SECTION 260500
COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes basic electrical requirements and work results applicable to Divisions 26 of the Specifications.

B. Design Intent:

1. The Contract documents indicate and specify the electrical design intent. The Contract drawings are schematic and diagrammatic and are not intended to indicate construction details and routing unless specifically indicated. The specifications establish minimum performance, product and installation requirements.

2. In addition to the specified and indicated performance and quality requirements, furnish products and perform installation work consistent with the design intent and necessary to the provision of complete operating electrical systems.

1.3 REFERENCES

A. American National Standards Institute (ANSI):

1. C2 - National Electrical Safety Code.

B. National Electrical Contractors Association (NECA):

1. 1 - Standard Practices for Good Workmanship in Electrical Construction

2. 400 – Recommended Practice for Installing and Maintaining Switchboards.

3. 402 – Recommended Practice for Installing and Maintaining Motor Control Centers.

4. 404 - Recommended Practice for Installing Generator Sets.

5. 500 - Recommended Practice for Installing Indoor Commercial Lighting Systems.

C. National Fire Protection Association (NFPA):

1. 70 - National Electrical Code.

1.4 SYSTEM DESCRIPTION

A. Fault Current Analysis and Protective Device Coordination:

1. The Engineer has preformed Fault Current Analysis and Protective Device Coordination in the course of design.

1.5 SUBMITTALS

A. General:

1. Submit information substantiating that the products comply with the Contract requirements.

2. Submit Shop Drawings, Product Data, Samples and other specified submittals on a "system" basis. Retain, and assemble drawings and data from manufacturer or component manufacturers such that each submittal is for a complete system.

3. Refer to submittal requirements in related Division 1 sections of the Specifications.

4. Submit information substantiating that the products comply with the specified regulatory, testing, code, and standards requirements; including independent testing agency requirements, such as Underwriters Laboratories Inc., and industry standards organization requirements, such as the National Electrical Manufacturers Association.

5. Develop and submit a curriculum and outline for each training course, for equipment specified.

B. Contract Closeout Submittals:

1. Refer to related Division 1 sections of the Specifications for basic definitions and requirements for record documents.

2. Submit, at the completion of the work, record drawings in the approved electronic format, indicating the actual electrical installation, size and construction details. Include the following information:

a. Lighting layout, type, circuit designation and control, including each conduit and wire as installed.

b. Power distribution system, including distribution equipment and each conduit and wire size installed.

c. Layout and circuiting for wiring devices, surface raceways and related equipment, including each conduit and wire size.

d. Layout and circuitry for power circuits to mechanical equipment and other electrified building equipment, including each conduit and wire size.

e. Supporting and mounting details.

f. Special systems layouts such as fire alarm, security, lighting control, and telecommunications systems.

g. Layout, cabling and circuiting of site electrical systems such as underground duct banks, and site lighting fixtures. Include system and cable identification of communication systems such as telephone, data, fiber optic, fire alarm, security system and other cabling systems.

h. Panel schedule drawings consisting of each panelboard, motor control center, bus duct, switchboard, switchgear, automatic transfer switch and substation. Schedules shall indicate the “as built” circuiting with loads and room numbers identified. Room numbers on schedules shall include the architectural room number indicated on the Drawings and the signage room numbers from the signage schedules.

i. Power one-line diagrams shall be provided in a plastic, framed enclosure and mounted in the rooms housing the electrical switchboards.

1.6 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Comply with the applicable requirements of ANSI C2 and NFPA 70.

a. Requirements of ANSI C2 and NFPA 70 shall be minimum standards of products and installation work. Furnish products and perform installation work which exceeds the standards of ANSI C2 and NFPA 70 when specified or indicated.

2. Comply with applicable requirements of city, county, and state laws, ordinances and regulations including modifications and supplements to ANSI C2 and NFPA 70.

3. Comply with the applicable requirements of U.S. Department of Labor, Occupational Safety and Health Administration Standards (OSHA).

1.7 PROJECT/SITE CONDITIONS

A. Environmental Requirements: Provide products suitable for operation under the following environmental conditions:

1. Temperature: - 0 to 100 degrees F.
2. Humidity: 0 to 95 relative percent, non-condensing.
3. Altitude: 0 feet above sea level.
4. Seismic performance category: Seismic Zone 3, IBC Site Classification “D”.

1.8 WARRANTIES

A. Refer to the Conditions of the Contract for provisions concerning Contract general warranty, Statements of Compliance, correction of Work period, and form of Special Warranty.

1.9 MAINTENANCE

A. General:

1. Retain portable and detachable portions of the installation such as tools, tool kits, instruction books, wiring diagrams, service manuals, operating handles and keys until the completion of work.
2. Transmit the above items to the Owner when the work has been accepted and an itemized receipt obtained.

B. Operations and Maintenance Manuals:

1. Prior to final acceptance of Project, and as described in related Division 1 sections of the Specifications furnish and deliver to Owner bound manual(s) of instructions for operation and maintenance of all pieces of equipment and systems furnished under this Division of Specifications.
2. Provide a separate binder(s) for each system.

C. Extra Materials:

1. Furnish keys to the Owner together with any duplicates which may have been made. Securely wire keys for each lock together and plainly tag and mark the keys to indicate the lock number or piece of equipment they operate. Also indicate the physical location of the lock by building name or number, panel number, or room name or number.
2. Provide wiring diagrams, instruction books, installation books, and service manuals to the Owner. Clearly identify each item as to which product it applies and the equipment location.
3. Provide special tools as specified and required for equipment maintenance to the Owner. Clearly identify each item as to which piece of equipment it applies and the equipment location.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. General:

1. Furnish products by one of the equipment manufacturers listed under the heading "Manufacturers" within the applicable sections. When given, furnish the specified product model or brand for the selected manufacturer.

2. Provide products, for which quantities of two or more are to be furnished, from the same manufacturer and of the same product or model series.

3. Furnish product components designed to be used together and which are physically and electrically compatible.

B. Product Substitutions: Product substitutions may be requested when the "or as approved" clause is specified under the heading "Manufacturers". Submit product substitutions for approval per related Division 1 sections of the Specifications.

2.2 PRODUCTS

A. Product Listing and Labeling: Provide listed and labeled product for which listings and labelings exist by Underwriters Laboratories Inc. (UL), Factory Mutual (FM), or similar independent testing organizations recognized by the authorities having jurisdiction. For products for which there are no such listings and labelings, provide listed and labeled components of those products, for which component listing and labelings exist.

B. PCB Content Prohibited: Provide products which do not contain any amounts of polychlorinated biphenyl (PCB) compounds.

C. Asbestos Content Prohibited: Provide products which do not contain any amounts of asbestos.

D. Firestop Systems: Provide products suitable for the application as specified in related Division 7 sections of the Specifications.

2.3 SOURCE QUALITY CONTROL

A. Factory Tests:

1. Permit Architect (and Owner) to observe factory tests. Provide minimum five working days notice of factory tests.

2. Schedule no more than one equipment or system factory test per week.

PART 3 - EXECUTION

3.1 COORDINATION

A. Coordinate arrangement, mounting, and support of electrical equipment:

1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.

2. To provide for ease of disconnecting the equipment with minimum interference to other installations.

3. To allow right of way for piping and conduit installed at required slope.

4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.

B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

C. Coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Division 8 sections of the Specifications.

D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 7 sections of the Specifications.

3.2 INSTALLATION

A. Common Requirements for Electrical Installation:

1. Comply with NECA 1.

2. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

3. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

4. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

5. Right of Way: Give to piping systems installed at a required slope.

B. Sleeve Installation for Electrical Penetrations:

1. Electrical penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.

2. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

3. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

4. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

5. Cut sleeves to length for mounting flush with both surfaces of walls.

6. Extend sleeves installed in floors 2 inches above finished floor level.

7. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable, unless indicated otherwise.

8. Seal space outside of sleeves with grout for penetrations of concrete and masonry.

   a. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.

9. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 7 sections of the Specifications.

10. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials. Comply with requirements in Division 7 sections of the Specifications.

11. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

12. Aboveground, Exterior-Wall Penetrations: Seal penetrations using cast-iron pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

13. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between raceway or cable and sleeve for installing mechanical sleeve seals.

C. Sleeve-Seal Installation:

1. Install to seal exterior wall penetrations.

2. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

D. Firestopping: Apply firestopping to penetrations of fire-rated floor and wall assemblies for electrical installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 7 sections of the Specifications.

E. Wiring Installation:

1. Install wiring for control systems, power feeder and branch circuits, lighting branch circuits, communication and auxiliary systems, such as fire alarm and security, in separate raceways unless otherwise indicated.

2. Install power system wiring for Emergency systems in separate raceways.

3. Run equipment grounding conductor in all raceways.

F. Device Location: Allow for relocation prior to installation of wiring devices and other control devices, for example, receptacles, switches, occupancy sensors, fire alarm devices and access control devices, within a 10-foot radius of indicated location without additional cost.

G. Wet, Damp, or Dry Location Work: Provide products as appropriate for wet, damp, or dry locations as defined by NFPA 70.

H. Hazardous Locations Work: Provide products in classified, hazardous locations per NFPA 70 as indicated on Plans.

I. Manufacturer Installation Instructions: Install equipment in accordance with the manufacturer's installation instructions and recommendations.

J. Field Painting:

1. Refer to related Division 9 sections of the Specifications for prime and finish field-painting requirements.

2. In a manner satisfactory to the Owner, touch-up or refinish factory-applied paints or finishes which are chipped, defaced, scratched, or in any other way disturbed due to handling, installation, or general construction work.

K. Personnel Protection From Suspended Work: Where suspended equipment, piping or ductwork or any of their supporting or reinforcing members extend 7 feet or less above the floor or any other

walking surface, cover all edges, projecting surfaces and sharp corners with pre-fabricated soft rubber pads, elastomeric insulation, caps or equivalent to prevent injury to personnel.

3.3 FIELD QUALITY CONTROL

A. Field Tests:

1. Permit Owner and Engineer to observe field tests. Provide minimum three working days notice of field test.

2. Schedule tests in coordination with other Contract work. Schedule no more than one equipment or system field test per day.

3.4 TRAINING

A. General:

1. Provide training for Owner's personnel in the operation and maintenance of equipment as specified in the applicable Section of the Specifications for the particular equipment and system.

2. Develop training schedule which is acceptable to the Owner. Submit schedule for approval.

3. Provide instruction books, manuals, and other classroom material required as part of the training sessions.

4. Provide instructors who are certified by the equipment and system manufacturers.

5. Provide training at the Project Site for the Owner's personnel, as specified in related Division 1 sections of the Specifications.

B. Operations and Maintenance Training:

1. Train personnel in all aspects of normal operation of the equipment, including starting, adjustments while running, and shutdown.

   a. Train personnel to recognize incipient problems, including inefficient or dangerous modes of operation, and provide instruction in corrective actions to be taken.

2. Train personnel to perform all recommended maintenance on the equipment.

C. Specialized Repair Training:

1. Provide specialized training for Owner's personnel in repair of equipment as specified in the applicable section of the Specifications for the particular equipment and system.

2. Provide training equal to that given to the respective manufacturer's entry-level repair personnel.

   a. Owner's personnel may take training along with manufacturer's personnel.

3. Test the Owner's personnel, and certify that those who successfully complete this training may perform routing troubleshooting and repair of equipment without altering or voiding the manufacturer's warranty.

END OF SECTION 260500