Preparing Activity: NAVFAC

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated July 2023
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11/18

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SECTION 11 11 37

ELECTRIC VEHICLE SUPPLY EQUIPMENT
11/18

NOTE: This guide specification covers the requirements for charging equipment to support electric automobiles and light trucks.

Adhere to UFC 1-300-02 Unified Facilities Guide Specifications (UFGS) Format Standard when editing this guide specification or preparing new project specification sections. Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable item(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments, suggestions and recommended changes for this guide specification are welcome and should be submitted as a Criteria Change Request (CCR).

PART 1 GENERAL

1.1 REFERENCES

NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a Reference Identifier (RID) outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature

to update the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.

****

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM C260/C260M	(2010a; R 2016) Standard Specification for Air-Entraining Admixtures for Concrete

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C2	(2023) National Electrical Safety Code

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2023) National Electrical Code

UNDERWRITERS LABORATORIES (UL)

UL 62	(2018) UL Standard for Safety Flexible Cords and Cables
UL 2202	(2012; Reprint Feb 2018) UL Standard for Safety Electric Vehicle (EV) Charging System Equipment
UL 2231-1	(2012; Reprint Aug 2016) UL Standard for Safety Personnel Protection Systems for Electric Vehicle (EV) Supply Circuits: General Requirements
UL 2231-2	(2012; Reprint Aug 2016) UL Standard for Safety Personnel Protection Systems for Electrical Vehicle (EV) Supply Circuits: Particular Requirements for Protection Devices for Use in Charging Systems
UL 2251	(2017) UL Standard for Safety Plugs, Receptacles and Couplers for Electric Vehicles
UL 2594	(2016) UL Standard for Safety Electric Vehicle Supply Equipment

1.2 DEFINITIONS

1.2.1 ELECTRIC VEHICLE SUPPLY EQUIPMENT

Electric Vehicle Supply Equipment (EVSE), also referred to as "charging stations," encompasses the conductors, including the ungrounded, grounded, and equipment grounding conductors and the electric vehicle connectors,

attachment plugs, and all other fittings, devices, power outlets, or apparatus installed specifically for the purpose of delivering energy from the premises wiring to the electric vehicle (EV). There are three types of EVSE:

a. Level 1 - Refers to a freestanding or wall mounted charging device that delivers a 110/120V charge, replenishing an EV battery at a rate of 4 to 6 miles of range per hour of charging time. Charging an EV at Level 1 typically takes between 7 and 20 hours depending on the size of the vehicle's battery.

b. Level 2 - Refers to a freestanding or wall mounted charging device capable of being networked that delivers a 208/240V charge, replenishing an EV battery at a rate of 10 to 20 miles of range per hour of charging time. Charging an EV at Level 1 typically takes between 2 and 5 hours depending on the size of the vehicle's battery.

c. Direct Current (DC) Fast Charging, a freestanding or wall mounted device capable of being networked that is designed to charge vehicles more quickly than Level 1 or Level 2 with an electrical output ranging between 40 kW - 120 kW delivering a charge of up to 480V. DC Fast Charging can typically replenish an EV battery at a rate of 50 to 90 miles of range per 30 minutes of charging time.

1.2.2 Certified Installers

Installers must be certified by EVSE manufacturer or a recognized certified training agency.

1.3 RELATED REQUIREMENTS

****

NOTE: Include Section 26 08 00 APPARATUS INSPECTION AND TESTING on all projects involving specialized power distribution equipment.

****

Materials not considered to be Electric Vehicle Supply Equipment or accessories are specified in Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM, Section 33 71 02 UNDERGROUND ELECTRICAL DISTRIBUTION, Section 32 17 23 PAVEMENT MARKINGS and Section 26 08 00 APPARATUS INSPECTION AND TESTING applies to this section with the additions and modifications specified herein.

1.4 SUBMITTALS

****

NOTE: Review Submittal Description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list, and corresponding submittal items in the text, to reflect only the submittals required for the project. The Guide Specification technical editors have classified those items that require Government approval, due to their complexity or criticality, with a "G." Generally, other submittal items can be reviewed by the Contractor's Quality Control System. Only add a "G" to an item if the submittal is sufficiently important or complex in context of the project.

For Army projects, fill in the empty brackets following the "G" classification, with a code of up to three characters to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy, Air Force, and NASA projects.

The "S" classification indicates submittals required as proof of compliance for sustainability Guiding Principles Validation or Third Party Certification and as described in Section 01 33 00 SUBMITTAL PROCEDURES.

Choose the first bracketed item for Navy, Air Force, and NASA projects, or choose the second bracketed item for Army projects.

****

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are [for Contractor Quality Control approval.][for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

In addition, submit in accordance with paragraph COORDINATED SUBMITTAL REVIEWS herein.

****

NOTE: Bracketed submittal items correspond to bracketed paragraphs within the text. Use these submittal items when the bracketed paragraph is used.

****

SD-02 Shop Drawings

Cords; G[, [_____]]

[Level 1 Wall Mounted EVSE; G[, [_____]]

][Level 1 Pedestal Mounted EVSE; G[, [_____]]

][Level 2 Wall Mounted EVSE; G[, [_____]]

][Level 2 Pedestal Mounted EVSE; G[, [_____]]

][DC Fast Charger Wall Mounted EVSE; G[, [_____]]

][DC Fast Charger Pedestal Mounted EVSE; G[, [_____]]

] SD-03 Product Data

Cords; G[, [_____]]

[Level 1 Wall Mounted EVSE; G[, [_____]]

][Level 1 Pedestal Mounted EVSE; G[, [_____]]

][Level 2 Wall Mounted EVSE; G[, [_____]]

][Level 2 Pedestal Mounted EVSE; G[, [_____]]

][DC Fast Charger Wall Mounted EVSE; G[, [_____]]

][DC Fast Charger Pedestal Mounted EVSE; G[, [_____]]

] SD-07 Certificates

Qualifications; G[, [_____]]

Certified Installers; G[, [_____]]

SD-08 Manufacturer's Instructions

Cords; G[, [_____]]

[Level 1 Wall Mounted EVSE; G[, [_____]]

][Level 1 Pedestal Mounted EVSE; G[, [_____]]

][Level 2 Wall Mounted EVSE; G[, [_____]]

][Level 2 Pedestal Mounted EVSE; G[, [_____]]

][DC Fast Charger Wall Mounted EVSE; G[, [_____]]

][DC Fast Charger Pedestal Mounted EVSE; G[, [_____]]

] SD-09 Manufacturer's Field Reports

Testing of Electric Vehicle Supply Equipment; G[, [_____]]

SD-10 Operation and Maintenance Data

Electric Vehicle Supply Equipment, Data Package 3

SD-11 Closeout Submittals

OMSI Warranty; G[, [_____]]

****
NOTE: Delete Record Documentation for Navy projects. Normally as-built documentation is a requirement of Division 01.
****

[Record Documentation

][1.5 MAINTENANCE MATERIAL SUBMITTALS

Provide a list of manufacturer recommended maintenance items required for EVSE Operation.

1.5.1 Operation and Maintenance Manuals

****
NOTE: Provide number of copies based on Base needs.
****

Submit in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA. Submit [two] [_____] manuals and electronic file at least 2 weeks prior to field training.

[1.5.2 Spare Parts

****
NOTE: Do not include for Navy projects.
****

Provide one spare cord and connector assembly for every three stations installed.

]]1.6 QUALITY CONTROL

1.6.1 Regulatory Requirements

In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" or "must" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction," or words of similar meaning, to mean the Contracting Officer. Provide equipment, materials, installation, and workmanship in accordance with the mandatory and advisory provisions of NFPA 70 unless more stringent requirements are specified or indicated.

1.6.2 Standard Products

Provide materials and equipment that are products of manufacturers regularly engaged in the production of such products which are of equal material, design and workmanship and:

a. Have been in satisfactory commercial or industrial use for 2 years prior to bid opening including applications of equipment and materials under comparable circumstances and of similar size.

b. Have been on sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2-year period.

c. Where two or more items of the same class of equipment are required, provide products of a single manufacturer; however, the component parts of the item need not be the products of the same manufacturer unless stated in this section.

1.6.2.1 Qualifications

Products having less than a 2-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6000 hours, exclusive of the manufacturers' factory or laboratory tests, is furnished.

1.6.2.2 Material and Equipment Manufacturing Date

Provide products manufactured within 2 years prior to date of delivery to site. As a minimum, meet requirements of UL, where UL standards are established for those items, and requirements of NFPA 70 for all materials, equipment, and devices.

1.6.2.3 EVSE Installers

Submit documentation certifying that pertinent personnel are qualified for EVSE installation. The documentation must include installation experience on two projects of comparable size and scope of work.

1.7 WARRANTY

****
NOTE: Include first bracketed option for CONUS, second bracketed option for OCONUS or fill in the third bracket for special circumstances.

NOTE: Delete first paragraph on Navy Projects.
****

[Provide equipment items supported by service organizations that are convenient to the equipment installation in order to render satisfactory service to the equipment within [24] [48] [_____] hours of notification during the warranty period of the contract.

] Provide warranty for Materials and Workmanship of EVSE: Two years.

PART 2 PRODUCTS

2.1 PRODUCT COORDINATION

Provide products and materials not considered to be ELECTRIC VEHICLE SUPPLY EQUIPMENT and related accessories for power requirements as specified in[Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM,][and][Section 33 71 02 UNDERGROUND ELECTRICAL DISTRIBUTION][and][Section 32 17 23 PAVEMENT MARKINGS].

2.2 ELECTRIC VEHICLE SUPPLY EQUIPMENT

2.2.1 System Description

****
NOTE: Number and type of supply stations selection must be based on users requirements, after interviewing User to determine number and frequency of EVs to be charged.
****

Electric Vehicle Supply Equipment capable of charging [one] [multiple] vehicles at [Level 1] [Level 2] [Direct Current (DC) Fast Charging].

[2.2.2 Level 1 EVSE

****
NOTE: Power levels for Electrical Supply Equipment should be based on User's Projected Electric Vehicle

usage. Verify power requirements for available chargers.
****

2.2.2.1 Level 1 Wall Mounted EVSE

UL 2202, UL 2251, UL 2231-1, UL 2231-2, UL 2594. Type 1, SAE J1772 connector, 120 volt, [input 15 amps, output 12 amps, 2 kW] [input [_____] amps, output [_____] amps, [_____] kW].

2.2.2.2 Level 1 Pedestal Mounted EVSE

UL 2202, UL 2251, UL 2231-1, UL 2231-2, UL 2594. Type 1, SAE J1772 connector, 120 volt, [input 15 amps, output 12 amps, 2 kW] [input [_____] amps, output [_____] amps, [_____] kW].

][2.2.3 Level 2 EVSE

****
NOTE: Power levels for Electrical Supply Equipment should be based on User's Projected Electric Vehicle usage. Verify power requirements for available chargers.
****

2.2.3.1 Level 2 Wall Mounted EVSE

UL 2202, UL 2251, UL 2231-1, UL 2231-2, UL 2594. Type 2, SAE J1772 connector, 208 volt, [input 30 amps, output 30 amps, 7.2 kW] [input [_____] amps, output [_____] amps, [_____] kW].

2.2.3.2 Level 2 Pedestal Mounted EVSE

UL 2202, UL 2251, UL 2231-1, UL 2231-2, UL 2594. Type 2, SAE J1772 connector, 208 volt, [input 30 amps, output 30 amps, 7.2 kW] [input [_____] amps, output [_____] amps, [_____] kW].

][2.2.4 DC Fast Charger EVSE

****
NOTE: Power levels for Electrical Supply Equipment should be based on User's Projected EV usage. Verify power requirements for available chargers.
****

2.2.4.1 DC Fast Charger Wall Mounted EVSE

UL 2202, UL 2251, UL 2231-1, UL 2231-2, UL 2594. [CHAdeMO] [CCS SAE J1772 DC combo charging] [CHAdeMO and CCS Combination] connector[s], 480 volt, [input 32 amps, output 62 amps, 24 kW] [input [_____] amps, output [_____] amps, [_____] kW].

2.2.4.2 DC Fast Charger Pedestal Mounted EVSE

UL 2202, UL 2251, UL 2231-1, UL 2231-2, UL 2594. [CHAdeMO] [CCS SAE J1772 DC combo charging] [CHAdeMO and CCS Combination] connector[s], 480 volt, [input 32 amps, output 62 amps, 24 kW] [input [_____] amps, output [_____] amps, [_____] kW].

]2.2.5 Cords

UL 62.

****
NOTE: Provide length of cord for installation.
****

a. [4.25 meters14 feet] [_____], minimum, UL rated charging cords with integral retractable cord management mechanism or separate cord management.

2.3 CONNECTOR HOLSTER DOCK

Provide connector holster dock to store charger plugs when not in use. Holster construction consist of high strength injection molded plastic with temperature ratings of minus 30 deg C to 50 deg C. Provide holster to match EV plug.

2.4 PEDESTAL CONSTRUCTION

****
NOTE: Select NEMA rating based on location conditions.
****

Provide corrosion resistant construction for outdoor use and continuous exposure to a marine environment. Pedestal shall be NEMA 4x [NEMA 3]Construction.

[2.5 ACCESSORIES

****
NOTE: Provide accessories listed below as determined by user requirements.
****

[a. Back-lit touch button interface keypad with audio feedback. LCD must display READY TO CHARGE, CHARGING, CHARGE COMPLETE, PAUSE-WAITING TO CHARGE AND FAULT.

][b. Daylight readable 64x480 active matrix LCD with auto brightness control.

][c. Activation of EVSE upon identification utilizing [magnetic swipe],[RFID][or barcode cards].

][e. Real-time energy measurement controls.

][f. Fifteen minute energy measurement interval recording.

][g. Time-of-day pricing capability.

][h. Nuisance tripping avoidance and auto-re-closure features.

][i. Cold Load Pickup (Randomized auto restart following power outage).

][j. Provide minimum four keycards/barcodes/RFID keys for each charger to activate the charger and its data network.

][k. EVSE must include automatic web-based tracking / metering and control connection via a cell phone service provider compatible with Electric Vehicle Management system.

The web-based application shall generate per vehicle kW usage and charging times based on user input intervals.

EVSE Electronic Data Interface shall capture and be capable of push and pull file transfer of the parameters listed below. Web-based control capability shall enable remote charger station administration and access control by the Government. Data must be User ID and Password protected.

(1) Kilowatt (kW) data report must be compatible Microsoft Excel (Version 2007 or higher).

(2) Must have option to limit usage to designated users with bar code/key card type system (locked or open access).

(3) Manufacture control of EVSE is not allowed without prior written Government approval.

]]2.6 CAST-IN-PLACE CONCRETE

****
NOTE: Coordinate the requirement for concrete pads with user requirements.
****

****
NOTE: Use the first bracketed paragraph when project includes a concrete section in Division 3; otherwise, the second bracketed paragraph may be used. Coordinate requirements with Section 03 30 00 CAST-IN-PLACE CONCRETE.
****

[Concrete associated with electrical work for other than encasement of underground ducts shall be 30 MPa 4000 psi minimum 28-day compressive strength unless specified otherwise. All concrete shall conform to the requirements of Section 03 30 00 CAST-IN-PLACE CONCRETE.
]

****
NOTE: If concrete requirements are detailed and no cast-in-place concrete section is to be included in the project specification, refer to Section 03 30 00 CAST-IN-PLACE CONCRETE, and select such portions as needed to provide complete requirements in addition to the requirements below.
****

[Shall be composed of fine aggregate, coarse aggregate, portland cement, and water so proportioned and mixed as to produce a plastic, workable mixture. Fine aggregate shall be of hard, dense, durable, clean, and uncoated sand. The coarse aggregate shall be reasonably well graded from 4.75 mm to 25 mm 3/16 inch to one inch. The fine and coarse aggregates shall be free from injurious amounts of dirt, vegetable matter, soft fragments or other deleterious substances. Water shall be fresh, clean,

and free from salts, alkali, organic matter, and other impurities. Concrete associated with electrical work for other than encasement of underground ducts shall be 30 MPa 4000 psi minimum 28-day compressive strength unless specified otherwise. Slump shall not exceed 100 mm 4 inches. Retempering of concrete will not be permitted. Exposed, unformed concrete surfaces shall be given a smooth, wood float finish. Concrete shall be cured for a period of not less than 7 days, and concrete made with high early strength portland cement shall be repaired by patching honeycombed or otherwise defective areas with cement mortar as directed by the Contracting Officer. Air entrain concrete exposed to weather using an air-entraining admixture conforming to ASTM C260/C260M. Air content shall be between 4 and 6 percent.

]2.7 MANUFACTURER'S NAMEPLATES

Each item of equipment shall have a nameplate bearing, as a minimum, the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable. Include additional information as applicable to fully identify the equipment. Nameplates shall be made of noncorrosive metal.

2.8 PAVEMENT MARKINGS

****
NOTE: Verify base requirement and coordinate pavement markings. Coordinate with Section 32 17 23 PAVEMENT MARKINGS.
****

Provide pavement markings for the vehicle charging parking spots to indicate the restrictions for electrical vehicle parking.

2.9 ELECTRIC VEHICLE SUPPLY EQUIPMENT (EVSE) SIGNAGE

****
NOTE: Coordinate signage requirements with base requirements and Manual on Uniform Traffic Control Devices (MUTCD).
****

Provide signage Electric Vehicle Supply Equipment per MUTCD and Base standards.

****
NOTE: Provide wheel stops or bollard where existing curbing isn't present for protection of EVSE.
****

2.10 WHEEL STOPS AND BOLLARDS

Provide wheel stops or bollards in Electrical Vehicle parking spaces to provide protection for Electric Vehicle Supply Equipment.

PART 3 EXECUTION

3.1 INSTALLATION

Electrical installations shall conform to IEEE C2, NFPA 70, and to the

requirements specified herein.

a. The EVSE installer must be certified by the manufacturer or a recognized training facility to perform the installation.

b. Provide chargers per manufacturer instructions and recommendations. EVSE must be programmed and configured by a certified installer.

3.2 GROUNDING

NFPA 70 and IEEE C2, except provide grounding systems with a resistance to solid earth ground not exceeding 25 ohms.

3.2.1 Grounding Electrodes

Provide driven ground rods as specified in Section 33 71 02 UNDERGROUND ELECTRICAL DISTRIBUTION. Connect ground conductors to the upper end of ground rods by exothermic weld or compression connector. Provide compression connectors at equipment end of ground conductors.

3.3 FIELD APPLIED PAINTING

Where field applied painting of enclosures is required to correct damage to the manufacturer's factory applied coatings, provide manufacturer's recommended coatings and apply in accordance with manufacturer's instructions.

3.4 FIELD FABRICATED NAMEPLATE MOUNTING

Provide number, location, and letter designation of nameplates as indicated. Fasten nameplates to the device with a minimum of two sheet-metal screws or two rivets.

3.5 FOUNDATION FOR EQUIPMENT AND ASSEMBLIES

****

NOTE: Mounting slab connections may have to be given in detail depending on the requirements for the seismic zone in which the equipment is located. Include construction requirements for concrete slab only if slab is not detailed in drawings.

****

3.5.1 Exterior Location

Mount on concrete slab, unless otherwise indicated. The slab shall be at least 200 mm 8 inches thick, reinforced with a 152 by 152 - MW19 by MW19 6 by 6 - W2.9 by W2.9 mesh placed uniformly 100 mm 4 inches from the top of the slab. Slab shall be placed on a 150 mm 6 inch thick, well-compacted gravel base. Top of concrete slab shall be approximately 100 mm 4 inches above the finished grade. Edges above grade shall have 15 mm 1/2 inch chamfer. The slab shall be of adequate size to project at least 200 mm 8 inches beyond the equipment. Provide conduit turnups and cable entrance space required by the equipment to be mounted. Seal voids around conduit openings in slab with water- and oil-resistant caulking or sealant. Seals shall be of sufficient strength and durability to protect all energized live parts of the equipment from rodents, insects, or other foreign matter. Cut off and bush conduits 75 mm 3 inches above slab surface.

3.6 OPERATION AND MAINTENANCE

3.6.1 Operation and Maintenance Training

Conduct a training course for the members of the operating staff as designated by the Contracting Officer. Make the training period consist of a total of [4],[_____] hours for Level 1 or level 2 and [8],[_____] hours for DC Fast Charge of normal working time and start it after all work specified herein is functionally completed and the Performance Tests have been approved. Conduct field instruction that covers all of the items contained in the Operation and Maintenance Manuals as well as demonstrations of routine maintenance operations. Submit the proposed On-site Training Materials and schedule concurrently with the Operation and Maintenance Manuals and at least 30 days prior to conducting the training course.

[3.7 RECORD DOCUMENTATION

****
NOTE: Delete Record Documentation for Navy projects.
****

Provide drawings indicating construction provided for this project. Provide electronic files and hard copies on279 mm by 432 mm 11 inch by 17 inch paper.

]3.8 FIELD QUALITY CONTROL

3.8.1 Testing of Electric Vehicle Supply Equipment

Provide testing of Electric Vehicle Supply Equipment with test equipment per current standards and manufacturers recommendations. Provide data submittal indicating time of charge and kW level used.

3.8.2 Performance of Acceptance Checks and Tests

Perform in accordance with the manufacturer's recommendations and include the following visual and mechanical inspections and electrical tests. Submit reports, including acceptance criteria.

3.8.2.1 EVSE

a. Visual and mechanical inspection.

(1) Compare equipment nameplate data with specifications and approved shop drawings.

(2) Inspect physical and mechanical condition. Check for damage.

(3) Inspect anchorage, alignment, and grounding.

(4) Perform specific inspections and mechanical tests as recommended by manufacturer.

b. Electrical Tests

(1) Perform resistance measurements through all bolted connections with low-resistance ohmmeter.

(2) Verify voltage levels.

(3) Check ground fault circuit interrupt.

(4) Check pilot signal detection and verification.

(5) Verify current limit.

(6) Verify operation of alarms.

(7) Verify EVSE Electronic Data Interface.

Values of test shall be within limits of manufacturer's recommendations.

-- End of Section --