

SECTION 260000

BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 STIPULATIONS

- A. The specifications sections "General Conditions of the Construction Contract", "Special Conditions", and "Division 1 - General Requirements" form a part of this Section by this reference thereto, and shall have the same force and effect as if printed herewith in full.

1.2 RULES AND REGULATIONS

- A. Work and materials shall conform to and be executed, inspected and tested in accordance with the latest edition of the National Electric Code and with the governing rules and regulations of federal and local governmental agencies.
- B. Other codes which will apply to this installation include the current editions of:
 - 1. ANSI C2 - National Electrical Safety Code
 - 2. NEMA Standards
 - 3. NFPA 101 - Life Safety Code
 - 4. Underwriters Laboratories
- C. Where governing codes indicate the Drawings and Specifications do not comply with the minimum requirements of applicable codes, be responsible for either notifying the Department in writing during the bidding period of the revisions required to meet code requirements, or providing an installation which will comply with the code requirements.

1.3 SUMMARY

- A. This Section includes general administrative, material, and procedural requirements for electrical installations. The following administrative and procedural requirements are included in this Section to expand the requirements specified in Division 1:
 - 1. Electrical, product general requirements and accesses.
 - 2. Submittals.
 - 3. Record documents.
 - 4. Maintenance manuals.
 - 5. Rough-ins.
 - 6. Electrical installations.
 - 7. Cutting and patching.
 - 8. Factory Training.
- B. Related Sections: The following sections contain requirements that relate to this section:
 - 1. Division 23 Section "ELECTRICAL REQUIREMENTS FOR MECHANICAL EQUIPMENT," for factory-installed motors, controllers, accessories, and connections.
 - 2. Section 260001 - BASIC ELECTRICAL MATERIALS AND METHODS, for materials and methods common to the remainder of Division 26, plus general related specifications including:

- a. Access to electrical installations.
- b. Excavation for electrical installations within the building boundaries and from building to utility connections.

1.4 SUBMITTALS

- A. Follow the procedures specified in Division 1 Section "Submittals."
- B. The contractor is responsible for complying with all contract requirements. Checking of submittals by the Professional or Consultant is only for general conformance with the design concept of the project and general compliance with the information given in the contract documents. Any action indicated by the Professional or Consultant is subject to the requirements of the contract documents. Should the Professional or Consultant miss catching an error or feature in the submittal that does not comply with the contract requirements the Contractor remains responsible for meeting the requirements of the contract. The contractor is responsible for: dimensions which shall be confirmed and correlated at the job site; confirming and correlating all quantities; fabrication processes and techniques of construction; coordination of work between all trades; and the satisfactory performance of his work.
- C. Submittals marked "No Exception Taken" indicate that the Professional or Consultant has found no obvious deviations from the contract requirements and that the contractor may continue the procurement process subject to compliance with the contract requirements.
- D. Submittals marked "Make Corrections Noted" indicate that the Professional or Consultant has made corrective notations on the submittal in response to contract deviations that he has found and that the contractor may continue the procurement process subject to compliance with the notations and the contract requirements.
- E. Submittals marked "Revise and Resubmit" indicate that the Professional or Consultant has found significant deviations from the contract requirements and that the contractor must correct the submittal in accordance with the Professional or Consultant's notations and resubmit the submittal for review; however, the likelihood is that the submittal can be corrected to come into compliance with the contract requirements.
- F. Submittals marked "Rejected" indicate that the Professional or Consultant has found deviations from the contract requirements of such magnitude that the submitted cannot be made compliant with the contract requirements and will not be accepted for further consideration; that the contractor must prepare a new submittal using a different manufacturer, product, model, or process, as applicable, and in accordance with the contract requirements.
- G. Submittals marked "Submit Specified Item" indicate that the submittal is rejected and that only the item specified on the plans or in the specifications will be acceptable, and that the contractor must prepare a new submittal using the specified item.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to the project properly identified with names, model numbers, types, grades, compliance labels, and other information needed for identification.

1.6 WARRANTIES

- A. All Division 26 equipment shall be provided with a factory warranty for all parts and labor with 24 hour service. The warranty shall expire 24 months from the date of Substantial Completion, as defined by the date of the Substantial Completion Certificate. This is not necessarily a 24 month warranty period, rather, early start-up of the equipment prior to the substantial completion date should be expected and shall not affect the expiration date. The contractor shall coordinate this aspect with his suppliers as required.

1.7 EXTENDED WARRANTIES

- A. Select pieces of equipment may be specified to have extended warranties which expire after the primary project warranty lists in the paragraph above. However, extended warranties shall also be coordinated with the date of substantial completion to expire in time periods relative to the substantial completion certificate.

1.8 FACTORY START-UP

- A. Provide factory start-up on major pieces of equipment. Start up of all electrical equipment shall be performed by a factory trained technician with at least 40 hours of factory training on said piece of equipment.

1.9 FACTORY TRAINING

- A. Provide factory training on all equipment. Schedule training with at least 21 days notice to the Department and AE, by submitting a draft training schedule. Indicate all proposed training dates with specific equipment descriptions. The Contractor shall then confirm these dates with the Department and AE, and after received approval of these dates shall submit a final training schedule at least 14 days prior to the agreed upon dates.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. All materials, unless otherwise specified, shall be new and be the standard products of the manufacturer. Seconds, rejects, or damaged materials will be rejected.
- B. The equipment to be provided under these Specifications shall be essentially the standard commercial grade product of the manufacturer. Where two or more units of the same class of equipment are required, these units shall be products of a single manufacturer.
- C. The listing of a manufacturer for certain equipment and systems does not indicate acceptance of a standard or catalogued item of equipment. All equipment and systems shall conform to the Specifications.

2.2 U.L. LISTING

- A. All equipment shall bear the Underwriter's Laboratories (UL), or other approved agency, listing label.
- B. Wherein an item of equipment is specified to be U.L. Listed, the entire assembly shall be listed by Underwriters Laboratories, Inc. Any modifications to suit the intent of the Specifications, shall be performed in accordance with the National Electrical Code and listed by U.L.

2.3 ACCESS

- A. Generally, all concealed junction boxes, control devices, duct mounted smoke detectors and other items of equipment requiring maintenance and/or operation are located above accessible type ceilings. Should any concealed junction boxes, control devices, etc., be inaccessibly located, furnish access doors with flush screwdriver operated lock, of size to permit complete access. Doors shall be of the type suited to the construction into which they are to be installed. Refer to Section 260001 - Basic Materials and Methods, for acceptable door requirements.
- B. Install electrical systems, materials, and equipment and coordinate with all adjacent items so as to maintain the manufacturer's recommended service clearance requirements. Indicate service clearance requirements on the coordination shop drawings. Advise the Consultant of any service clearance conflicts prior to installation. Remove, relocate, and revise conflicting items that have already been installed without additional cost to the Department.
- C. Locate all equipment which must be serviced, operated or maintained in fully accessible positions. Minor deviations from the drawings may be made to allow for better accessibility at no additional cost to the Department, but changes shall not be made without approval of the Consultant.
- D. Minimum clearances in front of or around equipment shall conform to the latest applicable code requirements.

2.4 OPTIONS AND CAPABILITIES: Any feature, item, component, accessory, etc... described anywhere with Division 26 as a capability, an option, optional, or similar descriptor shall be provided, complete and operational in every manner.

PART 3 - EXECUTION

3.1 ROUGH-IN:

- A. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.
- B. Refer to equipment specifications in Divisions 2 through 26 for rough-in requirements.

3.2 ELECTRICAL INSTALLATIONS

- A. General: Sequence, coordinate, and integrate the various elements of electrical systems, materials, and equipment. Comply with the following requirements:
 - 1. Coordinate electrical systems, equipment, and materials installation with other building components. Be responsible for any changes in openings and locations necessitated by the equipment installed.
 - 2. Verify all dimensions by field measurements.
 - 3. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for electrical installations.
 - 4. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.
 - 5. Sequence, coordinate, and integrate installations of electrical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing in the building.

6. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible.
7. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the Professional.
8. Protect all equipment and materials from the elements, dirt and other damage from the time it is removed from the point of storage until final acceptance.
9. Equipment shall include the component parts thereof such as disconnect switches, motor starters, motors, drives, and guards necessary to the satisfactory and safe operation of the equipment.
10. Installation shall include setting equipment to accurate line and grade, leveling equipment, aligning equipment components, providing and installing couplings, bolts, guards, and anchor bolts.
11. All tolerances in alignment and leveling, and the quality of workmanship for each class and stage of work shall be subject to manufacturer's installation instructions.
12. All manufacturer's finished equipment surfaces damaged during construction shall be brought to an "as new" condition by touch up or repainting. Any rust shall be completely removed and the surface primed prior to repainting.
13. Workmanship shall conform to the "Standard of Installation" published by the National Electrical Contractors Association.
14. Division 26 shall do all trench and pipe excavation and backfilling required for his work inside and outside the building, including repairing of finished surfaces, all required shoring, bracing, pumping, and all protection for safety of persons and property. In addition, the Contractor shall check the indicated elevations of the utilities entering and leaving the building. If such elevations require excavations lower than the footing levels, the Professional shall be notified of such conditions and a redesign shall be made before excavations are commenced. It is also the responsibility of Division 26 to make the excavations at the minimum required depths in order not to undercut the footings.
15. Provide all scaffolding, rigging, hoisting and services necessary for erection and delivery of equipment and apparatus furnished into the premises. These items shall be removed from the premises when no longer required.
16. No electrical equipment, raceways or other work of any kind shall be covered up or hidden from view before it has been examined and approved. Any unsatisfactory work or materials shall be removed and corrected immediately.
17. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components, where installed exposed in finished spaces.
18. Install electrical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.
19. Install access panel or doors where units are concealed behind finished surfaces. Access panels and doors are specified in Division 8 Section "ACCESS DOORS" and Section 260001 - BASIC ELECTRICAL MATERIALS AND METHODS.
20. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.

3.3 MANUFACTURER'S DIRECTIONS AND SUPERVISION

- A. Where supervision by a manufacturer is specified, follow all instructions and recommendations of the manufacturer. The manufacturer shall supervise the installation, connection, start-up, and adjustment, instruction of the Department and final tests of such equipment or system. Where two or more manufacturer's equipment is interrelated, take responsibility to coordinate their work and provide supervision.

- B. Have the manufacturer instruct the Department in the proper operation and maintenance techniques of all equipment, systems, etc., at the time of completion of all work.

3.4 TEST AND INSPECTION

- A. Upon completion of the work, notify the Professional in writing, that the entire electrical installation has been examined, inspected, tested, calibrated or adjusted as specified and that it is ready for final inspection. Work to be connected prior to final inspection and also include all of the work specified for "Manufacturers' Directions and Supervision." Include specified testing and inspection of documentation.
- B. Prior to each inspection, provide a written certification that each system or piece of equipment to be operated during that test has been tested and does meet design performance criteria of the Contract Documents.
- C. On completion of the work, obtain Certificates of Compliance, and approval or acceptance from all authorities having jurisdiction over the work, and deliver these certificates to the Professional. The work shall not be deemed to have reached a state of completion until the certificates have been delivered.

3.5 LOOSE EQUIPMENT

- A. Provide four keys for every different piece of electrical equipment which is equipped with a lock.
- B. Provide all other loose equipment specified/supplied for use with all systems.

3.6 MARKERS

- A. Furnish and install punched color tape markers, or color coded markers as determined by Department. Affix to ceiling grid or to access panel to indicate which ceiling panel is to be removed to obtain access to what control device, duct mounted smoke detector, etc.

3.7 SUBMITTALS AND SHOP DRAWINGS

- A. Refer to Division 1 for quantities and types of submittals and shop drawings.
- B. Submittals and shop drawings shall be submitted in groups by systems. For example, all lighting fixtures, lamps, ballasts and accessories shall be submitted simultaneously in one package.
- C. Where there are no specific submittal requirements in the specification section, provide manufacturer's standard literature showing the submittal items.
- D. Shop Drawings and/or Submittals Required:
 - 1. MC cable and associated connectors
 - 2. Automatic transfer switches
 - 3. Ballasts and accessories
 - 4. Batteries and battery chargers
 - 5. Boxes
 - 6. Cable tray
 - 7. Central control and monitoring systems
 - 8. Circuit breakers

9. Dimmers
10. Disconnect switches
11. Ductbanks and associated raceways
12. Electrical devices
13. Emergency generators and associated equipment
14. Emergency generator control system
15. Fire alarm systems
16. Firestopping
17. Fuses
18. Grounding materials
19. Interior and exterior lighting fixtures
20. Lamps
21. Ballasts
22. Lighting control equipment
23. Low voltage wire and cable
24. Nameplates and device markings
25. Panelboards and cabinets for Communication/Special Systems
26. Protective devices
27. Panelboards
28. Raceway connectors and fittings
29. Raceways
30. Interior lighting
31. Access Control & Security devices/equipments
32. Systems cabinets
33. Dry type transformers
34. Wiring devices

3.8 OPERATION AND MAINTENANCE MANUALS

- A. Prepare maintenance manuals in accordance with Division 1 Section "PROJECT CLOSEOUT." In addition to the requirements specified in Division 1, include the following information for equipment items:
 - B. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of replacement parts.
 - C. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and summer and winter operating instructions.
 - D. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
 - E. Servicing instructions and lubrication charts and schedules.
 - F. The minimum information that shall be furnished in the maintenance manual shall include the following:
 1. Individual characteristics for trouble shooting sequences for each item of each:
 - a. Branch circuit panel.
 - b. Communication system.
 - c. Distribution panel.

- d. Dry-type transformers.
 - e. Emergency generator control system.
 - f. Fire alarm system.
 - g. Generator set.
 - h. Special systems.
- G. Catalog cut sheets for every item for which a shop drawing is required.
- H. Schedule of loads served from each:
- 1. Automatic transfer switch.
 - 2. Branch circuit panel
 - 3. Distribution panel.
 - 4. Emergency generator control system.
 - 5. Generator set.
- I. On-hand spare parts list and complete parts list for each:
- 1. Distribution panel.
 - 2. Emergency generator control system.
 - 3. Generator set.
 - 4. Individual motor starter.
 - 5. Special system.
- J. Tap setting schedule for each:
- 1. Transformer.
- K. Bolt tightening torques and inspection intervals on each:
- 1. Bolted bus connection.
 - 2. Cable connection.
 - 3. Miscellaneous bolted electrical connections.
- L. Manufacturers' recommended cleaning intervals and special procedures for each:
- 1. Cooling fins.
 - 2. Dry-type transformer coil assembly.
 - 3. Electrical equipment interior.
 - 4. Electrical equipment ventilation opening.
 - 5. Lighting fixture lenses and reflectors.
- M. Main and arcing contact adjustment and replacement for each:
- 1. Automatic transfer switch.
 - 2. Contactor.
 - 3. Circuit breaker.
 - 4. Fused switch.
- N. Calibration and exercise procedures and intervals for each:
- 1. Automatic transfer switch.
 - 2. Control system.
 - 3. Generator set.
 - 4. Insulated case breaker.
 - 5. Molded case breaker.
 - 6. Relay.

- O. "As designed" and "as left" relay settings.
- P. Testing interval and target values for ground fault protection circuit relays.
- Q. Testing and trouble shooting procedures unique to special systems.
- R. Approved special construction details that differ from the details shown on Drawings.

3.9 COORDINATION DRAWINGS

A. QUALITY CONTROL:

1. Coordination Drawing Subcontractor: Employ the services of a third party entity who is not providing any physical construction work and who specializes in coordination drawing preparation utilizing three dimensional modeling techniques. The coordination drawing subcontractor shall have a minimum of five years of experience in providing this type of service using three-dimensional modeling. The coordination drawing subcontractor shall be directly contracted by the General Contractor.
2. Submittals: Within 30 days of receipt of notice to proceed submit the following. No other Division 23 or 26 submittals shall be released until after submission of this material.
 - a. Coordination Drawing Subcontractor Qualifications: Provide a firm profile describing the experience of the company in providing these services along with three project examples (including a name and phone number for a reference for each project). Provide a resume for key staff who will work on the project.
 - b. Coordination Implementation Plan: Submit a narrative description of how the coordination drawing subcontractor will work with the general contractor and each trade subcontractor. The narrative shall explain how individual trade shop drawings will be developed in concert with the coordination drawings, how coordination between the trades shall be accomplished, and how coordination meetings will occur along with a schedule. Indicate how structural steel shop drawings will be developed to coordinate with actual equipment and system weights and openings, and how the structural steel and Division 23 and 26 shop drawings and the coordination drawings shall all coordinate. Discuss how existing and new building architectural elements shall be accurately modeled and coordinated. Discuss how site features, such as grades and site utilities shall be modeled and coordinated. Explain what software will be used for each of the individual trades to produce their shop drawings, what software shall be used for modeling of the coordination drawings, and what software shall be used for clash detection. Explain the proposed clash resolution process.
 - c. Shop Drawings: Submit color shop drawings along with the native electronic drawing file. Unless the native electronic file is Autocad, Revit, or Navisworks, submit two copies of the viewing software required for the Consultant to review the model in 3D, including panning, zooming, and rotating views.
3. Coordination Drawing Activity Kick-off Meeting: Prior to the development of any trade shop drawings conduct a field meeting to kick-off the coordination process. Schedule the kick-off meeting with the Professional and Consultant a minimum of seven days in advance. The meeting shall review the complete coordination drawing process. Key staff and the foremen for every major trade shall be in attendance. Division 23 and 26 work shall not start on any portion of the site or building until Consultant's approval (or partial approval) of the associated coordination drawings for that portion of the work.

- B. Provide coordination drawings. Prepare coordination drawings in accordance with Division 1 Section "Project Coordination", to a scale of 1/4 inch = 1 foot - 0 inch or larger; detailing major elements, components, and systems of electrical equipment and materials in relationship with other systems, installations, and building components. Coordination drawings are a multi-discipline task and the drawings listed in both Division 23 and 26 shall be prepared by a single third party organization specializing in coordination drawing preparation and utilizing three dimensional modeling techniques to indicate: the building structure, walls, ceilings, lights, electrical and mechanical equipment, conduits 2" diameter and larger, ductbanks, cable trays, panelboards, main distribution panel, cabinets, racks, ductwork, HVAC piping, plumbing piping 2" diameter and larger, fire sprinkler piping, and similar features. Coordination drawings shall indicate both above ground and below grade work, both interior of the building and exterior of the building (on-site). Individual system shop drawings shall be prepared in coordination with the coordination drawing preparation. Coordination drawings shall indicate locations where space is limited for installation and access and where sequencing and coordination of installations are of importance to the efficient flow of the Work, including (but not necessarily limited to) the proposed locations of main distribution panel, panels, cable trays, racks, conduits, lighting fixtures, piping, ductwork, equipment, and materials. The contractor shall organize each subsystem to fit within the allowable space and shall propose minor to moderate alternative locations and/or rerouting of systems to resolve spatial conflicts. These adjustments shall be clouded. Include the items listed in the following paragraphs in the coordination drawing package.
- C. Indicate clearances to other equipment, systems, components, ductwork, piping, and structural elements.
- D. Indicate clearances for servicing equipment, including space for equipment disassembly required for periodic maintenance.
- E. Show exterior wall and foundation penetrations.
- F. Show fire-rated wall and floor penetrations.
- G. Show equipment connections and support details.
- H. Indicate sizes and location of required concrete pads and bases.
- I. Detail the electrical equipment rooms.
- J. Detail the IT room.
- K. Indicate scheduling, sequencing, movement, and positioning of large equipment into the building during construction.
- L. Prepare floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.
- M. Prepare reflected ceiling plans to coordinate and integrate installations, air outlets and inlets, light fixtures, communications systems components, sprinklers, and other ceiling-mounted devices.
- N. Prepare site utility drawings, coordinating the work with the Utility Company Structural Facilities shop drawing. Indicate all Division 26 and Division 23 work. Detail every crossing of Division 26 work with a site utility, including but not limited to: sanitary, storm, water, storm water retention, gas, geothermal, transmission lines, etc.
- O. Check for conflicts between Division 26 wall mounted devices and architectural furniture, fixtures, equipment, casework etc. Propose the relocation of Division 26 wall mounted devices and cloud the same on the drawings.

3.10 RECORD DOCUMENTS

- A. Prepare record documents in accordance with the requirements in Division 1 Section "PROJECT CLOSEOUT." In addition to the requirements specified in Division 1, indicate installed conditions for:
- B. Major raceway systems, size and location, for both exterior and interior; locations of control devices; distribution and branch electrical circuitry; and fuse and circuit breaker size and arrangements.
- C. Equipment locations (exposed and concealed), dimensioned from prominent building lines.
- D. Contract Modifications and actual equipment and materials installed.

3.11 CUTTING AND PATCHING

- A. General: Perform cutting and patching in accordance with Division 1 Section "CUTTING AND PATCHING." In addition to the requirements specified in Division 1, the following requirements apply:
- B. Perform cutting, fitting, and patching of electrical equipment and materials required to:
 - 1. Uncover Work to provide for installation of ill-timed Work.
 - 2. Remove and replace defective Work.
 - 3. Remove and replace Work not conforming to requirements of the Contract Documents.
 - 4. Remove samples of installed Work as specified for testing.
 - 5. Install equipment and materials in existing structures.
 - 6. Upon written instructions from the Professional, uncover and restore Work to provide for Professional observation of concealed Work.
- C. Cut, remove, and legally dispose of selected electrical equipment, components, and materials as indicated, including but not limited to removal of electrical items indicated to be removed and items made obsolete by the new Work.
- D. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.
- E. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.
- F. Protection of Installed Work: During cutting and patching operations, protect adjacent installations.
- G. Patch finished surfaces and building components using new materials specified for the original installation and experienced Installers. Installers' qualifications refer to the materials and methods required for the surface and building components being patched.
 - 1. Refer to Division 1 Section "DEFINITIONS AND STANDARDS" for definition of experienced "Installer."

3.12 FACTORY TRAINING

- A. Provide factory training on all equipment. Schedule training with at least 21 days notice to the Department and AE, by submitting a draft training schedule. Indicate all proposed training dates with specific equipment descriptions. The Contractor shall then confirm these dates with the Department and AE, and after received approval of these dates shall submit a final training schedule at least 14 days prior to the agreed upon dates.

END OF SECTION 260000