

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

**DESIGN GUIDANCE FOR ELECTRIC VEHICLE CHARGING STATION EQUIPMENT
March 25, 2021**

Purpose of Design Guidance:

For inclusion in all projects utilizing Electric Vehicle Supply Equipment (EVSE). For projects owned by the Department of Public Service, Consultant shall confirm with the Capital Improvements Project (CIP) Engineer (Project Manager) for project any 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 a detail drawing included with this guidance. Term definitions and equipment specifications are located at the bottom of 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, 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.

Description of Work:

This design guidance covers the installation of EV Charging Stations and all appurtenances part thereof when used in public roadways, 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), 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 and onsite signage; equipment and installation; curbing, paving and striping; landscaping; conduit and cabling installation; electric equipment installation, grid connection hardware, etc.

Approval Process:

- 1) General process to install EVSE

Step 1 - 910 Permit Application (45 days concurrent to subsequent activities): Before allowing placement of a facility in the public ROW a 910 permit is required. An application fee for the 910 permit must be paid prior to submitting for location pre-approval. The 910 permit is coordinated with the Right of Way manager. A 910 permit must be approved prior to issuance of a 903 permit for construction

Step 2 - (10 days) Location Pre-Approval: Make a submission with the information detailed below in part B to Parkingservices@columbus.gov .

Step 3 - (BZS review 12 days) - Contractor submits a Site development application [Site development website](#), which shall include the previous pre-approved site plan and pre-approval email from parking services within the plan set. This plan is reviewed by all agencies and comments are sent back within 12 days.

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

Step 5 - (12 day initial review/ 6 day back-check) - Submit an E plan for review

Step 6 - The E plan is approved (per Design Approval process below)

Step 7 - (14 days) - construction agreement (AGR) signature process is started.

Step 8 - 910 permit is approved

Step 9 - Construction agreement executed, surety provided, and inspection deposit paid

Step 10 - Obtain a 903 excavation permit

Step 11 - (varies) - installation and inspection. Inspection for this work can be arranged by calling 614-645-0433 by 2PM the day prior to needing inspection

2) Location Pre-Approval.

The initial request for approval of a location shall be submitted in writing by the Contractor to the Department of Public Service, CC: Assistant Director, Parking Services. 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) Provide a site plan of the location that will be reviewed by DOTM for scoping after pre-approval. Include a plan view showing entire block-face showing the number of parking spaces
- b) Number of spaces requested and the size of each parking space
- c) Meter number(s) (if applicable)
- d) Mobile payment number(s) (if applicable)
- e) Any posted on-street restrictions (time limits, street sweeping, etc)

- f) Placement of the charger in ROW
- g) Written confirmation from the power company with location pre-approval information.
- h) Model/Type of charger if known, or at least charger dimensions for the site plan “pre-approval.”

The contractor, in coordination with 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 a signed agreement with the Department of Public Service.

3) Design Approval.

The contractor will submit an E plan for review through Site Engineering [Site development website](#)

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 Right-of-Way.

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 site plans have been approved by the City and all applicable permits 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 Stations, 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 Locations as needed, and will cooperate generally with the Contractor during the planning, permitting, and construction of the Charging Stations.

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, 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. Details must be provided on the site specific plan. EVSE shall be ADA compliant.
- 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 be approved by the City Engineer.
- e) Adequate site lighting should be considered during design layout.
- f) Replace existing pavement or hardscape per associated standard drawings.
- g) Charging stations and other above ground infrastructure shall be located a minimum of 10 feet from fire hydrants
- h) A fire department emergency power disconnect shall be provided within 50 feet of the electric vehicle charging station, and supporting electric equipment, but no closer than 10 feet to any charger or cabinet, 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 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 20-23' long.
- 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) Charging parking spots should be located adjacent to Corners with ADA curb ramps.
- b) Chargers shall not be installed on streets with peak hour restricted parking.
- c) Equipment setback - 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..

8) Contractor Responsibilities:

- a) All units and parts shall be at least 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.
- 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) Performing all installation work in accordance with all (as applicable) local, state and federal zoning and fire code requirements.
 - iii) Installation shall meet the requirements of EV charging detail drawings.

10) Operation and Maintenance:

- a) Ensure all maintenance is performed for EV Charging Stations in accordance with all OEM requirements and recommendations.
- b) Each EV Charging Station shall be operated and maintained through the end of the Contract Term.
- c) Each EV Charging Station shall be fully operational a minimum of 160 hours per week (excludes “acts of god,” natural disasters, etc.).
- d) See maintenance agreement for Contractor responsibilities and response time.
- e) Customer Support Services
 - i) Provide the list of customer support options and contact information directly on the physical charging units or through the display.
 - ii) Be available 24/7 via toll-free phone or web portal through the operation period.
 - iii) Resolve issues over phone or web portal (i.e. remote reset, use guidance, screen errors, system errors, etc) or dispatch service personnel to arrive within 24 hours of notification of problem.

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. 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:
 - i) All applicable NEC and NFPA standards:
 - ii) EVSE shall be certified by a Nationally Recognized Testing Lab.
 - iii) Compliant with UL 2202 – Standard for Safety for EV Charging System Equipment
 - (a) Compliant with UL 2231 (Parts 1 and 2) – Standard for Personnel Protection Systems for EV supply circuits.
 - (b) Compliant with UL 2251 - Standard for Plugs, Receptacles, and Couplers for Electric Vehicles.
 - iv) Society of Automotive Engineers (SAE) J-1772 Combined Connector System (CCS) Standards.
 - v) IEEE Std 2030.1.1-2015 (CHAdeMO).
 - vi) Validated and certified by UL 2594 or equivalent – Outline for investigation for EV supply Equipment.
 - vii) NFPA 70, National Electrical Code (NEC) Article 625.
 - viii) SAE J2894, Power Quality Requirements for Plug-In Electric Vehicles.
 - ix) NIST Handbook 44 - EVSE used to charge electric vehicles shall indicate the electrical energy, the unit price, and the total price of each transaction.
 - x) Authorization under part 15, subpart B of the FCC regulations for unintentional radiators.
- b) Electrical Safety

- i) EVSE shall have the ability to remotely stop flow of power through unit when not in use.
 - ii) EVSE shall have over-current protection to prevent vehicles from drawing too much power.
 - iii) 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
- i) EVSE should be network-ready to allow for management of charging operations.
 - ii) EVSE should use Open Charge Point Protocol (OCPP 2.0 or later) to communicate with a network.
 - iii) EVSE hardware should be operable by a different network service provider without modification necessary from the original vendor.
 - iv) EVSE should be capable of remote configuration, reporting, and management.
 - v) EVSE should be capable of connecting to network via secure wireless or cellular network.
 - vi) EVSE should be accessible by the City upon request.
- d) Load Management/Demand Response
- i) 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.
 - ii) 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.
 - iii) Where applicable, network communications, controls, and back office support service should have the ability to respond to utility provided demand response signals via the Open ADR 2.0b protocol.
- e) Customer Payment Options
- i) 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.
 - ii) The fee collection system shall accept, at a minimum, two forms of payment, such as access codes, mobile application, and/or contactless RFID cards without incurring additional fees, inconvenience, or delays for one payment or access control method over another.
 - iii) 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.
 - iv) 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. Appropriate signage shall be placed by the City at the Locations 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 will place signage and will enforce for “NO PARKING EXCEPT ELECTRIC VEHICLE CHARGING”

- v) 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.
- vi) The owner may require a charging fee from the station users.
- vii) Equipment shall conform to city applications as required such as the Multi Modal Trip Planning Application (PIVOT).
- f) Charger Specifications
 - i) Level 2 (L2) – 240V AC at 15-30 amps (3 to 12 kW)
 - ii) DC Fast Charging (DCFC) – 480-600V at 120 amps (25 kW to >350 kW) with both SAE CCS Combo standard and CHadeMO standard plugs
 - iii) 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
 - i) The following minimum data reporting requirements will apply to all publicly accessible chargers installed within the City right-of-way:
 - (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 at least one of the following options in order to share the data fields in section (a)
 - (a) .csv file with the data fields from (a) above included for the month
 - (b) An Application Programming Interface (API) using SOAP or REST paradigms
 - (3) Supplier should report EV charging stations to AFDC Station Locator once fully operational.
 - (4) Live EV Charging Station status reporting should be provided (online/in-use/out-of-service) and make available on a web portal or through third party EV Station Locator.
- h) Screen displays:
 - i) 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.
 - ii) Display cost, time limitations, power, charging, charging complete, remote control, system status, faults, and service.
- i) Access
 - i) EVSE should be accessible to all members of the public, with no membership required to a specific network for access.
- j) Appearance:

- i) Any form of graphics including branding, logos, and/or art, included on or in the vicinity of the charging stations within the public right of way are subject to the rules and regulations included within the City of Columbus graphics code.
- ii) The Supplier shall coordinate with the Department of Public Service on the potential installation of art work incorporated into charging station locations.
- k) Remote Shut-off Switches:
 - i) Knox Remote Power Box (see attached product sheet) mounted to a 5' pedestal per standard construction drawings 4100 and 4163.
- l) Distribution Cabinets/Pedestals:
 - i) 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 utility providing electrical service.
- m) Underground conduit used for EVSE installation shall meet requirements of NEC and City DOP TDMIS standards as applicable.
- n) Misc. Minimum Requirements:
 - i) 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.
 - ii) 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.
 - iii) 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.
 - iv) 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)*
 - v) EVSE and any external accessories (if applicable) shall have outdoor-rated enclosure - NEMA 3R or greater.
 - vi) EVSE should have the ability to measure demand and energy delivered at an accuracy of +/- 2%.
 - vii) Refer to City DOP TDMIS 9211 specification for pull box criteria.

12) Document Definitions:

- a) EV Charging Station - also referred to as Electric Vehicle Supply Equipment (EVSE), Definition. "Charging Station" shall mean all electrical and mechanical equipment, hardware, and software installed by Contractor, electrical wiring and/or cabling, equipment infrastructure, the Contractor's signage 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.
- b) CoC – City of Columbus (the City)
- c) Contractor - means the entity responsible for the project
- d) AFDC – Alternative Fuels Data Center

- e) 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.
- f) EVSE – Electric Vehicle Supply Equipment: Supplies electric energy used to recharge electric vehicles.
- g) Charging Port: Single cord with connector emanating from a charger.
- h) Supplier: An entity supplying EVSEs.
- i) Fully Operational: An EV charging station is open and ready for use by customers in accordance with the OEM operating standards.
- j) Installation Completion – The date the EV Charging Station is fully operational.
- k) OEM – Original Equipment Manufacturer: The manufacturer of the EV Charging Station.
- l) Maintenance: Both scheduled maintenance and prompt repair as needed to insure availability of EVSE as described in the associated agreement.
- m) PAR - Pedestrian Access Route, further detail in the DPS ADA Rules and Regulations

13)EXAMPLE FOR USE ON A CIP PROJECT

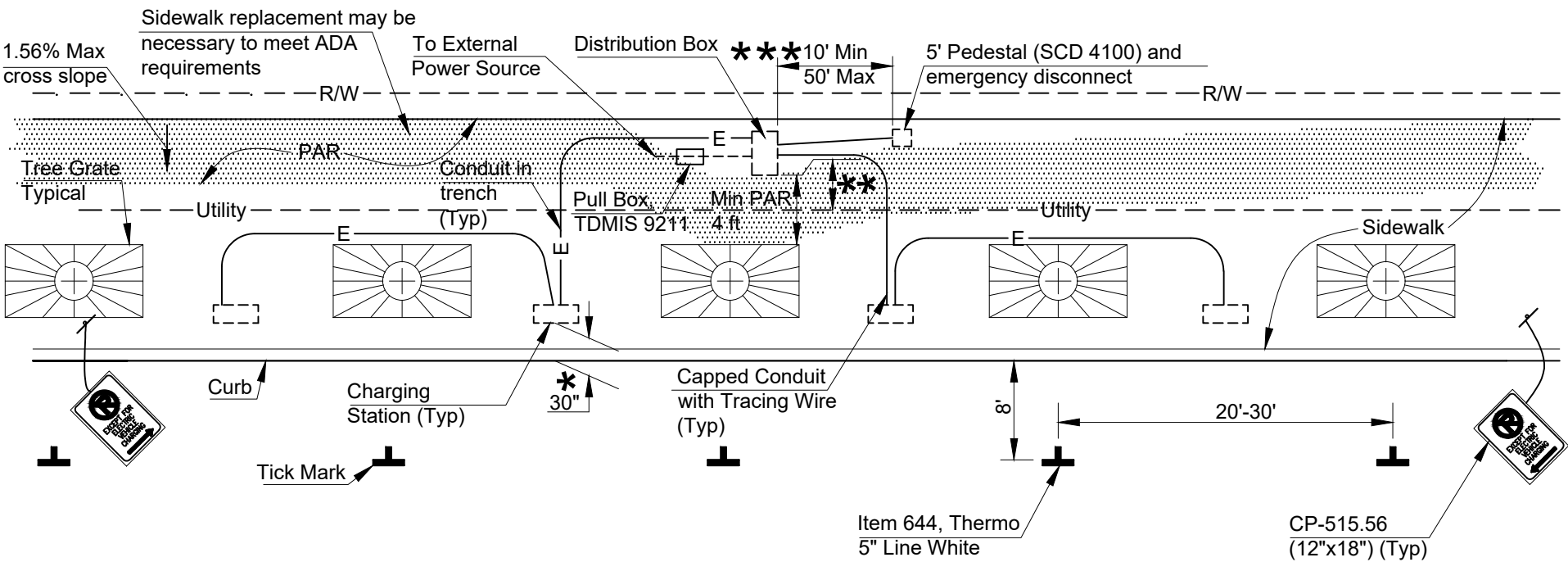
METHOD OF MEASUREMENT

The City will measure electric vehicle charging station ready site infrastructure by the number of future electric vehicle charging stations sites installed. An electric vehicle charging station ready site is composed of one distribution cabinet location, one emergency shutoff location, and any number of charging station locations detailed on a plan sheet(s) specific to each site. This item of work shall include all conduit, pull boxes, pedestals, pedestal foundations, and distribution cabinet foundations installed for future electric vehicle supply equipment.

This item of work does not include charging stations, charging station foundations, distribution panel cabinets, or any wiring. These items shall be provided and installed by the Supplier.

Electric Vehicle Charging Station Ready Site Infrastructure lump sum pay item includes all work to make a site ready for installation of EVSE under a different contract. It includes all underground work and surface restoration specified in the plans. The site shall be left with pull boxes covering locations for future chargers, distribution equipment, and emergency shutoff equipment. All sidewalk surface impacted shall be left in a fully walkable condition.

Electric Vehicle Charging Station Site Complete lump sum pay item will include all work described in the Electric Vehicle Charging Station Ready Site infrastructure pay item plus installation of all charging equipment, distribution cabinet, shutoff switch, wiring,....



NOTES:

Details in this design detail are intended to show standards and minimum detail provided for an EV charging station design and construction. All EV charging stations require detailed design to the specific site location to be reviewed and approved.

The drawing shows EV chargers placed on an existing street and does not depict ADA accessible EV chargers. Site specific design providing for access and reach requirements is needed for an ADA accessible charger.

Charging infrastructure shall not be placed in locations which block a Pedestrian Access Route (PAR).

All existing concrete sidewalk not scheduled for replacement but being crossed by the installation of traffic items, electrical conduit, piping, etc. shall be fully removed at an existing joint and replaced per standard drawing 2300 unless noted otherwise. Refer to standard drawing 144.1 page 2 for curb repair. Show a minimum 4 ft PAR through the site with shading detailing the path. Provide spot shot elevations and cross slopes throughout the PAR. Adhere to all requirements of the City ADA Rules and Regulations.

* Can be 18" from face of curb when located within 5 ft of parking stall delineation.

** 3 ft clearance shall be maintained between underground charger infrastructure including pull boxes, conduit, foundations, and existing utilities. Refer to Plan Routing Manual for utility clearances.

*** See section 6 of the EVSE design guidance for spacing requirement.

EV CHARGING PARALLEL PARKING - DESIGN DETAIL

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