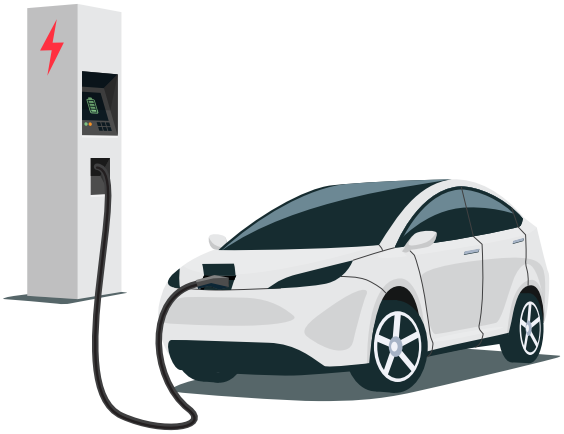
Electric Vehicle Infrastructure

Moreland City Council has an objective to achieve a zero carbon community by 2040. This guideline assists with incorporating Electric Vehicle (EV) Infrastructure into the design of new development.



What is an Electric Vehicle (EV)?

In the context of this guideline, an electric vehicle is a battery electric vehicle (BEV) which requires recharging using electrical outlets. This also includes plug-in hybrid (PHEV). However, it does not include fuel cell electric vehicles (FCEV) as such vehicles use hydrogen as an energy source.

What is EV Infrastructure?

EV infrastructure includes the electrical components required to recharge the car; from the main switchboard to the charger. It does not include the charger itself which is generally considered an 'Active' system, as opposed to, 'EV Ready'. Depending on the development type, EV infrastructure may include, however is not limited to: distribution boards, load management systems, metering communication, wiring, circuit breakers, and cable trays.

How does EV infrastructure contribute towards achieving zero carbon emissions?

When charged with 100% renewable electricity, EVs may be considered zero emissions vehicles. With zero or low tailpipe emissions, EVs also contribute towards improved air quality.

Why should new development be built with EV infrastructure – termed 'EV ready'?

Industry, including the car industry, have identified that EVs are the way of the future to meet the growing need to address car emissions contribution to climate change, with many car manufacturers outlining plans to phase out conventional fuel vehicles. With knowledge of this expected change, future proofing infrastructure is becoming increasingly important. The availability of charging infrastructure is key to accelerate EV uptake. This is especially in apartment buildings where retrofitting existing infrastructure may prove increasingly difficult and costly.

What are the charging parameters and industry standards?

Charging is described by several parameters: namely 'level' and 'mode' which respectively describe the charging infrastructure used, as well as, 'type' which describes the plug configuration. The parameters originate from North American and European standards.

- Charging 'levels' are used to categorise the rated power, voltage and current of the charging system. There are 3 different EV charging levels (as defined by SAE International J1772 and IEC 62196-2).

Different levels of charging in North America: SAE configurations

Level 1
- Supply from household outlet
- Portable EV charging cable
- 120 V 1 phase AC; 12-16 Amp
- Charging power 1.4 kW or 1.9 kW

Level 2
- Supply from household outlet or EV charge point
- Portable EV charging cable
- 208-240 V 1 phase AC; 12-80 Amp (**Typ. 30 Amp**)
- Charging power 2.5 kW to 19.2 kW (**Typ. 7 kW**)

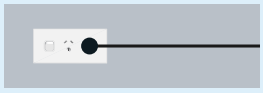
Level 3
- Supply from 208-600 V 3 phase AC
- Stationary EV charging cable
- 400 Amp (Typ. 60 Amp)
- Charging power up to 240 kW (Typ. 50 kW)

Source: E-Mobility Simplified (2019)

- Charging 'modes' are used to categorise the mode of power delivery, protection installation and communication/ control of charging system. There are 4 different EV charging modes (as defined by IEC 61851-1). Modes 3 is currently considered the most suitable for charging EVs in multi-dwelling developments.
- Charging 'types' detail the physical shape of an EV plug and charging capabilities. Most EVs in Australia have a type 2 plug. A CCS2 is another form of type 2 plug that enables fast charging using Direct Current (DC).

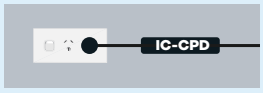
Different modes of charging

Household Outlet (230 W)



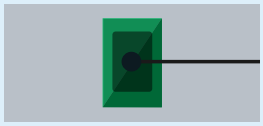
Mode 1
- Alternating Current (AC) charging
- Regular household outlet
- Un-safe – not recommended to use

Household Outlet (230 W)



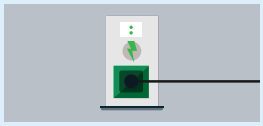
Mode 2
- AC charging
- In-cable control and protection (IC-CPD)
- Limited to 3.7 kW (16 Amp) in residential use or 7.4 kW (32 Amp) for industrial

Dedicated EVSE



Mode 3
- AC charging
- Control, communications and protection functions incorporated in the charge point (Electric Vehicle Supply Equipment – EVSE)
- Wide range of charging: 3.7 kW to 43 kW

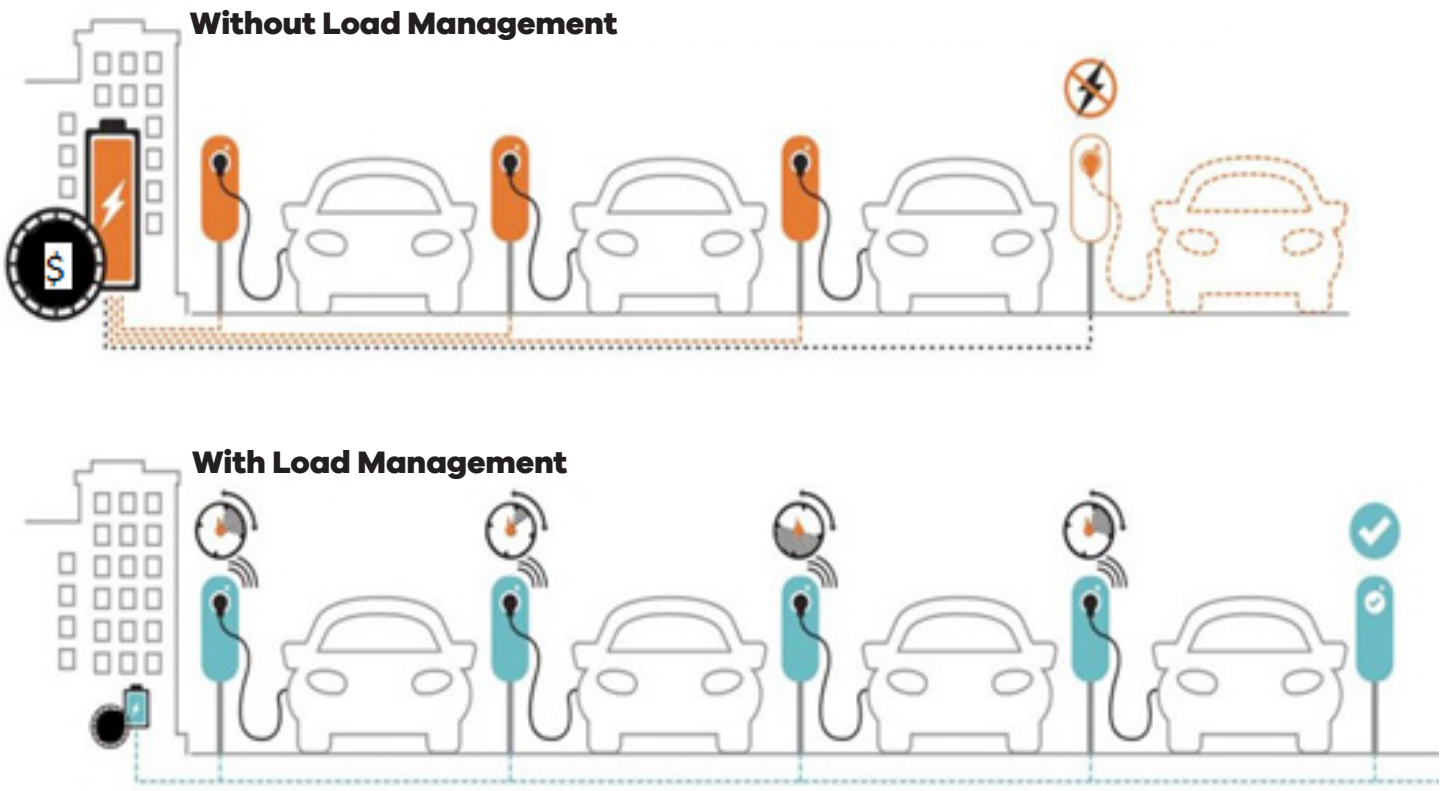
DC Charger



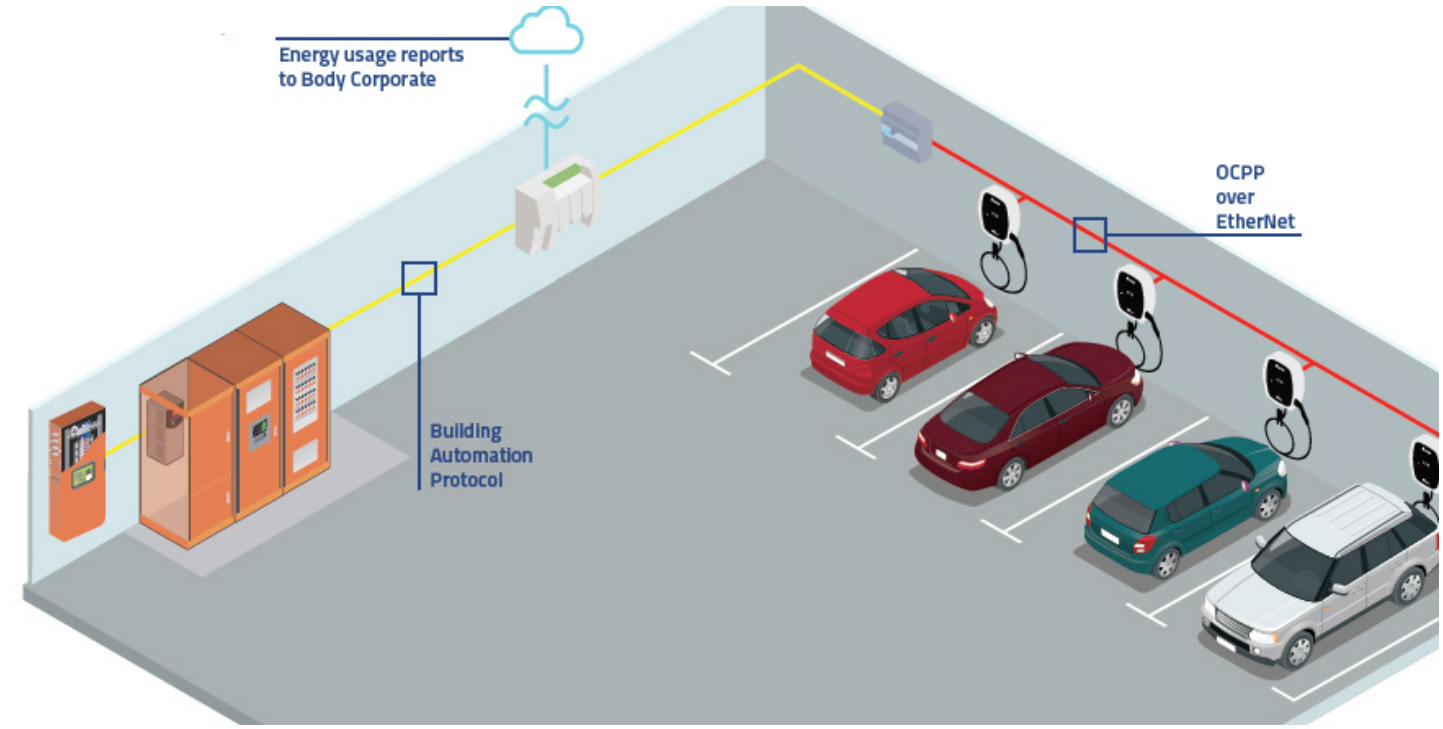
Mode 4
- Direct Current (DC) charging
- Option of either CHAdeMO or Combined Charging System (CCS)
- For public and commercial charging applications
- Wide range of charging capabilities – over 150 kW

What is load management?

Load management is simply defined as the scheduling of charging EVs. Incorporating a load management system within a development reduces the maximum electricity demand to a building and provides better grid stability. Load management is a key element that supports a cost effective and stable EV charging system and can be facilitated in various forms; from simple timers to a more sophisticated smart and dynamic controlled system.



Source: WATT Consulting Group (2018)



Source: NHP (2020)

Moreland EV infrastructure Metrics

Supported by Moreland City Council's zero carbon agenda, new development within the City of Moreland are encouraged to include EV charging infrastructure. The design and requirements of the EV infrastructure differs depending on the building typology and are reflected in the two EV metrics provided.

METRIC 1: **Medium Density Development (townhouse, dual-occ, and standalone dwellings)**

Metric Specifications

Provide the following EV infrastructure to each dwelling that includes:

- Infrastructure and cabling to each garage or carport that can support Level 2 (Mode 3) 32 Amp EV car charging.*
- Load management systems that ensure that:
  - EV charging occurs outside of peak electricity demand hours; and
  - The EV infrastructure does not adversely impact the site's maximum demand.

* The inclusion of an EV charger unit (Active EV Charging) is not expected.

Design Guidance

Base EV infrastructure for each dwelling includes:

- A dwelling switchboard ('load centre') with a dedicated circuit sufficient to supply 1 x 7 kW 32 Amp electric vehicle charging station.
- Cabling capped off at an isolator in readiness for a future 7 kW 32 Amp electric vehicle charging station. An active 15 Amp General Power Outlet (GPO) may be installed in the interim that may later be converted to an EV charging unit.
- Clear signage placed next to the junction box, isolator, or GPO that indicates that the circuit cabling can accommodate charging an EV at 32 Amp.
- A pre-set timer to ensure EV charging does not occur during peak demand hours. Peak demand generally occurs during weekdays from 6am to 9am in the morning and from 4pm to 10pm in the evening.

Maximum Demand

Adding EV charging infrastructure will increase the maximum demand of the dwelling, which in some typologies and locations is an acceptable outcome. In other typologies (such as 5-10 unit development), increasing the maximum demand may prove costly due to network connection fees.

Australian Standard AS/NZS 3000:2018 (Wiring Rules) Section 2.2.2 specifies multiple methods to determine the maximum demand. Relevant methods include (a) Calculation and (b) Assessment which are applied as follows with respect to the following Options:

Behind-the-Meter Load Management

Option 1:

Available Capacity (preferred)

- 2.2.2(a): Calculation: which is based on adding all the loads and their diversity factors. When using this method, the 32 Amp associated with the EV infrastructure must be added to the maximum demand on the basis of 100% usability rate. This increases the maximum demand of each unit by 32 Amp and that of a block of up to 5 units by 32 Amp per unit. In some locations, this means a higher network connection fee, in this case, method 2.2.2(b) may be more feasible.

METRIC 1: **Medium Density Development (townhouse, dual-occ, and standalone dwellings)**	
Design Guidance	**Option 2:** **Load Shedding (preferred)** • 2.2.2(b) Assessment: which can be based on demand management. Demand management may consist of monitoring and control devices such as – A load shedding contactor; – A contactor and current transformer/sensor; – A current limiting device; – A Programmable Logic Controller (PLC); – A building management system; or – An approved charge control module which supplies the EV charger only when there is spare capacity within the dwelling, ensuring that the maximum demand of the dwelling (as per the mains breaker) is not exceeded. This method allows the load to be managed behind the meter and within the boundary of each private dwelling. This means that the maximum demand of the block will be that of all dwellings added together, or in the case of a load management strategy (e.g. rotational delayed start), maximum demand may be less than that which would be the case under a 'charging always available' arrangement. **Site-Wide Load Management** When behind-the-meter methods lead to a maximum demand for the block that is higher than the maximum allowance of the street's infrastructure as determined by the DNSP, another dynamic site-wide load management method may be considered. **Option 3:** **Owners' Corporation EV Circuit Control** • A device capable of disconnecting each EV charger from its supply in the dwelling (contactor) may be controlled by a signal from a master controller. • The master controller may be installed on common property and managed by the owners' corporation. • The installation of a master controller ensures that EV charging may only occur when there is sufficient spare capacity within the site. • A low voltage instrumentation wire runs from the master controller to the load centre of each dwelling and is connected to the EV circuit breaker. • Metering requirements may not necessarily be required for the owners' corporation. • Additional capacity may not necessarily be required for the site.
Elements to include on plans	EV infrastructure specifications need to be detailed and demonstrated on relevant plans. *As part of your technical drawings needed for building compliance, the electrical plans will need to include the design of all EV infrastructure demonstrating that it will deliver the electricity demand to serve EV charging to the development site.

METRIC 2: **Apartments**

Metric Specifications

Provide the following EV infrastructure to each apartment development:

Capacity and Load Management

- Dedicated EV distribution board(s) in each carpark storey that is capable of:
  - Supplying a minimum Level 2 (Mode 3) 7 kW, 32 Amp single phase dedicated circuit to all residential car parking spaces; and
  - Managing the maximum demand load of the development so that it does not exceed the site capacity, while providing a minimum average of 12 kWh of charge to each car parking space (particularly during off peak periods).
- Dedicated space for cable trays to support the future installation of EV cabling from the distribution board to the edge of each car parking space.
- Additional EV infrastructure, as required, which may include power use metering and communication systems, and conduit installations.

Motor cycle, moped, electric bicycle or scooter parking

- A 10-15 Amp charging outlet to every 6 bicycle parking spaces.
- Prominent, accessible and secure locations for the bicycle parking and other personal mobility devices.

Shared or Communal Space EV Charging

- A minimum of 1 Active EV charging unit should be installed at a shared or communal parking space, where relevant.
- Shared or communal EV charging spaces should be located in highly visible, priority locations, to encourage EV uptake.
- Clear signage must be provided to indicate that EV charging is available at the shared or communal spaces.

Parking Facilities

Parking facilities for low and zero emission vehicles should be located in a prominent, accessible location to encourage easy access by building occupants and visitors, ahead of larger and emission intensive vehicles.

METRIC 2: **Apartments**

Design Guidance

Base infrastructure for an apartment building includes:

- 1 or more distribution boards provided to each car parking level with a capacity to meet the future charging capacity of the level required. The location of the distribution boards should be centrally located at the parking spaces to reduce individual cabling costs for EV owners.
- An approved power use metering system.
- Cable trays and/or conduit installed to service each residential parking space to accommodate future EV cabling (power and communications).

The location of EV charging units

- Whether the design includes EV charging units ('Active') or is EV Ready, the design should ensure that infrastructure will be readily accessible and not obstructed.
- Where storage cages are provided in, and around, car parking spaces, ensure that future charging will be feasible and EV infrastructure is not obstructed.

Designs that include EV charging units (Active EV Units)

- Electricity supply to EV charging units may utilise common property electricity rather than electricity individually metered to a dwelling, with metering of individual circuits to each EV space via a NMI pattern (installed in, or adjacent to, the distribution board).
- Metering should be in a location that is accessible locally by an owners' corporation representative or appointee, and should have a means for communicating the kW consumed (e.g. pulse output or communications protocol) so that if a remote meter reading solution is desired by the owners 'corporation in the future, it can be implemented.
- Spatial provisioning for NMI metering within load centres should be included until regulations are clarified.

Load Management

- The load management system can be physical or cloud based systems.
- Load management should be designed to manage the predicted increase demand when using future EV charging to prevent exceeding the maximum electricity capacity for the site.
- The development should include site wide load management that can operate EV charging circuits within and between relevant spaces that comprises either:
  - Static load management – a system that charges all vehicles at the same time, which equally allocates a reduced load managed charge;
  - Rotational (time-shared) load management – a system that equally allocates charging based on a fixed schedule; or
  - Active/dynamic load management – a smart, communications-based and controlled charging system that responds to the energy requirements of the development and supplies EV charging to vehicles based on availability.
- The load management system (whether a separate system or in-built in charger types) should be scalable so that it can accommodate an increasing number of EVs as they are introduced to the building over time, up to the point where the development can accommodate EV charging to all residential parking spaces, as a minimum.

Elements to include on plans

EV infrastructure specifications need to be detailed and demonstrated on relevant plans.

* As part of your technical drawings needed for building compliance, the electrical plans will need to include the design of all the EV infrastructure demonstrating that it will deliver the electricity demand to serve EV charging to the development site. This includes the size and location of each cable tray and/or conduit to be installed to service each residential car parking space.

Other Design Guidance

Engaging the relevant expert to prepare the design

An electrical engineer has the expertise to design the base infrastructure and load management system within an apartment and mixed use development. EV charging infrastructure must be designed by a suitably qualified electrical engineer and installed by a licensed electrician. All works must be undertaken in accordance with the wiring rules and any other State or Federal regulations.

Protocol for ongoing management

The ongoing management of EV infrastructure and the EV system should be kept in mind when embedding relevant infrastructure within a development. New owners should be made aware of such systems, as well as, the owners' corporation.

Communicating the availability of such systems and resources within a development will ensure that responsibilities and protocols can be established that enables ongoing effective load management, metering and cost allocation, as well as, the equitable use of shared or common charging stations.

Alternative solutions

Where it is demonstrated that a metric cannot be met, an alternative solution and design approach may be appropriate. The alternative solution will need to be discussed on a case-by-case basis and must be supported by Council Officers.

Further Information

For additional guidance and details, please refer to:

Moreland City Council Low Emission and Electric Vehicles Standard (Moreland City Council, 2021)

Moreland Zero Carbon Planning

Moreland City Council 90 Bell Street, Coburg 3058 **www.moreland.vic.gov.au**

Moreland Language Link

廣東話	9280 1910	عربي	9280 1913	हिंदी	9280 1918	All other languages	
Italiano	9280 1911	Türkçe	9280 1914	普通话	9280 0750	9280 1919	
Ελληνικ	9280 1912	Tiếng Việt	9280 1915	ਪੰਜਾਬੀ	9280 0751		