

# CANADIAN EV CHARGING STATION DESIGN & PERMITTING Q&A GUIDE

**WHAT'S INSIDE: RETAILERS AMP UP FOR EV CHARGING,  
CHOOSING AN EV CHARGER, UNDERSTANDING POWER  
REQUIREMENTS, FUTURE-PROOFING YOUR NEW BUSINESS  
AND CANADA'S TOP EV CHARGING NETWORKS**

# CANADIAN RETAILERS AMPING UP TO MEET EV CHARGING DEMANDS

**Electric vehicles (EV) are the undisputed future of personal transportation for shoppers and consumers alike.**

By 2040, it is estimated that EVs will represent 55% of the global light-duty vehicle market (over 60 million vehicles), according to Bloomberg New Energy Finance. The Government of Canada's ambitious plan for zero-emissions vehicles (ZEVs) would see 10% of all light-duty vehicles be ZEVs by 2025. This plan increases to 30% by 2030 and 100% by 2040.

As the charging infrastructure for EVs expands to meet growing needs, the locations where charging stations are being built are already starting to influence where consumers choose to shop. By offering EV solutions, companies can showcase corporate sustainability initiatives and their dedication to the environment by going green.

## MAJOR RETAILER BRANDS ARE BUYING IN

In 2020, Canadian Tire announced a \$5M investment plan in EV charging stations to bolster their sustainability commitments. That plan would see DC Fast Chargers and Level 2 chargers brought to 90 of its nationwide locations, making it one of the largest charging networks in the country. Not only will EV owners identify Canadian Tire as a convenient place to charge their vehicle: they will inevitably spend more dwell time browsing the aisles as they wait for their vehicle to charge.

Currently, there are roughly 6,962 charging stations across Canada, up 15.7% since April 2021. Of that number, nearly 2,700 are DC Fast Charging Stations, capable of delivering a full charge in less than an hour.

### CHARGING STATIONS CANADA WIDE



**6,962**

CHARGING STATIONS  
ACROSS CANADA.  
UP 15% SINCE APRIL 2021

The time it takes to charge a vehicle and where a charging station is located are undoubtedly two of the most important decisions consumers face when deciding where to plug in. Naturally, shopping centres, restaurants, convenience stores and other retail centres are already places where people purchase things. By satisfying sustainability needs for consumers, those who install EV charging stations will stand out from the crowd.



Retail giant IKEA Canada has already begun to rollout charging stations at each of its 12 stores across Canada, almost all of which are located outside city centres and along major transportation corridors, making these “destination stores” ideal candidates for this type of technology. For the project, the company partnered with Sun Country Highway Ltd., a Canadian owned company responsible for electrifying the Trans-Canada highway from Victoria, BC to St. Johns, NL. Sun Country Highway is also endorsed by Tesla, the world’s leading EV manufacturer.

In an effort to tap into the future of transportation, 7-Eleven announced plans earlier this summer to add at least 500 chargers to 250 stores across the U.S. and Canada by the end of 2022. Petro-Canada boasts 105 DC Fast Chargers at 54 Stations across Canada, as well as two Level 2 Chargers, and has steadily grown since 2019. Since Petro-Canada is already ideally placed along the Trans-Canada highway, the company has created ample opportunity for dwelling-time within its stores as drivers undertake long stretch journeys within the country.

*“The time it takes to charge a vehicle and where a charging station is located are undoubtedly two of the most important decisions consumers face when deciding where to plug in...By satisfying sustainability needs for consumers, those who install EV charging stations will stand out from the crowd.”*

## GOOD FOR THE ENVIRONMENT – AND BUSINESS

Convenience stores and retail fueling stations are the obvious oasis in the highway lifeline. But when it comes to EV charging, non-traditional retailers are pursuing the new business opportunities EV charging presents.

Planning EV charging stations at strategic retail locations across the country will promise economic gain and prosperity well into the future. Expect to see the competition heat up as more and more retailers get into the game.

## WHAT TYPE OF EV CHARGER IS RIGHT FOR YOUR BUSINESS?



### LEVEL 2 CHARGING

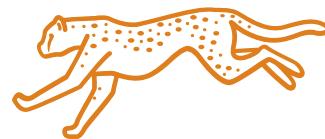
**SERVICE:** 208-240V **CONNECTORS:** J1772, Tesla

**RANGE/ CHARGE TIME:** 16 to 32 km / hour

**PUBLIC CHARGING STATIONS (CANADA):** 5,550+

The most common EV charging technology, with over 5,550 charging stations across Canada. It's commonly referred to as 'destination' or 'opportunity charging', because drivers must stay at a destination for a longer duration to get the desired charge – or simply require a top-up. A fast, cost-effective choice for retail businesses with longer dwell times and in urban locations where customers don't necessarily require a complete charge.

*Sources: Forbes, Energyhub.org, Natural Resources Canada, Plug 'N Drive*



### LEVEL 3 CHARGING (DC FAST & SUPERCHARGE)

**SERVICE:** 400V – 900 V **CONNECTORS:** J1772, Tesla – OR SAE Combo, Tesla, CHAdeMO

**RANGE/ CHARGE TIME:** (Empty to 80% full in 30-45 minutes)

**PUBLIC CHARGING STATIONS (CANADA):** 1,190+

By converting AC power to DC Power to charge the battery, Level 3 charging stations have dramatically decreased charge time. This has made EV charging a viable option for shorter-stay businesses. Twenty minutes of charging is more than enough for most drivers to get home with juice to spare. An hour will provide a full charge in most EVs from empty, making Level 3 Chargers an ideal choice for highway routes. With a higher price point, it is an investment.

# WHAT POWER SERVICE DO I REQUIRE FOR A RETAIL EV CHARGING STATION?

*By Ivar Cegarra, P.Eng.*



As you might expect, the biggest requirement for businesses seeking to install E/V charging stations is bringing ample electrical service onsite.

So, what are the power requirement for a retail EV charging station?

Businesses will generally install a minimum of two charging stations per site.

Each Level 3 charger requires **50kW (kilowatts) of power on a 3-phase source**. This requires a **480V (AC)** service to create the direct current necessary for DC fast charging.

As you might expect, 480V service is not common in most commercial retail construction. Which means, you will almost certainly need to upgrade your existing electrical service.

## Electrical Requirements (per charger)

**03** >> **50kW** >> **480V**

**LEVEL 3 E/V CHARGER**      **3-PHASE SYSTEM**      **(A/C)**

To put this into context, here is the standard power service you might expect to find in an existing building, or specified in most corporate design standards:

BUSINESS TYPE	STANDARD ELECTRICAL SERVICE
Standalone Restaurant	800 A on 120/280V or EDO 400A on 120/208V
Standalone Retail Business ( <i>Big Box Store, Grocery</i> )	1200A to 1400A on 120/208V
Retail Gas Station	400A on 120/208V

## WHAT DOES AN ELECTRICAL UPGRADE INVOLVE?

To upgrade an existing facility or to modify a corporate design standard for EV charging, you will need to submit a design package to the municipal permitting and development authorities. The work must be stamped by a qualified electrical engineer.

A small electrical transformer will need to be installed inside the building's electrical room. In some instances, it may be a dedicated transformer. With an existing facility, the transformer will usually be placed outside in a secure, weatherproof enclosure. These transformers are relatively compact and do not take up much space in the electrical room.

Your local electrical utility will be required to bring in the power supply. All wiring must be installed underground. For greenfield construction, this requires little extra effort.

On an existing site, installation will involve trenching, and often paving work.

## CHARGE THE TASK TO A QUALIFIED ENGINEERING FIRM

It can all sound quite technical. Don't worry. Your engineering partners will look after the details to ensure all work is properly designed and safely installed – and conforms to all bylaws and code requirements.



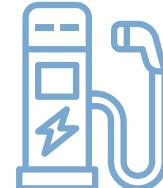
# ROI ON AN EV CHARGING INVESTMENT

How quickly can retailers expect to see a return on investment after installing charging stations? According to ChargePoint, there are four key factors.



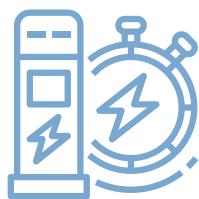
## Utilization

The more customers who are using your charging stations, the sooner you can pay them off. Adoption may be higher in urban centres, or in rural areas along major transportation corridors.



## Charge Amount (kWh):

Sales will be influenced by how much energy is required for each charge session, and the duration of the charge.



## Charge Rate:

Currently, it can take an hour to fully charge a vehicle on a Level 3 charger. As charge rates become faster, retailers will be able to serve more vehicles in less time. Today, the average charger is 50kW. That is expected to increase to 150+ kW in the coming years.



## Driver Pricing (charging fees):

Today, customers pay according to the time of their charging session (eg. \$0.30/minute). Currently, Measurement Canada does not permit charging by the kWh, but this is being considered.



# NOT QUITE READY? FUTURE-PROOFING YOUR BUSINESS FOR EV CHARGING

As Canadian retailers wait for the adoption of electric vehicles to hit a critical mass, many are laying the groundwork for future EV charging stations now.

"We are seeing a growing number of national retail clients, including service stations, designing and wiring their new sites to be ready for EV charging stations at a later date," reveals Ryan Guanlao, Business Development Director for CTM Design.

Guanlao says it is far more cost efficient to install the necessary wiring and base infrastructure at the time of construction, than to try to update a site that has already been built.

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## 3 ADVANTAGES OF PRE-PLANNING AND PRE-INSTALLING 480V SERVICE:

### 01 Design Efficiencies

Planning for future EV charging stations at the design stage can save you a lot of headaches down the road.

Upfront planning allows you to efficiently integrate the charging stations within the overall site layout. It will allow the design team to account for the impact on traffic flow, parking, related infrastructure (eg. lighting, other onsite buildings or services, even landscaping – and be strategic and proactive in making it all work together. This is especially important on smaller sites where every inch of real estate counts.

ChargePoint recommends setting aside 5-10% of parking spaces for EV charging (as high as 15% in high-adoption markets).

You can design your indoor electrical room to accommodate the required transformers, with all wiring safely in place and ready to go.

You'll also need to give some thought to mounting the station (eg. wall mounted or pedestal mounted). Pedestal mounting or bollard mounting may require the installation of concrete pads if there is not an adequate concrete base already in place.

Finally, you will need to ensure you have strong 3G cellular connectivity at the proposed charging station site, as the stations will need to connect to the network system. If there is a weak signal, a booster may be required.

#### RECOMMENDED PLANNING



**5-10%**  
OF PARKING SPACES  
SET ASIDE FOR EV  
CHARGING



**3G**  
STRONG 3G CELLULAR  
CONNECTIVITY AT  
THE PROPOSED SITE

## 02 Permitting Efficiencies

This goes hand-in-hand with design efficiencies.

By submitting the detailed drawings for the electrical systems and location of the EV chargers as part of the design package, the permitting authority can review it in the context of the larger development. This will expedite the design approval process.

According to Guanlao, the municipal permitting authorities don't care if the actual chargers are in place immediately. When the actual EV chargers and transformers are eventually installed, they will simply require a site inspection to ensure proper installation.

## 03 Construction Efficiencies

As a rule, it is always more economical to install infrastructure when a site is being built. The crews and equipment are already on-site. Plus, there is greater ability to ensure all aspects of the build are staged and coordinated in an efficient manner.

Once a site is built, the costs to renovate or upgrade can add up.

"It's easier and cheaper to install electrical cabling in dirt than to tear up and replace pavement, sidewalks and existing landscaping," Guanlao says.

He notes that adding new infrastructure to an existing site plan can be trickier. It may require compromises in order to pass inspection. For example, if space is tight, you may only be able to install one station, when your vision was to have three.



## READY WHEN YOU ARE

By putting everything in place at the outset, you have the flexibility to defer the added cost of the EV chargers (which can run anywhere from \$4000 to \$16,000 or more per unit) to a later date.

By laying the groundwork for EV charging stations in advance, the power is in your hands to launch your EV charging service when it makes the most sense for your business. And your customers.





# CANADA'S TOP EV CHARGING NETWORKS

As the EV industry becomes more saturated, the market for charging networks has continued to spread across the country. As each company vies for dominance in the sector, choosing the right charging network has become more complex. Here are some of Canada's most prominent players and how they can align with your business:



**DC FAST CHARGE:** 988 chargers, 102 stations

**LEVEL 2:** 1,653 chargers, 567 stations

The most recognized name in the EV sector, Tesla represents a substantial portion of the existing global charging network even though the charge technology is only available to Tesla vehicle owners. The network in Canada originated in a limited capacity between Toronto and Montreal in 2014 but has now grown to hundreds of stations from Vancouver to Halifax. Tesla partners with global hotels and resorts, restaurants, shopping centres and more – and is committed to the success of its vendors.



**DC FAST CHARGE:** 196 stations

**LEVEL 2:** 3,163 stations

Flo is Canada's largest and most extensive charging network. They offer turnkey functionality for businesses, making it one of the most popular networks around. On its website, Flo offers pricing options for multiple different types of businesses and can guide you through the entire installation process.

## chargepoint®

**DC FAST CHARGE:** 148 chargers, 100 stations

**LEVEL 2:** 2,000 chargers, 771 stations

ChargePoint EV chargers can be found in every Canadian province, making it a truly national network. They offer an intuitive guide to all charging stations in your area (which can promote your business). They allow drivers track charging status, notifications and statistics based on EV usage. ChargePoint representatives work with businesses to provide sound advice on planning, equipment and deployment.

## THE LIST IS GROWING

There are a number of other players competing to gain a foothold in the market. This includes Electrify Canada, SWTCH Energy, Ivy Charging Network and BC Hydro EV and many, many more.

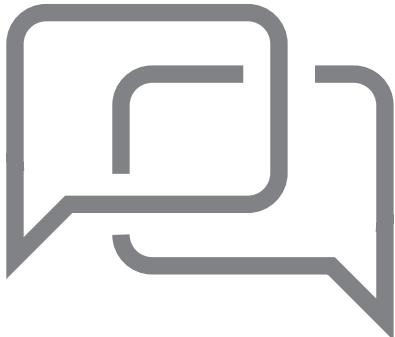
When choosing a network partner, shop around. Do your research. Compare pricing and consider what support your will receive. The more plugged-in you are to the market, the better prepared you'll be to choose a network.



# GREEN MEANS GO...

Contact CTM Design to put your EV charging station into the fast lane.

These days, sustainability and eco-awareness is critical to consumers. Preparing for the future of EV usage will put your business ahead of the competition and create positive connections to your brand. CTM Design is here to help with any and all things EV: from your initial design package to permitting approvals and construction inspection. The future is green. The opportunities for committed businesses are golden.



**Let's talk! Let CTM Design help with any and all things EV**

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## ABOUT CTM DESIGN

CTM is an integrated, full-service, design, and engineering firm. Rather than be all things to all people, we specialize in gas bars, convenience stores, car washes, quick service restaurants, retail and commercial space. For over 25 years, CTM has worked with both independent owner/operators and corporate clients across Ontario and Western Canada to create inviting, efficient, superbly designed, productive and profitable environments that elevate the brand experience.

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