

City of Mississauga - Electric Vehicle Charging Stations (EVCS) Standard

Prepared by the Green Fleet and Equipment Working Group

Date: 19/08/2020

1.0 Standard Application

1.1 General

This technical design standard supports the Green Fleet and Equipment Policy and is meant to provide the appropriate information to base specifications and designs for facilities owned and operated by the City of Mississauga in relation to Electric Vehicle Charging Stations (EVCS) specifically. These standards should apply to the design of new buildings as well as for maintaining, upgrading, and renovating existing buildings.

This standard describes minimum requirements and specifications for EVCS hardware, networking and management platforms, and customer support services provided at buildings and spaces owned and/or operated by the City of Mississauga.

These design standard requirements need to be used in conjunction with all current and relevant standards, codes, and regulations, as noted in section 4.0 – Relevant Codes and Standards. Design consultants and contractors are ultimately responsible for their designs, product selections, and installations.

1.2 Applicable Project Types

This standard shall be applied to any of the following typical project types whether for use by members of the public, City employees, or Corporate Fleet vehicles:

- New Electric Vehicle Charging Station installations;
- Adding to existing charging stations
- Replacements of EVCS
- New building construction;
- Major renovations to existing facilities; and
- Parking lot/structure upgrades and replacements.

1.3 Standard Users

The standard applies to the following parties:

- Consultants;
- Contractors;
- Project Managers;
- Building Operators/Property Managers;
- Fleet Services Representatives;
- Procurement Analysts; and
- Other groups/stakeholders involved in the provision of EVCS for staff and the general public.

2.0 Definitions

Access Card: A radio frequency identification (RFID) card allowing users access to an EV Charging Station. Each Access Card bears a unique identification number and enables an EV Charging Station to identify that user and the corresponding User Account with the network provided by the EV Charger Service Provider.

Actively Charging: When an electric or plug-in hybrid vehicle is connected to and receiving power from an Electric Vehicle Charging Station.

Charging Station Management System (CSMS): A network connected software platform that manages EV Charging Station access, collects and stores data, and performs analytics.

Electric Vehicle: A vehicle that uses one or more electric motors for propulsion. They can be classified as Battery Electric Vehicles (BEVs), which use only electricity, or Plug-in Hybrid Electric Vehicles (PHEVs), which use fossil fuels via an internal combustion engine and electricity via a high capacity battery. Both plug in to recharge.

Electric Vehicle Charger Service Provider (EV Charger Service Provider): A third-party organization that supplies EV Charging Stations, remote diagnostics and troubleshooting, maintenance services, a data collection and analytics platform, and/or customer support.

Electric Vehicle Charging Station (EVCS): Also known as Electric Vehicle Supply Equipment, this equipment connects an EV to a source of electricity to recharge an Electric Vehicle and/or battery.

Level 2 Charging Station: A charging station which operates at 240 volt AC, and typically ranges between 6.0 – 7.2 kW of power output.

Level 3 Charging Station: A direct current fast charger (DCFC) rated for a minimum of 50 kW of power output. One hour of Level 3 charging delivers approximately 250 km of vehicle range.

Open Charge Point Protocol: The Open Charge Point Protocol (OCPP) is the industry-supported de facto standard for communication between an EV Charging Station and a Charging Station Management System (CSMS) and is designed to accommodate any type of charging technique. OCPP is an open standard with no cost or licensing barriers for adoption.

Operators/Property Managers: City of Mississauga Departmental or Divisional representative(s) responsible for maintaining the infrastructure and amenities of a building where EV Charging Stations are installed.

Service-level Agreement (SLA): A contract between a service provider and the City of Mississauga that documents what services the provider will furnish and defines the service standards the provider is obligated to meet.

3.0 Description

3.1 EV Charging Station Type(s)

It is recommended that any EVCS installed on City property be a minimum of Level 2. Installation of EVCS higher than Level 2 shall be based on the needs and speed required for EV charging.

Since Level 3 Charging Stations can lead to spikes in electricity demand, concerns associated with higher electricity demand should be considered by the Operator/**Property Manager** and discussed with Energy Management and the Environment Section before moving forward with any Level 3 charger installation.

3.2 Revenue and Rates

Initially, where applicable, general parking fee revenues from Municipal Parking Lots will be used to offset the administration costs of the electricity charging service (e.g. EV charging services and transaction service fees). As the City expands its installation of EVCS, distinct revenues related to the EV charging service will be re-evaluated and updated as appropriate.

4.0 Relevant Codes and Standards

All materials, installation methods, and software platforms associated with EVCS on City of Mississauga properties must comply with the following standards, where applicable.

- Canadian Standards Association (CSA) Standard 22.2 No. 107.1 or equivalent
- NFPA® 70 Standard for Electrical Safety in the Workplace®
- NEC® Article 625 Electric Vehicle Charging System which covers the installation of Electric Vehicle Charging Systems
- UL 2202 - Standard for Electric Vehicle (EV) Charging System Equipment or equivalent
- UL 2231 – Personnel Protection Systems for Electric Vehicles supply circuits or equivalent
- UL 2594 – EV Supply Equipment
- UL 991 – Safety-Related Controls Employing Solid-State Devices
- ICES-003 - Interference-Causing Equipment Standard or equivalent
- IEC 61851-1 - EV Supply Equipment
- ISO 15118-1- Communication between EVs and EV Supply Equipment
- OCPP 1.6 or newer - Standard for communication between an EV Charging Station and an EV SCSMS
- Ontario Electrical Safety Code (OESC)
- All other standards/codes as applicable by authorities having jurisdiction

5.0 EV Charging Station Hardware

4.1 General

This section provides the technical specifications and requirements for Electric Vehicle Charging Station hardware installed across City properties. It is highly preferred by the City that selected EVCS can support operability with multiple OCPP compliant Charging Station Management System (CSMS).

4.2 Level 2 Charging Stations

- 208-240 volt (V) alternating current (AC) with SAE J1772 connector
- Commercial grade and certified for use in Canada nationally recognized certification agency CSA, Underwriters Laboratories of Canada (uLC) or other certification marks approved by the Technical Standards and Safety Authority (TSSA);
- Enclosure must be rated for outdoor operation and achieve a minimum National Electrical Manufacturers Association (NEMA) 3 certification
- Enable OCPP - version 1.6 or higher
- Have certified operating temperature range between minus 35 Degree Celsius ($^{\circ}\text{C}$) and plus 50 $^{\circ}\text{C}$;
- Surge protection 6 kV @ 3,000A
- Cable length must be 5.49 meters (18 feet) or longer, and a cable management / retraction system must be an option and is preferred
- Electricity metering accuracy of +/- 3%
- Ability to remotely adjust and manage power supply (energy management and power sharing/limiting features (i.e. adjustable operating current (amperage))
- Cellular network enabled / connectivity (3G or better)
- RFID access in accordance with ISO 14443 A/B, ISO 15693, NFC, NEMA interoperability protocol
- Payment Card Industry (PCI) compliant card reader
- Light Emitting Diode (LED) status indicator

4.3 Level 3 Charging Stations

- Direct current (DC) vehicle fast charger with SAE J 1772 combo and/or CHAdeMo charging connectors
- Both power factor and efficiency greater than 93 per cent
- Commercial grade and certified for use in Canada nationally recognized certification agency CSA, uLC or other certification marks approved by the Technical Standards and Safety Authority (TSSA);
- Enclosure must be rated for outdoor operation and achieve a minimum NEMA 3 certification
- Enable OCPP - version 1.6 or higher
- Have certified operating temperature range between minus 30 Degree $^{\circ}\text{C}$ and plus 40 $^{\circ}\text{C}$;
- Cable length must be 5.49 meters (18 feet) or longer and a cable management / retraction system must be an option and is preferred
- Electricity metering accuracy of +/- 3%

- Ability to remotely adjust and manage power supply (energy management and power sharing/limiting features (i.e. adjustable operating current (amperage))
- Cellular network enabled / connectivity (3G or better)
- RFID access in accordance with ISO 14443 A/B, ISO 15693, NFC, NEMA interoperability protocol
- Surge protection 6 kV @ 3,000A
- PCI compliant card reader
- LED status indicator
- Push buttons for start, stop and emergency stop

6.0 EV Charger Service Provider

5.1 General

All EVCS installed across City owned sites are to have network operability through an EV Charger Service Provider. The City of Mississauga requires that the EV CSMS be OCPP compliant, with the most up to date OCPP versions being favourable. Accordingly, it is highly preferred by the City that the EV CSMS has the capability, and has been proven through field testing, to work with EVCS hardware from multiple manufacturers.

This section outlines the City's requirements and preferences for the system used to manage EVCS operations, the functionalities needed to support a satisfactory user experience, the process for collecting, distributing, and reporting on revenue generation, the minimum requirements for remote monitoring and EV Charger troubleshooting, and the ability for the City to procure maintenance and repair services from the EV Charger Service Provider.

5.2 EV Charging Station Management System

- The following data points are to be continuously tracked, stored, and remain accessible to the City of Mississauga in .xls or .csv format in perpetuity by the EV CSMS.
 - EV Charger Identification (ID)
 - EV Charger location
 - Unique customer identifier (a non-personal identifier (e.g. Network user ID))
 - Charging session date
 - Charging session start time
 - Charging session end time
 - Amount of power provided during charging session (kWh)
 - Amount of revenue generated (CAD)
 - Encountered malfunctions (including issue codes and descriptions, and duration of downtime)
- The EV CSMS will include a dashboard that communicates and/or displays at a minimum:
 - A map showing the number and location of EV Charging Stations
 - Real-time EV Charger status (e.g. in-use, available, inoperable, etc.)
 - Cumulative electricity provided to vehicles, revenue generation, and GHG emissions avoidances are preferred

- The EV CSMS and/or subsidiary reporting features must provide the following analytical functions at a minimum:
 - Isolate all data points by the entire EV Charging Station portfolio, specific site where chargers are installed, charger type (i.e. Level 2 vs. Level 3), and individual charger.
 - Determine the charging utilization ratio, between a specified calendar or time interval, across the EV Charger portfolio, a specific site, or individual EV Charger (*e.g. between 8:30am and 4:30pm at a specified office location, determine what percentage of time are chargers in use*)
 - Determine the length of time EVs are plugged in but not Actively Charging across the EV Charger portfolio, a specific site, or individual EV Charger
 - Report on revenue generation between a specified calendar or time interval
 - Set tiered and flexible pricing models for use (*e.g. applying a time-based fee for vehicles which are Actively Charging AND a different rate for vehicles which remain plugged-in after charging has completed*)
 - Automatically program and manually adjust maximum power output and power-sharing modes in EVCS
 - Enable or disable EV Charger operation
 - Adjust messaging that appears on EV Charger displays
 - Automatically notify operations staff and EV Charger Service Provider of charger malfunctions and loss of functionality
- The EV CSMS will ideally provide the following additional management functions (Optional):
 - The ability to report on GHG emissions avoidances is preferred
 - The ability to integrate EV Charger operation with electric utility demand response programs is preferred
 - The ability to integrate with fleet fuel cards, telematics, and asset management systems is preferred
 - The ability to integrate with on-site energy storage and generation systems (e.g. solar photovoltaics with battery banks) is preferred
 - The ability to generate real time notices of vehicles plugged in but not actively charging is preferred

5.3 User Services

- The City of Mississauga requires the following functionalities from the EV Charger Service Provider's networking platform to be provided for users of EV Charging Stations on City owned sites:
 - Free subscription to the networking platform
 - Locating and providing directions to EV Chargers, communicating accessibility (*e.g. hours of operation, public or private*), and conveying fees for use via an online and mobile application accessible map
 - Unlocking station and facilitating payment for use via a mobile application
 - Real-time visibility of the vehicle battery's state of charge, power provided, and fees incurred during a charging session via a mobile application
 - Notifications sent to EV drivers once a vehicle is fully charged, or reached a user determined battery charge level, via short message service (SMS) or a mobile application

- The EV Charger Service Provider will have the option to provide an Access Card to users that can enable EV Charger use via RFID, without the use of a mobile application
- The EV Charger Service Provider will operate a toll-free 24/7 customer support call-center for users who need assistance accessing the EVCS

5.4 Revenue Collection and Management Services

The EV Charger Service Provider will:

- Collect EV Charger user payments from credit/debit cards and mobile application accounts and when required remit proceeds the next business day
- Directly connect with the City's Merchant Acquirer (Global Payments) to deposit transaction revenues and deduct transaction expenses to/from the City designated bank account (CIBC)
- Be compliant with Payment Card Industry Data Security Standard (PCI DSS) standards to manage transactions, as determined by the City's Qualified Security Assessor (QSA)
- Automatically issue transaction receipts directly to registered users within 24 hours, via email, following use of an EVCS
- Manage user disputes regarding payment errors and requests for reimbursements
- Provide financial statements to the City within 21 days of each Calendar month-end containing, at a minimum: gross revenues, charging fees, taxes charged and paid to the relevant authorities, net revenues, transaction fees/EV Charger Service Provider commissions, and distributable revenues.
- Demonstrated ability to integrate currently with existing parking payment collection technology at site or a roadmap which demonstrates that capability and the timelines associated with it.
- Provide secure access to designated City staff to: intra-day transaction activity, end-of-day transaction summary and next day bank-deposit information for tracking and audit purposes

5.5 Remote Monitoring and Troubleshooting

The EV Charger Service Provider will:

- Attempt to resolve any EV Charger issues remotely within four business hours of issue detection
- If the issue cannot be remotely resolved, notify the City's designated Operator/Property Manager of the issue

5.6 Availability of Maintenance and Repair Services

The EV Charger Service Provider will have offerings for the City to enter into SLAs to carryout preventative maintenance and repair services as needed for City owned EVCS. It is highly preferred by the City that the EV Charger Service Provider has the ability to maintain and repair EVCS hardware from multiple manufacturers, and can troubleshoot connectivity and communications issues between EVCS and multiple CSMS.

7.0 Installation

6.1 General

This section outlines installation requirements as they relate to electrical and civil work, and prescribes signage and parking space painting requirements to ensure EVCS locations and terms of use are clearly communicated. All EVCS and associated equipment and infrastructure will be installed in accordance with the equipment manufacturer's installation requirements.

6.2 Electrical

Plans for installation or expansion of EV Charging Stations should consider potential impacts that charging stations may have on the electric capacity of a building or location. If there are significant impacts, mitigation should be addressed under the implementation / capital plan for the charging station project, with timing tied to planned replacement of capital, when feasible.

- Where a site is undergoing its first installation of EVCS, the contractor design shall include for spare conduits to a number of additional parking spaces as determined by the City.
 - o The number of spaces to 'future-proof' for future EV Charger installations shall be determined in consultation with key City of Mississauga staff (e.g. project controller or project manager). If no provisions for future EV Chargers are desired, this can be considered on a case-by-case basis.
- Metering and logging capabilities for the panel serving the EVCS shall be designed in accordance with City standards
- Dedicated panel and associated infrastructure (e.g. transformer) is preferred wherever applicable.
- Sizing of wiring, conduit, transformer, panel, etc should accommodate a minimum of 20% growth
- The consultant is responsible for creating and submitting detailed system design drawings and any accompanying documents to the City of Mississauga, and other regulatory agencies as needed to obtain permits and approvals. These include, but are not limited to Alectra Utilities and the Electrical Safety Authority.
- Provide surge protection equipment as part of the installation.

6.3 Civil

- The location of all utilities and underground service connections are to be performed by the contractor prior to the installation of EV Chargers.
- All curbs, gutters, raised traffic inlands, walkways, piers, foundations, duct works etc. shall be designed and constructed in accordance with City Standards
- Positive surface drainage shall be ensured to avoid water ponding
- Underground ducts for all power cables required to feed chargers, lights and ancillary equipment may be necessary

- EVCS (e.g. not wall mounted) shall be mounted on a pedestal on a concrete pad (4" minimum height,) and/or protected with bollards (if a unit is 4 feet or less from the vehicle)
- EVCS installed on a wall the bottom of the unit should be minimum 3 feet above finished floor (aff)
- All trees in the vicinity of parking should be retained and protected during construction

6.4 Signage and Parking Space Painting

Note: This is typically carried out by the City of Mississauga, particularly in Municipal Parking Lots.

- Provide permanent signage, at least one sign for every two dedicated parking spaces, to read ELECTRIC VEHICLE PARKING – ONLY WHILE CHARGING
- Provide permanent signs, one per charging station site, to outline the terms of use
 - o This signage must make reference to the appropriate By-Law(s) and Policies
 - o This signage must outline acceptable payment methods (where applicable)
- Provide adequate way finding signage to direct EV drivers to the EV Charger site from the parking lot entrance and/or the nearest street, where deemed necessary by the City
- Provide parking space pavement markings and painting as per City specifications (where applicable)

8.0 IT

8.1 Software (Vendor hosted solution):

- Vendor is required to complete the City's SaaS Checklist
 - o To be reviewed by IT Security and IT Architect
- Vendor is to provide proof that a third party audit has occurred
- Vendor is to regularly perform software & firmware updates.
 - o Vendor to provide a schedule
 - o Vendor to provide proof that they are at a certain patch level
 - o Vendor to provide reports. IT will periodically review to ensure that that they are in compliance
- Vendor to provide proof that they have undertaken Vulnerability & Security testing.

8.2 Data

- Privacy Impact Assessment (PIA) must be performed if Personally Identifiable Information (PII) is in scope
- Data in transit must be encrypted (TLS) and at rest (AES-256) on all systems where data traverses or is stored (including all third party vendors)
- No PII data to be stored locally on the EVCS
- EVCS must be tamper proof
- Data from the EVCS must be one-way (i.e. vehicle to the EVCS) to prevent against cyberattacks such as "juice jacking"

- Vendor to clarify whether or not the EVCS has the ability to inject data from the EVCS to the vehicle
- EVCS access must be limited to authorized users only
- Vendor is required to outline what data is being collected
- Vendor is required to specify whether they are they tracking the frequency and locations of where users charge, time spent charging, and whether the data is tied to the device or a user's ID.
- A non-disclosure agreement (NDA) is required with the Vendor if Personally Identifiable Information (PII) data is in scope
- Certificate of data destruction is required from vendor upon termination of contract or discontinuation of business relationship
- Data governance role must be established with vendors to ascertain *data owner* from *data custodians*
- Preference for the vendor to provide an API which provides the City with access to data that can be for analyzing adoption rates

8.3 Payment infrastructure

- Vendor is to meet all PCI requirements
- Vendor must provide the City a certificate of PCI compliance on an annual basis
- All PCI payment data should logically segmented as per PCI DSS recommendation
- Any payment data has to go through a separate VLAN
- All financial transaction processing must be conducted off City network
- Transaction and payment information should not be stored on the EVCS
- No credit card data or personal information to be stored locally
- Transactions must be secure and need to be encrypted including when at rest

8.4 Network

- No inbound from the internet to internal resources, if inbound is required (push of data, NOT a pull data)
- Vendor is responsible for providing network connectivity (LTE is preferred) to the charging stations.
- Vendor is responsible for managing all devices, managing network connectivity as well as all data transfers required for the full functionality of the system.

8.5 Cellular

- Cell signal needs to be present and the signal strength needs vendor solution's requirements.
- Vendor is responsible for determining if the strength of the signal meets their requirements
- Antennae may be required in underground or covered areas

8.6 Guidance

- NISTIR – 8228 (Should PII become in scope)
- NIST SP- 800-122 (Should PII become in scope)

9.0 Role and Responsibilities

8.1 General

The installation of EVCS on City property is an emerging area of work for the City. As best practices and standard operating procedures are developed and implemented, roles and responsibilities will likely evolve.

8.2 Responsibilities of City of Mississauga Staff

City of Mississauga staff are responsible for becoming familiar with this Standard and are required to follow the requirements outlined in these documents when installing EVCS on City property.

8.3 EV Charging Station Asset Management

All EVCS installed on City property must be logged with Asset Management in Facilities and Property Management in order to ensure proper demand and preventative maintenance.

8.4 Data Management, Operations, and Expansion

The Operator/Property Manager of the charging station is responsible for data acquisition, operations, and decisions regarding expansion of services. The Environment Section will support corresponding teams with associated analysis and decision-making tasks where required.

10.0 Term

Electric Vehicles and their associated charging station technology have been evolving rapidly and it is anticipated that this trend will continue in the future. As a result, this Standard will be reviewed every two years to ensure it remains up to date with the state of Electric Vehicles and associated charging technology.