QUEENSLAND GOVERNMENT ACCOMMODATION OFFICE

ELECTRIC VEHICLE INFRASTRUCTURE PROGRAM

TECHNICAL GUIDELINE

Queensland Government

Contents

Technical Guideline

This Technical Guideline is intended to support agencies to undertake a preliminary due diligence sufficient to develop a proposal and application for the installation of EV infrastructure in their building(s). It also provides guidance on EV charging typologies and the design and installation of EV charging infrastructure.

EV transition plan

At the outset, agencies should develop an EV transition plan which at minimum includes:

- **Building Location:** the buildings where QFleet EV's are, or will be garaged, and the ownership/tenure of the buildings
- **EV Projections:** the number of eligible QFleet vehicles garaged in each building which have, or will be converting to EV over the next 4+ years
- **Current Charging Infrastructure:** the number and type of chargers currently in each building.

This information will inform the projected charging infrastructure required for each building to meet future demand. An example EV Transition Plan is detailed in Diagram 1 below.

Diagram 1: Example EV Transition Plan

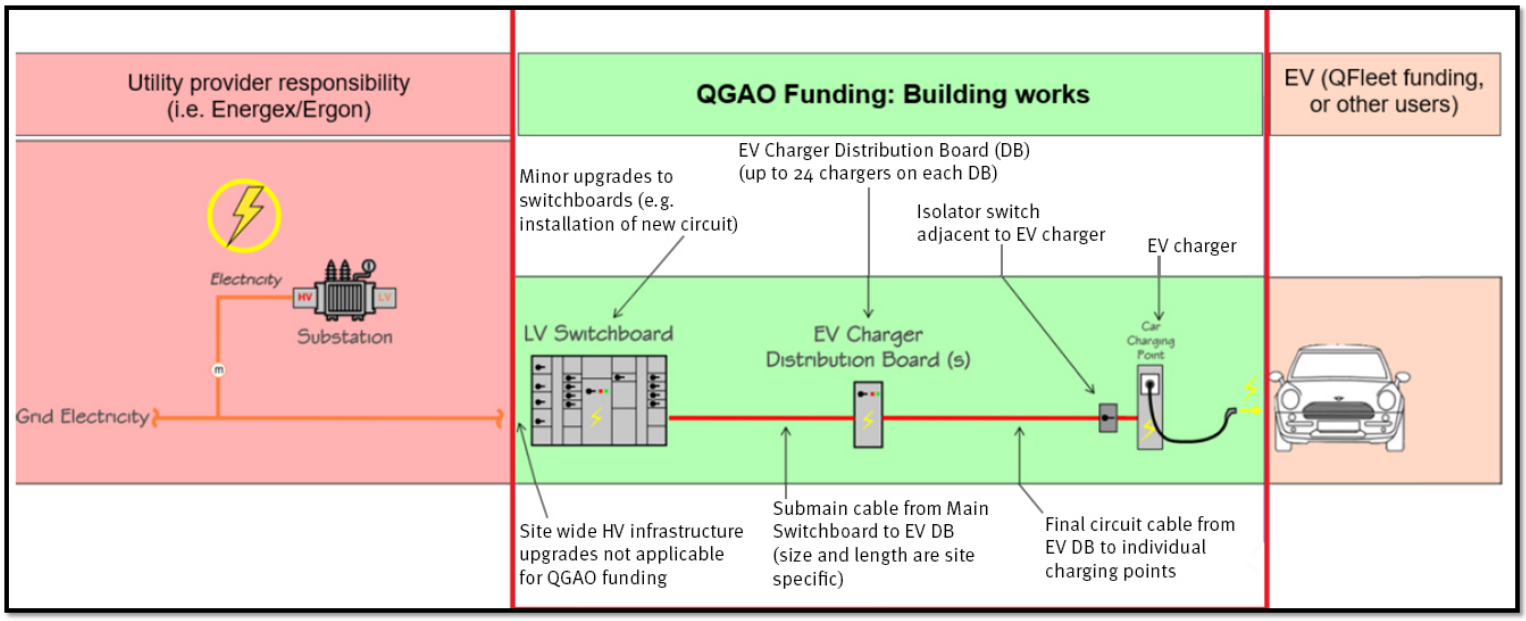
Location of building where EVs are garaged		**EV projections**						**Current charging infrastructure**			**Projected EV charging requirements**		
Building owner/ tenure	Building	Current EVs	FY 22/23	FY 23/24	FY 24/25	FY 25/26	Total	No. of chargers currently installed	Charger type	Shared or 1:1	Additional charging points required	Charger type	Shared or 1:1
QGAO owned	Cairns DEPW office and depot	3	0	1	0	0	4	1	Level 2 AC	Shared	1	Level 2 AC	Shared
QGAO owned	Garbutt QBuild depot and offices	2	1	1	0	0	4	2	Level 1 AC	1:1	0	Level 1 AC	Shared
QGAO leased	Robina Town Centre	4	0	0	0	3	7	0			4	Level 2 AC	Shared
QGAO leased	45-51 Barrack Road Cannon Hill	29	0	6	3	5	43	10	Level 2 AC	Shared	12	Level 2 AC	Shared

EV charging infrastructure

In order to develop a proposal and application for the installation of EV infrastructure, it is necessary to have an understanding of EV terminology and charging technologies.

Diagram 2 identifies the scope of 'EV Infrastructure' for the purpose of the EV Infrastructure Program (Program). The Program provides a capped funding contribution toward 'building-side infrastructure' and 'charging infrastructure' identified in green below.

Diagram 2: Scope of EV infrastructure



EV charger typology

Charging level

Agencies will need to determine their preferred charging typologies. The 'charging level' refers to the voltage and power of the charging system. The main charging levels are summarised in Diagram 3:

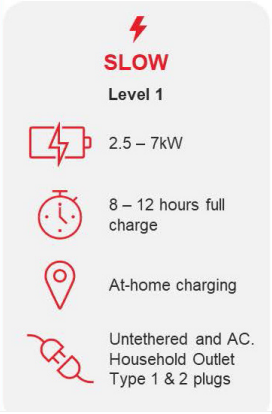
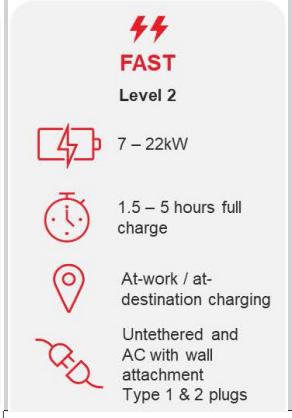
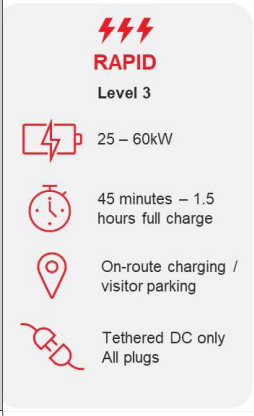
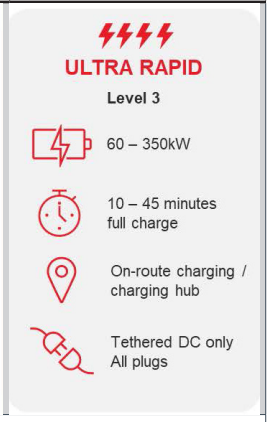
	Level 1 Slow	Level 2 Fast	Level 3 Rapid	Level 3 Ultra-Rapid
	← Inside funding scope →			
Overview				
Typical usage	Typically used in standalone domestic homes to 'top up' daily use of EVs.	Dedicated AC EV chargers up to 7kW (32A single phase) or 25kW (three-phase). These are typically installed in homes, apartment complexes, workplaces, shopping centres and other locations where vehicles are parked for a long period of time.	Rapid and Ultra-Rapid Chargers have power levels from 25kW to 350kW (40-500 Amp, three phase). These are typically commercial chargers, which provide fast charging services, and are commonly found along major highways, shopping complexes and charging hubs.	
Example installation	They are existing power points (10-15A, single phase), used in combination with a special, untethered cable, which must be connected both from the vehicle to the wall.	Level 2 cables are typically untethered to a wall attachment and infrastructure requires a dedicated circuit, heavy gauge wire and is commonly hardwired to comply with standards.	Cables are tethered to the charging station and cannot be removed, meaning users connect the provided wire to their vehicle only.	
Charge range	This method adds between 10-20km of range per hour when charging. Level 1 chargers are commonly used with the goal of fully recharging an EV overnight.	This method adds up to 40km of range per hour and delivers a full recharge overnight.	At the lower end, this method adds up to 150km of range per hour to fully charged vehicles in 10-45mins. These chargers are not part of the QGAO funding.	
Cost	Lowest Cost – up to $5,000	Medium Cost – up to $10,000	Highest Cost $50,000+ Ultra-rapid chargers draw a significant amount of power and are generally the most impactful on the power grid.	

Diagram 3: Charging levels

Assessment of journey types and charging behaviour

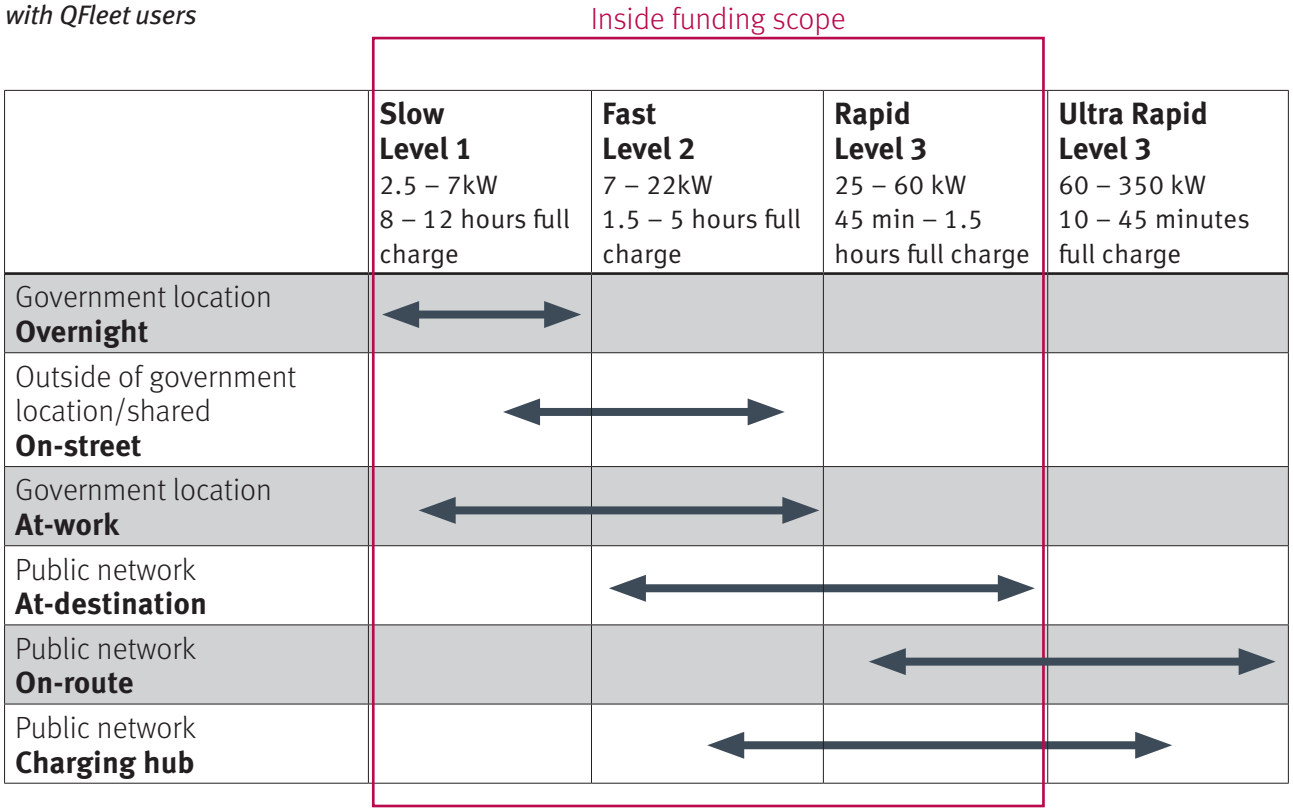
To identify the most appropriate charging level, agencies should assess the journey types and charging behaviour of their users. Agencies should also consider that publicly accessible rapid and ultra-rapid chargers are increasing in availability at various locations across Queensland. This enables staff to top up EV's at destinations or while on-route. Publicly accessible charging locations can be identified via apps such as Plugshare. Rapid chargers are particularly useful for users that may have longer journies or overnight stays.

Diagram 4 below illustrates the 'levels' of charging typically associated with QFleet users.

QFleet recommend that agencies consider installing AC 7kW dedicated charge units which will provide 30–60km of range per hour. The 7kW, 32amp, single phase chargers are a good option for most users because they are easy and affordable to install. AC charging is limited by the vehicle's onboard charger. You can install a 22kW AC charge unit, however if the vehicle's onboard charger is only 7kW, it won't charge any faster. Current ZEVs feature 6.6–11kW onboard chargers.

The program provides funding for Level 1 and Level 2 Chargers. While Level 3 Rapid Chargers may be considered on a case-by-case basis, funding is unlikely to extend to Level 3 Ultra Rapid Chargers.

Diagram 4: Levels of charging typically associated with QFleet users



Dual head chargers

Dual head chargers provide simultaneous charging of two EV's at the same time. It splits electricity between the two cars. While it may increase charging time (if two vehicles are being charged simultaneously), it is also a cost-effective solution for agencies. Dual head chargers can expand the capacity of a limited electrical setup and allow for charging of additional EV's located in adjoining bays.

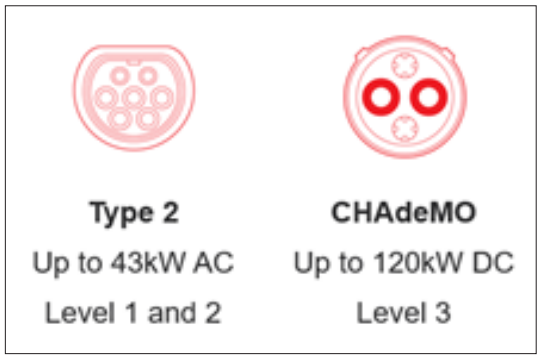
Charging type

Charging type refers to the model of plug associated with the charging cable and vehicle inlet. There are two main plug types which are commonly used across different EV models and manufacturers.

- **Type 2 plugs** are single-phase plugs with three-phase capabilities. When used in private bays, they have charging power levels of up to 22kW. In public charging stations, Type 2 plugs can have power levels of up to 43kW. Most public charging stations are equipped with Type 2 sockets, however EVs can typically be charged by Type 1 and 2 plugs. Type 2 plugs are typically associated with both level 1 and 2 charging.
- **CHAdeMO** are plugs used at DC charging stations which can be installed as a second socket by vehicle manufactures next to the AC charging socket on the EV. These plugs are typically associated with Level 3 charging, delivering high power of over 50kW.

The two main plug types are in Diagram 5 below. There are also combined charging systems which can be used for both AC and DC charging.

Diagram 5: Charging types



EV infrastructure design

When developing an EV infrastructure proposal, agencies should consider the following design requirements.

Location

The physical characteristics of the site, building, and proposed charging bay should be considered, including:

- available space
- internal/external carpark
- location of switchboard
- trenching requirements
- ceiling/vehicle height
- pedestrian and vehicle traffic flow
- risk of vehicle impact
- vehicular turning circles
- flood risk and surface drainage
- fire safety and alignment with existing building fire safety solutions
- evacuation plan and emergency services accessibility
- proximity to hazards (including dangerous goods and services)
- safe sight distances

The location of the charging station and cables in relation to the EV parking bay, should have the capacity to cater for all models of EV's with front, rear or side charging points.

Charging points should be located so that cables do not form a hazard for pedestrians or other vehicles.

Accessibility

Visibility, lighting and signage

The charging station should be easily visible and accessible for users to find. Parking bays allocated for EV use should be clearly marked with 'EV Charging Only'.

Parking bays should also have adequate lighting and where appropriate, public bays should meet the Crime Prevention through Environmental Design Guidelines. Lighting should clearly show signs, instructions and controls at the EV charging station. Agencies should also consider installing bollards, wheel, stops, line marking and other measures to ensure the parking bays are kept safe.

Instructions on how to use the charging stations should be clearly displayed in a prominent location. In addition, staff should undertake appropriate training including how to recharge electric vehicles. Training modules are available via QFleet.

Charger sharing

EV charging stations should be positioned to provide access to plugs from two adjoining or adjacent parking bays where possible.

Agency sharing

Agencies should also consider the benefits of sharing chargers with other agencies in the same building or within close proximity, particularly where electrical supply limitations restrict charger numbers. A code of conduct has been developed to support agencies with charger sharing arrangements.

Public sharing

Agencies that are customer facing or have visitor bays should consider incorporating public charging, as this supports broader government objectives to support private ownership and uptake of EVs. Publicly accessible charging infrastructure should be appropriately signed and located in areas easily identifiable and accessible to visitors to the site. For short-term visitor bays or public charging

stations, a viable solution may be to install a 60 kw dual head charger located to service two adjoining visitor bays, with at least one bay having universal access (discussed below).

Inclusivity

Agencies should include a charging bay or bays that incorporate principles of universal design. Universal design aims to make products, environments, and services accessible and functional for all, regardless of age, disability, or other factors. This is considered consistent with agencies' legislative obligations.

While there is currently no Australian Standard in relation to accessible charging of electric vehicles, British Standard PAS 1899:2022 provides guidance that promotes inclusivity and equal access to electric vehicle charging facilities, enabling a more inclusive transition. The document can be used as a guide to ensure that charging stations are designed to overcome any restrictions or barriers that could prevent any user from making full and independent use of the charge point. The Department of Transport and Main Roads are currently developing a guideline to support inclusive charging of electric vehicles.

Electrical supply and capacity

To reduce costs, parking bays should have easy access to electricity supply. EV chargers can introduce a large load on existing building infrastructure and electricity supply limitations can restrict the number and type of chargers appropriate for a particular site. For example, if ten new 22kW chargers were installed within a building, and all ten chargers were to draw full load, this would provide an additional 220kW of load onto the building, which may not be available within the existing building infrastructure.

It is therefore important to assess the electrical capacity of the building to ensure it can accommodate the proposed number and level of chargers. While moderate upgrades to the electrical capacity of the building may be necessary, extensive upgrades are costly and may make the proposal financially unfeasible.

It is recommended that agencies consult with Energy Queensland to ensure that the proposal will not impact the energy supply network. This is particularly relevant in rural and remote areas, where networks may be isolated or rely on alternative power supplies.

Load management

Prudent planning of how electrical demand will be managed can reduce the cost of, or even negate the need for, upfront electrical installation and network connection upgrades, as well as reduce operational costs. Load management should be discussed early with the site's electricity retailer, electricity distributor (Energex or Ergon Energy Network), and any relevant consultant or stakeholder.

To mitigate potential risk, load management software is recommended. This can either be a static load management system, however a dynamic load management system is generally preferred:

- **A static system** is where a set load can always be used by the chargers, however the

software is then able to allocate a certain amount of that between all the different EV chargers. It can be split up evenly or, depending on the software, can also assign priority to ensure that some chargers will always charge at full capacity.

- **A dynamic system** is the same as a static system, however in this case it can change the amount of load it can draw from the building based on the current load that is being utilised by the building. Therefore, at times when the normal building load is low, more power can be delivered to the EV chargers.

Wider transport decarbonisation

To ensure agencies meet their emissions targets and the objectives of the Queensland Energy and Jobs Plan, EV installations should implement measures to address wider transport decarbonisation.

Renewable energy

Ideally, charging stations should be coupled with distributed renewable energy, such as solar PV and battery energy storage combined with appropriate electricity tariffs that reward charging at times of high solar generation. Buildings can have solar PV installed on their roof or over outdoor parking areas to provide on-site renewable energy. This usually provides several benefits including low-cost electricity and decreased need for electrical infrastructure upgrades.

Emissions reporting

Agencies should consider their emissions reporting requirements and how these will be monitored and reported.

Carpark technology

EV charging management

Agencies must ensure that EV chargers have 'smart' charging technologies capable of carpark booking, billing functionality, load management and real-time data collection. EV charging stations should be Open Charge Point Protocol (OCPP) compliant and able to be updated to a newer versions. OCPP is an open-source communication standard for EV charging stations and network software companies. OCPP-compliant charging stations can be configured to run any similarly OCPP-compliant software. This will future-proof the installation and allow agencies to incorporate software, either now or in the future.

Access controls

The charging stations should have an integrated RFID card reader with ISO/IEC 14443-4:2018 preferred (particularly if publicly accessible) to enable access controls to be implemented.

Regulatory requirements

All EV installations must comply with regulatory requirements and standards. A summary of the main regulatory requirements and standards applicable to EV Installations are detailed below.

Building permits/ approvals

Installing chargers to an existing carpark is usually ancillary to the purpose of the car park and generally would not instigate any need for planning development applications. However, there are circumstances where building application may be required, for example:

- If installing EV charging infrastructure will reduce the number of originally approved carparking bays.
- If installing EV charging infrastructure will result in a commercial return e.g. public charging hub.
- If alterations to an existing building are required to facilitate the installation.
- If installing EV charging infrastructure at a Queensland heritage place.

For new buildings or developments, advice should be sought from the project architect, town planner and building certifier.

For further information contact QBuild Technical Services via email: qbuildtstownplanning@epw.qld.gov.au.

National Construction Code

The National Construction Code (NCC) is maintained by the Australian Building Codes Board (ABCB). The NCC is Australia's primary set of technical design and construction provisions for buildings. It outlines the minimum requirements that need to be met when constructing a new building (subject to a building application) or refurbishing an existing building (depending on the size of the refurbishment).

It is important to note that the relevant version of the NCC (i.e. applicable year), is dependent on the year of construction of the building.

NCC 2022

The latest volume of the National Construction Code, 2022, requires the following minimum number of car parking spaces in relevant buildings to be 'building-ready' for EV charging capability:

- apartment buildings (class 2) to have 100 per cent of car parking spaces
- 10 per cent of car parking spaces with office buildings (class 5) and retail shops (class 6)
- 20 per cent of car parking spaces with other commercial buildings which cover class 3 (e.g. hostels), class 7b (e.g. warehouses), class 8 (e.g. factory) and class 9 (e.g. buildings of a public nature like health care and educational facilities).

The NCC 2022 provisions include requiring electrical distribution boards to be dedicated for EV charging (quantity depends on the class of building). Table J9D4 of the NCC, reflected in Diagram 6 below, stipulates that any one electrical distribution board should not service more than 24 chargers per storey and that load management cannot be curtailed to deliver under 12k in an 8-hour working day.

Diagram 6: Table J9D4 NCC Electric Vehicle Distribution Board requirements for each storey of a carpark

Car park spaces per story for EVs	Electrical distribution boards for EV charging per storey
0-9	0
10-24	1
25-48	2
49-72	3
73-96	4
97-120	5
121-144	6
145-168	7
More than 168	One additional distribution board for each additional 24 spaces or part thereof.

Australian Standards

The Australian Standards are specifications, procedures and guidelines to ensure products and services perform safely and reliably. The installation of EV charging infrastructure must comply with the below standards.

AS/NZS 3000:3018 Electrical Installations (Wiring Rules)

AS/NZS 3000:2018 are the technical rules that provide guidance to electricians for the design, construction and verification of electrical installations. They are intended to protect from hazards that may arise from electrical installations. They also provide guidance to ensure the electrical installations will function correctly and are fit for purpose. The standard was updated in 2018, with the update including addition of some clauses with respect to EV and EV charging.

AS/NZS 3820:2020 Essential Safety Requirements for Electrical Equipment

AS/NZS 3820:2020 provides a set of criteria for the safety of electrical equipment before being placed on the market. All electrical equipment imported, and sold in, Australia must be proven to be electrically safe. All electrical products, regardless of use, must comply with AS/NZS 3820, which is the general electrical safety standard.

AS/NZS 3017:2022 Electrical Installations – Verification by Inspection and Testing

AS/NZS 3017-2022 specifies inspection and test methods to demonstrate that low voltage electrical installations comply with safety requirements for the prevention of fire, and to prevent a person or livestock from sustaining an electric shock. Covers electrical installations connected to an MEN system of earthing.

AS IEC 61851.23:2014 Electric vehicle conductive charging system D.C electric vehicle charging station

AS IEC 61851.23:2014 is an international standard which provides requirements for electric vehicle conductive charging systems (DC Electric Vehicle Charging Stations).

Fire safety

EV charging infrastructure should provide a suitable level of protection in relation to fire risks. Implementing fire safety strategies can add a substantial cost to your proposal, particularly if charging equipment is located in a basement carpark. Key guidance on fire safety requirements is detailed below.

QFES position statement

Queensland Fire and Emergency Services (QFES) has released a Position Statement related to EV cars and EV chargers. The Position Statement covers items which are to be considered within the design of the EV Chargers to provide a suitable level of protection for occupants and Fire Brigade intervention actions.

ABCB advisory note – June 2023

ABCB engaged EV Firesafe to develop a set of recommendations to support the safer installation and use of EV chargers without being an unreasonable barrier to adoption. ABCB have issued an Advisory Notice which contains recommendations to support safer EV charging. Diagram 7 has been extracted from the Advisory Notice and provides a summary of those recommendations.

Diagram 7: ABCB recommendations

Other recommendations

Based on previous project experience, QGAO also recommends that:

- The wall above the installation point of each fire extinguisher and fire hose reel within the carpark, must be mechanically and securely fixed with lettering not less than 20mm high on a contrasting background reading:
  "Do not attempt to manually extinguish an electric vehicle/charger fire"
  "Do not attempt to manually extinguish an e-bike/e-scooter or charger fire"
- Evacuation Plans and Fire Protection Drawings should be updated to clearly identify the location of EV charging and e-bike/e-scooter storage and charging areas.

Agencies should engage a fire engineer to undertake a site-specific review, which may identify additional requirements. This is usually done during development of the proposal, after the electrical capacity assessment and can assist to inform the most appropriate location for chargers.

Maintenance requirements

AS/NZS 3760:2022 provides that EV chargers which are in service must be tested and tagged with an "In Service" tag every 12 months. Specific service and maintenance requirements for EV chargers will be documented by the relevant supplier. Agencies should ensure that an appropriate service and maintenance regime is implemented. It is recommended that agencies contact QBuild to arrange a service maintenance program.

Need help

For general information about the program please email QGAO on:
qgao-evinstallationenquiries@epw.qld.gov.au

QBuild have an active EV program delivery team and are ready to provide technical assistance in developing your EV Infrastructure Proposal.

For assistance from QBuild please email:
MyQBuild@epw.qld.gov.au
or contact your customer relationships manager.

QGAO manages one of the largest property portfolios in Queensland.

$2.1 billion in owned property

179 owned assets

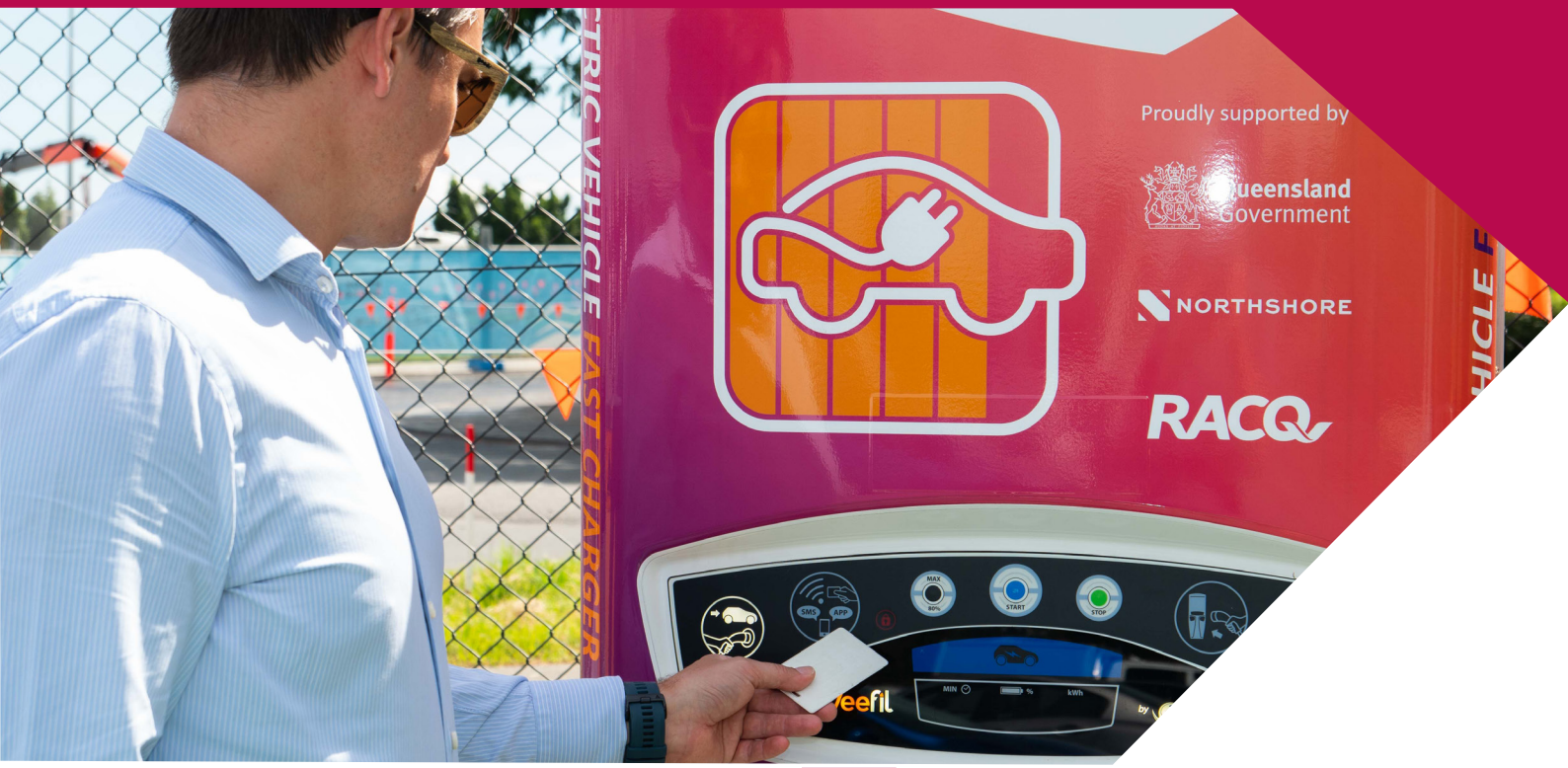
over **700** leases

across over **540** private buildings

1 million square metres of office space
(145,000 m² owned and 877,100 m² leased)

1,769 houses & **1279** apartments for Qld Gov employee housing

Figures are approximates only



www.epw.qld.gov.au/QGAO

Queensland Government