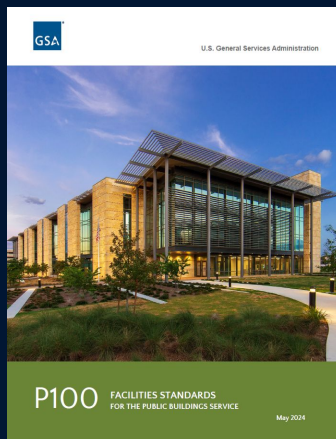




2024 P100 Training



This session is being recorded.

P100 A+E Training Series Ground Rules

- Attendance will be taken automatically; there is no sign-in sheet
- GSA Participants who attend 95% of the session will be provided CLPs
- If you join by phone, please email your name and the phone number you joined with so we can record your attendance.
Address email to: mark.kutchi@gsa.gov & benjamin.pisarcik@gsa.gov
- Mute microphone when not speaking
- Use Q & A to ask questions; questions will be taken at specific intervals throughout and at the end of the presentation

P100 A+E Training Series Ground Rules

- Approach each topic in a positive and constructive manner
- Slides and recordings will be made available after the session internally on Insite and publicly on: www.gsa.gov/p100.
- Slides will be added in a few days but recordings will take a few weeks.
- We are starting the meeting recording, please leave the meeting if you do not consent to being recorded.

Electrical Training

Electrical Engineering



This session is being recorded.

Presenters

Jeff Schetrompf
Electrical Engineer



Ben Pisarcik
Electrical Engineer





01

General

General
Requirements

02

Lighting

Updates to the
Performance Tables
and Prescriptive
Requirements

03

Power

Updates to the
Performance Tables
and Prescriptive
Requirements



01

General Requirements

Updates & Reminders

General Requirements

P100 Compliance & Waivers

- P100 compliance is mandatory.
- P100 waivers are considered for unique project specific circumstances.
- P100 waivers are for preinstalled deviations, they are not granted after the fact.
- P100 waivers are not granted to save cost or value engineering.
- We encourage those that may have a potential waiver request to reach out to us prior to routing the waiver for signatures
- Jeff and I maintain a running log for future P100 considerations, feel free to contact us at any time to add items.

The background features a dark blue gradient with a series of parallel, slightly curved lines in shades of teal and blue. A bright orange and yellow light source on the left creates a lens flare effect, with rays of light extending across the scene. A trail of small, glowing blue particles curves from the bottom left towards the top right, following the path of the light rays.

02

Lighting Requirements

Updates & Reminders

Lighting - Reminder

Standard Light Levels

Table 6.1 Interior Lighting Requirements (Unless otherwise required by agency design guides)

Area/Activity	Illuminance Lux	Illuminance Fc
Office Enclosed (Ambient)	323	30
Office Open (Ambient)	323	30
Conference/Meeting	323	30
Classroom/Lecture	323	30
Lobby	108	10
Atrium	108	10
Lounge/Recreation	108	10
Dining Area	108	10
Food Preparation	538	50
Restrooms	108	10
Corridor/Transition	108	10
Stairs	108	10
Active Storage	108	10
Inactive Storage	54	5
Electrical/Mechanical/Technology	323	30

Lighting

Updates Lighting Controls 6.3.2.5

- DLC SSL updated from 5.0 to Version 5.1 (Efficacy, controllability, glare and distribution) as appropriate
- Luna 1.0 is new (Efficient exterior luminaires, minimizing light pollution while providing adequate visibility as appropriate)
- In cases where luminaires meeting DLC requirements are not available, the lighting designer has to evaluate on a case-by-case basis

Lighting

Updates Lighting Controls 6.3.2.5

- Standardized Digital Protocols
- DALI-2 Standardized Digital Protocols
- Not required to install individually addressable luminaries
- D4i goes above and beyond DALI-2 standardized protocols for sensors drivers and luminaires.

Lighting - Updates

Updates - Power over Ethernet (PoE)

- Use red cabling for emergency lighting to differentiate from other lighting cabling
- Comply with UL924 where applicable for emergency lighting
- Cabling must be different in color from IT cabling for identification purposes, minimum CAT5e or above
- Limit cable bundles to 24 or less to reduce heat gain while increasing the systems longevity
- PoE systems shall adhere to the maximum power output of the switch and individual port used to power the luminaire

Lighting - Updates

Updates - Power over Ethernet (PoE) Continued

- Cable runs must be limited to 328 feet
- Comply with IEEE 802.3bt class 8, 90 watt standard
- Comply with NEC Articles 725 and 840
- All luminaires must be provided with dedicated drivers
- GSA IT must provide and maintain PoE switches

Lighting - Reminder

Retrofits

- UL rating maintained
- Retrofit kits must be DLC Standard
- Must have dimmable drivers
- Low risk level of flicker
- Meet IES Guidelines for tasks performed
- A mock up is required for typical areas within the building
- Must be reviewed and approved by the regional SME

Lighting - Updates & Reminders

Retrofit TLEDs

- Type A
 - Use existing ballast
 - Disadvantage ballast production is limited
- Type B
 - Update - Prohibited due to safety reasons and inability to be controlled
- Type C
 - Preferred
 - Replaces ballast with LED driver
 - Disadvantage few options for American made

Lighting

Updates

- Section 6.3.1.10 Luminaires installed in a drop ceiling grid must have additional support via wire, chain or threaded support.
 - Two supports are required at minimum diagonally





03

Power Requirements

Updates & Reminders

Power - Secondary Distribution-Reminder Section 6.5.6.2



**UL 1558
Switchgear**

Longevity
Resilient

More expensive
Larger



**UL 891
Switchboard**

Less costly
Smaller

Less reliable and
maintainable
Cannot be
refurbished



**UL 67
Panelboard**

Used up to 400
Amps

Power - Secondary Distribution 6.5.6.2.1

Update

- Switchgear must meet UL 1558 and be provided for the service entrance equipment of any **service building** 1200 amps or greater.

Update

- All switchgear and switchboard panels must have hinged covers in lieu of removable covers for safety purposes.



Power - Spare Capacity Requirements Section 6.5.2.3.5

Reminders: ampacity and capacity

- Panelboards for branch circuits 50% & 35%
 - All Panelboards must be fully populated with both active and spare circuit breakers
- Panelboards for lighting circuits 50% & 25%
 - All Panelboards must be fully populated with both active and spare circuit breakers
- Switchboards 35% & 25%
 - One spare per each size or as directed by GSA
- Switchgear 25% & 25%
 - One per each frame size fully equipped



Power - Spare Capacity Requirements Section 6.5.2.3.5

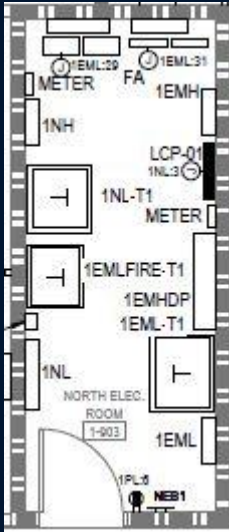
Update

- Spare Capacity “new components of the electrical system”
- If a project is adding circuits to an existing panel this is why the spare requirement exists.
- If the project is adding a new panelboard switchboard etc. the spare is required within this new equipment



Power - Electric Room Requirements - Reminder

Section 6.5.7.2



- Stacked in core areas
- Accessible by two perimeter walls
- Minimum Size 6'X10'
- Serves no more than 10,000 square feet
- Branch circuit 120' or less
- 30% spare wall space

Power - Duct banks Section 6.5.4.3 & 4

Minor Updates

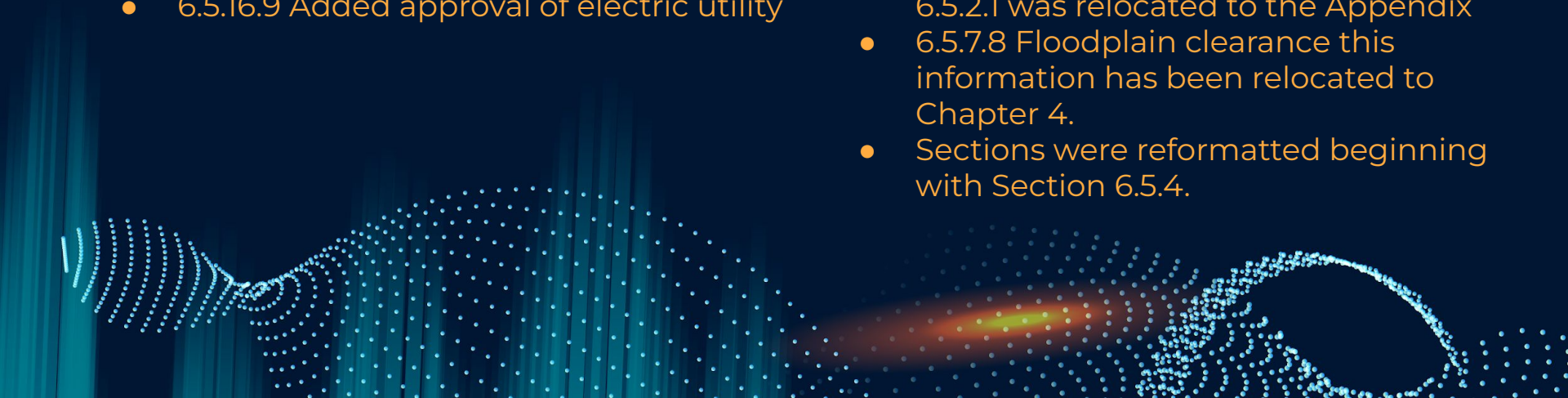
- Clarified direct bury conduit terminology
- 30" ~~thick~~ deep backfill above a concrete encased duct bank
- Increased manhole opening requirements from 30" to 36"

Power - Elevators

Section 6.5.8.3 Updates

- Ensure critical control circuits in elevator pits are positioned or otherwise protected from water intrusion to ensure operability during OEE or fire service use.
- 6.5.8.3 Elevator controllers must have a short circuit rating (SCCR) that exceeds the calculated fault current in accordance with NEC Article 620.16.
- Shunt trip circuit breaker or current limiting fused disconnect must be provided for sprinkled systems

Power - Miscellaneous Updates

- 6.5.9.6.1 Updates to conduit usage in accordance with the NEC
 - Electric Vehicle Supply Equipment has been moved to Chapter 8
 - 6.5.16.9 Added approval of electric utility
 - Type 2 SPDs increased from 250kA to 300kA
 - Maximum standard size
 - Codes and Standards section under 6.5.2.1 was relocated to the Appendix
 - 6.5.7.8 Floodplain clearance this information has been relocated to Chapter 4.
 - Sections were reformatted beginning with Section 6.5.4.
- 

Power - Miscellaneous

Reminders

- 6.5.16.1 Severe weather PV Specifications
- 6.5.9.2 Controlled receptacles and marking in accordance with ASHRAE 90.1



Power - Generators

Updates

- 6.5.11.2 Fuel Source diesel is recommended for generators larger than 500 kW
- Elevation see Chapter 4 as previously mentioned for electrical equipment
- 6.5.11.2.1 Load bank sizing 20% for gas and 75% for diesel

Power - Generators

Reminders

- 6.5.11.1 Separation of systems Life safety, required standby and optional standby NEC 700-702
- Fuel storage 48 hrs instead of 72 hrs
- UL 1558 Emergency/Standby Switchgear is required for 1200 Amps or greater



Power - Arc Flash Section

6.5.14.3

Reminders

- The final studies must be completed by the contractor
- The model must be provided to the region in a coordinated format along with the source code and all rights at no additional cost
- Updates to existing power system models shall be incorporated into any modifying project
- Where no model exists it must be generated if greater than 25% of the overall distribution is replaced



Power - MC Cable Section

6.5.9.6.2

Permitted

No more than 3
current carrying
conductors

- #10 Maximum
- Labeled 3 feet

Secured in
accordance with the
NEC



Not Permitted

Highly finished
spaces or embedded
in concrete

- Wet, Damp or Hazardous Spaces
 - Feeding critical equipment

**Cannot terminate
directly to a
panelboard**



Questions?

Contact Information

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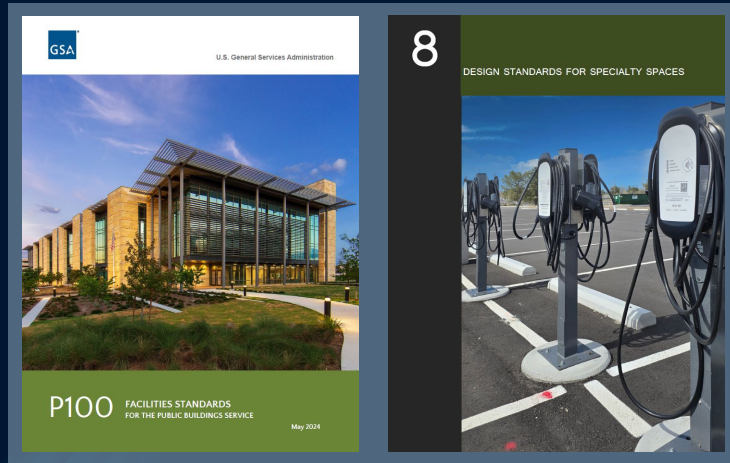
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Training

Electric Vehicle Supply Equipment (EVSE)



This session is being recorded.

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P100 Section 8.5 and Why

Major changes this cycle include:

- Relocation of all EVSE information into a common area
- Incorporation of Accessibility and Fire Protection Interim Guidance
- Increase in ratio of chargers to vehicles
- General update to reflect lessons learned



When to Include EVSE In A Project

EV chargers must be installed for GOVs for any project significantly modifying or installing parking lots or parking garages, including resurfacing.

Location Order of Preference:

1. Outside surface parking areas
2. Roof level of a parking structure
3. All other parking structure locations



Charger Quantities & Types (using the table)

Table 8.2 - Vehicle Charging	
Charger Quantities. Based on GOV Fleet Program Requirements	
Baseline	1 charging port for every 2 GOVs with 1 accessible charging facility
Tier 1	1 charging port for every 1 GOV with 1 accessible charging facility
Tier 2	> 1:1 ratio to allow for visiting EV charging with 1 accessible charging facility
Charger Types. Based on GOV Fleet Program Requirements	
Baseline	Mid Power AC Level 2 Charger: Minimum 6.6 kW at 208v or 7.2 kW at 240v
Tier 1	High Power AC Level 2 Charger: 8.0 kW - 20.0 kW range
Tier 2	Direct-Current Fast Charger (DCFC): Uses a 3-phase AC electric circuit but delivers direct current (DC) to the vehicle.
M & V	Not applicable
Plans & Specs	Yes
Calculations & Analysis	Provide analysis on quantity and capacity of chargers selected and how they relate to vehicle predicted usage patterns or tenant policy. Note: for level 2 and level 3 chargers, provide an accessible charging facility for each level of charging in one charging station
References	UL 1741, UL 2202, UL 2594, UL 9540
Basis of Design	Describe EV charging system requirements and how power sharing and/or charge management will be incorporated.
Construction Verification	Verify charge management controls for each charger.

8.5.1 EV Charging

An EV charger delivers an electrical current to the vehicle via a charging port. A charging port is defined as the cord and connector that attaches to the vehicle.

- 1- Comply with NEC
- 2- EV charging stations must be listed and labeled in accordance with UL 2202,
- 3- EVSE equipment must be listed and labeled in accordance with UL 2594
- 4- EVSE equipment with vehicle-to-grid capability must be listed in accordance with UL 1741
- 5 - Wireless power transfer equipment must be listed and labeled in accordance with UL 2750
- 6- Battery Energy Storage Systems (BESS) must meet NFPA 855 & UL 9540



8.5.1 EV Charging (cont'd)

- 7- Chargers to be located closest to feeding panels
- 8- Comply with manufacturer's requirements
- 9- Where applicable, EV charging stations must meet the lateral force-resisting requirements in the IBC and ASCE/SEI 7-22
- 10- EV charging stations must not operate if the EV's battery management system indicates a fault condition
- 11- In case of an electrical malfunction, the EV charging station must automatically disconnect
- 12- Chargers to be network capable & FedRAMP authorized
- 13- Open Charge Point Protocol (OCPP) compliant
- 14- Parking structures shall utilize wiring practices for damp locations



8.5.1 EV Charging (cont'd)

- 15- Wall mounted devices on non-combustible surfaces
- 16- Exterior parking vegetation/combustibles clearance
- 17- GFCI protection for receptacles
- 18- Charging cord protection (cable management systems)
- 19- Physical protection to chargers (bollards, wheel stops)
- 20- Lighting about the charging area
- 21- Ventilation
- 22- Metering must be included
- 23- Labels with feeding circuits
- 24- When updating electrical distribution, ensure future EVSE needs are incorporated



8.5.2 GOV Requirements

Federal fleet EVSE build-outs must minimally include:

- Complete and operational charging ports.
- Quantity and configuration of chargers and ports must be designed to accommodate tenant vehicle types and usage.
- Power sharing allows multiple charging ports to share a single branch circuit and must be incorporated, where appropriate (e.g., where vehicles have a high overnight dwell time).
- Charge management capabilities must be included to limit expansion of the power distribution system and to limit exposure to peak demand charges. Common elements to include under charge management are delayed charging, staggered charging, and avoiding time-of-day peak rates.
- Limited chargers may be added to the Emergency Power Supply System (EPSS) where required by tenant policy and spare capacity is available. Where spare EPSS capacity is not available, a stand-alone Battery Energy Storage System (BESS) could be considered.

8.5.3 POV Requirements

Where no tenant policy on the number of POV EVSE requirements exists, provide the following EVSE infrastructure:

- For lots with fewer than 50 POVs, install infrastructure for two charging ports.
- For lots with 50-100 POVs, install infrastructure for six charging ports.
- For lots with greater than 100 POVs, install infrastructure for a quantity of charging ports representing 6% of the planned POV parking.

8.5.4 EVSE Infrastructure

Infrastructure for each EV charging station, including both GOVs and POVs must include:

- One power conduit between the nearest electrical room (or otherwise approved location) and each charger. Where empty conduit is **provided for future use**, the minimum conduit size must be 2-1/2 inches for circuit runs up to 100' and 3 inches for longer runs.
- A minimum 1-inch communications conduit between an approved network switch location (or otherwise approved location) and each charger must be **included for any installation not using cellular communications or when the future communications method is unknown**.

8.5.4 EVSE Infrastructure

Infrastructure for each EV charging station, including both GOVs and POVs must include:

- Power conduits at the charging station must terminate in a concrete traffic rated hand-hole enclosure.
- Communication conduit, where needed, must terminate in an independent concrete traffic rated hand-hole enclosure.
- All conduits must be provided with pull string and be sealed with waterproof plugs at both ends.
- Traffic rated hand hole enclosures are not required in locations not exposed to vehicular traffic.
- Underground conduit installation requirements can be found in Section 6.5.4 Site Requirements of P100.

8.5.5 EVSE Accessible

Charging

GSA facilities must provide an Accessible Charging Station (ACS) with mobility and reach range features when installing Electric Vehicle (EV) charging stations.

Refer to the U.S. Access Board (USAB) website [USAB website link](#) for recommendations regarding accessible components.

GSA EVSE policy differs in some ways from the USAB recommendations and current rulemaking

Per P100 Chapter 1- 1.3.5, The Architectural Barriers Act Accessibility Standard will be applied to all GSA facilities , if local accessibility standards exist and are more restrictive, GSA must follow the more stringent code requirements .

yes



no



8.5.5.1 ACS COMPONENTS

Charging space configuration:

- Standard Charging Space - 11'-0" w x 20'-0" with 5'-0" side aisle and accessible route to building entrance and clear floor areas to access charger and ports.
- Hands Free Charging Space - 9'-0" w x 18'-0" with 5'-0" side aisle and accessible route to building entrance and clear floor areas to access charger.

Charger/Port:

- All transaction elements to be within accessible reach ranges per ABAAS CH.3
- Communication interface to support sight and hearing impaired
- Ports: Maximum force to lift cord and connect the port to vehicle must be between 5 lbs-10 lbs and include a cord support frame.



8.5.5.2 ACS SITE

1. Site Option 1 - Provide one (1) ACS for each separate parking facility being served and each separate level of charging (Level 1, Level 2, or DC fast Charge) in that area.

a. Position as the nearest charging space with an accessible route to the building entrance.

2. Site Option 2 - Provide one (1) ACS open to all vehicles (Government Owned Vehicles (GOV) and Privately Owned Vehicles (POV) open to all and nearest the building entrance and have one level of charging.

3. Site Option 3 - Provide one (1) ACS replacing an existing accessible parking stall at the same stall location and size.

a. This option is only used when hands free charging is provided and there are two or more accessible parking spaces present.

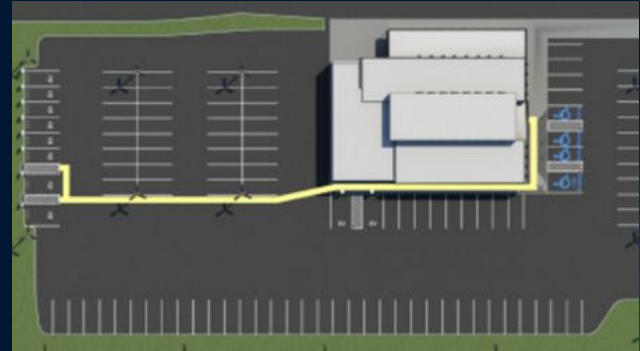


Table 8.3 Vehicle Accessible Charging Exceptions

Table 8.3 Vehicle Exceptions	
CONDITION	EXCEPTIONS
GOV new construction and alterations GOV/POV tenant initiated alterations	<ul style="list-style-type: none">• EVSE serving buses, trucks, delivery vehicles, emergency/law enforcement vehicles (as generally described in ABAAS F208.1 Exception) located in a particular parking facility are not required to provide an ACS for those vehicles only• Spaces reserved for a specific Federal Employee
POV - new construction (infrastructure only)	N/A

8.5.6 EVSE Fire Protection - Parking Structures

Automatic Sprinkler Protection

- Automatic fire sprinkler protection must be provided throughout parking structures where EV charging station(s) are installed or placed.
 - Includes Open & Enclosed Parking Structures.
 - See Chapter 7 for additional requirements for sprinkler systems installed in parking structures.

Standpipe Systems

- A Class 1 standpipe system must be provided at an accessible location for use by fire department personnel where EV charging station(s) are installed or placed within a parking structure or on the roof level of a parking structure.
 - Includes Open & Enclosed Parking Structures.
 - See Chapter 7 for additional requirements for standpipe systems in parking structures.

8.5.6 EVSE Fire Protection - Outdoor Parking Areas

- The location for outdoor surface parking area must meet one of the 4 bullet requirements for horizontal separation distance, measured at a 90-degree angle from the EV parking area to the exterior wall of a building:
 - The separation distance must be equal to or greater than 25 feet, or
 - The separation distance must be equal to or greater than 30 feet if the exterior wall is constructed of combustible materials or contains unprotected openings, or
 - The separation distance must be at a distance acceptable to the GSA Fire Protection Program Office that incorporates an alternative approach or method that achieves an acceptable level of safety, or
 - The separation distance must be at a distance acceptable to the GSA Fire Protection Program Office, with respect to fire exposure to any potential hazards.

8.5.6 EVSE Fire Protection - Manual Power Supply Disconnecting Means

- All Level 2 and Level 3 EV charging station installations must be provided with a manual power supply disconnecting means to disconnect the power supply to the EV charging stations.
 - The proposed location must consider whether the manual power disconnecting means is accessible by fire department personnel if an EV is on fire when connected to the EV charging station.
 - Appropriate signage must be provided on the EV charging station denoting the location of the manual power supply disconnecting means.
 - Appropriate signage must be provided at the manual power supply disconnecting means denoting which EV charging station(s) will be disconnected from their power supply.

8.5.6 EVSE Fire Protection - Parking Structure Entrance(s) Signage

- Each entrance to a parking structure must be provided with signage indicating the presence and locations of EV charging stations.
 - The signage must be installed in a position at each entrance to the parking structure that is visible from a vehicle entering the parking structure.
 - The signage must indicate that EV Charging Stations are present and the parking level(s) where the EV charging stations are located.

Questions

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 - David Frable - dave.frable@gsa.gov
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 - Jeff Schetrompf - jeffrey.schetrompf@gsa.gov
-