



Electric Vehicle Charging Stations

EV Charging Stations on Commercial Properties

The demand for electric vehicles has grown rapidly throughout the world over the past 10 years. With this change in consumer demand, is the need for infrastructure changes to support electric vehicle usage, including the need for electric vehicle (EV) charging stations. This bulletin is intended to educate users on ways to manage risk for this technology.

Growing Number of Electric Vehicle Supply Equipment

According to the U.S. Department of Energy's Alternative Fuels Data Center, there are currently over 48,000 public EV charging station locations in the U.S., with a total of over 125,000 individual (EVSE) charging ports. In Canada there are over 8,000 EV charging station locations and 18,000 charging ports².

The federal government and many states are moving towards implementing more regulations to support EVs. The Bipartisan Infrastructure Law aims to install 500,000 public charging stations along America's highways and in communities by 2030³.

Many cities like Los Angeles, San Francisco, and Seattle have more EV users and want to have 100% EV sales by 2030⁴. Even carmakers like Volkswagen and General Motors plan to stop selling conventional fuel cars by 2035⁵. In Canada, the Federal Government has implemented the goal of 100% zero-emissions vehicle sales for light duty vehicles by 2035⁶. There is a clear trend moving towards the growing number EV charging stations and this will correlate with the amount we will find in commercial properties.

What is an Electric Vehicle Charging Station

While people mostly use the term "EV charger," the technical name for a charging station is EVSE, which stands for Electric Vehicle Supply Equipment. EVSE is equipment that you can use to charge electric vehicles and plug-in hybrids. While gas stations are spread across the country, EV Charging Stations are not as widespread. An EV Charging Station is the same as plugging in any electronic device to charge it. There are 3 levels of charging stations based on how much voltage it charges.

EV Charging Station Levels

Level 1

A Level 1 EV Charger is the slowest charger. It has a standard 120V charge. You can plug this into any 120V electrical outlet and the other end plugs into the car. Level 1 can supply 2-5 miles of range per hour (8km/hour). These types of chargers are typically found within residential homes and intended for personal use.

Level 2

A Level 2 EV Charger is the most common type of charger. This one is used in commercial property EV Charging Stations. These are separate chargers that allow for 240V charging. It is 3 to 7 times faster than a Level 1 charger and can supply 10-60 miles of range per hour (30km/hour). Level 2 EV chargers must be installed by qualified electricians.

Level 3

A Level 3 EV Charger is for fast charging and is used for commercial applications. It allows for 480V -900V charging. These are direct current (DC) fast chargers and can supply 3-20 Miles of range per minute (100km/30 minutes or 80% charge at 50kW). These types of chargers are most often found along major highways. Level 3 chargers often require the utility company installing a transformer.

Commercial Property EV Charging Stations

Today, commercial EV charging stations can be found at a wide variety of commercial buildings. As more and more drivers go electric, Commercial EV Charging Stations are becoming a necessity, not a luxury. Some examples of where you will find EV Charging Station installed are:

- Apartments & Condo Buildings
- Auto Dealerships
- Entertainment Districts
- Shopping Malls & Strip Centers
- Hospitals & Medical Offices
- Private Parking Lots & Garages
- Class A Office Buildings
- Colleges & Universities

For property owners, electric vehicle charging stations will one day be an expected workplace amenity, no different than free Wi-Fi or snacks in the breakroom. The same may go for multifamily properties, where tenants will expect or demand a certain amount of charging stations when searching for a new place⁷. In Canada, a recent report prepared for National Resources Canada, suggests a significant need for rapid expansion of EV charging stations to an estimated need of 32-34,000 Level 3 charging stations and 410,000 - 436,000 Level 2 stations by the year 2035⁸.

EV Charging Station Safety Concerns

With the growing trend of electric vehicles and the need for additional EV charging stations, many owners will begin installing commercial EV chargers on their properties. These EV charging stations do have apparent risks associated with them, including fires and electrical shock. The following will provide risk insight on fire hazards, electrical hazards and also provide general safety information property owners should take into consideration.

Fire Hazards

All batteries, whether on a charger, in use, or idle, are energy storage devices with the potential to dramatically release stored energy as fire or an explosion. This can happen at any time, for a number of reasons and without warning. In order to protect your property, it is essential this risk is understood, assessed, mitigated and prepared for.

One of the most common causes of battery fire and explosion is thermal runaway, which occurs when the amount of heat generated inside the battery is greater than the heat being dissipated, the rate of increase can become exponential, and pressure builds in the battery cell. Once initiated, thermal runaway cannot be stopped and often results in dramatic fire and/or explosion events. Even relatively small lithium-ion cells, such as those found in hoverboards and vaping devices can cause a significant fire and, depending on what it fire exposes, sizeable damage. Fires involving lithium-ion batteries develop rapidly, often without warning and are notoriously difficult to extinguish.

Wherever possible, chargers should be located outside and away from buildings and critical infrastructure. Consider the location of transformers and any of the following: combustible yard storage and waste; sprinkler tanks and fire pump house; flammable liquid or gas storage, cages, and tanks; foliage growth, etc. - anything that is combustible and/or business critical or that could exacerbate a fire should an incident occur. The aim should be to ensure a fire at a charger or vehicle cannot and does not spread towards or within any exposed assets.

Electrical Hazards

Overloading existing electrical installations can result in frequent interruptions, fault, damage, and fire. A site survey of the electrical capacity and demand should be completed to determine the number and type of charge points that can be installed. Once the load details are known, then the type and number of chargers can be calculated.

- Chargers should be installed and maintained in accordance with manufacturer's instructions and by a certified electrician.
- Regular infra-red thermographic inspections can help identify emerging faults. These inspections should incorporate isolator switches, the local electrical supply network as well as charging infrastructure.
- Chargers should be located so that charging cables do not become overstretched.
- The circuit supplying the EV charger should be checked to ensure it has capacity for the additional electrical load. Ideally there should be provision of an independent dedicated circuit, protected by its own residual current device (RCD) and easy to isolate.
- If a charger becomes faulty, it must be isolated and electrically isolated (locked-out) immediately.
- Electrical isolations should be clearly understood, labelled and readily accessible.
- Routing of cabling should be carefully considered, particularly if multiple cables are running through cable trays, as current draw may cause heating within trays or conduits.
- Surge protection safety devices and lightning protection should be installed and regularly tested.
- Regular visual checks should be undertaken to ensure charging cables and connectors are not damaged or otherwise showing signs of wear.

General Safety Considerations

- Any regulatory or other risk assessments (such as fire risk assessments) should be reviewed and revisited.
- Upon installation, a thorough check should be completed of the newly installed charger, including:
 - Quality of installation
 - Electrical connections
 - Weather tightness (if external), etc.
- Ensure charging equipment has been rated and listed by a Nationally Recognized Testing Laboratory such as UL, CSA, or ETL.
- Cord Management – Avoid slip, trip, and fall hazards by managing charging cables. If it is necessary to run your cable across a walk- or carriageway, invest in a cable protector that allows people to walk over the cable lying flat, as well as protecting it from damage and increased risk of fire or electric shock.
- As well as allowing for vehicle maneuver and parking, charging bays should be spaced and arranged to minimize the impact of fire spreading from one to another.
 - The distance between vehicles charging should be as large as possible.
- Charging bays should be conspicuously marked, with adequate signage in place. Consider including a contact number for people to report damage or other issues with charging infrastructure.
- EV charging parking spaces are often painted green. This is not a good idea is to paint the curbing green especially if it is in a grassy area. This doesn't draw attention to the change in surface height.
- Protect charging stations from vehicle impact. Local jurisdiction may vary on this.
 - Examples: curbing, wheel stops and bollards.
 - Reference applicable codes (NEC, IBC, etc.) to meet any standard requirements.
 - Communicate with the installer and the local AHJ.
- The charging area should be kept entirely clear of any combustible materials and not located near combustible waste, pump houses, other critical infrastructure such as transformers, electrical panels, gas cylinder or hazardous material stores, etc.
- An emergency manual isolation switch should be provided in a safe and readily accessible location
 - Also ensure there is adequate signage to direct people to it.

- As with any high hazard process, interlocking with the fire alarm is an effective means of automatically isolating the charging units. Therefore, as part of any fire alarm strategy, regardless of the location of the charging units, they should be de-energized at the isolator switch upon a fire alarm activation.
- Provide a “Quarantine” area for vehicles which are suspected to have a damaged or faulty battery.
 - Remember, a damaged battery can take several hours to go into thermal runaway and so it is important this is located at a good distance from the building, away from other infrastructure, vehicles, and people. Where the battery is suspected to be damaged or is faulty, the servicing provider should be contacted at the earliest opportunity.
- Complete regular visual inspections of charging areas, look for damage, rust, impact, combustible waste or detritus accumulation, signs of vandalism, signage and markings are still in place and conspicuous, etc.
- It is good practice to understand what fire water is available with pressure and flow tests. The addition of battery charging facilities may require more water in a fire.
- When lithium-ion batteries on fire are suppressed with water, they will produce amongst other by-products, lithium hydroxide and hydrogen.
 - Consider fire water run-off and containment to protect the environment/contamination.
 - Consider the generation of hydrogen and any potential exacerbation of the fire.
- The location of EV charging externally should be considered in relation to the potential for heavy rain accumulations (surface water) or flooding. If exposed and where required, attention should be paid to local drainage and flood defenses.
- Site topography should also be considered in relation to the provision of EV charging consider all seasons of the year; the nature of the site at its busiest time of the year; the nature of the site and its geography (e.g., ground slope), etc.
- Consider the impact on any neighboring properties or adjacent assets that expose your site
 - Similarly, if neighbors start to install EV charging units, consider the exposure this creates
- Review and update Business Continuity and Emergency Response Plans. Some questions to ask might be:
 - What contingency plans are in place in case chargers are out of service for a prolonged period of time?
 - What impact on the site fire strategy does the installation of EV chargers have?
 - What is the impact on site access/egress in the event of a fire involving an EV, etc.?
- Ensure access to chargers, cables and charging infrastructure is secured against illicit use and malicious damage.
 - Think about physical perimeter protection, isolation, removal of cables, CCTV and whether there is adequate lighting in the area.

Conclusion

Electric vehicles and their charging stations are becoming increasingly more present in our lives, so it is important to consider the risks when owning and installing charging stations on your property. Developing an EVSE program that includes preplanning, assessments, and regular inspection can help identify issues such as malfunctions, theft and vandalism, and may decrease the chances of injuries, claims and litigation.

Should you have any questions about commercial EV Charging stations, you can contact your local HUB Risk Services representative for assistance.

Resources

- https://afdc.energy.gov/fuels/electricity_basics.html
- https://afdc.energy.gov/fuels/electricity_charging_workplace.html
- <https://www.usfa.fema.gov>
- <https://www.usfa.fema.gov/blog/ig-062322.html>
- <https://www.usfa.fema.gov/downloads/pdf/publications/electric-vehicle-safety-handout.pdf>

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