
SECTION 26 00 00

ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. Conform to General and Supplementary Conditions, the modifications thereto and Division 1 General Requirements for all work in Division 26.
- B. Plans take precedence. Where conflict between specifications and plans, plans shall take precedence.

1.2 SCOPE OF WORK

- A. Provide labor, materials and appliances and satisfactory installation of electrical work ready to operate in accordance with these specifications. Work includes, but is not limited to, that as delineated in this specification section and on the architectural, civil, landscape, and structural drawings. Provide all work set forth below.
- B. Coordinate all electrical requirements with architect before ordering or installing any electrical components.

1.3 PROPOSAL

- A. Proposals shall contain, but not be limited to, the following data:
 - 1. Basic contract price for systems described herein.
 - 2. Adjustments to contract price for alternates.
- B. Contractors are invited and encouraged to develop and submit for consideration alternates to the basic systems and sub systems. Contractor shall include costs for redesign, plan revisions and permit resubmittal in their alternate pricing.

1.4 INCLUSION

- A. Bidding Requirements, Conditions of the Contract, and Division 1 are a part of this Section and Contract for this Work and apply to this Section as if fully repeated here.

1.5 CODES AND STANDARDS

- A. If any conflict occurs between legally adopted codes and this specification, the codes are to prevail; this shall not be construed as relieving the Contractor from complying with any requirements of the plans or specifications which may be in excess of code requirements and not contrary to same.

- B. All materials and equipment installed, including lighting fixtures, shall have been tested and listed by Underwriters' Laboratories (or other code recognized laboratory) unless otherwise permitted by the authorized code inspector and the Architect/Engineer.
- C. All electrical work shall be executed in strict accordance with the latest edition of the standards and codes and all local ordinances and regulations as indicated on plans.
- D. The Contractor is required to familiarize himself with the detailed requirements of these standards and any local codes and ordinances as they affect the installation of specific electric systems.

1.6 FINAL CONSTRUCTION APPROVAL

- A. Completion and approval of the following is required for final approval of systems.
 - 1. Execution of Architect's and Engineer's final observation reports.
 - 2. Operation and maintenance instruction.
 - 3. Operation and maintenance manuals submitted.
 - 4. Equipment cleaning.
 - 5. Record drawings submitted.
 - 6. Preliminary Commissioning Report submitted.
 - 7. Final Commissioning Report submitted.
 - 8. Energy Code Installation Certifications submitted.
 - 9. Energy Code Acceptance Certifications submitted.

1.7 SUMMARY OF WORK

- A. The work included by the Division 26 contractor shall be to provide complete systems relating to the information shown on the drawings and specified herein.
 - 1. The following shall be the responsibility of the Division 26 contractor:
 - a. All systems and requirements indicated on Electrical plans.
 - b. Initial site visit to confirm existing conditions.
 - c. Incoming Utilities – Installation of Incoming Services: Power; telephone infrastructure; cable TV infrastructure, including complete coordination with utility companies.
 - d. Interior/exterior lighting – Lighting fixtures, branch circuiting, controls, switching (manual, automatic, and daylighting).
 - e. Power Distribution: Feeders, branch circuiting, control wiring, equipment, disconnection means, overcurrent protection, panelboards.
 - f. Wiring Devices: Receptacles, switches, occupancy sensors, and matching wall plates.
 - g. HVAC / Plumbing System Connections: Disconnecting means, motor starters, conduit for controls & CO/NO₂ sensors, 120V wiring for controls and fan shutdown as required by mechanical and plumbing contractors.
 - h. Building System Connections: Disconnecting means, starters, controls, conduit, etc. for building systems including (but not limited to): Doors, Sump pumps, Elevators, Vehicle charging stations; Lifts, Automatic doors; Overhead and garage

doors; Irrigation; Energy management systems; Water treatment and management systems, etc.

- i. Emergency Systems: NEC articles 700, 701 and local jurisdictional requirements.
 - j. Fire Alarm Systems: Control panel, associated devices, submittal and local jurisdictional review and approval, permitting, testing, etc. for complete code compliant system.
 - k. Emergency Responder Distributed Antenna System (DAS): Testing, system installation, and local jurisdictional approval.
 - l. As-built red-lined drawings.
 - m. Grounding / Bonding of electrical systems and equipment per NEC, state and local code.
2. Obtain and pay for all permits for the work of this section.
 3. Coordinate with General Contractor and contractors for work of other sections which interface with the work of this section and affect the detailing and proper installation of this work.

1.8 DOCUMENTATION

- A. Product Submittals: Within thirty (30) calendar days (or as required by Division 1) after contractor's receipt of Owner's Notice to Proceed, submit in PDF format:
 1. Organized PDF electronic file that includes relevant catalog data for all electrical equipment and light fixtures in accord with Division 1.
 2. Unless otherwise indicated, material and equipment to be submitted includes all items specified in Part 2 (Products) in each section of Division 26 and as listed on equipment schedules on drawings, and/or necessary to complete the work.
 3. Clearly indicate on each page the equipment schedule designation, as applicable, and model intended for use.
 4. Do no fabrication or manufacture any products until return of approved submittals.
 5. Electrical service gear shall not be ordered prior to receiving Utility approval of equipment shop drawings.
- B. Provide shop drawings for all products, systems, system components, and special supports which are not a standard catalog product and which may be fabricated for the Contractor or by the Contractor. Lay out drawings to scale and show dimensions where accuracy of location is necessary for coordination or communication purposes.
- C. The word "provide" in the drawings and specifications shall be understood to mean "furnish and install complete and operational".
- D. Permits: Submitted for, paid for, and obtained by Contractor. Submit copies of signed, approved permits to the Architect. See Supplementary Conditions.
- E. Record Drawings: See Division 1. Provide two sets of record drawings.
- F. Operating and Maintenance Manuals: Furnish three (3) copies of operating and maintenance manuals along with identical document in PDF format. Manual shall be hard-cover loose-leaf with index and tabbed Sections. Manual shall include the following:
 1. Manufacturers, suppliers, and subcontractors' names, address, and phone numbers.

2. Schedule and description of routine maintenance for each component.
 3. Written guarantees.
 4. As-built Record drawings corrected and completed.
 5. Copies of manufacturer's warranties on equipment.
 6. Equipment submittals.
- G. Operation Instruction Period: Conducted by Contractor during minimum eight (8) hour period. Deliver and post all operation and maintenance instructions at this time.

1.9 WARRANTY

- A. Warrant materials and workmanship for one year in accord with the General and Supplementary Conditions. Provide written guarantees which exceed one year. Submit with Maintenance and Operating Manual. Warranty period to extend from date of substantial completion.

1.10 EMERGENCY SERVICE

- A. The subcontractor shall provide a twenty-four (24) hour emergency telephone number for all warranty work related to their contract. The subcontractor shall complete all emergency service work with the same day of notice.

1.11 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and methods needed for proper performance of the work of this section.
- B. All electrical equipment, materials, construction methods, tests and definitions shall be in strict conformity with the established standards of the following in their latest adopted revisions.
1. Underwriters Laboratories, Inc. (UL)
 2. National Electrical Manufacturers Association (NEMA)
 3. Rules and regulations of the public utilities and agencies serving this project.
 4. National Fire Protection Association (NFPA)

1.12 COORDINATION

- A. The Division 26 Contractor is responsible to coordinate electrical work with other trades to allow the code compliant installation of electrical equipment, raceways, lighting, etc. with respect to other equipment including but not limited to ductwork, piping, HVAC equipment, and furniture. Coordination shall be performed with other trades, including General Contractor, by reviewing shop drawings, architectural/mechanical/civil/structural drawings, and furniture layouts. Relocation of electrical equipment to accommodate other trades shall not be considered grounds for additional funds beyond the base contract, but shall be considered part of Contractor's coordination responsibility.
- B. Special attention is called for the following items:

1. Door swings such that switches will be located on the "strike" side of the door.
 2. Location of fixtures, pipes, ducts and other mechanical equipment such that electrical outlets, lighting fixtures and other electrical equipment are mounted on proper relationship to these items.
 3. Adequate space above ceiling to allow for recessed lighting fixtures.
 4. Recessed lighting fixture trim and installation required to accommodate ceiling type (i.e. Gyp or lay-in).
 5. Location of cabinets, counters, and furniture, such that electrical work is clear from and in proper relation to these items.
 6. Penetrations of building structure for electrical work.
 7. Compliance with Section 110-26 of C.E.C. Working Clearances.
 8. Coordination and provisions for maintaining lighting and power to areas in use during construction (comply with General Division Provisions).
 9. HVAC equipment controls. Provide conduit for 120V HVAC controls.
- C. When conduit, inserts or sleeves for outlet boxes and/or conduits are required, Contractor shall fully coordinate the installation thereof with other trades.
- D. The Division 26 Contractor shall take full responsibility for troubleshooting all electrical systems in the building. The Electrical Contractor shall be responsible for overall coordination of all electrical systems and ensuring correct and full operation of all systems and system interfaces. The Electrical Contractor shall coordinate the interfaces between the electrical systems and all other systems.

1.13 UTILITY COMPANY COORDINATION

- A. The Division 26 contractor shall be responsible for all aspects of providing the incoming services. Prior to bid, contact serving utility companies and confirm requirements for incoming services (power, telephone, cable TV, fiber). Provide all conduit, vaults, pads, grounding, trenching, backfill, etc. as required by serving utilities.
- B. Visit the site to examine and note all conditions as to the character and extent of work involved. Verify locations of existing utilities and include all demolition, restoration and/or relocation necessary to accommodate incoming utilities.
- C. Coordinate temporary service requirements (application, location, capacity, etc.) with utility company and general contractor.
- D. Utility company fees to be paid by owner.
- E. Attach service record label with space for future service to all major equipment.

1.14 SYSTEMS DESCRIPTION

- A. General
 1. Provide complete and operating systems, including all labor, materials, services, transportation, meters, structures, equipment, lines, conductors, devices, and connections to public services and utilities. Pay all permit fees, etc., and arrange for

and coordinate all work done by the public works agencies and utilities supplying service to and within the project.

2. Coordinate with other contractors for irrigation, fire sprinkler system and building systems which inter-connect with the work of this section, and with the contractor for work of other sections, for additional conditions, sizes, loads, and requirements which shall be incorporated in this work.
- B. Electrical Service
1. Provide secondary conduit in size and number sufficient to accommodate conductors per utility requirements.
 2. Short Circuit Current
 - a. Contractor shall confirm available short circuit current at utility company transformer and shall notify Engineer if fault exceeds design value indicated on plans.
 - b. Series rated systems are not acceptable unless explicitly approved by Engineer and local AHJ. Provide manufacturer's literature showing Series rated system.
- C. Convenience Outlets
1. Provide receptacles in accordance with CEC and local codes.
 2. Device locations in first guestroom unit shall be reviewed and approved by Owner prior to rough-in of remaining units.
 3. Provide Ground Fault Circuit Interrupter (GFCI) type receptacles in all areas exposed to water, and as required by N.E.C.
 4. Provide weatherproof type receptacles (GFCI) type with "Weatherproof While In-Use" cover) in all exterior areas.
 5. Provide Arc-Fault Circuit Interrupter type circuit breakers serving dwelling unit family rooms, dining rooms, living rooms, dens, bedrooms, closets, hallways, etc. as required by C.E.C.
 6. Provide Combination type Tamper-Resistant receptacles in all areas of dwelling unit as required by C.E.C.
 7. Dwelling Units – Provide tamper-resistant type receptacles in dwelling units as required by C.E.C.
- D. Lighting
1. Provide all light fixtures, fully lamped, as specified. Light fixtures that have screw-in lamp bases shall bear a visible label indicating the maximum wattage of the lamp to be installed as indicated in the Luminaire Schedule on the plans. Fixtures that are not properly labeled and are noted by the Inspector shall be relabeled so they are compliant with the Energy Code.
 2. Provide circuiting and controls for lighting as required by the Energy Code.
 3. Provide Energy Code required local, manual, and automatic controls.
 4. Lighting Shutoff Controls: Unless otherwise shown on drawings, all exterior lighting shall be switched on by a roof-mounted photocell and multi-pole contactor control and switched off by an automatic, digital, astronomical time clock. Coordinate control scenario with owner prior to installation.
 5. Provide gyp board taped tent (to match fire rating of ceiling assembly) over all recessed fixtures in fire rated ceilings, or in direct contact with insulation.
 6. Pole-base: Provide concrete pole base for all exterior pole-mounted luminaires.

E. Data/Telephone System

1. Unless otherwise shown, provide raceway and rough-in for telephone outlets and data outlets as indicated on plans. Contractor shall coordinate locations of all data/telephone outlets with Owner's representative and Owner's Data/Telephone Vendor prior to installation.
2. Contractor shall provide incoming telephone service infrastructure in compliance with serving telephone company. In addition, provide for: telephone company meeting at site, incoming conduit, vaults, backboards, grounding, etc.

F. Cable TV System

1. Contractor shall provide incoming cable TV service infrastructure in compliance with serving cable TV company (Conduit, backboard, vaults, installation). In addition, this shall include, but not be limited to: Cable TV company meeting at site, incoming conduit, vaults, backboards, grounding, etc.
2. Owner's Data/Telephone Vendor to provide design and installation of cable TV system.

G. HVAC/Plumbing System

1. Provide power connections to all mechanical equipment, local disconnecting means, starters not provided with equipment or by Division 22 and Division 23, 120V control wiring, conduit for control wiring, fire-smoke damper connections, duct detectors, and separate wall control switch for exhaust fans. Coordinate requirements with Division 22 and Division 23.
2. Provide code required convenience receptacles (GFCI weatherproof for outdoor locations) within 25'-0" of mechanical equipment.
3. Provide 120V thermostats, as sized by Division 23.

H. Distributed Antenna System (DAS)

1. Provide a complete Distributed Antenna System (DAS), to provide radio coverage for first responders, as required by section 510 of California Fire Code, section 915 of the California Building Code, state and local codes. Coordinate required type and frequency with local public safety officials.
2. Requirements, testing, permits, etc. shall be coordinated with local AHJ.

PART 2 - PRODUCTS**2.1 GENERAL**

- A. Provide only materials that are new, of the type and quality specified. Where Underwriters Laboratories, Inc. has established standards for such materials, provide only materials bearing the UL label.
- B. Materials and equipment furnished shall be of current production by manufacturers regularly engaged in manufacturing of such items, for which replacement parts shall be available. Items not meeting this requirement, but which otherwise meet technical specifications, and merits of which can be established through reliable test reports or physical examination of representative samples, will be considered.

- C. When more than one unit of the same class of equipment or material is required, such units shall be the products of a single manufacturer.
- D. Provide only materials of dimensions, which will fit in the space or spaces indicated and allow proper clearance and access per code.

2.2 POWER DISTRIBUTION

A. Panels

1. Branch Panelboards: Single door, dead front of code gauge steel with trim and door of 12 gauge stretcher-leveled steel, factory finish painted. Flush trims: No exposed hardware, 20" wide (minimum) x 5-3/4" deep (maximum), unless otherwise noted. Where flush enclosures are deeper than wall, provide frame to seat trim flush.
 - a. Provide lockable flush type combination latch (all locks keyed the same), with two keys for each lock.
 - b. Install six inch by eight inch (6"x8") typewritten directory behind plastic on inside of enclosure door showing circuit number and complete as-built description of all outlets controlled by each circuit breaker. Arrange directory to match actual circuit breaker arrangement within panel.
 - c. Circuit breakers to be molded case, quick-make/quick-break thermal magnetic, with on, off and tripped positions. Provide lock-off position breakers as required by code.
2. Acceptable Manufacturers: Square D, Eaton-Cutler-Hammer, G.E., Siemens.

B. Raceways

1. Conduit furnished and incorporated into the electrical work shall be manufactured in accordance with National Electrical Code, and the American Standards Association.
2. Rigid steel conduit: Threaded type, hot dipped galvanized, with threads hot galvanized after cutting shall be used in wet, corrosive, or hazardous environments, subject to physical damage, and panel feeders exceeding 2-1/2" DIA. Conduit to double locknuts and grounding bushings.
3. Electrical metallic tubing: Zinc coated shall be used in dry, concealed locations, such as stud partitions and construction. Electrical metallic tubing shall form a continuous run from outlet to outlet or terminal and shall use approved watertight compressor ring or tap-on type fittings. Indented fittings shall not be used.
4. Flexible steel conduit: Zinc-coated shall be used in short runs from motors to junction boxes and from recessed circuit wiring as approved. Where approved, flexible steel conduit may be used when conditions make the use of other conduit impractical. Fittings shall be of the screwed wedge type. Use neoprene-jacketed flexible conduit in locations exposed to weather or dampness with suitable gland type waterproof fittings.
5. Rigid Non-Metallic Conduit: Schedule 40 PVC shall be used for underground applications or encased in concrete, unless otherwise noted. All bends 45 degrees or larger shall be made with rigid steel elbows. Schedule 80 PVC shall be used under drivable surfaces.
6. Liquidtight flexible metal conduit (LFMC) – Zinc coated galvanized steel with PVC jacket – oil and sunlight resistant. It shall be used for connections to vibrating equipment, motors, and locations subject to weather, water and other liquids. It shall not be used for runs exceeding 6'-0".
7. Provide supports, fasteners, etc. as approved by state and local codes.

8. Provide raceways for low voltage systems in exposed areas, garage, electrical/mechanical rooms.
9. MC Cable may be used where indicated on plans.
10. NM (Non-metallic) type cable may be used as indicated on plans.
11. Acceptable Manufacturers: Allied Tube & Conduit, National Electrical Products, Western Tube & Conduit, Carlon.

C. Boxes

1. Outlet boxes: 4-square, galvanized pressed steel to suit the device or outlet, as manufactured by Steel City, Bowers or Appleton. Four inch, square or octagon boxes shall be used in common areas. Approved plastic, single gang boxes may be used in dwelling units, where NM type cable is used.
2. Junction and Pull boxes: Use standard outlet boxes where possible. If not possible, use code-gauge, factory painted, sheet steel box with screwed-on cover to suit.
3. Cast concrete pull boxes: Sized per code + 25%. Provide traffic cover where exposed to traffic. Complete with side and bottom.

D. Conductors

1. Solid or stranded, copper with 600 volt insulation unless otherwise indicated or required. Conductors used in high temperature locations shall have insulating types required by code. Aluminum feeders acceptable where indicated on plans. Wire size #8 AWG and smaller shall be standard conductor with THHN/THWN insulation. Minimum conductor size for branch circuit wiring shall be #12 AWG. For control, wiring may be #16 AWG, if not indicated otherwise on the drawings. Marking of conductors shall be in accordance with code requirements. Size conduit accordingly. Deliver unmarked cable or wire to the job site in unbroken containers.
2. Splices: Splices shall join conductors with an electrically and mechanically secure connection. Conductors of #4 AWG or larger shall be joined by approved pressure type solderless connectors and may be taped or covered with approved hot molded insulating covers. Use "Scotchlock" or equal wire screw connectors on #6 AWG and smaller wire.
3. Insulating tape: Insulating tape shall be an approved electrical plastic of self-curing laminated rubber type, and shall be applied tightly with a minimum of three (3) half lapped layers.
4. Terminal connectors: Terminal connectors of conductors #4 AWG and larger shall be made with approved pressure type solderless lugs. For aluminum wire, use indenter or set screw type.
5. Acceptable Manufacturers: American Wire & Cable, Cabelec, Southwire.

E. Wiring Devices

1. Duplex receptacles: Back and side wired with a thermoplastic nylon, high impact resistance face, wraparound mounting strap, brass ground contacts riveted to strap with brass rivets – 125 volt rated. Provide GFCI type as indicated, and as required by code. Color by Architect.
 - a. 15amp and 20amp, commercial grade – Standard
2. Switches: 125 volt, grounding quiet type, of type indicated on the drawings for use intended. Color by Architect.
 - a. 20amp, commercial grade – Standard

3. Coverplates: Nylon, impact resistant plates, to match wiring device type and color. Provide weatherproof type for exterior locations. Color by Architect.
4. Acceptable Manufacturers: Leviton, Hubbell, Pass & Seymour.

2.3 LIGHT FIXTURES

A. General

1. All light fixtures shall be complete units, delivered in original carton, free from damage or blemishes.
2. Pendant or surface-mounted fixtures shall be provided with required mounting devices and accessories and shall include hickey, stud extension, ball aligners, canopies and stems.
3. Mounting heights shall be as directed by Architect.
4. Provide all necessary anchors, plates, etc., to mount fixtures as required by surfaces on which they are mounted.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordination

1. Coordinate as necessary with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this section.
2. Coordinate the installation of electrical items, openings, chases, sleeves, etc. with the schedule for work of other trades to prevent unnecessary delays in the total work.
3. Where lighting fixtures and other electrical items are shown in conflict with locations of structural members and mechanical or other equipment, provide required supports and wiring to clear the encroachment.
4. Owner/Architect has the right to move any device location within 5'-0" of location shown prior to rough-in without change in contract cost.

3.2 INSTALLATION

A. General

1. Install all work so that its several component parts function as a workable system, complete with all accessories necessary for its operation.
2. Comply with the standards and the installation instructions of the manufacturers of all materials and equipment used, where dimensions or specific installation and operating instructions are not provided in the drawings or specifications. Conflicts between the manufacturer's recommendations and the drawings or specifications shall be brought to the attention of the Architect prior to bid opening and resolved before the product is deemed acceptable.
3. Install equipment to avoid obstructions, preserve headroom and to keep openings and passageways clear. Keep conduits within furring lines established on the architectural Drawings.

4. Install all portions of this work thoroughly braced, supported and secured per code and for service life of hard use.
 - a. Provide all inserts and anchors required.
 - b. Provide all sleeves, blockouts, bucks, etc. and place in construction as the work progresses.
 5. Provide all cutting and patching as required for this work.
 6. Arrange all equipment for economy of operation and ease of access and maintenance.
 - a. Provide access panels as necessary for concealed portions of the work.
 - b. Group related equipment and controls together.
 - c. Label all controls, panels, disconnect switches, etc. with permanent machine-written engraved labels.
 - d. Install all work neatly, taking care that the finished work is level, plumb, and true to line and dimensions.
 - e. Install controls, switches, etc. as required by code for disabled access.
- B. Conduit Installation**
1. All wiring (except NM type and MC cable) shall be run in conduit and concealed, unless specifically noted otherwise and approved prior to installation. All wiring (including NM type cable, low voltage) shall be run in conduit where exposed (garages, unfinished areas). Exposed conduit shall be prior approved by Architect.
 2. MC cable shall be allowed for resident unit load center feeders and branch circuits only. It shall not be used for panelboard feeders, HVAC & building system equipment – pumps, motors, fans, etc.
 3. Conduit may be run exposed in unfinished areas (as approved by Architect). Conduit shall be run plumb and straight with building lines and routing shall be approved by Owner/Architect prior to installation.
 4. Conduit shall be supported by straps, suitable clamps, or hangers to provide a rigid installation per NEC requirements. Perforated strap hangers and twisted wire attachments will not be acceptable. Raceways shall be independently supported and separate from other system supports.

3.3 TESTING AND INSPECTION

- A. Provide personnel and equipment, make required tests, and secure required approvals from the servicing utilities and governmental agencies having jurisdiction.
- B. Test all parts of the electrical system and ensure that all such items provided under this section function electrically in the manner required.

3.4 TRAINING

- A. Provide two 2-hour training sessions by factory representatives for all low voltage systems: security, access control, intercom, emergency system, etc. Coordinate sessions with Owner.

END OF SECTION