

**Division 26: GENERAL ELECTRICAL REQUIREMENTS**

**1. GENERAL INSTRUCTIONS**

**A. GENERAL REQUIREMENTS**

All requirements under Division 01 and the general and supplementary conditions of these specifications apply to this section and division. Where the requirements of this section and division conflict with those of Division 01, the electrical division takes precedence. Electrical work shall conform with all codes and regulations that affect this division, section, or both. Work under this division includes all material, equipment, supplies, transportation, services, and labor required to complete the entire system as required by the drawings and specifications, or necessarily inferred to be necessary to facilitate the function of each system as implied by the design and equipment specified.

The specifications and drawings for this section are complementary, and any portion of work described in one shall be provided as described in both. In the event of discrepancies, notify the Engineer and request clarification prior to proceeding with the Work involved.

Drawings are graphic representations of the work which the contract is based. They show the materials and their relationship to one another, including size, shape, location, and connection. They convey the scope of work, indicating the inter- and cross-arrangement of the systems without showing all of the exact details as to locations, offsets, control lines, and other installation requirements. Use the drawings as a guide when laying out the work and to verify that materials and equipment will fit in the designated areas, and when installed per manufacturer's requirements, will ensure a complete, coordinated, satisfactory, and properly operating system.

**B. DEFINITIONS**

Furnish "to supply and deliver to the project site, ready for unloading, unpacking, assembling, installing, and similar operations."

Install "to perform all operations at the project site including, but not limited to, the actual unloading, unpacking, assembling, erecting, placing, anchoring, applying, working, fitting, joining, connecting, chalking, wiring, commissioning, starting up and similar operations, complete, and ready for the intended use."

Submittals shall contain the project name, applicable specification sections, submittal data, equipment identification tags as shown on the drawings, and the Contractor's stamp. The stamp shall certify that the submittal has been checked and approved by the Contractor and that the drawings, specifications, and it is coordinated with other trades. Manufacturer product literature shall include shop drawings, product data, performance charts, samples, and other submittals required for proper installation and operation. Include the installation under the warranty required by this division. Engineer means increased involvement by and obligations to the Engineer, in addition to involvement by or on behalf of the Architect.

AJH: The local code and/or inspection agency (Authority) Having jurisdiction over the Work.

NRTL, National Recognized Testing Laboratory, as defined and listed by OSHA in 29 CFR 1910.7 (e.g., UL, ETL, CSA, and approved), and the AHJ are the only nationally recognized testing laboratories and standards listed are used only to reproduce the characteristics required and not intended to be used for any other NRTLs that are acceptable to the AHJ and standards that meet the specified criteria.

Horizontal: That portion of an electrical circuit originating at a junction box, termination box, receptacle, or switch with termination at an electrical panelboard. Note: Where MC cable (A230 cable) is utilized for receptacles and/or lighting branch circuiting, the originating point of the horizontal shall be at the first outlet on the circuit or at the junction box located in an accessible ceiling space as close as possible to the first load.

The terms "approved equal," "equivalent," or "equal" are used synonymously and shall mean "accepted by or acceptable to the Engineer as the General and Supplemental Conditions." The term "approved" shall mean labeled, listed, certified, or, if three, by an NRTL, and acceptable to the AHJ over the project.

**C. PRE-BID SITE VISIT**

Prior to submitting bid, visit the site of the proposed work and become fully informed as to the conditions under which the work is to be done. Failure to comply with this requirement shall not be considered sufficient justification to request a change in the contract price.

**D. MATERIAL AND WORKMANSHIP**

Provide new material, equipment, and apparatus under this contract unless otherwise stated herein, of best quality normally used for the purpose in good commercial practice, and free from defects. Model numbers listed in the specifications or shown on the drawings are not necessarily needed to designate the required item, written descriptions of the item govern model numbers. Provide markings or nomenclature for all material and equipment identifying the manufacturer and providing sufficient reference to establish quality, size, and capacity. All workmanship shall be of the highest quality by regular and experienced mechanics of the proper trade. In general, provide the following quality grades for all materials and equipment:

Commercial specification grade.

Provide all hoists, scaffolds, staging, runways, ladders, machinery, and equipment required for the performance of the electrical work. Store, maintain, and equipment in clean condition, and protected from weather, moisture, and physical damage.

Furnish only material and equipment that are listed, labeled, certified, or, if three, by an NRTL, wherever any listing or labeling exists for the types of material and equipment specified.

At a minimum, general work practices for electrical construction shall be in accordance with NECA 1 (latest edition), "Standard Practices for Good Workmanship in Electrical Construction."

**E. MANUFACTURERS**

In other articles where lists of manufacturers are introduced, subject to compliance with requirements provided by one of the manufacturers specified.

When a list is provided, manufacturers are listed alphabetically and not in accordance with any ranking or preference.

When manufacturers are not listed, provide products subject to compliance with requirements from manufacturers that have been actively involved in manufacturing the specified product for not less than 5 years.

**F. COORDINATION**

Coordinate all work with other divisions and trades so that various components of the systems are installed at the proper time, in the available space, and allow proper service access to those items requiring maintenance. Components which are installed without regard to the above shall be relocated at no additional cost to the Owner.

Unless otherwise indicated, the General Contractor shall provide chase and openings in building construction required for installation of the systems specified herein. Contractor shall furnish the General Contractor with information where chase and openings are required. Contractor shall keep informed as to the work of other trades engaged in the construction of the project and shall secure work in a manner as not to interfere with or delay the work of other trades.

Figural dimensions shall be taken in preference to scale dimensions. Contractor shall take his own measurements at all buildings, as variations may occur. Contractor shall be held responsible for errors that could have been avoided by proper checking and inspection.

Provide materials with trim that will properly fit the type of ceiling, wall, or floor finishes actually installed. Model numbers listed in the specifications or shown on the drawings are not intended to designate the required trim.

**G. ORDINANCES AND CODES**

Work performed under this contract shall, at a minimum, be in conformance with applicable national, state and local codes having jurisdiction. Equipment furnished and installed shall conform with the following AHJ, including any amendments and standards as set forth by the following:

- 1. National Fire Protection Association (NFPA)
- 2. Underwriters Laboratories (UL)
- 3. Occupational Safety and Health Administration (OSHA)
- 4. American National Standards Institute (ANSI)
- 5. American Society of Testing Materials (ASTM)
- 6. Rules and regulations of public utilities and municipal governments having jurisdiction over the project.
- 7. Other national standards and codes whose application is indicated.

Where the contract documents exceed the requirements of the codes, ordinances, rules, regulations, and codes, the contract documents shall take precedence. Where conflicts do exist between codes, ordinances, rules, and regulations set forth, comply with the most stringent.

Promptly bring all conflicts observed between codes, ordinances, rules, regulations, referenced standards, and these documents to the attention of the Architect and the Architect's legal resolution. Contractor will be held responsible for any violation of the law.

Procure and pay for permits and fees required for the accomplishment of the Work. Provide all safety lights, guards, and warning signs required for the performance of the work and for the safety of the public.

**H. PROTECTION OF EQUIPMENT AND MATERIALS**

Store and protect tools, equipment, and materials delivered to job site. For materials and equipment to be used in the project, store in a secure, dry, and protected area. Store materials in a secure, dry, and protected area. Store materials in a secure, dry, and protected area.

Remove all debris and materials from the work area. Remove all debris and materials from the work area. Remove all debris and materials from the work area.

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**I. SUBSTITUTIONS**

Materials, products, equipment, and systems described in the Bidding Documents establish a standard of required function, dimension, appearance and quality to be met by the proposed substitution. The basis for proposed substitution is the products from the manufacturer named in the drawings and specifications. To request a substitution, request the Substitution Request Form from the Architect or Engineer. Complete and submit the Substitution Request Form to the Architect or Engineer. The proposed substitution must be approved by the Architect or Engineer. Existing service entrances and leader conductors may be reused if all of the following conditions are met:

- 1. Proposed substitution has been fully investigated and determined to meet or exceed the specified work in all respects.
- 2. Proposed substitution is consistent with the Contract Documents and will produce indicated results.

Existing service entrances and leader conductors may be reused if all of the following conditions are met:

- 1. Existing service entrances and leader conductors may be reused if all of the following conditions are met:

- 1. Conductor sizes meet or exceed the sizes specified on the drawings.
- 2. Conductor insulation is in good or better condition.
- 3. Conductor insulation is the correct type for the conditions.

**C. EXCAVATION AND BACKFILLING**

Perform excavation and backfill required for installation of underground work under this contract. Perform excavation and backfill required for installation of underground work under this contract. Perform excavation and backfill required for installation of underground work under this contract.

No substitutions will be considered unless the Substitution Request Form is completed and attached with the appropriate substitution description. No substitution will be considered prior to receipt of bids unless written request for approval prior to bid has been received by the Engineer at least 10 days before the date of bid opening.

If the proposed substitution is approved prior to receipt of bids, such approval will be stated in an addendum. Bidders shall not rely upon approvals made in any other way. Verbal approval will not be given. No substitutions will be considered after the contract is awarded unless written approval is provided in the contract documents.

Provide factory generated point-by-point calculations for all exterior light fixture (photometric) files supplied to the engineer can generate a point-by-point do not suffice for the point-by-point calculations. Provide interior point-by-point calculations at the discretion of the engineer.

**J. SUBMITTALS**

Assemble and submit for review shop drawings, material lists, manufacturer product literature for equipment to be furnished, and other submittals required for proper installation and operation. Provide submittals in sufficient detail as to demonstrate compliance with these Contract Documents and the design concept. Prior to transmitting submittals, verify that the equipment submitted is mutually compatible and suitable for the intended use. Verify that the equipment, and maintain manufacturer recommended service clearances. If the size of equipment furnished makes necessary any change in location or configuration, submit a shop drawing showing the proposed submittal.

Transmit submittals as early as required to support the project schedule. Allow two weeks for Engineer review time, plus four working days for the Architect, plus a duplication of this time for resubmission. (Engineer Only) Resubmission for resubmission.

Submittals shall contain the project name, applicable specification sections, submittal data, equipment identification tags as shown on the drawings, and the Contractor's stamp. The stamp shall certify that the submittal has been checked and approved by the Contractor and that the drawings, specifications, and it is coordinated with other trades. Manufacturer product literature shall include shop drawings, product data, performance charts, samples, and other submittals required for proper installation and operation. Include the installation under the warranty required by this division. Engineer means increased involvement by and obligations to the Engineer, in addition to involvement by or on behalf of the Architect.

Submittals and shop drawings shall not contain firm names, logos, the seal, or signature of the Engineer. They shall not be copies of the work product of the Engineer. The Contractor desires to use elements of such product, refer to paragraph "Electronic Drawing File" for procedures to be used.

Separate submittals according to individual specification sections. Identify submittals to be rejected and returned without review. Catalog data shall be properly bound, identified, indexed and tabbed in 3-ring binder. Each item on model number shall be clearly marked and accessible in drawings. Label the catalog data with the equipment identification tag or number as used on the drawings and include performance curves, capacities, sizes, weights, materials, finishes, wiring diagrams, electrical and mechanical drawings, and other submittals required for proper installation and operation. Shop drawings will be returned without review if the above mentioned requirements are not met.

Provide the quantity of submittals required for the project. Provide a minimum of six (6) copies. Refer to Division 01 for acceptance of electronic submittals for the project. For electronic submittals, Contractor shall submit the documents in accordance with the procedure specified in Division 01. Contractor shall notify the Architect and Engineer that the submittals have been posted. If electronic submittal procedure is not utilized in Division 01, Contractor shall include a hard copy of the submittals, and acceptable to the Engineer. For submittals sent by e-mail, Contractor shall copy the designated representative of the Engineer as the recipient of the submittals for the Engineer review time as specified above in the construction schedule. Contractor shall submit only the documents required to provide the materials and/or equipment in the submittal.

The checking and subsequent acceptance of submittals by the Engineer and/or Architect shall not release the Contractor from the requirements and specifications, errors in drawings and specifications, details, size of equipment, or quantity, omissions of components or fittings, coordination of electrical requirements, and not coordinating items with actual building conditions and conditions of the project work. Contractor shall accept the responsibility for the design and coordination prior to implementing any deviation.

Aluminum Slotted Support Systems (Slotted Channel) Comply with MFMA-3, Type 6063-T6, per ASTM B221, factory-fabricated components for field assembly, 12-gauge, 1.58-inch by 1.58-inch.

Manufacturers: AFC Cable, Aflon, Anamet Electrical, Elchi-Flex, Indalex, Manhattan/CO/Clare/Flex, O-Zeddyne, Republic Raceway, Tyco International, Western Tube and Conduit, or Whelan/Tube.

1. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-3. 2. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane or polyester coating applied according to MFMA-3.

Aluminum Slotted Support Systems (Slotted Channel) Comply with MFMA-3, Type 6063-T6, per ASTM B221, factory-fabricated components for field assembly, 12-gauge, 1.58-inch by 1.58-inch.

Manufacturers: Cooper B-Line, ERCO International, HiL Power Solutions, Thomas and Betts, or Unifit.

Field Fabrication: Where field cutting of standard lengths of channel are required, make cuts straight and perpendicular to manufacturer's surface.

For field-cut or damaged steel of standard channels, dress cut ends, damaged surfaces, or both, with an abrasive material (e.g., Ho, grinding stone, or steel and cleaner to remove rust, oil, sharp edges, and slivers.

For channel with a factory-applied coating, re-finish cut edges with a coating compatible with the factory-applied coating and an recommended primer. For steel channel, use a manufacturer's touch-up paint or zinc-rich cold-painting compound, as applicable.

Provide access doors for all concealed equipment where indicated or as required by the code, above lay-in ceilings. Access doors shall be adequately sized for the equipment, provided with a minimum size of 18 inches x 18 inches. Access doors must be of the proper construction for the type of equipment to be installed. Doors shall be constructed of 1/2 inch thick steel, with a minimum of 1/2 inch thick steel for the door frame. Doors shall be constructed of 1/2 inch thick steel, with a minimum of 1/2 inch thick steel for the door frame. Doors shall be constructed of 1/2 inch thick steel, with a minimum of 1/2 inch thick steel for the door frame.

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Per form the following prior to starting up the electrical systems:

- 1. Check all components and devices and lubricate items accordingly.
- 2. Tighten screws and bolts for connections and terminals according to manufacturer's published torque listing values. If manufacturer's torque values are not indicated, use those specified in UL 48RA and UL 48RB.
- 3. Adjust loads on each transformer for rated secondary voltage when the transformer is at minimum load.
- 4. Check and record building's service entrance voltage, grounding conditions, grounding resistance, and proper shunting.
- 5. Replace or burn-out lamps and lamps used for temporary construction lighting in permanent light fixtures.
- 6. Balance the single-phase loads at each panelboard, redistributing branch circuit connections until balance is achieved. Do not use up final generated electricity until all rebalancing and redistribution of circuits are complete. Turn on all loads in an attempt to maximize the load on the panel and take accurate readings on each of the phases before redistributing circuits and balancing the panel.
- 7. After all systems have been inspected and adjusted, confirm operating features required by the drawings and specifications and make final adjustments as necessary.

**D. COINCIDENTAL DAMAGE**

Repair cracks, sidewalk, driveways, walkways, finishes, and other facilities damaged in the course of the Work. Repair cracks and other existing conditions, or as required by the Engineer, make satisfactory working condition. Repair work shall meet all requirements of the Owner, local authorities having jurisdiction, and meet the satisfaction of the Architect. Repair work shall be thoroughly first class. (Conform to requirements of Division 02 of the specifications.)

**E. CUTTING AND PATCHING**

Conform to the requirements in Division 01: Cut walls, floors, ceilings, and other portions of the facility as required to install work under this division. Obtain permission of the Architect prior to cutting. Do not cut or disturb structural members without prior approval from the Architect. Cut holes as small as possible. Patch walls, floors, and other portions of the facility with work under this division. Patching shall match the original material and construction including fire rating, if applicable. Repair and restore areas disturbed by work to the condition of existing surfaces in a manner satisfactory to the Architect.

**F. ROUGH-IN**

Coordinate rough-in all roughings with other divisions. Consult all conduit and raceways except in finished areas and where otherwise indicated on the drawings.

**G. CONCRETE BASES**

Provide concrete bases (e.g., housing/punch pads) for equipment where indicated on the drawings and as specified herein. Concrete bases shall have chamfered edges. Size of bases shall be a minimum of 4 inches greater than the footprint of the equipment that it supports and shall have a minimum height of 3-1/2 inches.

Construct equipment bases of a minimum 28-day, 4000 psi concrete conforming to American Concrete Institute Standard Building Code for Reinforced Concrete (ACI 318) and the latest applicable recommendations of the ACI standard practice manual. Concrete shall be composed of concrete conforming to ASTM C 150 Type 1 aggregate conforming to ASTM C23, and potable water. Exposed exterior concrete shall contain 5% organic admixture.

Unless otherwise specified or shown on the structural drawings, reinforce equipment bases with No. 4 reinforcing bars spaced at 12 inches on center with a minimum of two bars each side. Place reinforcing bars 24 inches on center with a minimum of two bars each side. Reinforce with No. 4 reinforcing bars 24 inches on center with a minimum of two bars each side.

Provide galvanized anchor bolts for equipment installed on concrete bases or on concrete slabs. Anchor bolts size, number, and placement shall be as recommended by the manufacturer of the equipment.

Steel Slotted Support Systems (Slotted Channel) Comply with MFMA-3, Type 6063-T6, per ASTM B221, factory-fabricated components for field assembly, 12-gauge, 1.58-inch by 1.58-inch.

Manufacturers: AFC Cable, Aflon, Anamet Electrical, Elchi-Flex, Indalex, Manhattan/CO/Clare/Flex, O-Zeddyne, Republic Raceway, Tyco International, Western Tube and Conduit, or Whelan/Tube.

1. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-3. 2. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane or polyester coating applied according to MFMA-3.

Aluminum Slotted Support Systems (Slotted Channel) Comply with MFMA-3, Type 6063-T6, per ASTM B221, factory-fabricated components for field assembly, 12-gauge, 1.58-inch by 1.58-inch.

Manufacturers: Cooper B-Line, ERCO International, HiL Power Solutions, Thomas and Betts, or Unifit.

Field Fabrication: Where field cutting of standard lengths of channel are required, make cuts straight and perpendicular to manufacturer's surface.

For field-cut or damaged steel of standard channels, dress cut ends, damaged surfaces, or both, with an abrasive material (e.g., Ho, grinding stone, or steel and cleaner to remove rust, oil, sharp edges, and slivers.

For channel with a factory-applied coating, re-finish cut edges with a coating compatible with the factory-applied coating and an recommended primer. For steel channel, use a manufacturer's touch-up paint or zinc-rich cold-painting compound, as applicable.

Provide access doors for all concealed equipment where indicated or as required by the code, above lay-in ceilings. Access doors shall be adequately sized for the equipment, provided with a minimum size of 18 inches x 18 inches. Access doors must be of the proper construction for the type of equipment to be installed. Doors shall be constructed of 1/2 inch thick steel, with a minimum of 1/2 inch thick steel for the door frame. Doors shall be constructed of 1/2 inch thick steel, with a minimum of 1/2 inch thick steel for the door frame.

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