CITY OF COLUMBUS, OHIO
DEPARTMENT OF PUBLIC SERVICE
DIVISION OF DESIGN AND CONSTRUCTION

DESIGN GUIDANCE FOR ELECTRIC VEHICLE CHARGING STATION EQUIPMENT
September 23, 2022

Purpose of Design Guidance:
For inclusion in all projects utilizing Electric Vehicle Supply Equipment (EVSE). For projects owned by the Department of Public Service (DPS), Consultant shall confirm with the Capital Improvements Project (CIP) Engineer (Project Manager) for any project specific direction or variation to this design guidance as each CIP may have unique circumstances that would dictate a variant design.

Note: The Department of Public Service developed an EV Charger Example with this guidance.

Term definitions and equipment specifications are located throughout the document.

General:
The completed Charging Station and equipment installation shall meet all City of Columbus design standards for roadway including Standard drawings, ADA rules and Regulations, Downtown Standards, Construction and Material Specifications, and parking and downtown requirements (as applicable) unless otherwise approved by the City Engineer. The charging stations and associated equipment shall also meet the requirements of the latest edition of the AASHTO Roadside Design Guide, any other applicable AASHTO requirements, and the ODOT Location and Design Manual.

Document Definitions:
- AFDC – Alternative Fuels Data Center
- Charging Port: Single cord with connector attached to a charging station.
- Contractor: The entity responsible for the project.
- EV – Electric Vehicle: A vehicle using one or more electric motors for propulsion. For the purposes of this specification, this will include both battery (BEV) and plug-in hybrid (PHEV) electric vehicles.
- EV Charging Station, also referred to as Electric Vehicle Supply Equipment (EVSE): “Charging station” shall mean all electrical and mechanical equipment, hardware, and software installed by Contractor, electrical wiring and/or cabling, equipment infrastructure, and all supporting equipment, including, without limitation, concrete pads, and, if elected to be constructed by the Contractor and approved by the City, a canopy covering the site.
- EVSE – Electric Vehicle Supply Equipment: Supplies electric energy used to recharge electric vehicles.
- Fully Operational: An EV Charging Station is open and ready for use by customers in accordance with the OEM operating standards.
- Installation Completion: The date the EV charging station is fully operational.

- Maintenance: Both scheduled maintenance and prompt repair as needed to insure availability of EVSE as described in the City's Operation & Maintenance agreement.
- OEM – Original Equipment Manufacturer: The manufacturer of the EV charging station.
- PAR - Pedestrian Access Route: Reference the DPS ADA Rules and Regulations for further detail.
- Plug and Charge: EV charging initiated when customers plug a connector into their vehicle and their identity is authenticated, charging commences, and payment occurs automatically without any other customer actions required at the point of use.
- Supplier: An entity supplying EVSEs.

Description of Work:
This design guidance covers the installation of EV charging stations and all appurtenances part thereof when used in public Right-of-Way, parking lots, parking stalls, and sidewalks. Installation includes all work necessary for the EV charging station to be fully operational, to include, but not limited to: Permits (e.g. construction and operation) and site preparation, to include, but not limited to (as applicable): excavation, boring, concrete cutting; installation of a shelter for an EV charging station; all lighting; equipment and installation; curbing, paving and striping; landscaping; conduit and cabling installation; electric equipment installation, grid connection hardware, etc. Onsite signage will be fabricated and installed by the City.

Approval Process:

1) General process to install EVSE.
   Please refer to Figure 1 – EV Charger Installation Flow Chart for additional guidance.

   Step 1: Obtain approval of EV charging station locations (10 business days). Make a submission with the information detailed below in Section 2 Location Pre-Approval to Parkingservices@columbus.gov.

   Step 2: Submit a 910 Permit Application and fee (45 calendar days concurrent to subsequent activities). Before allowing placement of a facility in the public right-of-way (ROW) a 910 permit is required: 910 Permit Application. A 910 permit must be approved prior to issuance of a 903 permit for construction.

   Step 3: Submit a Site development application and obtain a certified physical address for EV chargers (Building and Zoning Services (BZS) review 12 business days). Application shall include the previous pre-approved site plan and pre-approval email from the Division of Parking Services within the plan set:
   Site development website.

   - Step 3A (Power source inside ROW): Site Plan review is routed to DPS and Division of Traffic Management.
   - Step 3B (Power source outside the ROW): Site Plan review performed by BZS.

- For the certified address, if applicable, submit application and fees to BZS: Certified Address Request Form.

Step 4: Obtain Drawer E (E-Plan) scope (14 calendar days). The DPS Division of Traffic Management generates an E-plan scope, within 14 calendar days of issuing comments on the 1st site plan submittal.

Step 5: Prepare E-plan. Per City of Columbus Design Guidance for Electric Vehicle Charging Station Equipment.

Step 6: Submit E-plan for review (12 business days initial review/ 6 business days back check). Submit E plan for review and address comments.

Step 7: Receive E-plan approval. The E-plan is approved (per Design Approval process below).

Step 8: Obtain Final Site Compliance Plan approval (12 business days initial review/ 6 business days back check). Approval from BZS required when power source is outside the ROW. Site plan shall be approved prior to issuance of the electrical permit.

Step 9: Execute 901 Construction Agreement (14 calendar days). As part of the agreement, the Contractor shall provide all required documentation to the city, including:

- Insurance certificates
- Performance bond (901 AGR bond)
- Maintenance bond
- Construction cost estimate (in Excel format)
- Construction inspection fees
- Four (4) complete full size plan sets

Step 10: Obtain 910 Permit Approval.

Step 11: Submit 903 Excavation Permit and fees for approval (20 business days). ROW permitting information is located at: ROW Permits.

- Each City department identified as required for review will have twenty (20) business days from the date of submittal to complete the initial review. A plan drawing rejected for any reason, shall be resubmitted with the necessary changes and uploaded into the portal and labeled as revised drawing with the date. Ten (10) business days will be allowed for all re-submittals to department(s) for approval. Permit reviews cannot be due on a weekend or holiday. Due dates should be set for the next business day.

Step 12: Begin construction and inspection (Varies). In addition to all plan items, the Contractor is responsible for the following tasks during construction:

- Schedule weekly construction progress meetings with the Division of Parking Services.
- Schedule construction inspection: 614-645-0433.
- Obtain an electrical permit from BZS: Submit application, permit fee, and inspection fee: Electric Permit.

- Notify the Division of Parking Services if parking is impacted.
    - Pay for parking meter lost revenue fees.
    - Pay for parking meter head removal and reinstallation fees.

Step 13: Construction complete. Resolve and complete any remaining punch list items. By the time Owner completes the punch list must comply with Ohio Revised Code 3781.26.

Step 14: Annual inspection and permit renewal. The Contractor will be responsible for the following:

- Department of Public Safety – Division of Weights and Measures
    - $60/unit yearly inspection fee
- Annual 910 ROW permit renewal and fee

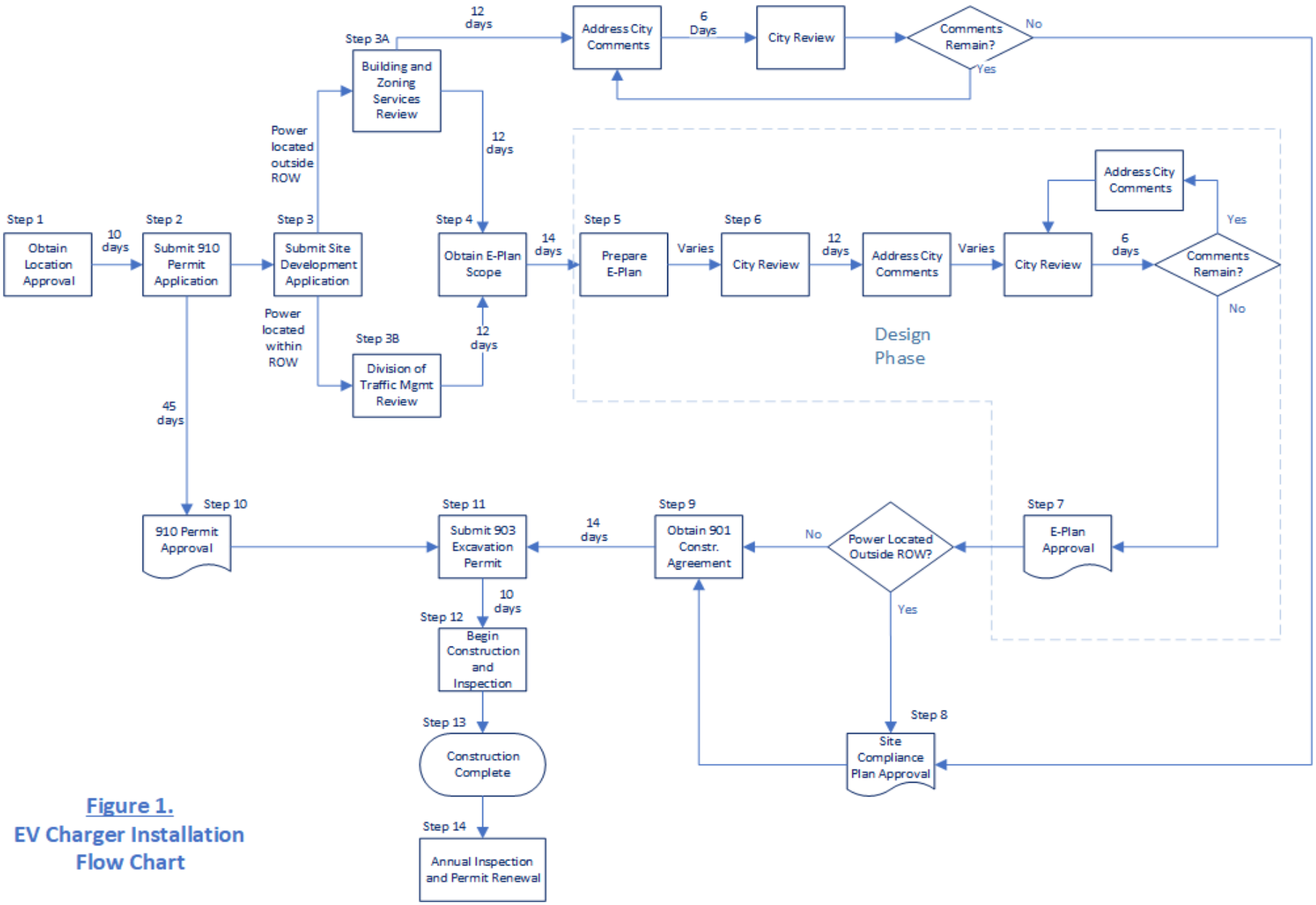

Figure 1.
EV Charger Installation Flow Chart

2) Location Pre-Approval.
The initial request for approval of a location shall be submitted in writing by the Contractor to:

Department of Public Service
Attn: Administrator, Parking Services
111 North Front Street 7th Floor, Columbus, OH 43215

The City shall then accept or reject the location and advise the Contractor of its decision. Items to be completed and provided for preliminary approval of a site include:

a) Location of proposed parking spots for EV including:
   i) Site plan of the location that will be reviewed by Division of Traffic Management for scoping after pre-approval. Include a plan view showing entire block-face showing the number of parking spaces, and ADA access route such as to the facility served.
   ii) Number of spaces requested and the size of each parking space.
   iii) Meter number(s) (if applicable).
   iv) Mobile payment number(s) (if applicable).
   v) Any posted on-street restrictions (time limits, street sweeping, etc.).
   vi) Placement of the charger in ROW.
   vii) Written confirmation from the power company with location pre-approval information.
   viii) Model/Type of charger if known, or at least charger dimensions for the site plan "pre-approval."

Parking Services will provide notice to the appropriate area commission, historic preservation, special improvement district (SID), etc., and provide any feedback necessary when available.
Upon pre-approval, the Contractor will enter into the City's Operation and Maintenance agreement.

3) Design Approval.
The Contractor will submit an E-Plan for review through Site Engineering. See the Site development website and follow the requirements of the STREET CONSTRUCTION (E-PLAN) REQUIREMENTS (Commercial Site). E-Plan design will include locations and details of charging equipment, remote shutoff switches, distribution and meter panels, striping, signing, PAR, existing and proposed utilities, and all other existing and proposed items in the ROW.

4) Construction and Installation of Charging Stations.
a) If any work by the Contractor, as outlined in this Agreement, requires an installation permit and/or blocking a traffic lane, the Contractor or authorized

agent shall apply to the Department of Public Service for the appropriate permit. A copy of approved plans shall be presented when applying for said permit.

b) The Contractor is solely responsible for supervising the construction and installation of the charging stations, and shall have control over construction, scheduling, and installation means, methods, techniques, sequences, and procedures, including the coordination of all work. No work will begin until E-Plan approval by the City and all applicable permits, agreements and certifications have been obtained.

c) Once approved, and after the Contractor has provided the City with all necessary insurance certificates required by any associated agreements, the Contractor will, at its sole cost and expense, oversee and manage the installation of the charging station(s), including the hiring and coordination of all vendors and contractors; the installation of electrical equipment, utility lines, hardware, and software; site preparation, trenching, repaving, and landscaping; and installation of all Contractor branded signage only. The City will provide staffing support to meet with the Contractor at the location(s) as needed, and will cooperate generally with the Contractor during the planning, permitting, and construction of the charging station(s).

5) Design Requirements.

a) This design guidance document and associated drawings, details, and design preferences are intended to provide City of Columbus design requirements for EVSE. For every EVSE installation, site specific plans are required detailing existing and proposed conditions for all equipment placement, electrical and underground details, parking and traffic control, and pedestrian access route (PAR).

b) Where an ADA accessible EVSE is required see the U.S. Access Board. An ADA compliant path must be provided to access the charger and the charging port of the vehicle along with meeting reach distance and height requirements. All other requirements set forth by the US Access Board including accessible mobility and communication features and number of accessible chargers must be met. In general, at least one charger for every 25 at a site must be accessible. Details must be provided on the site-specific plan.

c) Bollards or other fixed vehicle impact protection shall not be used within the City right-of-way except alleys due to driver safety concerns. Bollards may be considered in parking lots and alleys where speed is not a factor. Consult the Ohio Fire Code Section 312 for requirements on bollards.

d) Paint color shall meet the downtown streetscape standards (as applicable) and be approved by the City Engineer.

e) Placement of equipment shall not interfere with locations that will likely be used for other purposes.

f) Adequate site lighting should be considered during design layout.

g) Replace existing pavement or hardscape per associated standard drawings.

h) Charging stations and other above ground infrastructure shall be located a minimum of 10 feet from fire hydrants.
i) A fire department emergency power disconnect shall be provided within 50 feet of the EV charging station, and supporting electric equipment, but no closer than 10 feet to any charger or cabinet. One Knox Remote Power Box shall be installed per main power source feeding EVSE, and meet the following requirements:
    i) The disconnect shall be a Knox Remote Power Box (Red) with dual key.
    ii) The disconnect shall be mounted at a height of 60" from grade.
    iii) A Phenolic plaque with red background and 2" white lettering stating "FD Emergency Shutoff – Electric Vehicle Charging Station" must be installed at each disconnect.
    iv) All electrical work on the E-plan shall meet NEC 2020, or latest edition and include the electrical contractor name, address and license number signed by the license holder on all submitted electrical drawings, sketches and panel schedules.

6) Parking Requirements.
    a) All parking locations associated with EVSE must be delineated. For parallel parking spots, "T" marking is the preferred delineation.
    b) The parking spot shall be delineated with striping or a parking meter. Parking spots shall be 8' wide and approximately 20' long (however refer to ADA if intended to be an accessible space).
    c) Parking spaces must be located at least 30' from an intersecting street or stop sign/line. Ensure adequate sight distance is provided.
    d) All equipment must be at minimum 10' away from fire hydrants.

7) Location Placement Requirements.
    a) Chargers shall not be installed on streets with peak hour restricted parking.
    b) Equipment setback – For curbside charging, all charging equipment should be located a minimum of 30" behind the face of curb. Equipment may be located set back a minimum of 18" from the face of curb within 5' of the parking stall delineation where car door swings are not a concern. Charging locations on uncurbed roadway will require approved protection from vehicles such as bollards (where permitted), islands, etc. Per the ADA requirements, ensure clear ground space access to the charger.

8) Contractor Responsibilities.
    a) All units and parts shall be at a minimum like new and industry standard current technology available as of the notice to proceed date.
    b) EV charging station shall include all cables, connectors, interfaces, documentation for all components, and any other items needed for full assembly and operation.
    c) Factory calibration (as applicable) shall occur prior to, or during installation, in accordance with OEM standards.

d) EVSE includes all standard manufacturer accessories.
e) EVSE has most current software version available as of the installation date.
f) EVSE supports remote diagnostics and has the ability to be "remote started" by the Contractor's customer service support. For ADA, Technical requirements for two-way voice communication can be found in Section 508 (§412), and Effective Communication is addressed in DOJ ADA regulations. Multi-lingual access may also be required.
g) The Contractor assumes all responsibility for charging sites including equipment knockdowns and damage until the site has been accepted by the City and has been made operational at which point the responsibility transfers to the charging station operator.
h) Utility Costs. The Contractor shall assume and bear the cost of any utilities necessary to the operation and maintenance of the charging stations.

9) Installation.
   a) Contractor will be solely responsible for the following included as part of process for installing each EV charging station:
      i) Obtaining all (as applicable) local, state and federal permits required for installation and operation of the EV charging station. Any associated permit fees are the responsibility of the Contractor.
      ii) Locating utilities and facilities per Ohio Revised Code 153.64.
      iii) Performing all installation work in accordance with all (as applicable) local, state and federal zoning and fire code requirements.
      iv) Installation shall meet the requirements of EV charging station detail drawings.

10) Operation and Maintenance.
   a) The Contractor shall operate and maintain EVSE per the executed Agreement For Provision, Operation and Maintenance and/or contract documents.

11) Charging Equipment Specifications.
   a) EVSE can come from current City approved vendors or vendors approved as part of EV charging incentive programs applicable within the City limits such as AEP Ohio's EV Charging Rebate Program, the National Electric Vehicle Infrastructure (NEVI) Program through Ohio DOT, or the VW Settlement Fund Program though the Ohio EPA. All charging equipment shall be approved by the engineer as part of shop drawing review. The charging equipment must also meet the following standards, including:
      (1) All applicable NEC and NFPA standards
      (2) EVSE shall be certified by a Nationally Recognized Testing Lab
      (3) Compliant with UL 2202 – Standard for Safety for EV Charging System Equipment

(4) Compliant with UL 2231 (Parts 1 and 2) – Standard for Personnel Protection Systems for EV supply circuits
(5) Compliant with UL 2251 - Standard for Plugs, Receptacles, and Couplers for Electric Vehicles
(6) Society of Automotive Engineers (SAE) J-1772 Combined Connector System (CCS) Standards
(7) IEEE Std 2030.1.1-2015 (CHAdeMO)
(8) Validated and certified by UL 2594 or equivalent – Outline for investigation for EV supply Equipment
(9) NFPA 70, National Electrical Code (NEC) Article 625
(10) SAE J2894, Power Quality Requirements for Plug-In Electric Vehicles
(11) NIST Handbook 44 - EVSE used to charge electric vehicles shall indicate the electrical energy, the unit price, and the total price of each transaction
(12) Authorization under part 15, subpart B of the FCC regulations for unintentional radiators
(13) For AC Level 2 EVSE, chargers and equipment must be EPA Energy Star Rated®.

b) Electrical Safety.
(1) EVSE shall have the ability to remotely stop flow of power through unit when not in use.
(2) EVSE shall have over-current protection.
(3) EVSE shall have a Charge Circuit Interrupting Device (CCID) or Ground Fault Circuit Interrupter (GFCI) designed to shut off the flow of electric power to reduce the risk of electric shock.

c) Networking.
(1) EVSE shall be network-ready to allow for management of charging operations.
(2) EVSE shall use Open Charge Point Protocol (OCPP 2.0 or later) to communicate with a network.
(3) EVSE hardware shall be operable by a different network service provider without modification necessary from the original vendor.
(4) EVSE shall be capable of remote configuration, reporting, and management.
(5) EVSE shall be capable of connecting to network via secure wireless or cellular network. Ensure credit card transactions are compliant with the latest PCI and PA-DSS standards and to protect all sensitive and/or confidential data.
(6) EVSE shall be accessible by the City upon request.

d) Load Management/Demand Response.
   (1) Contractor shall coordinate with the utility provider to confirm expected power demand will remain within the capacity of the designed electrical system. Power management may be used to achieve reasonable power loads.
   (2) The network communications, controls, and back office support service should have the ability to monitor energy usage (kWh) and energy demand (kW) of the EVSE.
   (3) Where applicable, network communications, controls, and back office support service should have the ability to respond to utility provided demand response signals via the OpenADR 2.0b protocol.
   (4) EV-to-charger communications should meet ISO 15118 standards.
   (5) Communications should meet Open Charge Point Interface (OCPI) 2.2.2 protocols.

e) Customer Payment Options.
   (1) As applicable, the network infrastructure shall be PCI compliant in order to execute financial transactions with EV drivers safely and securely. Network provider shall have PCI DSS certification.
   (2) The fee collection system shall accept, at a minimum, two forms of payment, such as access codes, plug and charge, mobile application, and/or contactless RFID cards without incurring additional fees, inconvenience, or delays for one payment or access control method over another.
   (3) Infrastructure should have a point-of-sale and supporting network that uses an open protocol to allow subscribers of other EV charging system networks to access the EV charging station.
   (4) The City shall install and maintain parking meters, as defined in Columbus City Code Section 2155.01, and set the rates and times as appropriate for each electric vehicle car share space. The City shall fabricate and install signage at the so City parking enforcement, including ticketing and towing of vehicles, shall occur in order to maximize use and availability of the charging stations. The Contractor shall provide a schedule and coordinate with the City forces to allow access for the installation of the signage.
   (5) As applicable, the charging station owner will be billed for power as a standard customer by either the City of Columbus, Division of Power or AEP Ohio.
   (6) The owner may require a charging fee from the station users. This fee should, at a minimum, cover the power bill while supporting a sustainable business model for the owner and promoting publicly accessible EV charging.

f) Charger Specifications.
   (1) Level 2 (L2) – 208 to 240V AC at 15-30 amps (3 kW to > 12 kW)
   (2) DC Fast Charging (DCFC) – 480-600V at 120 amps (50 kW to >350 kW) with SAE CCS Combo standard plug required and optional additional CHadeMO standard plug.
   (3) Can vary from these ranges with engineer's approval if using solar, battery storage, upgraded technology or other sustainable charging options as part of the installation.

g) Data Collection and Reporting.
   The following minimum data reporting requirements will apply to all publicly accessible chargers installed within the City ROW.
   (1) Monthly data summaries including the following fields:
      (a) Number of charging events
      (b) Number of unique users
      (c) Total energy (kWh)
      (d) Peak system kW
      (e) Average charging event time
      (f) Average charging event kW and kWh
   (2) Data Formatting and Access. Provide the following:
      (a) .csv file with the requested data fields included for the month
      (b) An Application Programming Interface (API) using SOAP or REST paradigms. Live EV charging station data shall be provided through the API. This data will be used in a real-time city dashboard for public EV chargers.
   (3) Supplier shall report EV charging stations to AFDC Station Locator once fully operational.

h) Screen displays.
   (1) Should be LCD, LED or equivalent or better, user friendly, easy to operate, daylight and night viewable, and UV-protected with human-machine interface capability.
   (2) Display cost, time limitations, power, charging, charging complete, remote control, system status, faults, and service.
   (3) User interface (UI) for ADA. See U.S. Access Board from 36 C.F.R. §1194.1, App. A and C. EV chargers which do not incorporate a display screen would not be required to be speech-output enabled, but are still Information and Communication Technology (ICT) and would have accessibility requirements if they are any more complicated than just plugging it in.

i) Access.
   (1) EVSE should be accessible to all members of the public, with no membership required to a specific network for access.
   (2) Consider alignments that allow for trailer pull-through and avoid backing into traffic.
   (3) When under the ADA and ABA Accessibility Standards, EV charging stations must comply with the technical requirements for
      (1) floor and ground surfaces (§302),
      (2) clear floor or ground space (§305),
      (3) reach ranges (§308),
      (4) operable parts (§309),
      (5) accessible routes (§402),
      (6) parking (§502),
      (7) signs (§703),
      (8) fare machines (§707).

j) Appearance.
   (1) Any form of graphics including branding, logos, and/or art, included on or in the vicinity of the charging stations within the public ROW are subject to the rules and regulations included within the City of Columbus graphics code.
   (2) The Supplier shall coordinate with the DPS on the potential installation of art work incorporated into charging station locations.

k) Remote Shut-off Switches.
   (1) Knox Remote Power Box mounted to a 5’ pedestal per Standard Construction Drawings 4100 and 4163.

l) Distribution Cabinets/Pedestals.
   (1) Milbank Commercial Pedestal (or approved equal) to house all utility equipment including, but not limited to, the meter, panel, potential transformers, current transformers, step down transformers, etc. The unit specified must be approved by the Division of Power and the utility providing electrical service.
   (2) Special permission must be obtained from the City Engineer for uni-strut applications.

m) Underground conduit used for EVSE installation shall meet requirements of NEC and City DOP TDMIS standards as applicable.

n) Misc. Minimum Requirements.

(1) EVSE shall include security design features to remain tamper-resistant and vandalism-resistant, such as tamper-resistant screws, anti-vandalism hardware, locked enclosures, and graffiti-resistant coating.

(2) EVSE shall be capable of operating in an ambient temperature range of minus 22 to 122 degrees Fahrenheit with a relative humidity of up to 90 percent.

(3) EVSE shall be able to withstand extreme weather conditions including minor flooding, heavy rains, high winds, snow and ice, and is protected from malfunctions due to condensation.

(4) Cabinets and above ground structures need designed to a 90 MPH wind load as specified in *Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals*, *(Latest Edition).*

(5) EVSE and any external accessories (if applicable) shall have outdoor-rated enclosure - NEMA 3R or greater.

(6) EVSE should have the ability to measure demand and energy delivered at an accuracy of +/- 2%.

o) Refer to City DOP TDMIS 9211 materials specification for pull box criteria.

METHOD OF MEASUREMENT

Electric Vehicle Charging Stations plans require all pay items to be itemized for all sites included in subject plan set. This includes, but may not be limited to, all conduit, pull boxes, pedestals, pedestal foundations, distribution cabinet foundations, charging stations, charging station foundations, distribution panel cabinets, and/or any wiring. These items shall be provided and installed by the Supplier. All sidewalk surface impacted shall be left in a fully walkable condition that meets City of Columbus ADA Rules and Regulations. An example quantity table is included for reference.

ITEM	QUANTITY	UNIT	DESCRIPTION
202		SQFT	WALK REMOVED & DISPOSED OF
608		SQFT	CONCRETE SIDEWALK
620		EACH	SPECIAL – BOLLARD, AS PER PLAN
625		EACH	DISCONNECT CIRCUIT
625		LN FT	CONDUIT, 1”, 725.05
625		LN FT	CONDUIT, 2”, 725.05
625		LN FT	CONDUIT, 3”, 725.05
625		EACH	GROUND ROD
625		LN FT	TRENCH, AS PER PLAN
630		EACH	GROUND MOUNTED SUPPORT, NO. 2 POST
630		SQFT	SIGN, FLAT SHEET
632		LN FT	POWER CABLE, 1-CONDUCTOR, #4 AWG
632		LN FT	POWER CABLE, 2-CONDUCTOR, #4 AWG
632		LN FT	POWER CABLE, 3-CONDUCTOR, #4 AWG
632		EACH	PEDESTAL, AS PER PLAN
632		EACH	REMOTE SHUTOFF, AS PER PLAN
642		LN FT	PARKING LOT STALL MARKING
642		EACH	WORD ON PAVEMENT, 72 INCH
644		LUMP	REMOVAL OF EXISTING PAVEMENT MARKINGS
1002		EACH	DISTRIBUTION PANEL CABINET, AS PER PLAN
SPECIAL			[*VARIOUS CHARGERS BY DESIGNER]*