Schneider Electric

Electric Vehicle (EV) Charging Station

THIS GUIDE SPECIFICATION IS WRITTEN IN ACCORDANCE WITH THE CONSTRUCTION SPECIFICATIONS INSTITUTE (CSI) MASTERFORMAT. THIS SECTION MUST BE CAREFULLY REVIEWED AND EDITED BY THE ARCHITECT OR THE ENGINEER TO MEET THE REQUIREMENTS OF THE PROJECT. COORDINATE THIS SECTION WITH OTHER SPECIFICATION SECTIONS IN THE PROJECT MANUAL AND WITH THE DRAWINGS.
WHERE REFERENCE IS MADE THROUGHOUT THIS SECTION TO "PROVIDE", "INSTALL", "SUBMIT", ETC., IT SHALL MEAN THAT THE CONTRACTOR, SUBCONTRACTOR, OR CONTRACTOR OF LOWER TIER SHALL "PROVIDE", "INSTALL", "SUBMIT", ETC., UNLESS OTHERWISE INDICATED.
THIS SECTION IS WRITTEN TO INCLUDE THE 2004 MASTERFORMAT AND THE 1995 MASTERFORMAT VERSIONS. WHERE APPLICABLE, THESE ITEMS ARE BRACKETED AND, IN EACH CASE, UNLESS OTHERWISE INDICATED, THE FIRST CHOICE APPLIES TO THE 2004 MASTERFORMAT AND THE SECOND CHOICE APPLIES TO THE 1995 MASTERFORMAT.

SECTION [26 27 29] [16149]

ELECTRIC VEHICLE CHARGING STATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, [Division 01 - GENERAL REQUIREMENTS] [Division 1 - GENERAL REQUIREMENTS], and other applicable specification sections in the Project Manual apply to the work specified in this Section.

1.2 SUMMARY

A. **Scope:** Provide design and engineering, labor, material, equipment, related services, and supervision required, including, but not limited to, manufacturing, fabrication, erection, and installation for electric vehicle (EV) charging stations as required for the complete performance of the work, and as shown on the Drawings and as herein specified.

B. **Section Includes:** The work specified in this Section includes, but shall not be limited to, complete, electric vehicle charging stations as indicated on the Drawings and as specified herein.
   1. The extent of the electric vehicle charging infrastructure work shall be as indicated by the Drawings and by the requirements of this Section, including, but not limited to, the following:
      a. Panelboards or load centers.
      b. Integral branch circuit metering options for certain utilities that want to offer discounted electric vehicle charging rates.
      c. Power monitoring meters where the Owner wants to monitor the kW consumed by the charging station.
      d. Interface for demand response signals options (for future versions of electric vehicle charging station products).
      e. Work stations, software, and communications hardware when installing power monitoring devices.
   2. System installation shall include, but shall not be limited to, the following:
      a. Wiring of branch circuit conductors.
      b. Installation of external metering devices and wiring to the charging station where electric vehicle rates are offered by utilities.
      c. Installation of communications conductors and associated hardware when installing external power monitoring devices.

1.3 REFERENCES

A. **General:** The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only. The edition/revision of the referenced publications shall be the latest date as of the date of the Contract Documents, unless otherwise specified.

B. **American Society of Civil Engineers (ASCE):**
1. ASCE 7, "Minimum Design Loads for Buildings and Other Structures" (copyrighted by ASCE, ANSI approved).

C. **ASTM (ASTM):**
1. ASTM E 329, "Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction."

D. **California Code of Regulations (CCR):**
1. CCR Title 24, “California Building Standards Code.”

E. **International Code Council (ICC):**
1. ICC-ES AC156, “Acceptance Criteria for Seismic Qualification by Shake-Table Testing of Nonstructural Components and Systems.”
2. ICC IBC, "International Building Code."

F. **National Fire Protection Association (NFPA):**
1. NFPA 70, "National Electrical Code" (copyrighted by NFPA, ANSI approved) - hereinafter referred to as NEC.
2. NFPA 5000, “Building Construction and Safety Code.”

G. **SAE International (SAE):**
1. SAE J1772, "Standard for Electric Vehicle Conductive Charge Coupler."

H. **Underwriters Laboratories, Inc. (UL):**
1. UL 991, "Standard for Tests for Safety Related Controls Employing Solid State Devices."
2. UL 1998, "Standard for Software in Programmable Components."
3. UL 2231-1, "Standard for Personnel Protection Systems for Electric Vehicle (EV) Supply Circuits: General Requirements."
4. UL 2231-2, "Standard for Personnel Protection Systems for Electric Vehicle (EV) Supply Circuits: Particular Requirements for Protection Devices for Use in Charging Systems."
5. UL 2251, "Standard for Plugs, Receptacles and Couplers for Electric Vehicles."
6. UL 2594, "Standard for Electric Vehicle Supply Equipment.”

1.4 SUBMITTALS

A. **General:** See [Section 01 33 00 - SUBMITTAL PROCEDURES]
[Section 01300 - SUBMITTALS].

B. **Product Data:** Submit product data showing material proposed. Submit sufficient information to determine compliance with the Drawings and Specifications, including, but not limited to, manufacturer's product data and installation instructions for each component and system.

C. **Shop Drawings:** Submit shop drawings for each product and accessory required. Include information not fully detailed in manufacturer’s standard product data, including, but not limited to, list of components and equipment to be supplied, including, but not limited to, proposed locations, clearances, and power requirements.
1. **Panel Drawings:** Submit manufacturer’s dimensional drawings.

2. **One-Line Diagrams:** Submit one-line diagrams of the system configuration proposed if it differs from that illustrated in the riser diagram included in these Construction Documents. Submit one-line drawings indicating location and addresses of all hardware, including, but not limited to, panelboard or load center, circuit breaker, and charging stations.

D. **Wiring Diagrams:** Submit wiring diagrams detailing power, signal, and control systems, clearly differentiating between manufacturer-installed wiring and field-installed wiring, and between components provided by the manufacturer and those provided by others.
1. Submit typical connection diagrams for all components including, but not limited to, panelboards, communications devices, and personal computers.

E. **Qualification Data:** Submit qualification data for firms and persons specified in Quality Assurance Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names of architects and owners, and other information specified.

F. **Contract Closeout Submittals:**
1. **Operation and Maintenance Data:** Submit operation and maintenance data for electric vehicle charging stations to include in operation and maintenance manuals specified in [Division 01 - GENERAL REQUIREMENTS] [Division 1 - GENERAL REQUIREMENTS].
2. **Warranty Data:** Submit manufacturer's standard warranty documents.

1.5 QUALITY ASSURANCE

A. **Qualifications:**
1. **Manufacturer Qualifications:** Manufacturer shall be a firm engaged in the manufacture of electric vehicle charging stations of types and sizes required, and whose products have been in satisfactory use in similar service for a minimum of 20 years.
   a. The manufacturer shall be ISO 9001 certified and shall be designed to internationally accepted standards.
   b. Factory fax/telephone/email system support shall be available free of charge from the manufacturer during normal business hours.
2. **Installer Qualifications:** Installer shall be a firm that shall have a minimum of five years of successful installation experience with projects utilizing electric vehicle charging stations similar in type and scope to that required for this Project and shall be approved by the manufacturer.
3. **Inspecting and Testing Agency Qualifications:** To qualify for acceptance, an independent inspecting and testing agency hired by the Contractor or manufacturer to test products shall demonstrate to the Architect/Engineer's satisfaction that they are qualified according to ASTM E 329 to conduct testing indicated.

B. **Regulatory Requirements:** Comply with applicable requirements of the laws, codes, ordinances, and regulations of Federal, State, and local authorities having jurisdiction. Obtain necessary approvals from such authorities.

C. **Standards:** Comply with applicable requirements of the following standards:

EDIT LIST BELOW TO SUIT THE PROJECT.

1. **NEMA Compliance:** Applicable portions of NEMA standards pertaining to types of electrical equipment and enclosures.
2. **NEC Compliance:** Applicable portions of the NEC, including, but not limited to, Article 625.
3. **UL Compliance:** Applicable UL standards for electric vehicle supply equipment, panelboards, circuit breakers, and energy management equipment.
4. **FCC Emissions:** Comply with FCC emissions standards.

5. **CCR Title 24:** Lighting control equipment shall be certified by the California Energy Commission.
6. **New York City:** Panelboards shall be certified for use in New York City by the New York City Authority.
7. **Seismic Compliance:** NFPA 5000, ASCE 7, ICC-ES AC156, and/or ICC IBC, as applicable to the Project location and as required by authorities having jurisdiction.

D. **Electrical Components, Devices, and Accessories:** Electrical components, devices, and accessories shall be listed and labeled as defined in NEC, Article 100, by an inspecting and testing agency acceptable to authorities having jurisdiction, and marked for intended use.

E. **Pre-Installation Conference:** Conduct pre-installation conference in accordance with [Section 01 31 19 - PROJECT MEETINGS] [Section 01200 - PROJECT MEETINGS]. Prior to commencing the installation, meet at the Project site to review the material selections, installation procedures, and coordination with other trades. Pre-installation conference shall include, but shall not be limited to, the Contractor, the Installer, and any trade that requires coordination with the work. Date and time of the pre-installation conference shall be acceptable to the Owner and the Architect/Engineer.

F. **Coordination:** Coordinate the work in this Section with all of the trades covered in other sections of the Specification to provide a complete and operable system. Furnish inserts and anchors that must be built into other work. Work closely with installers of finish materials so that units are properly aligned with adjacent materials.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the Project site in supplier's or manufacturer's original wrappings and containers, labeled with supplier's or manufacturer's name, material or product brand name, and lot number, if any.

B. Store materials in their original, undamaged packages and containers, inside a well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

1.7 PROJECT CONDITIONS

A. **Environmental Requirements:** Do not install electric vehicle charging stations until space is enclosed and weatherproof, wet work in space is completed and nominally dry, work above ceilings is complete, and ambient temperature and humidity conditions are and will be continuously maintained at values near those indicated for final occupancy.

1.8 WARRANTY

A. **General:** See [Section 01 77 00 - CLOSEOUT PROCEDURES] [Section 01770 - CLOSEOUT PROCEDURES].

B. **Special Warranty:** The Contractor shall warrant the work of this Section to be in accordance with the Contract Documents and free from faults and defects in materials and workmanship for period indicated below. This special warranty shall extend the one year period of limitations contained in the General Conditions. The special warranty shall be countersigned by the Installer and the manufacturer.
1. **Warranty Period:** Warranty period shall be 18 months from date of Substantial Completion.

C. **Additional Owner Rights:** The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to and run

concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. **Basis of Design:** Product specified is “Electric Vehicle (EV) Charging Station” as manufactured by Square D by Schneider Electric. Items specified are to establish a standard of quality for design, function, materials, and appearance. Equivalent products by other manufacturers are acceptable. The Architect/Engineer will be the sole judge of the basis of what is equivalent.

1. **Substitutions:** If a system from another manufacturer is submitted for review and acceptance, the following submittals shall be required:
   a. Short circuit study demonstrating NEC 110-10 compliance for remotely operated switching devices.
   b. Elevation drawing showing placement of equipment in equipment rooms.

2.2 CIRCUIT BREAKERS

A. **Branch Circuit Breakers:** Branch circuit breakers shall provide overload and short circuit protection suitable for the location in the electrical system, as defined in the panelboard and load center schedules. Circuit breaker devices shall have, but shall not be limited to, the following:

1. Integral branch circuit overcurrent protection as required by the NEC. Circuit breakers shall have an UL-listed interrupting rating sufficient for the application or UL-listed series connected ratings for the maximum available fault current at that point in the system.
2. UL-listed SWD ratings for 40 ampere two-pole branch devices, HID ratings, and HACR ratings.
3. There shall be an in-built auto ground fault reset functionality in the charging station that shall reset automatically after ground fault waits for 16 minutes and then shall attempt to supply power. This trial shall happen four times and at the end of fourth attempt the auto reset function shall quit. This functionality shall be nullified if a ground fault breaker is installed ahead of the charging station (so, always use a non-GFCI breaker).
4. Provide visible flag that shall clearly indicate the status of the circuit breaker contacts with the panel trim installed. Flag shall indicate, but shall not be limited to, on, off, and tripped circuit breaker states. The visible flag shall be mechanical in nature, directly tied to the circuit breaker mechanism, and shall be provided in addition to any status indicator supplied by the system electronics.

SELECT PERCENT OF SPARE SWITCHING DEVICE BELOW.

5. Provide switching full load endurance rating of 200,000 open/close/open remote operations. Switching devices with lower ratings may be judged to be acceptable, but shall be provided with [100 percent] [200 percent] spare switching devices for each circuit to ensure an equivalent total number of operations.

2.3 MASTER PANELBOARD

A. Master panelboards shall provide power and control for operating and monitoring operated branch circuit breakers located in both master and slave panelboards.

B. Master panelboards shall contain a nameplate label, located on the panel trim, indicating its designation and the designations of associated slave panels.

2.4 SLAVE PANELBOARDS

A. Salve panelboards shall contain a nameplate label, located on the panel trim, indicating its designation and the designations and address of its associated master panel.

2.5 ELECTRIC VEHICLE SUPPLY EQUIPMENT INDOOR ONLY (EVSE)

A. **Power Specifications:**
1. **Input Power:** 240 volts AC only, single-phase, 60 hertz, 30 amperes maximum.
2. **Input Power Connection:** Line 1, line 2, and ground.
3. **Feeder Circuit Breaker:** Two-pole, 40 amperes, non-GFCI type.
4. **Output Power:** 240 volts AC, 30 amperes, 7.2 kW maximum.

B. **Physical Specifications:**
1. **Enclosure Type:** Type 1 (indoor only).
2. **Enclosure Dimensions:** 9.53 inches (242 mm) wide by 12.73 inches (323 mm) high by 4.36 inches (111 mm) deep.
3. **Enclosure Mounting:** Wall-mounted.
4. **Cable Type:** SAE J1772.
5. **Cable Length:** 18 feet (5486 mm).
6. **Cable Management:** Non-retractable/separate from the enclosure.
7. **Shipping Weight:** 17.0 pounds (7.7 kg).

C. **User Interface:**
1. Power available status indicator.
2. Charging eight-segment progress indicator.
3. Ground fault red status indicator.
4. Stop pushbutton and red stop indicator.
5. Delay start pushbutton and delay up to eight hours, in one hour increments.

D. **Protection:**
1. Ground fault protection integral, CCID 5 mA, auto reset.
2. Ground fault protection system test automatic at the beginning of each charge cycle.

E. **Environmental:**
1. **Operating Temperature:** -22 °F (-30 °C) to 131 °F (55 °C).
2. **Electrostatic Discharge:** 15 kV open air, 8 kV contact.
3. **Surge:** 6 kV.
4. **Radiated Immunity:** 20 V/m.
5. **Conducted Immunity:** 20 volts.
6. **Electrical Fast Transient/Burst (EFTB):** 2 kV.
7. **Emissions FCC Class:** Class B.

F. **Standards Compliance:**
1. NEC, Article 625.
2. SAE J1772.
3. UL 991, UL 1998, UL 2231-1, UL 2231-2, UL 2251, and UL 2594.

2.6 ELECTRIC VEHICLE SUPPLY EQUIPMENT OUTDOOR (EVSE)

A. **Power Specifications (Each charging unit):**
1. **Input Power:** 208 volts AC to 240 volts AC/30 amperes, single-phase, 60 hertz.
2. **Input Power Connection:** Line 1, line 2, and ground.
3. **Feeder Circuit Breaker:** Two-pole, 40 amperes, non-GFCI type.
4. **Output Power:** 208 volts AC to 240 volts AC, 30 amperes.

B. **Physical Specifications:**

1. **Enclosure Type:** Type 3R.
2. **Enclosure Dimensions:** See the Drawings.
3. **Enclosure Mounting:** Wall-mounted or pedestal mounted.
4. **Cable Type:** SAE J1772.
5. **Cable Length:** 18 feet (5486 mm).
6. **Cable Management:** Non-retractable, integral with the enclosure.
7. **Unit Options:** Single unit (wall-mounted) and single/dual units (pedestal-mounted).

C. **User Interface:**
1. Power available status indicator.
2. Charging blinking blue indicator.
3. System detected fault red status indicator.

D. **Authentication:**
1. Type non-networked RFID/key fob.
2. Programming radio frequency remote control.

E. **Protection:**
1. Ground fault protection integral, CCID 5 mA, auto reset.
2. Ground fault protection system test automatic at the beginning of each charge cycle.

F. **Environmental:**
1. **Operating Temperature:** -22 °F (-30 °C) to 131 °F (55 °C).
2. **Electrostatic Discharge:** 15 kV open air, 8 kV contact.
3. **Surge:** 6 kV.
4. **Radiated Immunity:** 20 V/m.
5. **Conducted Immunity:** 20 volts.
6. **Electrical Fast Transient/Burst (EFTB):** 2 kV.
7. **Emissions FCC Class:** Class B.

G. **Standards Compliance:**
1. NEC, Article 625.
2. SAE J1772.
3. UL 991, UL 1998, UL 2231-1, UL 2231-2, UL 2251, and UL 2594.

ARTICLE BELOW IS OPTIONAL. RETAIN IF APPLICABLE TO THE PROJECT.

2.7 METERING

A. In cases where utilities offer separate rates for electric vehicle charging, provide standard or revenue grade meters as required by the specific utility.

B. Power meter shall transmit data using RS-485 Modbus RTU protocol, Ethernet, or cellular.

C. Power metering shall monitor the following parameters:
1. Power measurement.

BELOW IS OPTIONAL. RETAIN IF APPLICABLE TO THE PROJECT.

D. Ethernet network shall be as follows:
1. The Contractor shall coordinate work with the network administrator to assure that proper connection points are available. The Contractor shall also secure static IP address for each individual power monitoring web server.
2. Network shall support Ethernet communications.

2.8 SOURCE QUALITY CONTROL

A. **Component Testing:** Electronic component board assemblies shall be factory-tested and burned in prior to installation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. **Verification of Conditions:** Examine areas and conditions under which the work is to be installed, and notify the Contractor in writing, with a copy to the Owner and the Architect/Engineer, of any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.
   1. Beginning of the work shall indicate acceptance of the areas and conditions as satisfactory by the Installer.

3.2 INSTALLATION

A. Preparation and installation shall be in accordance with reviewed product data, final shop drawings, manufacturer's written instructions and recommendations, and as indicated on the Drawings. System installation shall be coordinated with related and adjacent work. Define each circuit breaker.

3.3 DEMONSTRATION

A. If required by the manufacturer for advanced installations, provide the services of a factory-authorized service representative of the manufacturer to provide start-up service and to demonstrate and train the Owner's personnel.
   1. Test and adjust controls and safeties. Replace damaged or malfunctioning controls and equipment.
   2. Train the Owner's maintenance personnel on procedures and schedules related to start-up and shutdown, troubleshooting, servicing, and preventive maintenance.
   3. Review data in operation and maintenance manuals with the Owner's personnel.
   4. Schedule training with the Owner, through the Architect, with at least seven day's advanced notice.

3.4 PROTECTION

A. Provide final protection and maintain conditions in a manner acceptable to the Installer, that shall ensure that the electric vehicle charging stations shall be without damage at time of Substantial Completion.

END OF SECTION