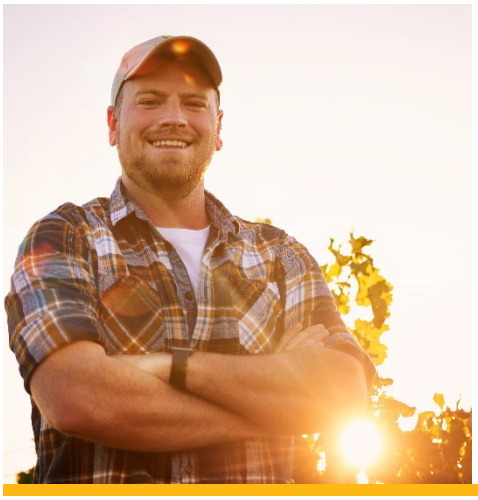
EV CHARGING BASICS & OPERATIONS GUIDE



Alberta Municipalities
Strength In Members

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

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1.0 CHARGING BASICS

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 state of charge, the power output of the charging station (in kilowatts, or kW), and the battery/ambient temperature. The following are the most common charging station types used for passenger EVs:

Level 1

Level 1 chargers use a standard 120-volt household plug to charge an EV and are typically limited to 15 amps. Level 1 charging cables typically come with an EV and are portable and can generally be stored in the vehicle trunk.

Level 1 is the slowest type of charger, typically charging 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 with smaller batteries that can be recharged overnight. However, in some scenarios EV drivers can meet their charging needs with only level 1 charging.

Level 2

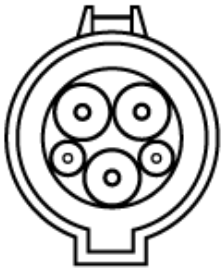
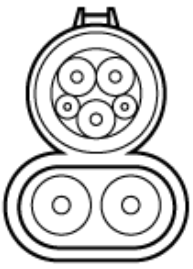
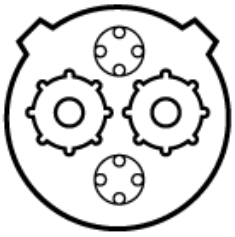
Level 2 chargers use either a 208 or 240 volt plug to charge an EV more rapidly than level 1. These charging stations can typically fully charge an EV in 8-10 hours. The speed of level 2 charging depends on the amount of current used within the circuit, which generally ranges from 20 to 80 amps, how low the battery is when charging begins, and the temperature. Level 2 chargers utilizes either a SAE J1772 plug or a North American Charging System (NACS) plug. Level 2 chargers are ideal for homes, businesses, and public buildings where vehicles park for more than two hours or for overnight charging.

Level 3

Level 3 chargers, otherwise known as Direct Current Fast Chargers (DCFC), are the fastest charging option for EVs and make long-distance travel easier. Depending on the power output of the DCFC, some EVs can recoup up to 80% of their charge in as little as 30 minutes. In North America the two most common level 3 plugs are CCS (combined charging system) and NACS (North American Charging Standard). The capabilities of both EVs and DCFCs are continuously improving and causing charging wait times to decrease. The power output of level 3 chargers can vary from 50kW to 350kW

1.2 Types of Connectors

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

Connector Shape				
Connector Name	SAE J1772	NACS (Tesla)	SAE CCS	CHAdeMO
Level	1 & 2	2 & 3	3	3

Nearly all EVs in North America use either the SAE CCS or NACS (Tesla) connector types for level 3 charging. Throughout 2024 the NACS connector became the dominant connector type amongst EVs as most major vehicle manufacturers adopted the NACS connector. Adapters allow many vehicles to utilize both the SAE CCS and NACS connector types. The CHADeMO connector is uncommon in 2025.

The following vehicle manufacturers utilize the NACS connector for their 2025 and future vehicle models:

- Audi
- BMW
- Fisker
- Ford
- Genisis
- GM
- Honda
- Hyundai
- Jaguar
- Kia
- Lexus
- Lucid
- Mazda
- Mercedes-Benz
- Mini
- Nissan
- Polestar/Volvo
- Porsche
- Rivian
- Rolls-Royce
- Tesla
- Toyota
- Volkswagen

Manufacturers not listed (i.e., Stellantis) utilize the SAE CCS connector type for DC fast charging.

1.3 Locating Charging Stations

As the EV charging infrastructure network is still being built out, it is important to plan long distance trips based on the availability of level 3 charging. To do so, drivers can view 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 for drivers to check their vehicle's compatibility with the charging station connectors. It's also important to consider the vehicle's maximum charge speed and how that will factor in their trip plan. Some vehicles are limited to 50 kW charge speeds, even at level 3 stations that are capable of outputting 100 kW+. This is why the Electric Vehicle Charging Program (EVCP) requires that all charging stations are networked.

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 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 control access to ensure turnover between users. The energy and greenhouse gas emission data collected and reported by networked stations also means that they 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 Open Charge Point Protocol compliant charging equipment. OCPP is a syntax language that is used to communicate with other networked charging stations and a network management system. A major advantage of OCPP compliance 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.

2.0 PROVIDERS & 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 previous EVCP iterations. It is recommended to review multiple quotes from various EV charging station equipment and installation providers to properly inform your procurement process. Alberta Municipalities 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
Tritium	1-310-618-4834	stok@tritiumcharging.com

2.2 Installers and Providers

Contractor	Phone Number	Email Address
Armax Electric	(403) 320-7533	armax@armaxelectric.ca
ATCO	(780) 420-3770	
D.A.D. Sales	(877) 230-9201	byoungs@dadsales.com
Dandelion Renewables	(306) 661-7719	sales@dandelionrenewables.com
Evalence	(587) 435-7349	inquiries@evalence.ca
Hady Electric	(58) 463-9777	info@hadyelectric.ca
Inferno Solar	(587) 774-7275	info@infernosolar.com
Lane Valente Industries Canada, Inc	(631) 620-5378	tnaccarato@canadalvi.com
Prestige Electric	(780) 203-8377	jordy@myprestige.ca
Sustainable Projects Group	1 (778) 788-5758	robinl@suspg.com
Swift	1 (888) 308-5820	info@swiftcharge.io
Wave Engineering	(780) 640-1616	hello@WaveEngineering.ca

3.0 INSTALLATION AND OPERATIONAL CONSIDERATIONS

3.1 Site Selection

There are several considerations when it comes to purchasing and installing public charging stations. Choosing the right site location is one of the most important as it will influence how often the station is used and how easily the station can be accessed and maintained. The approach to site selection may differ depending on whether the intended charging station is level 2 or level 3. If the intended location is a site where drivers can spend several hours charging their vehicle, a level 2 charging station may work best (e.g., 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 around 30-45 minutes before continuing their journey (e.g., locations near highway rest stops, downtown cafes, etc.). Visibility, appropriate signage, and ensuring there are reserved EV parking spaces are all important considerations. A good charging experience can be created by selecting sites that are close to amenities such as washrooms, refreshments, tourist locations, activities, and Wi-Fi hotspots.

In addition, consider snowy conditions during the winter months. Charging stations should typically be located away from snow piles and out of the way of snow ploughing and pavement cleaning paths to avoid damage and reduced accessibility. Site hosts and 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, a few other on-site considerations 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 the EV chargers impact demand charges and utility bills at the desired location? (This is particularly relevant for level 3 chargers.)
- Is the site's existing electrical infrastructure capable of supporting the desired level of charging?
- Will additional charging stations need to be added in the future? How can the site be designed to scale 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 installation as there may be other factors that could be overlooked. Funding may be 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
- Available space for an additional circuit breaker
- Duration of equipment warranty on purchase
- Additional demand charges based on utilities rate structures 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 and +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, depending on the current power demand profile. Consider discussing electric vehicle energy management systems with your contractors. 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 charging station is free and a simple process that increases visibility for stations and allows drivers to plan trips with the most up-to-date information on the charging network.
- As a public EV charging system owner, you can decide to provide complimentary charging or implement a fee for use. Rates and rate structures can vary per kWh (energy), per hour, or per minute for fast charging. On average, rates for level 2 charging are between $2.00-$3.00 per hour while level 3 fast chargers are $15-$20 per hour.
- All EV charging stations funded through the 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 $200-$400/year per connector.
- Transactions made through the station may incur a payment fee amounting to 10% to 15% of the amount which will be borne by the station owner to the network operator.
- Networked stations monitor usage patterns to understand user behaviour and the potential to maximize monetary returns on charging. Monitoring usage over several years will also show the growth in EV uptake.
- Consider implementing idling fees for charging sessions that exceed 8 hours for level 2 chargers or 1.5 hours for level 3 chargers to encourage user turnover and prevent overuse.
- Consider how your organization will ensure the dedicated parking locations will be only used by EVs.

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.
- 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 easy to use by those with mobility constraints.
- Avoid installation of chargers on sidewalks and walkways that would impede pedestrians.
- Consider installing charging stations with cut proof cabling and cable cutting alarms to deter vandalism.

4.0 RFP CHECKLIST

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

4.1 Information to Provide to Proponents

Project Overview:

- ☐ Project description
- ☐ Objectives of the project
    - 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
    - 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
    - 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)

4.2 Information to Request from Contractors

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 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 include:
  - EV charger equipment and electrical component costs
  - Installation labor costs
  - Engineering and design costs
  - Permitting and inspection costs
  - Signage costs
  - 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
- ☐ RFP evaluation criteria and weighting should be clearly identified and include:
  - ☐ Company's relevant experience
  - ☐ Proposed system design, specifications, and warranties
  - ☐ Overall cost
  - ☐ Quality and conformance of proposal

Submission Information:

- ☐ Provide contact information for proponents to connect with and have questions about the RFP answered, and provide a deadline for questions
- ☐ 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)

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