordance with ASTM E814 for a two hour fire (F) and temperature (T) rating.
- E. If combustible conduit materials are used, a UL listed firestop method shall be provided where the combustible materials penetrate fire rated wall, floor-ceiling and ceiling-roof assemblies. Firestop method shall be classified by UL as a through-penetration firestop device when tested in accordance with ASTM E814 for a two hour fire (F) and temperature (T) rating. Plastic conduit materials, including, but not limited to PVC, CPVC and ABS, are combustible. Firestop method shall be similar to Nelson Firestop Products.
- F. Escutcheon plates shall be used to conceal sleeve opening on exposed conduit. Floor plates shall be split, chrome plated, cast brass, similar to Ritter No. 36A.

## 2.7 ACCESS PANELS

- A. In general, boxes, devices and equipment shall be accessible through the removable panels in the ceiling. Where ceilings are not removable and in walls where access is required for service, access panels shall be provided. Access panels shall be appropriate for the finish in which they are installed, with a fire rating to match the wall or ceiling in which they are installed. Refer to other specification section covering access panels.
- B. Coordinate with other divisions and group boxes, devices and equipment together to keep the required number of access panels to a minimum.

## 2.8 IDENTIFICATION

- A. Equipment shall be identified with engraved plastic laminate or anodized aluminum nameplates with pressure sensitive backing. Plates shall also be provided with drilled holes and fastened to equipment with moly-rivets. Letters shall be at least 3/8 inch high and larger in proportion to the size of the piece of equipment. Identification shall be the same as noted on schedules on the Drawings. Include voltage and source panel on labels. Labels shall be provided for the following equipment.
  - 1. Switchboards (new loads)
  - 2. Motor control centers (new loads)
  - 3. Panelboards

4. Motor starting and control switches
  5. Disconnects
  6. Starters
  7. Cabinets
- B. Junction boxes and pull boxes, except those located at the fixture or equipment to which system is connected, shall be identified with permanent marker in large legible lettering to indicate system and circuiting on which installed. In exposed areas mark the inside of the cover.
- C. Panels shall be provided with a typed directory listing load served and associated circuit numbers.

## 2.9 FLASHING

- A. Conduit passing through the roof shall be provided with conical neoprene boots for any pitch roof with base extending minimum of eight inches from vertical portion of boot. Provide clamp for securing boot to conduit.
- B. Flashing assemblies specified above shall be set in place as part of the work under this Division of this Specification but will be finally installed as specified in another Division of this Specification.
- C. Base flashing of conduit and other equipment, if required, is specified in another Division of this Specification. Cap flashings shall be provided to make a water tight seal.

## PART 3 - EXECUTION

### 3.1 EXISTING CONDITIONS

- A. Visit the site and become familiar with existing conditions. Modifications to work required to allow for existing conditions shall be provided. Submit proposed modifications to the Engineer for approval prior to installation.
- B. Where electrical systems pass through the renovated areas to serve other portions of the premises, they shall be suitably relocated and the systems restored to normal operation. Any outages in systems shall be coordinated with the Owner. Where duration of proposed outages cannot be tolerated by the Owner, provide temporary connection as required to maintain service.
- C. Coordinate interruptions in service of existing systems with the Owner. Provide temporary connections to maintain operation of existing systems.
- D. Relocate existing hangers and supports where necessary to install new work. Maximum spacing requirements shall apply for relocated supports.
- E. Where new devices are added to existing walls and ceilings, new wiring shall be concealed by chasing existing walls as required. Devices shall be installed flush.
- F. Where new finishes or treatments are added to existing walls and ceilings by the Architect, provide necessary outlet box extensions, plaster rings, etc., so that devices are installed in the same manner as existing, i.e., flush, concealed, surface, etc.
- G. Where conduit is routed above lay-in ceilings through areas outside the scope of work to reach new equipment, carefully remove existing ceiling tiles and reinstall after conduit installation. For areas where ceilings are not being replaced but

above ceiling work is needed, provide video record on USB drive of existing ceiling conditions prior to ceiling tile removal to owner.

### 3.2 DEMOLITION

- A. Equipment removed that is salvageable and desired by the Owner to be retained, shall be stored on the site where directed by the Owner. Otherwise, other materials and equipment which are removed shall become the property of the contractor and shall be removed by him from the premises.
- B. In each area to be renovated, remove the entire existing electrical installation except those portions indicated to be reused. When existing electrical work is removed, remove conduit, ducts, supports, etc. to a point below the finished floors or behind finished walls and cap. Such points shall be far enough behind finished surfaces to allow for the installation of the normal thickness of finished material. Unused wiring and cable shall be removed back to source.

### 3.3 MANNER OF INSTALLATION

- A. The Drawings showing the layout of the electrical systems indicate the approximate location of outlets and equipment. The runs of feeders and branch circuits as shown on the Drawings are schematic only and are not intended to show the routing and location of conduits. The final determination of routing and location shall be governed by structural conditions, obstructions and connection locations on equipment. Detailed drawings showing major deviations shall be submitted to the Engineer for acceptance before such changes are made.
- B. The Drawings are generally indicative of the work to be installed, but they do not show all offsets, fittings and similar details required, which shall be provided to meet the job conditions. In areas where work is installed in close proximity to work of other trades or within trades covered by this Division of the Specifications, prepare larger scale drawings consisting of plans and sections to show how work is to be installed in relation to work of other trades.
- C. The Engineer reserves the right to a reasonable amount of shifting of outlet locations at no additional cost to the Owner until the time of roughing-in the work.

### 3.4 RECORD DRAWINGS

- A. Keep at the site one (1) set of black and white prints for the express purpose of showing changes from the contract Drawings made during construction. Mark up the prints with red pencil during construction and deliver the prints, before final inspection, to the Engineer as a final set of "Record Drawings". Refer to other specification section for additional requirements.

### 3.5 TESTING

- A. Perform tests and inspections as noted below and in specific section for the different electrical systems. Prepare test and inspection reports indicating procedures used, results and corrective action taken to achieve compliance with requirements for items that do not comply with requirements.
- B. Tests shall be conducted before equipment is connected that would be subject to damage from the test.
- C. Notify the Engineer of the date and time of the test at least three days prior to that date.

- D. The tests shall demonstrate to the satisfaction of the Engineer the following:
1. That lighting, power and control circuits are continuous and free from short circuits.
  2. That circuits are free from unspecified grounds, and grounded where specified.
  3. That the resistance to ground of non-grounded circuits is at least one megohm.
  4. That circuits are properly connected in accordance with the applicable wiring diagrams.
  5. That circuits are operable, which demonstration shall include functioning of controls and continuous operation of lighting and power circuits for not less than 1/2 hour.
- E. Should the performance or capacity of the systems, equipment or devices furnished be questioned by written notice from the Engineer after installation, provide necessary test equipment and complete a satisfactory test of the items in question. The test shall be run when and as directed by the Engineer and in the presence of his representative. Should the items furnished not pass such a test, they shall be removed and replaced by systems, equipment or devices satisfactory to the Engineer.
- F. Refer to Specification 260500 for tests specific to equipment.

### 3.6 PAINTING

- A. Remove rust, scale, grease, and dirt from equipment and material and leave ready for finish painting. Equipment specified with factory baked enamel finish shall be touched up as required to provide a surface visually free of scratches, nicks and blemishes.

### 3.7 OPERATING AND MAINTENANCE MANUAL

- A. Submit operating and maintenance instructions. Unless covered in another specification section, provide a minimum of four copies in three-ring binders and one CD. The manual shall include the following:
1. A brief description of systems and their various components.
  2. Full, definite and explicit instructions for starting, stopping, and controlling systems.
  3. List of manufacturer's representatives with address and telephone numbers.
  4. Manufacturer's printed operating and maintenance instructions, parts lists, illustrations and diagrams for pieces of equipment.
  5. One copy of each shop drawing, engineer's shop drawing review comments, and Contractor's drawings.
  6. One copy of other items of equipment where not required as a shop drawing submittal.
  7. One copy of each wiring diagram.
  8. Manufacturer's data report from UL certifying code compliance for equipment specified.
  9. Certificate of field test check by manufacturer's representation of the Fire Detection and Alarm System.
  10. Certificate of approval from the code authority.

### 3.8 FIELD INSTRUCTION

- A. Upon completion of work, furnish services of a competent representative to instruct Owner's representative in the proper operation and maintenance of elements of the electrical systems. Submit instructor's name and credentials to the Engineer for approval.
- B. Spend not less than 2 hours in such formal instruction to prepare Owner to operate and maintain the systems.

### 3.9 LIGHTING CONTROL SYSTEM COMMISSIONING

- A. After lighting control systems are in place and manufacturer's start-up is complete, perform functional testing to verify proper calibration, adjustment, and programming, in accordance with Contract Documents and manufacturer's installation instructions. Where occupant sensors, time switches, programmable schedule controls, photosensors or daylighting controls are installed, the following procedures shall be performed:
  - 1. Confirm that the placement, sensitivity and time-out adjustments for occupant sensors yield acceptable performance.
  - 2. Confirm that the time switches and programmable schedule controls are programmed to turn the lights off.
  - 3. Confirm that the placement and sensitivity adjustments for photosensor controls reduce electric light based on the amount of usable daylight in the space as specified.
- B. Provide corrective action as required to rectify deficiencies.

### 3.10 GROUNDING

- A. Provide grounding system as shown on the Drawings and as required.
- B. Grounds and connections shall be provided in accordance with the latest provisions of the National Electrical Code, and as indicated on the Drawings and specified.
- C. Unless otherwise noted, ground conductors shall be of copper, sized as required by the National Electrical Code. Ground lugs and clamps shall be cast non-ferrous metal, bolt-on type. Main ground connections shall be provided with four bolts for connections. Bolts shall be brass. Taps to lugs shall be provided with two bolts.
- D. Provide ground for metallic structures, enclosures, devices, and utilization equipment permanently and effectively in accordance with requirements of the National Electrical Code, and as shown and required. Grounding and bonding connections shall be solderless. Welding of conduit and fittings will not be allowed for bonding purposes.
- E. The required equipment grounding conductors and straps shall be sized in compliance with National Electrical Code. Equipment grounding conductors shall be provided with green insulation equivalent to the insulation on the associated phase conductors. The related feeder and the branch circuit grounding conductors shall be connected to the grounding bus with approved pressure connectors.
- F. Provided a separate green insulated equipment grounding conductor for each feeder and branch circuit. The required grounding conductor shall be installed in



the common raceway with the related phase and/or neutral conductors. Flexible metallic conduit equipment connections utilized in conjunction with the above shall be provided with suitable green insulated grounding conductors connected to approved grounding terminals at ends of the flexible conduit.

### 3.11 MOUNTING HEIGHTS

- A. Mounting heights indicated on the drawings provide a general location of the outlets for bidding purposes only. Where mounting height information is not given, or contradicting information is given, request the information from the Engineer. Field coordinate final location of outlets.
- B. Prior to rough-in, coordinate and adjust the location and mounting height of power, data and telephone outlets with architectural casework, shelving, counters, millwork, furniture, or other appurtenance. Adjust locations as necessary to avoid conflicts without having to cut out portions of countertop backsplashes and similar items.

END OF SECTION 260000