



ChargeNY

# Electric Vehicle Charging Station Installers Best Practices Guide

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# **Electric Vehicle Charging Station Installers**

## ***Best Practices Guide***

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Cover photo and photo to the right:  
Charging Station at GE Global Research in Niskayuna, NY.  
Courtesy of General Electric







Country Club Manor,  
Williamsville, NY  
Courtesy of Energetics Incorporated



# 1. Introduction

This guide collates insights from 20 New York State electricians that have experience in planning, layout, installation, and maintenance of electric vehicle (EV) charging stations. These installers have nearly 4,000 cumulative total charger installations including over 300 EV charging station installations in New York State.

Various installer guides and instructions are listed at the end of this document. The actual installation and connection of EV charging stations should be straightforward for a qualified electrician. This guide will not provide comprehensive instructions on how to install an EV charging station, but will instead discuss various specialized aspects of the installation process and useful lessons learned and best practices directly from electricians that have experience with EV charging stations.

## 2. Things to Look For During a Site Visit

Many aspects must be observed and evaluated during the initial site visit for an EV charging station installation. Every location and installation is unique, so consider all aspects of an installation to optimize preparations and on-site efforts. Explained in more detail in this section, the following key items should be thoroughly addressed during the initial site visit:

- **EV Charging Station:** make and model (including mounting type and cord management).
- **Location:** purpose of the stations, cost factors, parking lot management (i.e., snow, pedestrians, and cleaning).
- **Electrical Supply:** nearest panel, adequate capacity, up to current code.
- **Wire Run:** distance, obstructions, surface (is boring or trenching required?)
- **Cellular Signal:** strength (will a relay antenna be needed?)
- **Permitting:** required process and cost, local experience with charging station installations.
- **Other Features:** protection (e.g., bollards or tire stop), sign posts.

### 2.1 Initiate Communication

Use the site visit to meet in-person and initiate communication with site owners, managers, operators, staff, and other on-site stakeholders to ensure a good working relationship throughout the project. Understanding everyone's opinions and concerns at the start can make the remainder of the project go much smoother. This opportunity is also the time to gauge their knowledge of EV charging stations, properly plan follow-up informational discussions, and share appropriate educational materials as needed.

### 2.2 Discuss Station Location

Placement of the EV charging station is critical to the success of the project. Site hosts typically have a preferred location, but may not adequately understand the implications of such placement on user access, station protection, or installation costs. Always investigate and be prepared to propose an alternative placement that could save costs while not sacrificing access or other factors. Once site owners see the quoted installation costs for their proposed location, some may then have second thoughts and the installer should be prepared to provide a second option without having to do another site visit.

### 2.3 Identify Power Sources and Wire Routes

The proposed EV charging station's location should be as close as possible to the power source to reduce installation costs. Many site owners do not know the location of their property's electrical panels and subpanels. If the site owner has chosen a specific installation location, thoroughly search for the best and closest power source option. Examine the condition of the selected electrical panel(s) because the electrician is responsible for ensuring that the entire panel is up to current electrical building code after any modifications are made to add the EV charging station circuit. Routing power from the panel to the EV charging station can be a large portion of the installation costs due to trenching, conduit, and the wire itself. Attempt to design the installation with the shortest run and least obstructions (and re-address the placement of the station itself if less costly installation options present themselves).



## 2.4 Permitting and Grant Paperwork

The site visit is a good time to look into the permitting process and potentially meet with the local inspector if possible. Understanding the local jurisdiction's knowledge of EV charging stations will provide insight into how much effort will be needed (if they have not issued a permit for an EV charging station previously, some discussions and education early on in the process might save a lot of effort later when they are processing the permit). Required paperwork for EV charging stations funded with grants can also be more complicated if the requirements are not fully understood until after the installation. Discuss the requirements and obtain copies of the paperwork so it can be completed during the installation process, which will prevent the need to go back through receipts or timesheets for information and the need to go back on site for signatures.

## 2.5 Cellular Signal Strength

Networked stations require a good cellular signal to communicate with the provider. Testing with a cellular phone might work, but EV charging stations may use a different cellular network. This test is most critical for rural or underground locations where cellular signals are typically poor. If cellular signal strength is not strong enough, a booster or antenna may be required and should be included in a quote.

## 2.6 Other Considerations

Address parking space lighting and station security early on to advise site owners on ways to help ensure the safety of charging stations, EV drivers, and other parking lot users. Signage at the EV charging station is typically used to instruct drivers on parking or charging rules and may require the additional installation of a post that should be properly coordinated and potentially integrated into the EV charging station installation. Station protection, such as bollards or tire stops (Figure 1, next page), may also be incorporated into the installation and should be discussed and planned during the site visit.

# 3. Installer and Client Interactions

It is important to develop open communication between installers, site owners and/or managers, equipment vendors, and any other involved

stakeholders. The installation involves several parties working together to ensure permits are in place, hardware is configured properly, site managers approve work plans, and work is completed efficiently. In addition to the pre-installation meeting at the initial site visit, regular communication between the installer and site managers or other stakeholders is critical to identify any potential issues and concerns before they impact the installation process.

The installation of an EV charging station is occasionally initiated by a corporate office offsite and the on-site staff may not be knowledgeable about or as invested in the project. In these situations, an on-site point of contact should be identified by the corporate office and discussions should be held with this individual, the corporate office, and the installer at the beginning of the project to establish roles and responsibilities, along with the overall goals and objective for the project.

Good communication must begin at the start of the project during pre-installation planning, which is the most critical part of any EV charging station installation. Share the planning details with site managers to avoid installation issues stemming from miscommunication, which is the biggest cause for delays and budget changes on these projects. Before concluding the installation and leaving the site, provide on-site staff with a quick demonstration of the EV charging station and show them the location of the added circuits in the electrical panel.

# 4. Existing Electrical Panel May Need Upgrades

Always inspect the existing facility wiring that will be used to supply power to the EV charging station during the site visit before the work is quoted. Before any electrical installation work begins, confirm that the existing wiring is up to code and can handle the additional load from the EV charging station. Multiple EV charging stations at one location will likely be used simultaneously and draw a continuous load. Analyze this situation, in addition to the existing loads, to ensure that it does not exceed the capabilities of the existing system.

If the existing infrastructure is not up to code or is not capable of supplying adequate power to the EV charging station, significant additional costs will result, which may decrease the project viability. Therefore it is best to inform everyone of this detail as soon as possible. Newly built buildings typically have updated wiring, are more likely to meet current codes and



**Figure 1. Bollards and tire stops used for charging station protection**  
(left and bottom) Courtesy of Energetics Incorporated; (right) Courtesy of NYSERDA







**Figure 2. Electrical panel for an EV charging station at Frito-Lay in Rochester, NY.**  
Courtesy of Energetics Incorporated



**Figure 3. Electrical wire routing, single throw safety switches, and EV charging station at Pitcairn Properties' 100 Manhattanville parking garage in Harrison, NY.**  
Courtesy of Energetics Incorporated

have adequate power available, which results in lower installation costs. Buildings under construction or being planned are ideal for adding EV charging stations because the load calculations can be included in the overall facility design, the parking lot can be designed to optimize the station location, and conduit can be laid before any potential barriers or pavement is completed. Some sample electrical work for EV charging stations is shown in Figure 2 and Figure 3.

## 5. Aspects to Consider About Charger Location

Site owners often specify a location where they want the EV charging station to be installed. Regardless of how much the site owner is set on this location, discuss the reasoning behind their decision and look for opportunities to provide the same results at another location onsite that might be better. Experienced EV charging station installers recognize the value in collaborating with the site owner on the location decision because most site owners don't have the experience to fully understand the impact that station location has on user satisfaction, installation costs, or general safety.

Although the surfaces and obstacles between the EV charging station location and the electrical source may be an obvious factor to consider, they are very influential to the cost and complexity of a project. Hard surfaces, such as pavement and concrete, are costly to cut through and repair, and may not be of the same quality afterward. The proximity to large trees should also be noted as extensive root networks can make trenching significantly more difficult. Underground conduit runs have the highest risk of unexpected costs because of buried walls, debris, or other things that make the job much harder than anticipated. A detailed study using ground penetrating radar would be ideal to have, but this option costs money upfront. Many installers tunnel under sidewalks (shorter distance and safer for pedestrians), but open up through parking lot pavement. Some installers always choose to bore under regardless of the higher cost because it makes the least impact possible (Figure 4, next page).

Charging stations along walkways would create a safety hazard to pedestrians if the cord must cross the path of where people walk, so the station should be positioned close to where the EV will be parked.



**Figure 4. Hard surfaces can be costly to cut through and affect the aesthetics of a surface**  
Courtesy of Energetics Incorporated



**Figure 5. Snow accumulation can obstruct access to charging stations and snow plows can cause damage (right)**  
Courtesy of Energetics Incorporated



Carefully consider protection from adverse environmental conditions when choosing a location for the chargers. Although the charging stations are designed for outdoor use and exposure to the elements, areas prone to flood or places that accumulate significant snow during winter (because of drifting and plowing) should be avoided. Standing water near the EV charging stations could cause electrical connections to become shorted and may cause personal harm or damage to the unit. Excess snow accumulation

can make accessing the unit difficult or obscure the charger and cords during snow removal (Figure 5).

Cellular service availability for networked stations is an often overlooked element when selecting a location. This issue is primarily for underground or extremely remote installations. Sometimes a relay antenna can be used to boost the reception (a cost that should be accounted for from the start) or an alternative cellular network card may be selected for the station.

## 6. Comments and Concerns About Charging Station Hardware

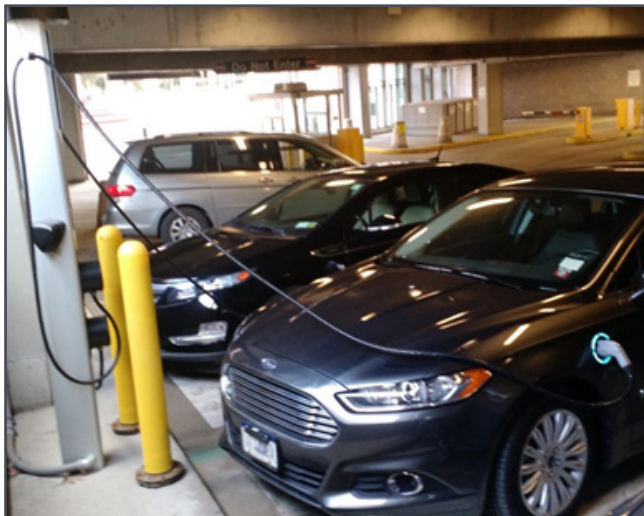
EV charging station technology has improved considerably in recent years, and most current systems are very reliable and user friendly. However, some manufacturers offer amenities and options that may not be available on other units. In certain situations, these features can make or break the success of the EV charging station.

Cable management approaches vary by product and should be one of the primary considerations when selecting an EV charging station. Publicly accessible stations may benefit from advanced cable management, as patrons may be less vigilant about recoiling the cable after use. Workplace or private

charging stations that experience repetitive use by the same individuals may not need a more expensive system with automatic cable management since the user would typically take the time to recoil the cord if they were likely the one to use it next. Examples of cord management approaches are shown in Figure 6.

Providing a watertight seal for the wire entry into a charging station can be problematic for nontraditional installations that cannot use the standard approach because there are not many smooth, flat surface areas to use. Some charging station models have less room inside to make the electrical connections than others, but installers quickly develop a good technique for each type after completing their first one. Some charging stations require special tools (e.g., ChargePoint stations need a #25 tamper-proof screwdriver), so review the instructions carefully to avoid unnecessary delays due to the lack of proper tools.

**Figure 6. Active cable management (left) and non-retracting cables**  
Courtesy of Energetics Incorporated



## 7. Installation Guides and Additional Information

### **Plug-In Electric Vehicle Handbook for Electrical Contractors**

U.S. Department of Energy

[www.afdc.energy.gov/pdfs/51228.pdf](http://www.afdc.energy.gov/pdfs/51228.pdf)

### **Electric Vehicle Charging Station Guidebook: Planning for Installation and Operation**

Vermont Energy Investment Corporation

[www.driveelectricvt.com/docs/default-source/default-document-library/electric-vehicle-charging-station-guidebook-.pdf](http://www.driveelectricvt.com/docs/default-source/default-document-library/electric-vehicle-charging-station-guidebook-.pdf)

### **Installation Guide for Electric Vehicle Supply Equipment (EVSE)**

Massachusetts Department of Energy Resources

[www.mass.gov/eea/docs/doer/clean-cities/ev-charging-infrastructure-manual.pdf](http://www.mass.gov/eea/docs/doer/clean-cities/ev-charging-infrastructure-manual.pdf)

### **The Electrician's Guide: Installing Electric Vehicle Charging Stations at Commercial and Multi-Family Properties**

Southern California Edison

[www.sce.com/wps/wcm/connect/606cda45-f2be-4023-9fc2-5c103354b1b1/CommEV\\_Electrician+Guide.pdf?MOD=AJPERES](http://www.sce.com/wps/wcm/connect/606cda45-f2be-4023-9fc2-5c103354b1b1/CommEV_Electrician+Guide.pdf?MOD=AJPERES)

### **The Electrician's Guide: Installing Electric Vehicle Charging Stations at Single-Family Homes**

Southern California Edison

[www.sce.com/wps/wcm/connect/1edda164-c538-461f-a530-e65e9847ca45/EVElectricianGuide.pdf?MOD=AJPERES](http://www.sce.com/wps/wcm/connect/1edda164-c538-461f-a530-e65e9847ca45/EVElectricianGuide.pdf?MOD=AJPERES)

### **Site Design for Electric Vehicle Charging Stations**

Sustainable Transportation Strategies

[www.nyserda.ny.gov/-/media/Files/Programs/ChargeNY/Site-Design-for-EV-Charging-Stations.pdf](http://www.nyserda.ny.gov/-/media/Files/Programs/ChargeNY/Site-Design-for-EV-Charging-Stations.pdf)





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