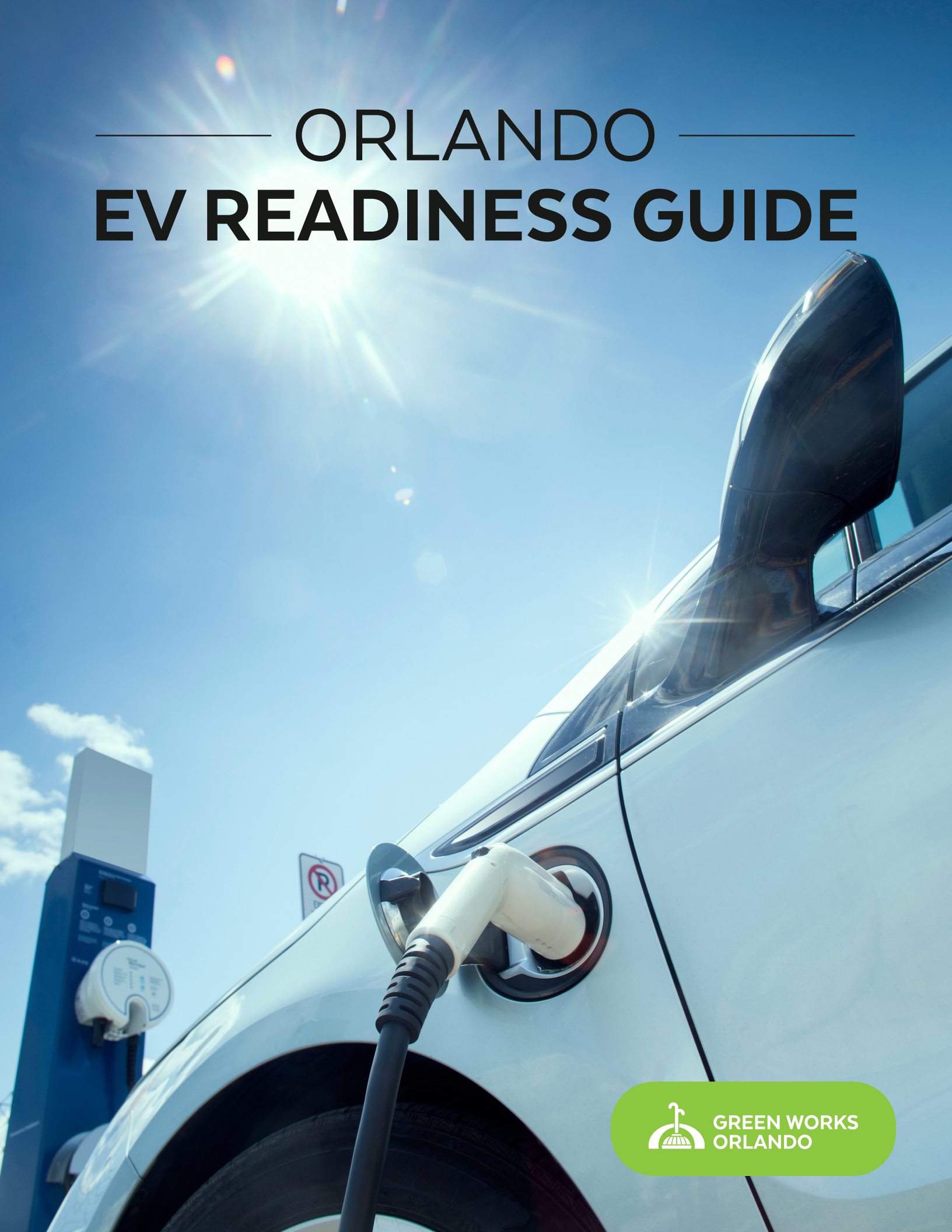
ORLANDO
EV READINESS GUIDE



GREEN WORKS ORLANDO


ELECTRIC VEHICLE
CHARGING STATION
RFID
CITY OF
ORLANDO
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ABOUT THIS GUIDE

This guide is intended to provide Orlando developers a detailed reference on the EV Readiness code purpose, coverage, resources, instructions for permitting, ADA, and other helpful tips for becoming EV Ready compliant. This guide also serves to support property owners and managers considering installation of EV charging infrastructure to their existing property. This document is not meant to replace approved codes or standards. For additional guidance, please contact the City of Orlando Planning Division.

GLOSSARY

- **Electric Vehicle (EV)** – powered by one or more electric motors. EVs plug into off-board sources of electricity and store the energy in a battery.
- **Internal Combustion Engine (ICE) –** generate mechanical power by burning a liquid or gaseous fuel.
- **Plug-In Hybrid Electric Vehicle (PHEV) –** powered by an ICE and by an electric motor that uses energy stored in a battery. PHEVs can be plugged into off-board sources of electricity to charge the battery.
- **Plug-in Electric Vehicles (PEV) –** derive all or part of their power from off-board sources of electricity. They include EVs and PHEVs.
- **Electric Vehicle Supply Equipment (EVSE) –** delivers electrical energy from an electricity source to charge a PEV's battery. It communicates with the PEV to ensure that an appropriate and safe flow of electricity is supplied. EVSE units are often referred to as "charging stations."
- **EV Capable –** Electrical panel capacity and conduit leading to future planned EV parking space. Electrical panel capacity must be at least 40A planned per two parking spaces.
- **EV Installed –** EV charging stations rated at a minimum of 32amp, 7.2 kW. EVSE should be installed per the requirements of the National Electrical Code (NFPA 70) as adopted and amended by the State of Florida for enforcement by the City.
- **Level 1 EV Charging –** 120V AC circuit, slowest speed of EV charging.
- **Level 2 EV Charging –** 240V AC circuit, most common form of public charging.
- **DC Fast Charging (DCFC) –** 480V DC circuit, high-speed charging often found in high traffic corridors.

ABOUT ORLANDO'S EV READINESS CODE

BACKGROUND

Since 2007, the City of Orlando has been working to transform into one of the most environmentally friendly, socially equitable, and economically vibrant cities in America. To achieve this vision, Orlando Mayor Buddy Dyer launched a comprehensive city-wide initiative, Green Works Orlando, to support city operations, community partners, businesses, and our residents in becoming a leading city at the forefront of innovation and sustainability.

The Green Works Orlando initiative has established several important municipal and citywide goals, including the transition of 100% city vehicle fleet to electric and alternative fuel vehicles by 2030 and to achieve a zero-carbon economy by 2050. As part of that goal, we have been investing in programs to accelerate the adoption of electric vehicles, including providing consumer rebates, public EV charging infrastructure, LYNX electric bus fleet, and streamlining the permitting process for EV charging infrastructure.

Through the passage of this EV Readiness code, the future developments of commercial and multifamily housing in Orlando will be more equipped to support the rapid increase in electric vehicle adoption and mitigate the disproportionately high retrofit expenses to install EV charging infrastructure in the future.

PURPOSE AND INTENT

The code is intended to provide electric vehicle charging abilities distributed throughout the city to serve public mobility needs, prepare for emerging electric vehicle technologies, improve air quality, and achieve city sustainability goals, including climate change mitigation.

EV Readiness code requires a portion of parking spaces in certain developments to meet current EV charging needs and prepare for future demand. This amendment adds minimum requirements for certain new developments and substantial enlargements to provide EV parking accommodations. Ensuring the city is EV ready is important for several reasons:

TECHNOLOGICAL ADVANCES:
Projections by the National Renewable Energy Lab (Department of Energy) indicate that up to 30% of light duty vehicle registrations will be electric by 2030. Automotive manufacturers and ride services are leading this transformation and recent public commitments include:

- General Motors: Committed to a 100% EV fleet by 2035
- Volvo: Committed to 100% EV fleet by 2030
- Range Rover/Jaguar: Committed to 100% EV by 2025
- Honda Committed to 100% EV by 2040
- Uber: Committed to 100% EV by 2030
- Lyft: Committed to 100% EV by 2030

Additionally, Ford has committed $24 billion by 2025 towards developing EV fleets. For consumers, one result is that the upfront cost of EVs is rapidly decreasing and projected to be less than traditional vehicles by 2024 according to Bloomberg Energy Finance.

REMOVING PROHIBITIVE COST BARRIERS:
Costs to make parking EV Capable at the time of construction are typically small, but remove significant financial barriers for building owners to retrofit later—typically saving around 75% compared to retrofit costs. Several contributing factors include: demolition and repair of surface parking, breaking and repairing walls, longer conduit runs (also referred to as raceways), upgrading electric service panels and soft costs including: permits, plans, inspections, and management.

PUBLIC HEALTH AND ENVIRONMENT:
The total life cycle emissions (including battery manufacturing) are substantially lower for EVs, particularly during the useful life phase where zero tailpipe emissions lower air pollutants by 63% in greenhouse gas emissions per mile in Florida.

EQUITY:
EVs are more affordable to drive compared to traditional gasoline vehicles. Fueling in Florida only costs $1.10 per e-Gal compared to $2.25 gallon of gas – over a 50% savings. This cost savings is reduced when charging in public, which is one reason why EV owners charge at home 80% of the time.

LOCAL IMPACT:
Combining EV adoption rate projections with City of Orlando development data suggests that adopting attainable EV Readiness regulations now will accommodate 1% of residential EV charging demand with EVSE Installed, and, more importantly, provides an additional 10% capacity needed by 2030 by way of EV Capable spaces.

KEY DEFINITIONS

EV Readiness requirements are categorized in two levels as follows:

1. **EV Capable**: These parking spaces prepare for future Electric Vehicle Supply Equipment (EVSE) installation by providing dedicated electrical capacity in the service panel (40amp breaker for every two EV Capable two spaces) and conduit to the EV Capable space. These spaces do not require wiring to the space or a receptacle.
2. **EVSE Installed**: These parking spaces are reserved for EVs and provide drivers the opportunity to charge their electric vehicle using EV charging stations rated at a minimum of 32amp 7.2 kW. These spaces should be installed per the requirements of the National Electrical Code (NFPA 70) as adopted and amended by the State of Florida.

APPLICABILITY AND REQUIRED NUMBER OF SPACES

The following requirements apply to new development or substantial enlargement of structures, which is the increase in the size of a building, structure or building site by more than twenty-five percent (25%) of its existing area. Only the new parking spaces added as part of a substantial enlargement are subject to this requirement. See definition in Municipal Code Chapter 66.

ACCESSIBILITY

Accessibility requirements include:

1. A minimum of one (1) EVSE Installed space must be located adjacent to an ADA designated space to provide access to the charging station.
2. The accessible space must be designated as an EV reserved space.
3. The EVSE Installed accessible spaces should have all relevant parts located within accessible reach, and in a barrier-free access aisle for the user to move freely between the EVSE and the electric vehicle.

LOCATION AND DESIGN

Placement of the EV Capable, EV Ready and EVSE Installed spaces should be identified by the development team during the Master Plan approval process.

Charging equipment must be mounted on the wall or on a structure at the end of the electric vehicle parking space provided. No charging devices may be placed within the dimensions of a space on the sides or entrance to a space. When cords and connectors are not in use, retraction devices or locations for storage shall be located sufficiently above the pedestrian surface and the parking lot as to reduce conflicts with pedestrians and vehicle maneuvering. Cords, cables, and connector equipment shall not extend across the path of travel in any sidewalk or walkway. Equipment mounted on structures such as pedestals, lighting posts, bollards, or other device shall be located in a manner that does not impede pedestrian, bicycle, or transit travel. Alternatives may be approved by the Zoning Official.

Depending upon location on the site, additional landscaping elements may be required.

SIGNAGE

Spaces should be designated following MUTCD standards.

TYPE	EV CAPABLE SPACES	EVSE INSTALLED
Certified affordable multifamily housing	20%	Not Required
Multifamily, hotel, all parking structures	20%	2% (requirement begins at 50 spaces)
Non-residential (offices, retail, public, recreational and institutional uses)	10%	2% (requirement begins at 250 spaces)
Industrial (employee parking only)	10%	2% (requirement begins at 250 spaces)

Note: Commercial projects for fuel retailers in which automotive services is the primary use are excluded from requirements contained in this part. All partial space requirements are rounded down.

The parking requirements of this part are intended to provide minimum standards and do not count towards maximum parking requirements. The EV parking requirements are based on a percentage of the minimum required parking spaces of Part 3 of this Chapter.

FREQUENTLY ASKED QUESTIONS

What do I need to submit for permitting?	For new development and substantial enlargements, you will need to demonstrate compliance through the plan review process. For existing properties looking to install EV charging, see these resources: • EV Charging Station Checklist • Get A Permit for an EV Charging Station
Why is EV charging important to our community?	Florida State Legislature has determined the use of electric vehicles conserves and protects the state's environmental resources, provides significant economic savings to drivers, and serves an important public interest, FL 718.113(8).
What are public entities doing to drive EV infrastructure growth?	FDOT published the Florida Electric Vehicle Master Plan (EVMP) on July 1, 2021. The City of Orlando in turn has recently commissioned 100 publicly accessible EVSE stations. OUC is in the process of installing Orlando's first downtown DCFC hub.
How will this requirement affect my electric panel sizing?	One 40A circuit is required per two EV capable parking spaces, providing flexibility for load-sharing between these two spaces. This load-sharing feature will reduce total power delivery when accessed by multiple EVs. If anticipated for frequent use, it is recommended that one 40A is dedicated per space.
How does EV charging address EV ownership barriers?	Recent Consumer Reports showed lack of access to public charging (48%) and home charging (28%) as significant barriers to adoption.
Does owning an EV charging station mean I am owning a public fueling station? Is it illegal to charge a fee for electricity?	No, Florida Statute 366.94(1) states, "The provision of electric vehicle charging to the public by a non-utility is not the retail sale of electricity."
Do I need to reserve spaces for EVs?	Only parking spaces with EV charging stations installed are required to be reserved for EVs, per state statute. "EV Capable" spaces should not be reserved for EV parking until EVSE is installed at that parking space in the future.
Why is EVSE at commercial and residential areas important?	The majority of EV charging occurs at home and long-dwell time areas. While Orlando leads the state in EV charging deployment, projections show the demand for EV charging Orlando unable to address anticipated increases in EV ownership in the coming years.
What is the guidance for integrating ADA parking?	At least one charging location is to be located adjacent to an ADA space and share the aisle providing barrier free access, ensuring accessibility to EV charging by all users. It is recommended that ADA accessibility is met at that EVSE space.
Which type of EV charging hardware should I use?	It is recommended to consider a variety of options for reducing project cost, including placing charging near existing electric panels, minimizing wiring and conduit runs, or installing dual port EV chargers (rather than single port charger options). Site hosts are encouraged to consult EV charging vendors and electricians to consider options for installation. (see remainder of this guide for more detail)

EVSE INSTALLATION GUIDANCE AND BEST PRACTICES

OVERVIEW

The table below summarizes the typical steps and considerations involved with installing EV charging stations, and serves as an outline for the remainder of this guide. These steps will vary by the application and site, with simpler projects like single-family residential requiring fewer steps. For additional resources, including guides tailored to particular applications like residential, multifamily, or workplace charging, please see the "Additional Resources" section.

STEP 1 **Project scoping**	• Assess Existing EV Charging Access • Survey Potential Users • Plan for Future Expansion • Identify Number of EV Ready and EVSE Spaces to Install • Select Type(s) of Charging Equipment to Install • Network and/or Access Control • Determine a Preliminary Budget • Review Available Programs and Incentives
STEP 2 **Site selection and design**	• Proximity to Power Source • Electrical Capacity and Metering • Visibility • EVSE Mounting • EVSE Protection • Signage and Wayfinding • Lighting • Accessibility
STEP 3 **Procurement and installation**	• Compliance with safety requirements • Choose charging equipment and network provider, if any • Select a licensed electrician • Permitting and inspection
STEP 4 **Operation and maintenance**	• Maintenance • Parking policy and enforcement • Usage fees and other revenue sources • Promote charging station use • Shared charging

PROJECT SCOPING

ASSESS EXISTING EV CHARGING ACCESS:

Review comprehensive sites like AFDC.energy.gov or PlugShare to gauge the existing number of public chargers near your site.

SURVEYING POTENTIAL USERS:

Particularly in multifamily buildings or workplaces where developers want to go beyond code requirements, conducting a survey can be a helpful way to gauge existing EV ownership or interest amongst potential users. Examples of workplace and multifamily tenant surveys can be found at the DOE AFDC website and Workplace Charging Challenge.

PLANNING FOR FUTURE EXPANSION:

Adding conduit or electrical panel space can reduce costs of expanding EVSE in the future, especially for large parking locations such as parking lots or garages where EVSE can easily expand to meet increased demand. By installing additional EV Capable or EV Ready spaces at the time of construction and all at once, economies of scale can reduce installation cost per space. Planning for future expansion may entail, for example, additional electrical panel space for future EV charging, installing additional conduit, and other investments to avoid retrofit costs in the future.

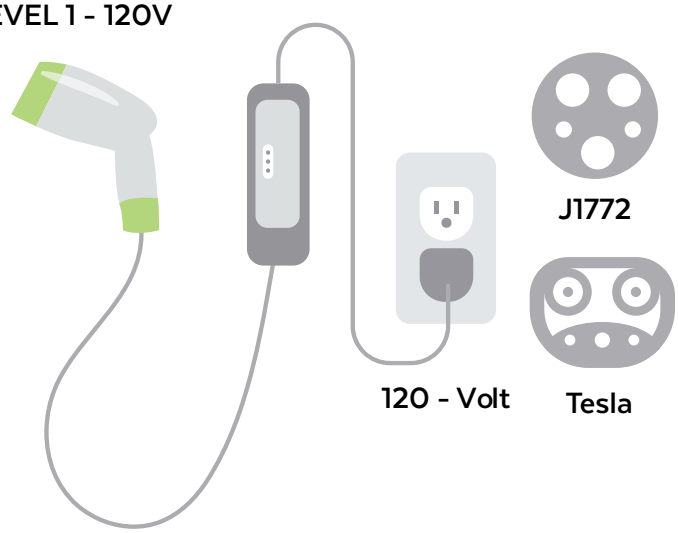
IDENTIFYING NUMBER OF EV READY AND EVSE SPACES TO INSTALL:

Review applicable requirements from Orlando's EV readiness ordinance and consider projected demand from your users ready to charge today and those likely to go electric with their next vehicle. You may consider obtaining LEED or other green building certifications - Orlando offers a Green Building Incentive Program, which offers up to 100% property-tax rebate and EV stations earn points towards certification.

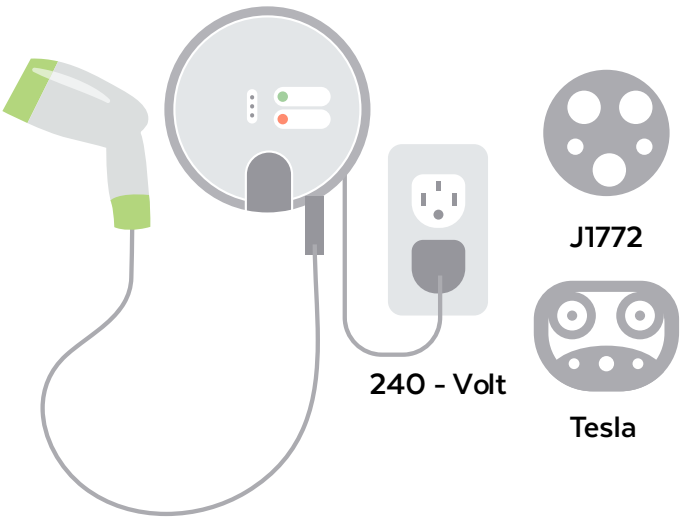
SELECTING TYPE(S) OF CHARGING EQUIPMENT TO INSTALL:

If the Orlando EV readiness ordinance applies to your project, Level 2 charging stations are required. See the table below for an explanation of the different "levels" of EV charging; Level 1 or DC fast charging may be relevant for those looking to go beyond the EV readiness code requirements. Additional considerations for selecting the type of charger to procure for your site can be found in the table on page 10.

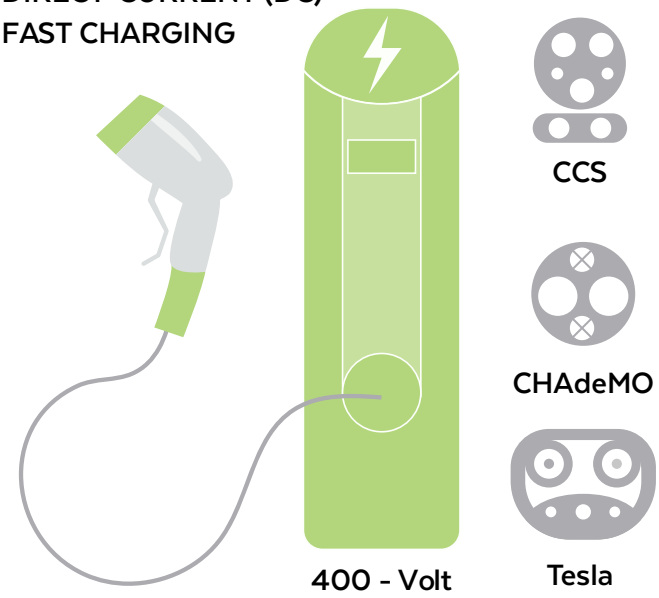
LEVEL 1 - 120V



LEVEL 2 - 240V



DIRECT-CURRENT (DC) FAST CHARGING



	REQUIRED BY ORDINANCE	FOR REFERENCE	
Charging Options	**Level 2 (240V)**	**Level 1 (120V)**	**Direct-Current (DC) Fast Charging**
Description	Provides charging through a 120-volt (V) AC circuit and requires electrical installation per the National Electrical Code. Most, if not all, PEVs come with a Level 1 EVSE cord set. On one end of the cord is a standard, three-prong household plug (NEMA 5-15 connector). On the other end is a J1772 standard connector, which plugs into the vehicle. Typically used for charging when only a 120-V outlet is available, such as at some residential and workplace locations.	Level 2 EVSE can easily charge a typical EV battery overnight, and it is a common installation for residential, workplace, fleet, and public facilities. Level 2 EVSE offers charging through a 240-V (typical in residential applications) or 208-V (typical in commercial applications) electrical service. These installations can be both hardwired and designed to plug into a compatible NEMA socket. Level 2 EVSE requires a dedicated circuit of 20 to 80 amps depending on the EVSE requirements and kW rating. As with Level 1 equipment, Level 2 equipment uses the J1772 connector. While Tesla uses its own unique charging standard, adapters are available to enable charging connectors.	DC Fast Charging EVSE (sometimes referred to as DCFC) enables rapid charging and is generally located at sites along heavy traffic corridors and at public charging stations. Some DC fast-charging units are designed to use 480-V AC input, while others use higher voltage inputs. DCFC is a less common public charging option, due in part to higher component and installation cost, and is often sited along major traffic corridors to provide highest-speed charging.
Voltage	208V or 240V	120V	208 or 480 3-phase
Amps	12-80 amps (typically 32 amps)	12-16 amps	<125 amps
Charging Rate	2.5-19.2 kW (typically 7 kW)	1.4-1.9 kW	40-350 kW (typically 50 kW)
Typical Charging Speeds	10-20 miles per 1 hour of charging	2-5 miles per 1 hour of charging	At least 60 miles per 20 minutes of charging; varies substantially by power level
Connector and outlet types	SAE J1772, Tesla Chargers can be hardwired, or plugged into an outlet. There are many wall outlets commonly used for Level 2 charging including the NEMA 14-50, 16-30, 6-50, and 14-30.	SAE J1772, Tesla Chargers can be hardwired or plugged into an outlet. BEVs are required to provide a Level 1 charging cord that can be plugged into a regular 110/120V outlet.	SAE CCS, CHADeMO, Tesla
Best Applications	Suitable for a variety of applications, including: • Single Family Homes • Multifamily residences • Workplaces • Public charging	Places where vehicles dwell for a long time, particularly where parking spaces are assigned, e.g.: • Single Family Homes • Multifamily residences • Workplaces	Best for places where vehicles dwell for a short period of time or to serve vehicles that need to be recharged quickly: • Public charging (e.g. supermarkets, service stations) • Ride hailing • Some fleets

Adapted from: https://www.epa.gov/greenvehicles/plug-electric-vehicle-charging

TABLE 2: ADDITIONAL CONSIDERATIONS FOR SELECTING EVSE

Images are Illustrative Only, the City of Orlando does not endorse any particular brand of EVSE.

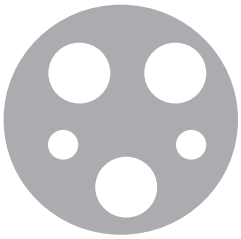
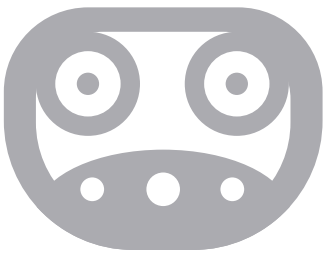
	DESCRIPTION	EXAMPLES	
Cable management	Cable management systems help keep charging cables suspended off the ground, reducing dirt and grime build-up on cables. These can be especially convenient for winter climates, or where utilizing longer cables that can allow for charging access to several spots. Additionally, cable management helps to reduce the accelerated breakdown of the insulated cable. However, cable management systems typically add cost.	EVSE with cable retraction system 	EVSE with simple cord wrap (Clipper Creek) 
Number of ports	Level 2 stations often come in single, dual-port, and sometimes even four port configurations. Dual port stations are very common and allow two vehicles to charge simultaneously. Where you are looking to serve multiple adjacent spaces, installation and equipment costs for one dual port station is typically lower than two single port stations.	Dual port station (EV Box) 	Single port station (EV Box) 
Non-proprietary chargers	At present, Tesla vehicles can utilize any EV charger with an adapter, while EVs from other automakers cannot utilize Tesla chargers. As a result, a best practice is to install non-Tesla chargers to enable access by all vehicles. Non-Tesla chargers typically utilize SAE International standard connectors such as the J1772.	J1772 plug (usable by all vehicles) 	Tesla plug (usable only by Tesla vehicles) 

TABLE 3: NETWORKING AND ACCESS CONTROL OPTIONS

Networking and/or Access Control: On some sites, opting for charging stations that are capable of networking or have some form of access control can be beneficial, particularly if the chargers are meant to be shared by multiple users. Table 3 summarizes different types of networking and access control.

	DESCRIPTION
Networked charging stations	Networked charging stations connect to the internet and provide many services that non-networked stations cannot, such as: integrating real-time information about a station's operational status; enabling managed charging solutions; collecting usage data; implementing a "wait list" queue, and directly processing payment for charging via credit card. While offering many benefits, these stations tend to be more expensive upfront, and incur ongoing costs to pay for internet connection and access to the software platform. These stations are likely best when they will be used by multiple users, to be able to manage access and allocate payment fairly. If opting for networked charging stations, it's recommended to go with hardware that uses the Open Charge Point Protocol (OCPP) version 1.6 or higher. This protocol ensures that station owners can switch networks in the future, helping to avoid stranded assets.
RFID/ NFC communication	Many charging networks utilize RFID cards for members to easily access stations. Additionally, workplaces or multifamily complexes could consider issuing special key fobs to enable easy access control.
Lock and key or combination lock	The simplest available form of access control is a simple lock and key or combination lock, which can come integrated into some charging stations. This approach may be useful in smaller multifamily building settings, or for fleets.

LOAD MANAGEMENT:

Networked chargers also can allow for load management options. Depending on hardware setup, load management software can be implemented within the EVSE unit settings, or as a separate, outside unit controlling flow of electricity to EVSE. Charging can be controlled by time, amount of energy dispensed/shared, or responsiveness to grid demand signaling (if available).

DETERMINING A PRELIMINARY BUDGET:

Once you've determined the number of EV ready spaces, EVSE installed spaces, type(s) of chargers, and any add-on features, you can begin to develop a preliminary budget. It should be noted that installation costs can vary substantially, particularly when retrofitting existing parking, so a more specific budget can be developed once a contractor is able to evaluate your site.

To help understand the wide ranges in estimated equipment costs, particularly for Level 2 charging, this graphic helps illustrate how different types of equipment, applications, and add-on features combine to result in different costs:

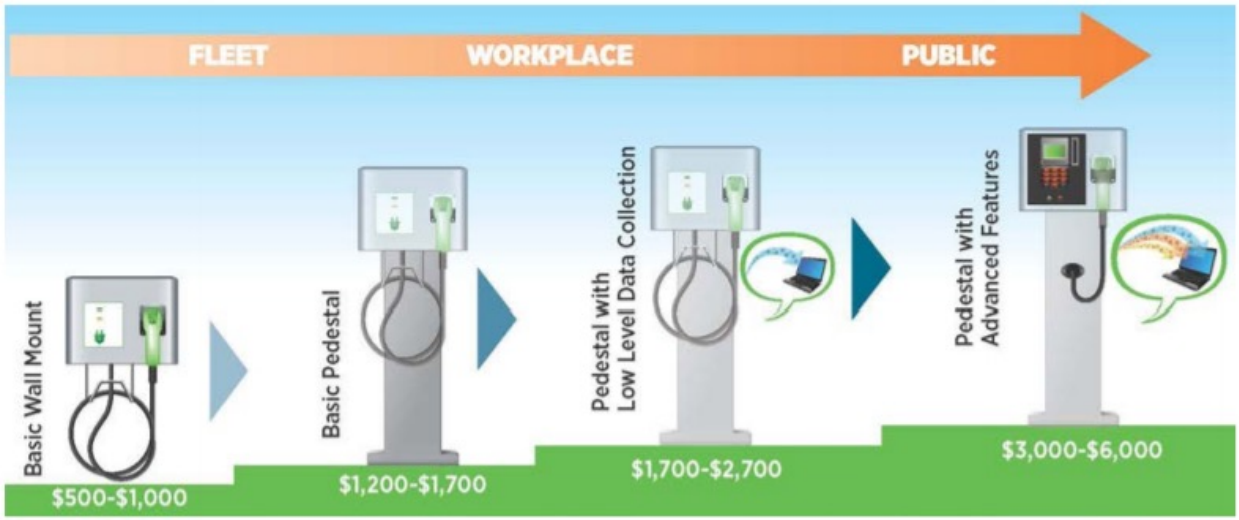


Figure 1: Ballpark Cost Ranges for Level 2 EVSE

INCENTIVES

Site hosts should review and apply for available programs and incentives to cover a portion of the costs of EV charging stations and/or to streamline installation and operation.

UTILITY PROGRAMS:

Orlando Utilities Commission (OUC) Commercial EV Charging Service Program: offers a number of leasing and ownership models for eligible commercial properties. Dubbed the "Charge-It" Program, site hosts may select:

- **CHARGE-IT OPTION**: OUC owns, installs, and maintains EVSE charging equipment for a fixed monthly fee over a contracted period of time.
- **OWN-IT OPTION**: OUC designs, procures, and installs EVSE charging equipment. Equipment is owned by the commercial site host.

FEDERAL TAX CREDIT:

EVSE installed through December 31, 2021 is eligible for a tax credit of 30% of the cost, not to exceed $30,000. Consumers who purchase qualified residential fueling equipment prior to December 31, 2021, may receive a tax credit of up to $1,000.

ELECTRIC VEHICLE INCENTIVE PROGRAM	ELIGIBILITY CRITERIA	NOTES	STATUS
OUC Charge-it Program	New and existing buildings	Utility bill financing program. Shifts cost from upfront capital expense to a monthly operating expense on utility bill, repaid over 5 years	**Existing** Utility financing program
Duke Energy Rebate Program	New and existing buildings	Multifamily Housing L2 = $304 per charger Commercial L2 = $434 per charger	**Coming Q1 2022** Utility program
IRS Federal Tax Incentive Program	New and existing buildings	Provides a tax credit for 30% of the cost for EV chargers, up to $30,000 maximum	**Existing** Federal program
Green Building Incentive Program	New buildings only	First-year Property tax rebate incentive. Building must achieve LEED Silver certification or greater to be eligible. EV policy helps achieve points for LEED certification	**Existing** City incentive program
Commercial - PACE financing (Property Assessed Clean Energy)	New and existing buildings	Property tax financing program. Enabled by State of Florida 163.08 and City of Orlando PACE resolution (2016). Provides 100% of cost of compliance and repays on property taxes over extended term	**Existing** City financing program
Transportation Impact Fee Reduction	N/A	Not applicable. Must be addressed at state level. Current impact fee formula does not include fuel type or EV-related improvements	**Not Currently Possible** Current state regulations
EV Charging Incentive Rebate Program	New and existing buildings	Infrastructure Bill rebate program to subsidize EV charging stations for new developments and existing buildings	**Proposed** New City incentive program
Business Assistance Program	New and existing buildings	Provides matching funds to new and expanding small businesses to offset development fees, including sewer and transportation impact fees, building permit fees, and public right-of-way infrastructure that may require new installation, repair, replacement or relocation. Will process program amendment to include cost of EV charging stations as eligible expense	**Proposed** Expansion of City incentive program

PLANNING MULTIFAMILY CHARGING:

Multiunit dwellings (MUD) typically feature one of two parking allocation and ownership models: assigned or shared parking. Specific considerations for planning multifamily charging include:

- **FOR ASSIGNED PARKING**: Consider EV owner's parking location and possible need for reassignment or creating shared EVSE spaces - For MUDs with assigned parking spaces, a new EV owner's space may be far away from existing EVSE. Installing additional EVSE may be cost prohibitive due to extensive trenching, boring, and other retrofitting costs. In these cases, possible solutions include:
  - Distribute EV capable spaces strategically. These spaces can be readily installed with EVSE. If outlets are also installed at the EV capable spaces, charging stations could be relocated easily.
  - Reassigning EV owner to new parking space closer to electric panel/source, to minimize installation costs.
  - Create shared EVSE in common parking areas, such as club houses or central parking locations.
- **FOR SHARED PARKING**: utilize charging policies that promote shared use - There are a variety of charging policies and technologies that can be used to ensure EV owners utilize charging, and equitably share with other visitors and tenants. This includes:
  - **ENABLING "WAIT LIST" FEATURE**: notifies EV users when charging is complete, and if there are other EV users waiting to utilize EVSE. If the EVSE is not available for an EV user (e.g. currently charging another vehicle), users can check in to the EVSE via the charging unit or smart phone app to reserve their space once the EVSE is available.
  - **INSTITUTE IDLE/CHARGING COMPLETE FEE**: a simple monetary fee can be programmed into EVSE, triggering after the EV has completed charging it's battery. This encourages PEV owners to move vehicles once charging is complete, while allowing for a grace period to give ample time to move the vehicle. Charging fees can also be amortized by time, allowing charging pricing to increase after a few hours of charging, also encouraging fair use of EVSE.
  - **CREATE VISITOR/TENANT TIERED PRICING**: For EVSE available to the general public/visitors to MUD, some EVSEs can be programmed to allow "white list" pricing for approved users; this can be used as a way to offer further customized charging access and pricing to ensure tenants have access to EV charging.
- **CONDOMINIUM ASSOCIATION RIGHT TO CHARGE LAWS**: For Condominium Associations and HOAs, Florida Statute (Section 718.113(8)) provides that neither the Board or the declaration of condominium or restrictive covenant may prohibit any unit owner from installing an electric vehicle charging station within the boundaries of the unit owner's limit common element parking area. The installation must follow the provisions set forth in the statute, including installing the charging station at the expense of the unit owner.

SITE SELECTION AND DESIGN

Strategically selecting where to install EV charging infrastructure, and how to design the charging stations can greatly impact costs and user experience. The following sections detail key considerations and best practices with respect to EV charging site selection and design.

PROXIMITY TO POWER SOURCE:

Sites closest to the buildings' electrical panel will be most cost-effective, reducing lengthy conduit runs, or for existing parking, having to trench or bore through concrete for long distances.

ELECTRICAL CAPACITY AND METERING:

Evaluate existing electrical infrastructure, and add additional electrical capacity if needed for EV charging load. It is recommended to coordinate with a licensed electrician and OUC to identify necessary infrastructure upgrades. For new construction, factor in EVSE load when sizing transformers and electrical panels. Many existing sites will have sufficient power for Level 1 charging, and may have sufficient power and panel capacity for a limited number of Level 2 chargers. Sometimes it may make sense to put EV charging stations on a separate meter from the main building, for example to more easily allocate costs or to take advantage of a specialized, favorable utility rate for EV charging. Typically, adding a separate meter adds cost.

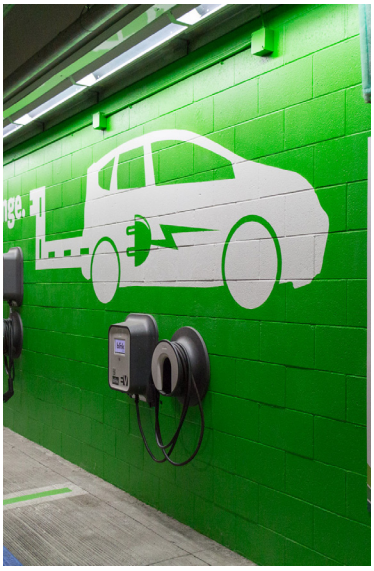
VISIBILITY:

Choosing a site that has high visibility can make it easier for drivers to locate the EV charging stations, and can raise awareness amongst other building users. While choosing sites that are close to a building's entrance can be an extra "perk" for EV drivers, typically it isn't worth the added cost if doing so would put stations far from the existing power source.

EVSE MOUNTING:

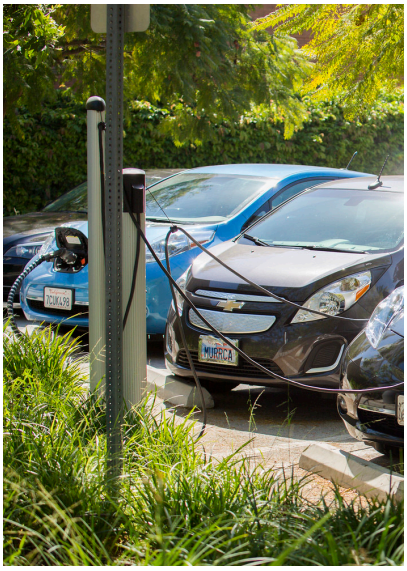
Chargers can be wall-mounted, pedestal-mounted, or in some rarer circumstances, ceiling mounted. Wall-mounted chargers tend to be more affordable and take up less space, so placing chargers along a wall of a parking garage or building can be a good strategy where feasible.

Wall-mounted



Ceiling-mounted

Pedestal-mounted



EVSE PROTECTION:

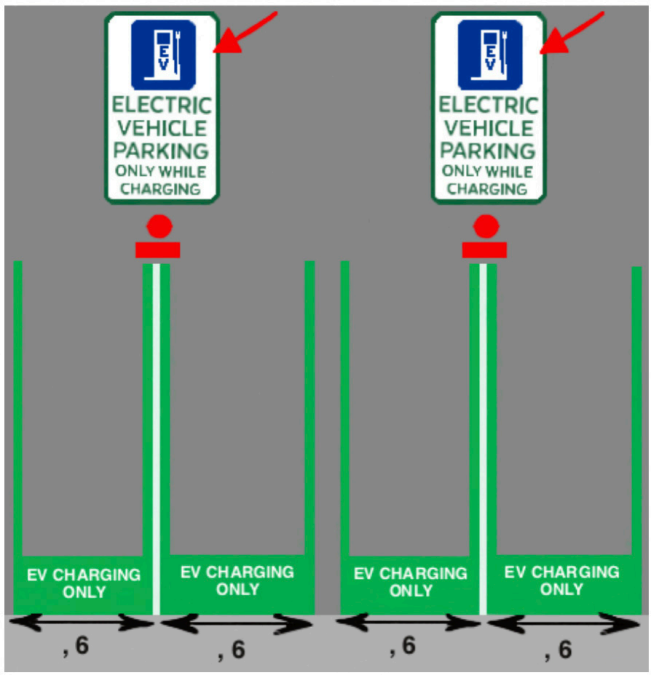
Bollards and wheel stops can be utilized to protect EV chargers from traffic incidents, particularly in higher traffic parking areas.

Bollards

Wheel stops

SIGNAGE AND WAYFINDING:

Particularly when it's difficult to place charging stations in a highly visible location, signage, pavement markings, and wayfinding can help users locate charging stations, and can communicate pertinent information like charging fees, time limits, and other rules for use. The Federal Highway Administration (FHWA) through the Manual on Uniform Traffic Control Devices has issued interim sign designs for charging stations, which should be utilized to designate EV charging spaces. Any signage to denote parking spaces is exempt from sign code.



City of Orlando Signage Standards: The City of Orlando utilizes the following wayfinding, space designation, striping, and regulatory signage for its own charging stations, and recommends site hosts utilize the same for consistency where feasible.

PARKING SIGN LOGO DESIGN:

Use MUTCD sign for parking space marker, with supporting "Electric Vehicle Parking Only" and "Electric Vehicle Charging Only" wording.

- Sign dimensions: 18.2 inches high x 12.2 inches wide
- Utilize green border on signage to match with green striping on parking spot.

PARKING SPOT STRIPING:

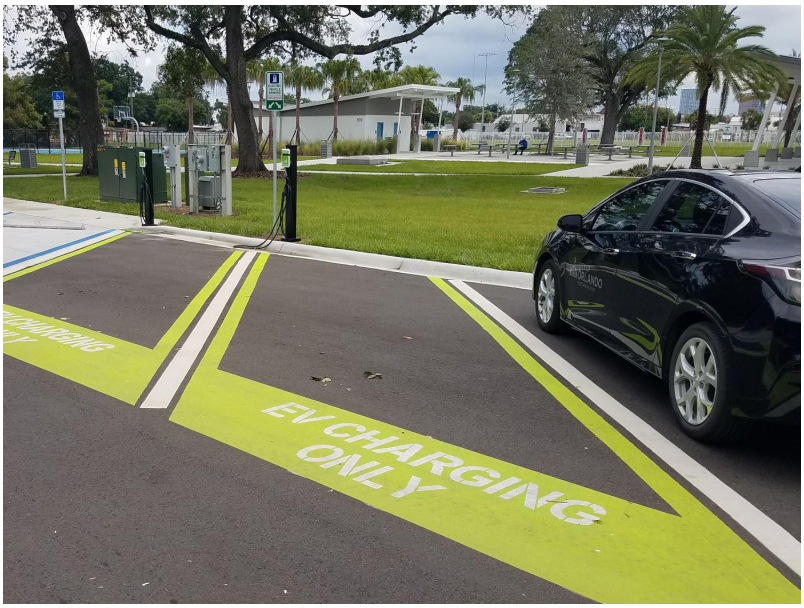
The City of Orlando utilizes the following striping to highlight EV charging spaces located in its facilities:

- Electric Lime Green color: Sherwin Williams (SW 6921)
- Paint a green strip on the 'inside' of the white parking border (see below)

PARKING SPOT STENCIL:

Stencil text should read: "Electric Vehicle Parking Only" or "EV Parking Only"

- Stencil dimensions: 12 inches high x 66 inches wide, 1/16" thick
- Stencil color: White

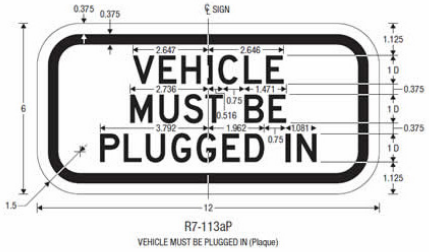


WAYFINDING SIGNAGE:

The following MUTCD signs can be combined with directional arrows to guide users to stations.

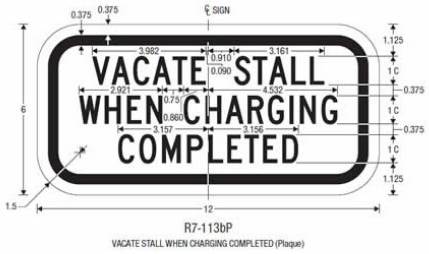
REGULATORY SIGNAGE:

For further customization, there are a variety of other FHWA approved signs that can be utilized to denote parking and charging rules. Example regulatory signage:



R7-113aP, R7-113bP
Issued: 6/17/2013

R7-113aP
VEHICLE MUST BE PLUGGED IN (Plaque)



R7-113bP
VACATE STALL WHEN CHARGING COMPLETED (Plaque)

R7-113
Issued: 6/17/2013
NO PARKING EXCEPT WHILE CHARGING

UPPER LEFT SECTION
COLORS: LEGEND, BORDER — WHITE (RETROREFLECTIVE)
BACKGROUND — RED (RETROREFLECTIVE)
UPPER RIGHT SECTION
COLORS: LEGEND, BORDER — RED (RETROREFLECTIVE)
BACKGROUND — WHITE (RETROREFLECTIVE)
LOWER SECTION
COLORS: LEGEND, BORDER — RED (RETROREFLECTIVE)
BACKGROUND — WHITE (RETROREFLECTIVE)
★ Reduce character spacing 40%.
★★ Reduce character spacing 60%.
★★★ Type D Arrow.

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R7-112
Issued: 6/17/2013
ELECTRIC VEHICLE PARKING (TIME LIMIT)

UPPER LEFT SECTION
COLORS: LEGEND, BORDER — WHITE (RETROREFLECTIVE)
BACKGROUND — GREEN (RETROREFLECTIVE)
UPPER RIGHT SECTION
COLORS: LEGEND, BORDER — GREEN (RETROREFLECTIVE)
BACKGROUND — WHITE (RETROREFLECTIVE)
LOWER SECTION
COLORS: LEGEND, BORDER — GREEN (RETROREFLECTIVE)
BACKGROUND — WHITE (RETROREFLECTIVE)
★ Reduce character spacing 40%.
★★ Optically space numeral.
★★★ Type D Arrow.

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COLORS: LEGEND, BORDER — BLACK (RETROREFLECTIVE)
BACKGROUND — WHITE (RETROREFLECTIVE)

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LIGHTING:

Placing EV charging near existing lighting or installing additional lighting should be considered to help avoid tripping hazards and increase site safety and security.

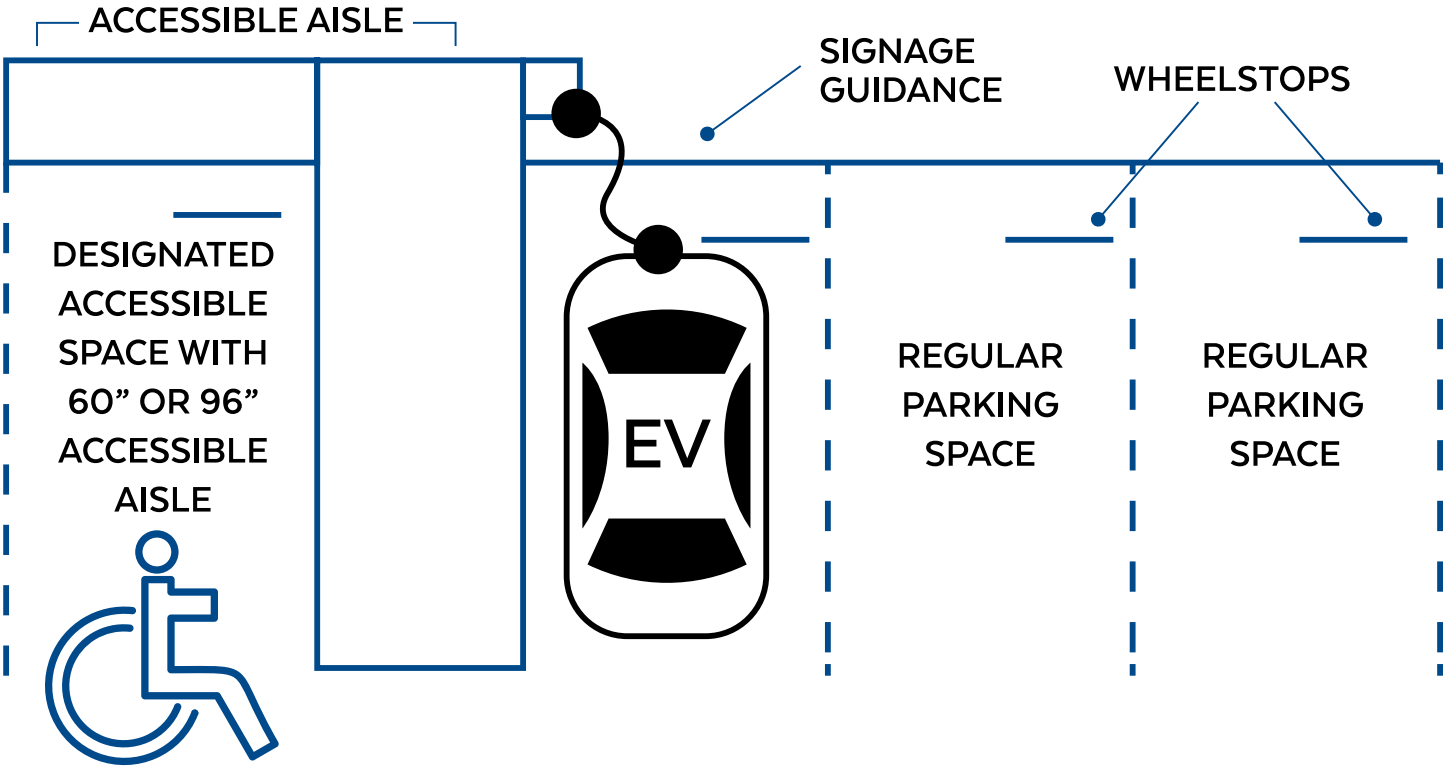
ACCESSIBILITY:

The federal government does not currently have regulations with respect to EV charging and the Americans with Disabilities Act (ADA). However, the Orlando EV Readiness ordinance includes the following requirements for non-residential and multifamily developments:

- Sec. 61.366. - Accessibility. (a) A minimum of one (1) EVSE Installed space must be located adjacent to an ADA designated space to provide access to the charging station. (b) The accessible space must be designated as an EV reserved space. (c) The EVSE Installed accessible spaces should have all relevant parts located within accessible reach, and in a barrier-free access aisle for the user to move freely between the EVSE and the electric vehicle.

The diagram on the next page illustrates how this typically works, with one dual or single port charging station with a sufficiently long cord able to serve both an accessible parking space and another space.

TYPICAL CONFIGURATION OF ADA ACCESSIBLE EV CHARGING SPACE:



Incorporating accessibility into charger design will ensure safety and ease-of-use to EV owners and users of all capabilities. Key considerations are highlighted below, and should be considered throughout the designing of your charging location, to include adequate space for exiting and entering the vehicle, unobstructed access to the EVSE, free movement around the EVSE and connection point on the vehicle, and clear paths/close proximity to any building entrances.

ADA COMPLIANCE AND SPATIAL REQUIREMENTS:

To meet accessibility needs, EVSE site hosts are recommended to follow federal Americans with Disabilities Act guidance (interpreting ADA/ABA 2004 ANSI) when creating accessible EV charging:

Parking Stall	8x18 feet for a car
Accessible Route Width	Minimum 36 inches wide
Accessible Route Slope/ Cross Slope	Maximum 1:20 (5%) running slope and 1:48 (2%) cross slope; Accessible vehicle spaces 1:48 (2%) in all directions
Reach Range	48 inches front and side to allow reach to all operable parts from a wheelchair
Accessible Controls	Operable with one hand and not requiring grasping, pinching, or twisting of the wrist or force more than 5 lbs.
Accessible Ramps	A ramp or curb-cut must be accessible in order to allow for operation of charging station
Facility Accessibility	A ramp or curb-cut must be accessible in order to allow for operation of charging station
Side Access Aisle	Side access aisle of 60 inches wide to allow space for wheelchair and equipment in and out of space
Accessible Card Reading Devices	Must be connected by a minimum 50-inch-wide accessible route in proximity (not necessarily adjacent) to the entrance of the building
Other Considerations	Ensure that bollards, wheel stops, or curb do not obstruct use of charging station

PROCUREMENT AND INSTALLATION

COMPLIANCE WITH SAFETY REQUIREMENTS:

All EV charging equipment should be installed per the requirements of the National Electrical Code (NFPA 70) as adopted and amended by the State of Florida for enforcement by the city.

CHOOSING CHARGING EQUIPMENT AND NETWORK PROVIDER, IF ANY:

Identify type of EVSE desired, such as level of charging, networked vs. non-networked, load management software, and other considerations. Some site hosts may wish to select the charging equipment and networking provider (if applicable) independent of selecting a local electrical contractor to install the stations, but your electrical contractor may also have suggestions or partnerships with certain EVSE manufacturers. Ensure it is certified for EV use by a Nationally Recognized Testing Laboratory (e.g. UL and/or ETL).

RESEARCHING CHARGING EQUIPMENT:

Utilizing the considerations outlined in the Project Scoping section, research available charging equipment to identify products that suit your site's needs. Some sites to utilize for research include:

- plugstar.com/chargers
- energystar.gov/productfinder/product/certified-evse/results
- nationalcarcharging.com

STATION OWNERSHIP AND OPERATION:

While most site hosts own and operate the EV charging equipment, there are alternatives. Some site owners or managers may wish to contract with a charging infrastructure provider to own and operate the charging stations in a leasing or "charging-as-a-service" arrangement, or just contract out maintenance (see OUC programs on page 14).

SELECTING A LICENSED ELECTRICIAN:

A qualified electrical contractor will conduct a thorough site assessment and load calculation to determine service capacity and power needs for the EVSE you plan to add to your site. While not significantly different from most electrical work, finding a contractor with experience with EVSE technology and installations may provide a better result. It is strongly recommended that a licensed electrician perform EVSE installation such that they comply with the National Electrical Code (NFPA 70) as adopted and amended by the State of Florida for enforcement by the city. You can find a qualified electrical contractor utilizing the following resources:

- OUC preferred contractors
- Plug in America list of electrical contractors

NOTE:

You may want to select and begin working with an electrical contractor early in the process of scoping and designing your EVSE installation, as they can help identify available electrical capacity, and may be able to provide an initial installation quote for different locations on your site.

PERMITTING AND INSPECTION:

The City of Orlando has an online, step-by-step guide for acquiring a permit for EV Charging Station projects, as well as an EV Charging Station permit checklist.

OPERATION AND MAINTENANCE

MAINTENANCE:

Level 1 and Level 2 EV charging stations require relatively little maintenance, while DCFC tends to require more given that it is more complex equipment. EVSE vendors offer different length warranties, which is worth considering when selecting equipment. Some EVSE vendors sell maintenance contracts or extended warranties which can help streamline repairs, but add costs. Another option is to contract with a qualified electrical contractor for periodic inspection and preventive maintenance.

PARKING POLICY AND ENFORCEMENT:

Regulatory signs help to enforce what vehicles are allowed to park in EVSE parking spots, as well as the time duration that EVs are permitted to park and/or charge at charging stations. Setting and posting time limits can help ensure turnover of stations to enable access for multiple users. As a reminder, it is unlawful for non-PEV to park in EVSE spaces, as subject by Florida Statute 366.94 and Chapter 35 of Orange County Code. If time limits or vehicle removal provisions are to be applied, regulatory signage including parking restrictions, hours and days of operations, towing, and contact information may be installed immediately adjacent to, and visible from, the electric vehicle parking or charging station.

USAGE FEES AND OTHER REVENUE SOURCES:

Some site hosts may wish to offer access to charging stations for free or as an amenity, while others may want to charge a fee to help recover their costs. Site hosts can research typical nearby public charger costs to help benchmark prices. In some cases, site hosts or charging providers have utilized EVSE in high-traffic locations to sell advertising space or promote a sponsor of the charging stations as potential additional revenue streams. Some of the options for pricing structures include:

PRICING STRATEGY/ ELEMENT	DESCRIPTION	PROS	CONS
Free charging	Electricity offered for free, paid for by site host.	• Can be offered as a perk for tenants, employees, or to attract retail visitors	• Doesn't enable site host to cover operating costs or recoup upfront costs.
Price per kWh (energy)	Pricing billed on a per kWh basis, equaling the amount of energy charged to the vehicle	• Directly relates to the amount of energy delivered, fair for vehicles that charge at lower speeds	• Without other fees or policies, does not provide an incentive for drivers to move their vehicle when done charging
Price per Hour/ Minute (time)	Pricing billed on length of time for EV charging session	• Encourages lower dwell time at chargers in high-traffic areas • Easy to understand • Simpler to integrate into existing time-based parking fees	• Does not directly correlate with the amount of energy delivered. • May be considered unfair to drivers with vehicles that charge at lower speeds
Price per Session	Flat rate fee billed to access charger per session	• Ensures minimum pricing for an EV charging session and can help cover fixed costs. • Simple to communicate	• Doesn't charge for the actual energy usage • Disincentivizes charging for short periods of time
Dwell time fee	Penalty levied for vehicles left beyond allowed charging time.	• Incentivizes turnover at chargers	• Needs parking enforcement to ensure vehicles not only plug but also move to enable other users

PROMOTING CHARGERS:

In addition to on-site signage, making sure stations that are publicly accessible are posted to comprehensive charging sites like AFDC.energy.gov or PlugShare.com can help EV drivers find and access the stations.

SHARED CHARGING:

Services like ampUp and EVmatch can help manage sharing charging stations between different user groups, such as for fleet charging overnight and public charging during the day, or residential charging overnight and public charging during the day. Sharing charging between user groups can help recoup costs more quickly.

ADDITIONAL RESOURCES

GENERAL RESOURCES

- Orlando Utilities Commission (OUC) Charge-It Program. OUC
- ChargeNY: Site Owners of Electric Vehicle Charging Stations on Commercial Properties. NYSERDA
- Level 2 Electric Vehicle Chargers: Ownership Perspectives. NYSERDA
- Alternative Fuels Data Center: Charging Infrastructure Procurement and Installation
- Guidance in Complying with Americans with Disabilities Act Requirements

PUBLIC CHARGING

- Plug-In Electric Vehicle Handbook for Public Charging Station Hosts, NREL (National Renewable Energy Laboratory)

WORKPLACE CHARGING

- Alternative Fuels Data Center: Workplace Charging for Plug-In Electric Vehicles
- Plug-In Electric Vehicle Handbook for Workplace Charging Hosts, Clean Cities.
- Workplace Charging. NYSERDA.

RESIDENTIAL CHARGING (MULTIFAMILY AND SINGLE-FAMILY)

- Alternative Fuels Data Center: Electric Vehicle Charging for Multi-Unit Dwellings
- Department of Energy – Charging at Home
- Alternative Fuels Data Center: Charging Plug-In Electric Vehicles at Home
- Multifamily Electric Vehicle Charging Guide. Plug in NC.
- Residential charging station installation handbook. Plug in NC.

REFERENCES

PAGE	EMBEDDED TEXT	URL
4	OUC Charge-It Program	ouc.com/business/commercial-ev-charging-service
4	IRS Federal Tax Incentive	clippercreek.com/tax-credits/
4	State of Florida 163.08	afdc.energy.gov/laws/8385
10	DOE AFDC website	afdc.energy.gov/fuels/electricity_charging_multi.html
10	Workplace Charging Challenge	afdc.energy.gov/files/u/publication/WPCC_sample_employee_survey_0816.pdf
4, 10	Green Building Incentive Program	orlando.gov/Green-Building-Incentive-Program
5	City of Orlando Planning Division	orlando.gov/Our-Government/Departments-Offices/Economic-Development/City-Planning
7	Municipal Code Chapter 66	library.municode.com/fl/orlando/codes/code_of_ordinances?nodeId=TITIICICO_CH66DE_PT2DE_S66.200DE
8	EV Charging Station Checklist	orlando.gov/Building-Development/Permits-Inspections/Get-a-Permit/Permitting-Checklists/EV-Charging-Station-Permit-Checklist#section-2
8	Get A Permit for an EV Charging Station	orlando.gov/Building-Development/Permits-Inspections/Other/Get-a-Permit-for-an-EV-Charging-Station
8	Florida Electric Vehicle Master Plan	fdotwww.blob.core.windows.net/sitefinity/docs/default-source/planning/fto/fdotevmp.pdf?sfvrsn=2bf9e672_4
8	Recent Consumer Reports	article.images.consumerreports.org/prod/content/dam/surveys/Consumer_Reports_Electric_Vehicles_Fuel_Economy_National_August_2020
8	Florida Statute 366.94(1)	m.flsenate.gov/Statutes/366.94
12	SAE International Standard Connectors	sae.org/standards/content/j1772_201001/
13	Open Charge Point Protocol	openchargealliance.org/
14	Ballpark cost ranges for level 2 EVSE	afdc.energy.gov/files/u/publication/evse_cost_report_2015.pdf
14	OUC Commercial EV Charging Program	ouc.com/business/commercial-ev-charging-service
14	Tax Credit	afdc.energy.gov/laws/10513
15	Section 718.113(8)	flsenate.gov/Laws/Statutes/2018/718.113
17	Issued interim sign designs	afdc.energy.gov/fuels/electricity_charging_station_signage.html
18	Sherwin Williams (SW 6921)	sherwin-williams.com/homeowners/color/find-and-explore-colors/paint-colors-by-family/SW6921-electric-lime
19	Example regulatory signage	mutcd.fhwa.dot.gov/resources/policy/rsevcpfmemo/
20	Typical configuration of ADA accessible EV charging space	afdc.energy.gov/files/u/publication/WPCC_complyingwithADArequirements_1114.pdf
21	OUC preferred contractors	ouc.com/business/find-a-preferred-contractor
21	Plug in America list of electrical contractors	plugstar.com/electricians

PAGE	EMBEDDED TEXT	URL
21	Online, step-by-step guide	orlando.gov/Building-Development/Permits-Inspections/Other/Get-a-Permit-for-an-EV-Charging-Station
21	EV Charging Station permit checklist	orlando.gov/Building-Development/Permits-Inspections/Get-a-Permit/Permitting-Checklists/EV-Charging-Station-Permit-Checklist#section-2
N/A	Notice of Commencement	orlando.gov/Building-Development/Permits-Inspections/File-a-Recorded-Notice-of-Commencement
22	Florida Statute 366.94	flsenate.gov/Laws/Statutes/2012/366.94
22	Chapter 35 of Orange County Code	newsroom.ocfl.net/2020/09/orange-county-toughens-parking-standards-and-enforcement-tools/
23	AmpUp	ampup.io/
23	EV Match	evmatch.com
23	OUC Charge-It Program	ouc.com/business/commercial-ev-charging-service
23	Alternative Fuels Data Center: Charging Infrastructure Procurement and Installation	afdc.energy.gov/fuels/electricity_infrastructure_development.html
23	Guidance in Complying with Americans with Disabilities Act Requirements	afdc.energy.gov/files/u/publication/WPCC_complyingwithADArequirements_1114.pdf
23	Plug-In Electric Vehicle Handbook for Public Charging Station Hosts, NREL (National Renewable Energy Laboratory)	nrel.gov/docs/fy12osti/51227.pdf
23	Alternative Fuels Data Center: Workplace Charging for Plug-In Electric Vehicles	https://afdc.energy.gov/fuels/electricity_charging_workplace.html
23	Plug-In Electric Vehicle Handbook for Workplace Charging Hosts, Clean Cities	afdc.energy.gov/files/u/publication/pev_workplace_charging_hosts.pdf
23	Alternative Fuels Data Center: Electric Vehicle Charging for Multi unit Dwellings	afdc.energy.gov/fuels/electricity_charging_multi.html
23	Department of Energy – Charging at Home	energy.gov/eere/electricvehicles/charging-home
23	Alternative Fuels Data Center: Charging Plug-In Electric Vehicles at Home	afdc.energy.gov/fuels/electricity_charging_home.html
23	Multifamily Electric Vehicle Charging Guide	pluginnc.com/wp-content/uploads/2016/06/Multifamily-Charging-Handout.pdf
23	Residential charging station installation handbook	pluginnc.com/wp-content/uploads/2016/06/Residentail_Handbok_FINAL.pdf


GREEN WORKS
ORLANDO