EV CHARGING INSTALL AND OPERATIONS GUIDE

February 2023

This guide provides best practices for the installation and ongoing operation of EV charging stations to support participants in the Electric Vehicle Charging Program.

Municipal
Climate Change
Action Centre

CONTENTS

1.0 CHARGING 101

1.1 Types of chargers

Electric vehicles (EVs) require a charging station to replenish their batteries. Different EVs use different types of charging stations and connector types. The charging time depends on the vehicle's battery capacity, and the power output of the charging station (in kilowatts, or kW). The following are the most commonly used charging station types used for passenger EVs:

Level 1 chargers use a regular 120-volt household plug to charge an EV and is typically limited to 15 amps. Level 1 charging cables come with an EV and are portable, generally stored in the vehicle trunk. This is the slowest type of charger that generally charges at a rate of 7 to 9 kilometers (km) per hour. Due to the slow charging rate, level 1 charging is typically used for emergencies or for plug-in hybrid electric vehicles (PHEVs) with smaller batteries that can be recharged overnight using a level 1.

Level 2 chargers use a 240 volt plug to charge an EV more quickly than level 1. These charging stations can fully charge an EV in 5-10 hours (or 30 to 90km/hour). The speed of level 2 charging depends on the amount of current used in the circuit which generally ranges from 20 to 80 amps. This style of charger utilizes a standard SAE J1772 plug connector that is universally used by electric vehicle manufacturers. Level 2 stations are ideal for homes, businesses, public buildings where vehicles park for more than two hours or for overnight charging.

Level 3 chargers, otherwise known as Direct Current Fast Chargers (DCFC) are the fastest charging option for EVs and make long-distance travel easier. This charge option allows EVs to be topped up to 80% battery life in as little as half an hour. This type of charger utilizes the CHAdeMO and CCS (combined charging system) plugs. The capabilities of both EVs and DCFCs are continuously improving and causing charging wait times to decrease. The power output of level 3 chargers is typically 50 kW but can be as high as 350 kW or higher with proprietary charging systems like Tesla's supercharger network.

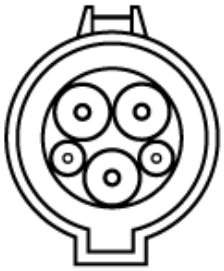
Figure 1- Typical 120 volt plug with an electric vehicle charging adapter. This is considered a Level 1 charger.

Figure 2 - A 240-volt Level 2 charging station can be installed at home or at work to charge an electric vehicle.

Figure 3 – Level 3 charging station is the fastest method of charging an electric vehicle.

1.2 Types of charging connectors

There are several different charging connector types available depending on the level of charger required. There following connectors are the most common for level 2 and 3 charging.

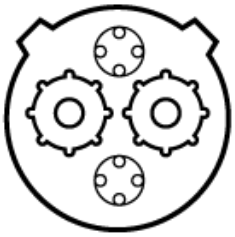


Connector: J1772

Level: 1 and 2

Compatibility: 100% of electric cars

Tesla: With adapter

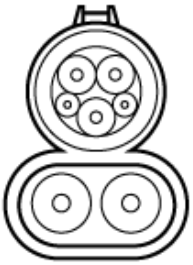


Connector: CHAdeMO

Level: 3

Compatibility: Check specifications of your EV

Tesla: With adapter



Connector: SAE Combo CCS

Level: 3

Compatibility: Check specifications of your EV

Tesla: With adapter

Connector: Tesla supercharger

Level: 3

Compatibility: Only Tesla

Tesla: Yes

The SAE Combined Charging System (CCS) and CHArge de MOve (CHAdeMO) are the standard connectors for level 3 stations. The availability of a CCS or CHAdeMO charging port on an EV will depend on the manufacturers' preference and local conditions. In North America, CCS is quickly becoming the standard charging option for vehicles and the standard connector type used at level 3 charging stations.

1.3 Locating charging stations

As the EV charging infrastructure network is still in development, it is important to plan long distance trips based on the availability of level 3 charging. To do so, drivers can view the PlugShare or ChargeHub charging station maps to see available charging station locations in Alberta and across North America. Before driving to a charging station or planning a trip, it is important to check your vehicle's compatibility with the charging station connector available. Some vehicles, like the Chevrolet Volt (a PHEV), are not compatible with level 3 stations. It's also important to consider your vehicle's maximum charge speed and how that will factor into your trip plan. Some vehicles are limited to 50 kW charge speeds, even at level 3 stations with 100 kW or higher output.

1.4 Networked charging stations

Networked charging stations (occasionally referred to as "connected" charging stations) can communicate with other stations and the internet via cellular or wireless signals. Networked charging stations offer multiple benefits when compared with non-networked stations.

Firstly, it allows for increased visibility when EV drivers are searching for a charging station. They can do so via a provider's mobile app, third-party websites, or through GPS navigation apps. This is key, as not being connected to any network means that a charger will be essentially invisible to drivers. Secondly, it provides an improved driver experience as networked stations can let EV drivers know when a station becomes available. Some services, such as Chargepoint's "waitlist" feature even allow EV drivers to get in a virtual queue so they can charge their vehicle once the vehicle ahead of them has finished. Networked charging

stations also allow the owner of the station to monitor usage and set up pay-per-use options. Lastly, there are several cost-saving benefits and flexibility options for networked chargers as well as numerous reporting features that station owners can benefit from. Station owners can receive the latest firmware updates, anticipate problems before they arise, and can control access to ensure turnover between users. The energy and greenhouse gas data collected and reported by networked stations also means that it can be justified as a sustainable investment when applying for grants or engaging with stakeholders.

1.5 Open-Source Charging Stations

Of the many factors to consider when purchasing a networked EV charging station is to consider OCPP compliant charging equipment. Open Charge Point Protocol or OCPP is a syntax language that is used to communicate with other networked charging stations and a network management system. A major advantage to OCPP-compliant charging stations is that it allows the freedom for station owners to choose any network they would like and allow access to more competitive pricing options. This provides additional flexibility and removes fears of a stranded asset should a manufacturer go out of business or being forced to use only the network that the station is compatible with (and all the fees that come along with it). As a free, open source, and easy to use protocol, OCPP ensures that all stations within the EV charging station network are speaking the same language and has thus become a global benchmark for interoperability throughout the EV charging industry. The protocol is analogous to cell phones users having the freedom to choose the network they would like to in comparison to being locked into a contract with a particular network provider. **Some restrictions may apply when it comes to OCPP. Contact your distributor for full details around OCPP compatibility.**

1.6 Managed Charging

Managed charging relies on communication signals from a utility or aggregator to be sent to a vehicle or charging device to control charging events. Managed charging programs fall into two categories: passive and active. Passive programs focus on altering customer charging behavior. One way to achieve this is using time-varying rates to incentivize customers to charge during less expensive off-peak hours. Active managed charging programs provide utilities, or a market aggregator working with charging networks, with the capability to determine and/or control charging time, scale, and location, to achieve a variety of outcomes, such as managing peaks, absorbing excess renewable generation, or supplying some ancillary services to a structured market. These charging schemes can benefit EV owners by reducing their overall cost of ownership either by paying reduced prices during charging events or receiving incentives to enrol into the programs. Managed charging can bring mutual benefits to EV owners and utilities by reducing the load on the grid during peak hours.

2.0 PROVIDERS AND CONTRACTORS

The following is a short list of charging station equipment providers. **Please note that this is not an exhaustive list of every provider or installer on the market, nor is this an EVCP eligible contractor list.** The following equipment manufacturers/installers have experience with EV charging projects in Alberta and have been involved in several existing projects through the EVCP. It is recommended to review multiple quotes from various EV charging station equipment and installation providers to properly inform your procurement process. **MCCAC expects EVCP participants to do their own diligence in hiring qualified contractors and follow their designated procurement processes.**

2.1 Equipment Manufacturers

Contractor	Phone Number	Email Address
ABB	1-800-435-7365	contact.center@ca.abb.com
Bosch	1-844-317-9525	infoevcharger@ca.bosch.com
ChargePoint	1-408-370-3802	info@chargepoint.com
Flo	1-855-543-8356	info@flo.com
Hypercharge	1-888-320-2633	info@hypercharge.com
Siemens	905-465-8000	contactus.ca@siemens.com
Sun Country	1-866-467-6920	info@suncountryhighway.ca
Tritium	1-310-618-4834	stok@tritiumcharging.com

2.2 Installers and Providers

Contractor	Primary Contact	Phone Number	Email Address
D.A.D. Sales	Ben Wells	587-879-4494	benwells@dadsales.com
Dandelion Renewables	Mikhail Ivanchikov	780-566-6058	mi@dandelionrenewables.com
Energy Network Services	Bill Charbonneau	587-572-3224	bcharbonneau@ensinc.ca
Sustainable Projects Group	Rodnee Makofka	403-861-8111	rodneem@suspg.com
Accu-Flo	Riley Parkson	403-243-1425	rparkson@accuflo.com
Hady Electric	Daryn Testawich	780-298-6061	daryn@hadyelectric.ca
SiTEWiRX	Brent Hrywkiw	403-703-0410	brent@sitewirx.com
Ambu Energy	Raj Thayalan	416-408-0623	info@ambuenergy.com
ATCO	Trevor Grenier	780-808-1591	trevor.grenier@atco.com
Armax Electric	Nathan Block	403-320-7533	armax@armaxelectric.ca
Wave Engineering	Nathan Bird	587-689-5656	Nathan.Bird@WaveEngineering.ca
Evalence	Nicholas Seniuk	587-435-7349	inquiries@evalence.ca

3.0 INSTALLATION AND OPERATIONAL CONSIDERATIONS

3.1 Site Selection

There are many considerations to be made when it comes to a public charging station's purchase and installation. Site location is one of the most important considerations as it will influence how often the station is used and how easily the station can be accessed. The approach to site selection may differ depending on whether the intended charging station is level 2 or level 3. If the location will be a site where drivers can spend several hours charging their vehicle, a level 2 charging station may work best (ex. locations near a shopping mall, downtown core, gym, movie theatre, beach, or park). Level 3 fast chargers, on the other hand, may be more appropriate in locations where vehicles will only be charging for about 30 minutes before continuing their journey (ex. locations near highway rest stops, downtown cafes, etc.). Visibility of the charging station will also need to be a top consideration including the addition of appropriate signage and reserved spaces for EVs to park. A good driver experience can be created by selecting sites that are close to amenities such as washrooms, refreshments, tourist locations, activities, and Wi-Fi hotspots.

Further, consider snowy conditions during the winter months. The charging stations should be typically located away from snow pile locations and out of the way of snow ploughing and pavement cleaning to avoid damage and reduced accessibility. Site hosts and their installers may need to contact the Utility Safety Team (formerly Alberta One Call) if the EV charging station project requires cable trenching or any earthworks to ensure all subsurface utilities are identified and marked.

3.2 Installation

Once a specific location has been selected, there are a few other on-site considerations. Some questions to consider include:

- Where in the parking lot will the charger be mounted?
- Will the charging station be wall-mounted or mounted to a pedestal?
- Is there space to include a charging station within the electrical breaker panel?
- How could EV charging impact demand charges at the desired location? (This is particularly relevant for level 3 chargers)
- Is the site's existing electrical infrastructure capable of support the desired level of charging?
- Will additional charging stations need to be added in the future? How can the site be scalable as EV uptake and demand for charging stations increase?
- What is the overall installation cost? Are there grants available to help offset these costs?

The answers to the above questions are important to consider. It is always best to speak with a licensed professional, such as an electrical contractor, when considering a charging station install as there may be other factors that could be overlooked. Funding is available through the Electric Vehicle Charging Program (EVCP) to aid in offsetting both equipment and installation costs for installing EV charging equipment.

3.3 Equipment and Electrical Considerations

While selecting and installing EV charging equipment, certain factors should be investigated to ensure seamless installation and operation. Some considerations include:

- Type of charging connector used and how common it is used
- Available space for an additional circuit breaker
- Length of equipment warranty on purchase
- Additional demand charges based on the utility's rate structure and load profile
- Availability of an EV charging specific rate code
- Availability of 3-phase power for level 3 charger installation
- Maintenance of installed charging stations
- Open Charge Point Protocol compliant software and hardware (See Section 1.5)
- Rated for operation in a wide temperature range (warrantied for operation between -40 °C to +40 °C)

It is especially important to consider the current power demand and billing structure of the proposed charging station location and the impact a potential level 3 charger could have. Level 3 charging stations often require 3-phase 480 volt power and may create a significant peak power demand when in use, dependent on the current energy usage profile. Consider seleceting an EV charging station that offers power magement which can prevent high peak power demands, which may lead to high utility costs and monthly rates. Additionally, consider contacting your Wire Service Provider (ATCO, ENMAX, Fortis etc.) to determine the potential locations billing structure, energy usage profile, and if any electric upgrades may be required.

3.4 Operational Considerations

- Newly installed EV charging stations should be listed to charging maps such as PlugShare or ChargeHub. Adding a station is free and simple process that increases visibility for stations and allows drivers to plan trips with the most up-to-date information of the charging network.
- Municipalities participating in the EVCP may provide complimentary electricity or implement a fee-for-use at public EV charging stations. As per the Municipal Government Act, any fee-for-use must be approved by the municipal council. Rates and rate structures can vary from per kWh, per hour, or per minute for fast charging. On average, rates for level 2 charging are between $1.00-$2.00 per hour while level 3 fast chargers are $15-$20 per hour. Rate structures based on volume of charging may be proposed in the future.
- Each transaction made through the station will incur a payment fee amounting to 10% - 15% of the amount which will be borne by the station owner.
- All EV charging stations funded through EVCP must be networked stations. Networked stations allow for a variety of features such as the transmission of real-time status information, remote troubleshooting, usage data, and fee-for-use. Network operators will charge a network fee that can range from $150-$250/year per connector.
- Networked stations monitor usage patterns to understand user behavior and the potential to maximize monetary returns on charging. Monitoring usage over several years will also show the growth in EV uptake.
- Ensure user turnover and prevent overuse by restricting the length of each session and potentially increasing the charging fee when the charging sessions exceeds 8 hours (level 2) or 1.5 hours (evel 3).
- Consider how your organization will ensure the dedicated parking location is only used by EVs. An amendment to existing parking or traffic bylaws would allow tickets or tows of non-EVs from the dedicated charging location.

3.5 Safety and Security

- Consider installing physical barriers between the parking space and the EV charging station to prevent accidental damage or vandalism. Mounting the station above bumper-level such as on the curb and including bollards and rubber tire stops will reduce this risk. Building or wall mounted stations are another option.
- Inform your insurance provider of the newly installed EV charging station to ensure coverage in case of accidental damage or vandalism. This ensures repair or replacement of components in the event of damage to the system not covered by warranty and will minimize downtime.
- Consider how the charging cable will be managed at the site to avoid damage and improperly stored cables from becoming a tripping hazard. Charging stations with cable retraction systems help limit this risk and ensure a safe charging experience.
- Consider the illumination of the EV charging station location. Proper lighting contributes to a safe charging experience and may deter vandalism.
- Charger installations should be accessible and easily used by those with mobility constraints.

- Avoid installation of chargers on sidewalks and walkways that would impede pedestrians.

4.0 REQUEST FOR PROPOSALS CHECKLIST FOR EV CHARGING STATION INSTALLATIONS

This checklist provides a list of best practice items to include in procurement processes involving a request for proposal (RFP) for EV charging projects.

4.1 Information to Provide to Proponents

Project Overview:

☐ Project description

☐ Objectives of the project (e.g., support or increase EV adoption, utilize existing electrical infrastructure, limit station owner investment, etc.)

☐ Number of chargers, if known, or other characteristics which will determine the number (e.g., space available, number of EVs in the region, available budget, public or private use etc.)

☐ Maximum project budget

☐ Project timeline

☐ Funding sources and/or grants or rebate programs being pursued for the project

☐ Contract type required if known and applicable (e.g., stipulated price, time and materials, etc.)

☐ Contact information for RFP inquiries

Site Description:

☐ Desired location of EV charging stations system and other location considerations (e.g., pedestal-mount, wall, etc.)

☐ Description and address of building or site, including images/schematics/building or site drawings, if available

☐ Site-specific design constraints (e.g., local design or aesthetics policies or limitations)

Load Profile & System Characteristics:

☐ Define charger power levels based on charging needs and site type

☐ Describe the existing onsite electrical system (e.g., 12/240V, 208V, 480V, single phase, three phase, etc.)

☐ Identify electricity retailer and distribution company for the site

☐ Include other relevant electrical specifications/requirements

Scope of Work:

☐ Desired services may include any of the following items. Clearly describe which of the following items should be included in the proposal:

- EV charging station installation design
- Site engineering assessment and availability of supply
- Installation and commissioning of EV chargers
- Connecting to and configuring the EV charging network

- Completion of all permitting applications, if required (e.g., building, electrical, and development), utility interconnection applications, and inspections, in order to comply with local regulations and codes
- Completion of a site survey to locate any underground services
- Completion of applicable rebate or incentive application forms or documents
- Inclusion of any data displays or data management and reporting systems
- Training and/or operation and maintenance manuals
- Arrangements for ongoing operation or maintenance
- Any additional equipment warranties (beyond manufacturer warranty)
- Any other potentially necessary surveys or approvals that the project may require (e.g. environmental assessments, etc.)

4.2 Information to Request from Applicants

System Design:

☐ Description of the proposed EV charging installation system, including a preliminary design and drawings/renderings which illustrate the proposed layout at the site

☐ Specification sheets for all proposed equipment including warranty details for the chargers and any other critical equipment

☐ Description of the proposed network and data monitoring system

☐ Description of any operation and maintenance service plans, if applicable

☐ Estimated annual earnings from EV chargers

Company Details and Experience:

☐ Name and role of project team members (including any relevant certifications)

☐ Name of subcontractors and their role in the project

☐ Relevant experience and references for systems as similar as possible to the desired request

☐ Company safety certifications and proof of WCB coverage

☐ Confirmation of company insurance certificates (general liability, or other insurance that may be required for the company to be working on municipal sites)

Work Plan and Schedule:

☐ Detailed proposed workplan and schedule for the project including time and duration of any activities that could disrupt regular operation

Project Costs:

☐ Total costs of the project

☐ Request a breakdown of the cost estimate (excluding ongoing costs) based on the desired services; a simplified breakdown may be as follows:

- EV charger equipment costs
- Installation labour costs
- Engineering and design costs
- Permitting and inspection costs
- Signage costs

- Other electrical components
- Other costs

☐ Description of the ongoing costs associated with networking fees per connector and the transaction fees

☐ If any services are optional, request their costs be clearly separated from the required services to enable a fair comparison of costs across multiple proposals

4.3 Evaluation Process and Selection Criteria

Evaluation:

☐ Provide a high-level overview describing how proposals will be evaluated (e.g., number of reviewers, time, etc.)

☐ RFP evaluation criteria and weighting should be clearly identified and frequently include:

- Company's relevant experience
- Proposed system design, specifications, and warranties
- Overall cost
- Quality and conformance of proposal

Submission Information:

☐ Provide contact information for someone who proponents can reach to have questions about the RFP answered, and provide a deadline for questions to be asked

☐ Provide clear details on how proponents are to submit their proposal, including:

- Deadline for accepting submissions
- Address and addressee for submissions
- Desired format for submissions (e.g., digital and/or physical)
- Number of physical copies (if required)

CONTACT US

Questions about the EVCP may be directed to:

Municipal Climate Change Action Centre
300-8616 51 Avenue
Edmonton, AB T6E 6E6
780.433.4431
contact@mccac.ca
Twitter: @MCCAC_Alberta
LinkedIn: linkedin.com/company/mccac-alberta

Founding partners of the Municipal Climate Change Action Centre

Alberta Municipalities Strength In Members

RMA Rural Municipalities of Alberta

Alberta