

Section 16000 - Electrical Specifications

General

1. General Conditions:
    - a. The General Conditions, Supplementary Conditions and Special conditions are a part of this contract and apply to this section as fully as if repeated herein.
  2. Scope:
    - a. This section of specifications includes but is not limited to:
    - b. All labor, tools, appliances, materials, and equipment required to furnish and install the complete installation shown on the drawings for this section of the work and/or in the following specifications, including that which is reasonably inferred.
  3. Codes and Regulations:
    - a. All IWCRI and materials shall be in accordance with applicable requirements of public authorities having jurisdiction and utilities furnishing services.
    - b. codes governing this work include but are not limited to the latest approved edition of the following:
      - i. national fire protection association's national electrical code (NEC)
      - ii. California administrative codes, title 9 and title 24 (in California only)
      - iii. occupational safety and health act (OSHA)
      - iv. local ordinances and regulations.
  4. Standards:
    - a. Electrical material and equipment shall have been tested and listed or labeled as conforming to approved published standards by Underwriters Laboratories where such listing or labeling service is available for the class of materials or equipment. Where applicable, listing or labeling shall apply to the complete assembled equipment and not to the components alone.
  5. Submittals:
    - a. Three copies of materials list, shop drawings, and data sheets shall be submitted to Owner's Construction manager for review. Submittals shall be made and favorable review secured before material and equipment is installed.
    - b. Materials list shall include fixtures, switchgear, panels, devices, wireways, disconnects, lamps, and all other specified or unspecified standard cataloged materials to be used. The list shall include manufacturer, type, and such other descriptive data as may be required to determine the acceptability of each item.
    - c. Shop drawings and data sheets for equipment and systems shall be submitted where required in the specification for those items. Include information on each component, wiring diagrams, layouts, dimensions and sufficient other data to establish compliance with the specifications and acceptability of the equipment or system.
  6. Permits and Drawings:
    - a. Permits and inspections shall be by the General Contractor.
  7. As-Built Drawings:
    - a. On a set of contract drawings, kept at the site during construction, mark all work that is installed differently from that shown, including any revised circuitry, material, or equipment. Upon conclusion of work, deliver to Owner's Construction Manager a set of signed and dated "as-built" drawings.
  8. Guarantee:
    - a. All work shall be guaranteed for a minimum period of one year from the date of acceptance by the Owner. The guarantee period for certain items shall be longer, as indicated in the specification for those items.
    - b. Should any malfunction develop during the guarantee time period due to defective material, faulty workmanship, or noncompliance with plans, specifications, codes, or directions of the Owner, Architect, Engineer, or Inspector, the Contractor shall furnish all necessary labor and materials to correct the malfunction without additional charges.
- Products
1. Metering and Service Equipment:
    - a. Metering and main service equipment shall be Square-D and shall include all required metering and main disconnect equipment such as power company meter socket and ring, current transformer space and connections, test block, gutters, main switches, and all other equipment required by the serving utility. Applicable codes shall apply to all service equipment and installation whether or not shown on the drawings or described.
    - b. The underground service pull section shall be furnished and installed by the Contractor as shown on drawings and shall comply with the requirements of the serving utility.
    - c. Construction and installation shall conform to the specification for "Distribution Switchboards". Location shall be as shown on the drawings.
    - d. Special construction or features shall be as shown on the plans. For switches and other items included refer to the paragraph where those items are specified.
    - e. Submit shop drawings as required under "Submittals".
    - f. All conductor terminals and equipment enclosures shall be UL listed for use with minimum 75-degree C rated conductors.
  2. Distribution Switchboards:
    - a. Switchboards shall be factory assembled type by the same manufacturer that furnished the main service equipment. Voltage, phase, wire, rating, location, arrangement, and components shall be as shown on the drawings.
    - b. Switchboards shall be free standing units of angle iron or formed steel construction enclosed on the four sides and top. Top, front, and back panels shall be die formed of code gauge steel with no raw metal edges on the front.
    - c. Switchboards shall be shop finished in ANSI 61 gray enamel. All front plate shall be baked to obtain maximum finish hardness.
    - d. Bussing shall be tin plated electrical grade aluminum. Dimensions of busbars shall be based upon the ampacity shown on the plans. Bussing shall extend the full height of distribution sections. Busbars shall be rigidly supported, braced for 65,000 amperes symmetrical and spaced according to the UL and NEC standards for bare busbar.
    - e. Provide a nameplate for each switchboard item on the face of the switchboard as specified in section "Nameplates".
    - f. Circuit breakers, switches, and other equipment to be included as an assembled part of a switchboard shall comply with the sub-section or paragraph where those items are specified.
    - g. All conductor terminals and equipment enclosures shall be UL listed for use with minimum 75-degree C rated conductors.
  3. Panelboards:
    - a. Panelboards shall be factory assembled circuit breaker type by Square-D. The number of poles, type, voltage, and ampere ratings shall be as indicated on the drawings. Bussing shall be aluminum.
    - b. Neutral wires shall be connected to a common neutral bus with binding screws or lugs. The neutral bus shall be insulated from the cabinet. Ground wires shall be connected to a common equipment ground bus with binding screws or lugs. The ground bus shall be bonded to the cabinet.
    - c. Cabinets shall be flush mounted. Cabinets shall be constructed of galvanized steel conforming to UL and NEC standards.
    - d. Fronts of cabinets shall be not less than 12 gauge steel fastened with screws in countersunk washers, or with approved concealed spring clamps. Cabinet fronts shall have hinged lockable doors with rolled keys (all panels shall be keyed alike) and circuit schedule holders with clear plastic windows. Provide typewritten schedule in holders and submit copies for record purposes. Doors shall be fastened to trim with full length flush hinges. Panel fronts shall be shop painted with 2 coats of primer and a finish coat of gray enamel.
    - e. Special panelboard construction or features shall be as shown on drawings. For circuit breakers, contactors, and other equipment to be included as an assembled part of the panelboard, refer to the paragraph where those items are specified.
    - f. All conductor terminals and equipment enclosures shall e UL listed for use with minimum 75-degree C rated conductors.
    - g. Panelboard directory for each panel shall be neatly typed indicating actual load for each branch circuit.
    - h. Provide signage for all panelboards and switchboards warning qualified persons of potential flash hazard as required in NEC 110.16.
  4. Circuit Breakers:
    - a. Circuit breakers shall be by the same manufacturer that furnishes the main service equipment and panelboards.
    - b. Breakers shall be molded case bolt-on type. Clamp-on, push-on, or plug-in types are not acceptable. Removable handle ties and dual, quad, or tandem breakers are not acceptable. Mounting hardware, accessories, faceplates, and enclosures shall be provided as necessary for the intended use.
    - c. Short circuit interrupting capacity shall be as indicated on the plans and shall in no case be less than 10,000rms symmetrical amps at the applied voltage.
  5. Disconnect Switches:
    - a. Switches shall be by Square-D.
    - b. Switches and enclosures shall be general duty. They shall be externally operated, quick-make, blade type, or numbers of poles and rating indicated or required.
    - c. Enclosures shall be NEMA 1 for dry interior locations and NEMA 3R for damp, wet, or exterior locations. Finish shall be ANSI 61. Covers shall have a detachable interlock. Operating handles shall be pad-lockable.
    - d. Short circuit withstand ratings shall be 200,000 rms symmetrical amps.
    - e. Switches shall accept fuses of the rating and UL or NEMA class indicated.
    - f. Submit data sheets of the disconnect switches as required under "Submittals".
    - g. All conductor terminals and equipment enclosures shall be UL listed for use with minimum 75-degree C rated conductors.
  6. Manual Motor Starters:
    - a. Where shown on the plans, fractional horsepower motors shall have toggle type manual starters with thermal overload protection on each motor where the motor is out of sight of the switch provide a pilot light in the cover to indicate switch is closed.
    - b. Submit data on starters as required under "Submittals".
  7. Snap Switches:
    - a. AC general use snap switches shall be toggle handle, quiet operating, premium or heavy duty electrical grade, UL listed and verified to meet Federal Specification W-S-896-D and NEMA heavy duty tests. Color shall be white.
    - b. All switches shall be rated 120/277 volts. For the 20 amp size, HP shall be 1 for 120V and 2 for 240V.
    - c. Switches shall be as listed below:
      - i. 20A SPST - Hubbell 1221, Leviton 1221, or PAS 521.
    - d. Switches required but not listed shall have equivalent quality as those listed above.
  8. Receptacle Outlets:
    - a. Receptacle outlets shall be standard NEMA configuration, grounding type.
    - b. General convenience outlets shall be 20 amp, 125 volt, 2 pole, 3 wire grounding. Outlets shall be UL listed and verified to meet Federal Specification W-C-595-c and NEMA heavy duty performance tests.

- c. Convenience outlet fronts shall be white. Color shall be brown on wood paneled walls.
  - d. Outlets shall be as listed below; numbers do not include color designation or options.
    - i. 20A convenience - Hubbell 5352, Leviton 5362, or PAS 5362.
  - e. Special outlets, not listed above, shall be standard NEMA configuration for the application shown and shall be of equivalent grade and quality to those listed above. An approved cord cap and plug shall be furnished with each receptacle outlet except general convenience type. Plug shall be of the same grade, quality, and manufacturer as the outlet.
9. Device and Box Cover Plates:
    - a. Provide a plate for each outlet, receptacle, switch, device, and box.
    - b. Plates for flush interior general use shall be white plastic. Color shall be brown on wood paneled walls. Plates for the kitchen, service, galley, and storage areas shall be stainless steel.
    - c. All plates for exterior use shall be listed and labeled "Suitable for Wet Location while in use".
    - d. Ganged devices shall have gang plates exactly matching the arrangement and quantity of devices.
    - e. Special plates, engraving, or application shall be as indicated on the drawings or otherwise specified.
  10. Outlet and Junction Boxes:
    - a. The size of each outlet or junction box shall be determined by the number and sizes of wires and conduits entering the box, per NEC, but shall not be less than 4-inch square and 1-1/2 inches deep unless otherwise noted.
    - b. Outlets and junction boxes for interior use shall be galvanized, one-piece pressed or welded steel, knockout type, except where other types of boxes are indicated or specified. In masonry or concrete construction, waterproof boxes manufactured for that purpose shall be used. Plastic, fiber, or composition boxes will not be permitted.
    - c. Outlet and junction boxes for surface exterior use shall be cast boxes, Crouse-Hinds FS type, or approved equivalent.
  11. Conduits and Fittings:
    - a. Standard weight rigid metal conduit shall be hot dipped galvanized. All fittings shall be of the screw thread type. Couplings, locknuts, bushings, etc., shall be hot dipped galvanized.
    - b. Electrical metallic tubing (EMT) shall be galvanized. Couplings and connectors shall be galvanized. Fittings shall be compression type with gland sealing rings or set screw type.
    - c. Flexible conduit shall be galvanized steel or aluminum. Where used in damp or wet locations, flexible conduit shall be of the liquid-tight type with outer neoprene jacket and suitable liquid-tight fittings.
    - d. Rigid nonmetallic conduit shall be PVC schedule 40, UL approved.
  12. Wire and Cable:
    - a. Wire and cable for use on systems of 50 volts to 600 volts shall be 600 volt rated type THW or THHN for branch circuits. Feeders shall be THHN.
    - b. Wire and cable for use on systems of 50 volts shall be 300 volt PVC insulated and suitable for the class of wiring except as otherwise indicated or specified.
    - c. All conductors shall be copper.
  13. Lighting fixtures and Lamps:
    - a. Fixtures shall be complete with all required accessories and equipment, including lamps, necessary for a complete installation. Contractor shall receive, unpack, assemble, and install fixtures indicated as being furnished by others.
    - b. Fluorescent ballasts shall be CBM, ETL approved, high power factor "P" rated with a sound rating of "A". Ballasts for interior use shall be high frequency electronic type with a THD of less than 20%. Fixtures shall comply with local lighting codes.
    - c. 4' fluorescent lamps shall be F32T8 type by Philips, GE, or Sylvania, color as indicated on plans. All A-type lamps shall be 130 volt.
    - d. Verify the ceiling or wall construction, voltage, and the mounting requirements of each fixture and provide plaster frames, special flanges, concrete pour housings, boxes, brackets, adapters, hangers, stems, canopies, special ballasts or lenses, and other materials necessary to properly purchase and mount the fixture.
    - e. Submit shop drawings on all fixtures as required under "Submittals". Shop Drawings may be catalog data sheets if complete information including mounting hardware is shown and identified. Shop drawings shall include mounting details and show compatibility with the ceiling or other equipment.
  14. Nameplates and labels:
    - a. Nameplates shall be provided for circuit breakers in the main switchboard, switches, and to identify each panelboard and similar items which are furnished or installed under this section.
    - b. Nameplates shall be engraved laminated plastic with characters cut through the black top layer to white layer below.
  15. Photo Electric Switches:
    - a. Photo electric switches and photo controllers shall be Honeywell. Type of mounting, poles, voltage, wattage rating, and arrangement shall be as shown on plans.
    - b. Submit shop drawings as required under "Submittals". Catalog sheets will be adequate if all information is shown.
  16. Time Switches:
    - a. Time switches shall be York. Type of mounting, poles, voltage, ampacity, and arrangement shall be as shown on drawings or required by conditions. Time switches controlling lighting shall have spring wound carry over and any other features shown on the plans or required for proper operation.
    - b. Enclosures shall be NEMA 1 for interior, dry locations.
  17. Magnetic motor starters:
    - a. Motor starters shall be horsepower rated non-reversing, full voltage of type required by motor with overload thermal protection.
    - b. Submit shop drawings as required under "Submittals".
  18. Relays:
    - a. Relays for motor control shall be heavy-duty industrial type, magnetically held, with both normally open and closed contacts.
    - b. Submit shop drawings as required under "Submittals".

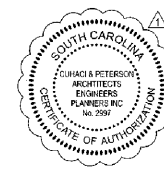
Execution

1. Installation and connection of electrical equipment:
  - a. Equipment furnished by others shall be complete and conform to the electrical system except as noted on the drawings. All fuses, breakers, and disconnects shall be provided as necessary for proper protection. Provide all flexible conduit, boxes, fittings, receptacles, cords, plugs, and other material required for proper installation. Refer to manufacturer's directions where applicable.
2. Work on hvac and plumbing systems:
  - a. Complete power circuits, including breakers, switches, disconnects, wire and conduit, outlets, and connections to hvac and plumbing equipment shall be provided under this section.
  - b. Starters and controllers shall be provided under this section except where part of a package unit or panel specified in Division 15.
  - c. Hvac and plumbing control and interconnecting wiring, regardless of type, and conduits for same, will be wired and connected under this section.
3. Installation of conduit:
  - a. Standard weight rigid metal conduit shall be used where exposed to the weather, placed underground below concrete slab, in concrete or masonry construction in contact with earth, and where shown on the plans.
  - b. Galvanized or aluminum metallic tubing shall be used where above ground, interior, dry locations protected from weather and physical damage, and may be used in concrete or masonry construction in contact with earth.
  - c. Flexible metallic conduit "M" shall be used where shown on the plans and to connect conduit systems to motors, direct wired and vibrating equipment and as a final connection to lighting fixtures (not limited to ceilings). It may be used as a wiring system instead of EMT in interior walls only (dry frame or stud construction).
  - d. Liquid-tight flexible metal conduit shall be used for final electrical connections to roof top or other equipment exposed to the environment.
  - e. Rigid nonmetallic conduit may be used for all underground or underground work in place of standard weight rigid metal and where specifically specified. All runs of rigid nonmetallic conduit shall be on a separate green ground wire adequately sized for service intended. Where required to continue above slab, stub nonmetallic conduit 6" above slab then make proper transition to metal conduit.
  - f. All rigid steel conduit installed in the ground shall be wrapped with Hant's Process No. 3, PVC coated or encased in 3" concrete on all sides.
  - g. The minimum sizes of conduit shall be code size for the number and size of conductors, unless a larger size is shown, in which case such larger size shall be used.
  - h. All final connections to motors shall be flexible metal conduit and as shown on drawings.
  - i. Where portions of raceways or sleeves enter areas such as cold storage or where passing from the interior to the exterior of a building, the raceway or sleeve shall be filled with an approved material to prevent the circulation of warm air at a cooler section of the raceway or sleeve.
4. Installation and connection of wiring:
  - a. No "EX" type conductor/flex conduit or Romex cable will be permitted. All wiring shall be installed in conduit, wireways, or gutters, except where other raceway systems or methods are specifically shown.
  - b. Clean out and dry all conduit and wireways before pulling any wires. Use no lubricant except as recommended by the wire or cable manufacturer.
  - c. Make all connections and splices necessary to properly complete the electrical wiring. Connections and splices shall be made only in pull, junction, or outlet boxes, or in switchboards, wireways, or panels having sufficient code sized gutter space. Connections and splices in wires smaller than No. 6 AWG shall be made with spring type connectors, and in wires No. 6 AWG and larger shall be made with compression, vice type, or split bolt solderless connectors, insulated and taped.
  - d. Connectors for the power wiring of the POS system shall be soldered only, no solderless connections will be allowed. Wire nut connections after soldering.
5. Telephone system:
  - a. Furnish and install complete conduit and terminal system for telephone services as indicated on drawings.
  - b. Install a 1/8-inch polyethylene pull-in wire in each conduit run.
  - c. Telephone wall outlets shall be 4-1/16 inch square by 2-1/8 inch deep metal boxes, with plaster ring and single bushed outlet flush telephone plate.
  - d. Furnish and install 3/4-inch conduit from the telephone equipment room main telephone backboard to nearest accessible cold water ground. This conduit should be terminated in such a manner that access to grounding device may be had at any time in the future. - per NEC 250 & NEC 800
6. Grounding:
  - a. Make good mechanical and electrical contact at all poles, panelboards, switchboards, outlet boxes, junction boxes, and wherever the conduit run is connected. Permanently and effectively ground all conduit, fixtures, motors, and other equipment as required by all applicable codes, regulations, and standards.
7. Cleaning and protection of products and premises:
  - a. At frequent intervals during the time of construction, the Contractor shall clean up after his work and remove his debris from the premises, leaving the building and grounds clean to the owner's satisfaction.

- b. The contractor shall take all necessary precautions to protect all materials, equipment, and property, whether electrical or not, from damage as a result of his work.
8. Checking and testing of equipment and systems:
    - a. Panels, disconnects, starters, and other equipment installed under this section shall be inspected for defects and tested for proper operation.
    - b. Systems shall be tested for short circuits, open circuits, and wrong connections and shall be free from mechanical and electrical defects. Circuits shall be tested for proper neutral and ground connections.
  9. Temporary construction power & telephone:
    - a. Electrical contractor shall provide all labor, cost, and materials required for installation and maintenance of temporary construction power and telephone. Construction power shall be minimum of 100A, 120/208V1-phase, 4W, with provisions for one 50A, 208V, 2P, 4W grounding receptacle and four 120V, 20A, 1P receptacles.
  10. Substitutions:
    - a. Alternative manufacturer's will be considered for electrical devices, switches, outlets, etc. not provided by owner.
    - b. Catalogs, data sheets, or shop drawings shall be submitted to the construction manager for all alternative manufactured equipment as required in "Submittals".

Order Plans

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CLIENT NAME  
**Cross Development**  
4536 Marsh Ridge  
Carrollton, TX 75010

PROJECT NAME  
**Caliber Collision Five Forks (161)**  
1215 East Butler Rd.  
Greenville, SC 29607

SHEET TITLE  
**Electrical Specifications**

RELEASE	PERMIT COMMENT RESPONSE 04/22/20
PROJECT NO.	2200087
DATE	07/08/2020
DRAWN	NO
CHECKED	JS

PROJECT NO.	2200087
DATE	07/08/2020
DRAWN	NO
CHECKED	JS

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BID SET 10/28/2020