Drive electric NSW

Office of Energy
and Climate Change

EV ready buildings grants

Stage 1 pre-application guidance materials for existing feasibility assessment reports

October 2023

NSW GOVERNMENT

Stage 1 feasibility assessment checklist

This document has been prepared to assist potential applicants who have conducted their own feasibility assessment from a hired contractor prior to applying and should be read in conjunction with the drive electric NSW electric vehicle (EV) ready buildings grants guidelines.

This document aims to help you:

- understand the requirements that must be addressed in an existing report to be deemed satisfactory
- ensure relevant information is submitted
- provide a practical example of a satisfactory feasibility assessment report.

When to use this document:

- when preparing to submit a stage 1 application and selecting "route 2 - applying for a review of an already completed feasibility assessment"

If you are unsure of the feasibility assessment report requirements, get in contact with the consultant who completed your feasibility assessment to find out more.

Existing feasibility assessment report requirements

Applications will ask you to confirm your report meets the following assessment criteria

• an assessment of the building, including detail of specific electrical requirements (such as recommended distribution switchboard upgrades, space for additional cabling, and smart charging/load management system requirements)	☐
• a suitability examination of the building that highlights potential challenges that may be faced during installation (such as capacity limitation of existing distribution switchboards, physical space limitations of distribution boards, physical separation of apartments and their car spaces, cabling distances, and access)	☐
• anticipated impact on electrical supply to site and/or on peak demand charges	☐
• user pay options	☐
• visitor parking considerations	☐
• options for upgrading EV chargers, including estimated costs and timings	☐
• photos of key areas (e.g., distribution boards, car spaces and cable pathways).	☐

Example feasibility assessment report

The following pages contain an example feasibility report for a generic location. Every building is different, but this report provides an example of the detail and information you will need to apply for the drive electric NSW EV ready buildings grants guidelines.

Example Feasibility Report

Contents

1.0 Executive summary

An independent consultant has been engaged to prepare a technical feasibility study report for the provision of EV charging infrastructure for an undisclosed location.

The location is a residential apartment complex that has:

- 88 undercover basement parking spaces across 4 levels including:
  - 74 residential parking spaces
  - 13 visitor spaces
  - 1 car share space.
- the spaces are distributed across each level accordingly:

L2 – 7 spaces B1 – 21 spaces B2 - 27 spaces B3 - 33 spaces

- level 2 does not have residential parking allocations and will not require EV charging.

The owners corporation has indicated that communal charging in the visitor parking area **will not** besuitable for this site. This report presents how the building can provide residents with access to equitable EV charging infrastructure throughout all levels of the carpark. The existing main switchboard has sufficient capacity available to more than replenish the daily driving needs of all residents both day and night (with some intelligent load management provisions – refer below).

The consultant recommends that the building install a network of switchboards and 'flat cable' busway throughout the carpark. This 'backbone' infrastructure will enable residents to readily install final EVcharging sub-circuits and approved vehicle chargers (at their cost) as the need arises. This will provide equitable EV charging access to all private car spaces and will facilitate cost-recovery and load management for simultaneous EV charging for all residents, both now and in the future.

Under this strategy, strata:

- provides only the **common** electrical infrastructure to car spaces (i.e. does not provideprivate chargers in every space)
- enables the relatively low cost for residents to install chargers electric vehicle supply equipment (EVSEs) if and when they choose to purchase an EV.

Without this backbone infrastructure, residents are unable to install charging at all. Whilst the upfront installation of this backbone infrastructure is relatively high initially, this configuration will provide the **lowest cost option over the long-term** when the vast majority of vehicles will be electric and need charging compared to an ad-hoc approach.

The provision of common electrical and communications infrastructure throughout all levels of the carpark is estimated to cost approximately $65,000-$75,000 (including internet services). The cost for each resident wishing to install an EVSE will be approximately $2000-$3000 per charging space.These cost estimates are based on a combination of the EV costing tool and indicative quotesprovided to the consultant by charging providers.

1.1 Site description

1.1.1 Building detail

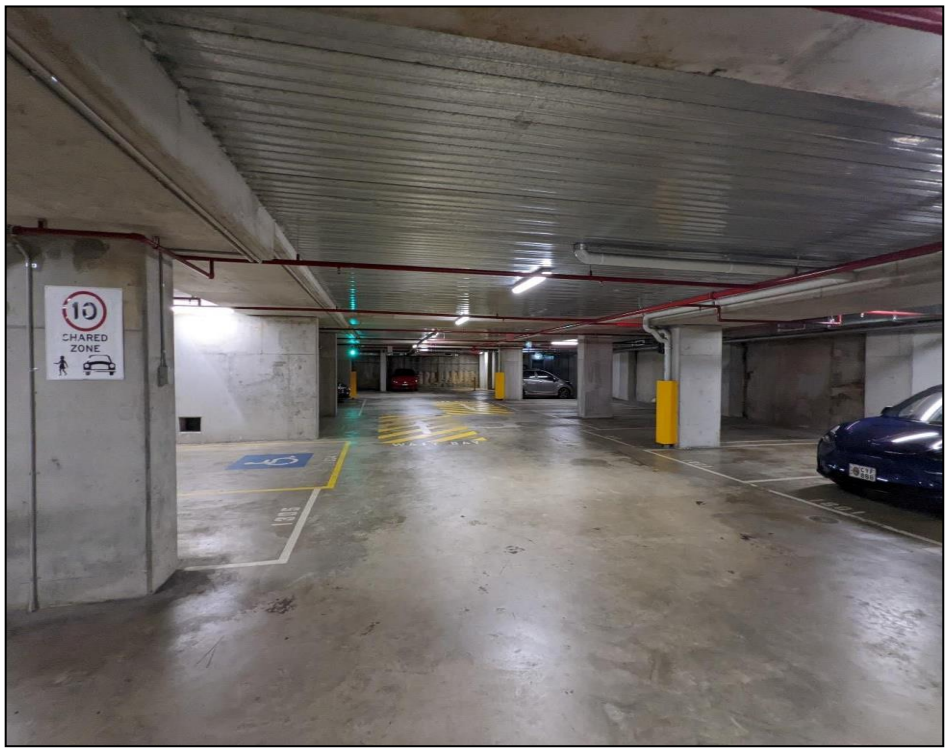
The building is a 20-storey mixed-use building constructed in 2016. It is comprised of a total of 100 apartments as well as a ground floor retail arcade. The building is located on a slope with vehicle access via a side road.

Example Figure 1: building

1.1.2 Parking layout

The building has 88 undercover basement parking spaces across one above ground and 3 basement levels (L2, B1, B2, B3). Seventy four of these are reserved for residents with the remaining 14 allocated to visitor parking and car share.

Each parking space is quite spacious with sufficient room for charging equipment behind or to the side of vehicles. This is a 20-storey mixed-use building built in 2016 comprised of a total of 100 apartments as well as a ground floor retail arcade. The building is located on a slope with vehicle access via a side road.



Example Figure 2: carpark level

1.2 Proposed charging methodology

1.2.1 Building electrical capacity

The building is supplied via Ausgrid substation 'x'.

The main switchboard, located on level 2, is serviced by a 640/800A service protection device. The site main switchboard is split between a metered and unmetered section. The unmetered section, which services the residents through electrical risers, has an 800A main switch. The metered section has a 600A main switch.

The consultant recommends that EV charging equipment be connected to the metered house services section of the MSB.

There is an existing 100A house services distribution board (HS-B1) located in the south corner of the B1 carpark. Whilst it is feasible to supply EV charging on this level through this distribution board, this would risk overloading this switchboard and impacting the lighting and power circuits currently connected. The cost of running a new submain to this level will be relatively insignificant.

According to the house services bill for the period 9/12/21 – 10/1/22:

- average daily electricity usage is 379.591 kWh per day
- the site has a consistent load profile throughout the year with very low seasonal variation

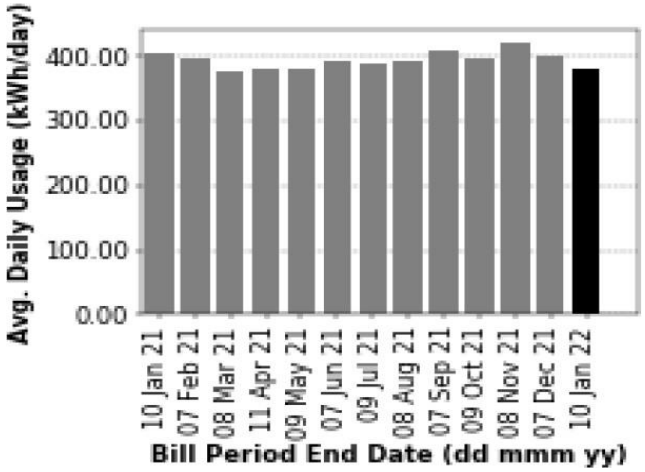


Figure 3: Annual house services energy usage - Win Electricity Bill

- the peak billed demand for this site over the past 12 months has been measured as 35.52 kW, equivalent to 51A/phase. This suggests that the metered section of the MSB has sufficient capacity available (up to 600A) for the connection of EV charging.

The non-essential services section of the MSB has 5 x 100A spare circuit breaker spaces which could be used to connect a network of dedicated electric vehicle distribution boards (EV-DBs). The proposed EV-DBs would be located on each level of the carpark. Residents would then connect to their corresponding level's EV-DB if and when they choose to install a charger.

Figure 4: MSB - House Non-Safety Services

Whilst we do not know the maximum demand on the unmetered (tenants) sections of the main switchboard, there is sufficient spare capacity on the metered house services sections to service EV charging for all residents.

At the time of charger installation, the total capacity and loading on the substation that includes the electricity supply to all residents within the building should be determined in consultation with Ausgrid.

The proposed EV charging system comprising each EVSE will need to include an open charge point protocol (OCPP) enabled charge management system. This system will monitor the load on the building's main switchboard and manage the respective loads by automatically varying the rate-of-charge to each EV.

By deploying intelligent load management there should be sufficient capacity available for mass EV charging at all hours of the day. The substantial supply to the site should be able to accommodate charging for EVs in all parking spaces.

The 3 proposed 100A EV-DBs will be able to provide full charging power for up to 28 x single-phase 7.2 kW EVSEs at any one time. However, this will be practically limited by the total site demand, which includes residential demand. Electrical load diversity will apply across all switchboards - not all vehicles will be plugged in simultaneously and not all vehicles will require immediate charging.

1.2.2 Billing data

Based on the consultants' site assessment and the analysis of the building's house services billing data we have determined:

- the NMI number for the embedded network house services is 'x' and the electricity charges are applied based on Ausgrid EA302 Demand Tariff
- the site consumes 138,550 kWh per year and the maximum billed demand of the past 13 months is 35.52 kW. Billed maximum demand is a rolling capacity charge (between 2 pm-8 pm)
- the maximum demand capacity charges are $0.405901/kW per day
- kWh based charges are as follows:
    - 18.71c/kWh in peak periods (2 pm – 8 pm weekdays)
    - 15.17c/kWh in shoulder periods (7 am – 10 pm weekdays if not peak)
    - 9.41c/kWh in off-peak periods (10 pm – 7 am and all weekend).
- this low rate for energy means that providing charging will cost strata approximately $270 per vehicle per year (assuming each vehicle charges an average of 32 km per day). This cost can be accurately recorded using a dedicated EV charge management (and billing) system to facilitate cost-recovery for the owner's corporation
- apart from the additional energy use (kWh) that will result from EV charging the kW peak demand charges may also increase

This has the following considerations:

- the EV charging tariff system should consider demand charges when applying an energy tariff to each user
- strong pricing signals to avoid increasing peak demand are recommended, e.g:
    - peak periods (2 pm-8 pm) – 40c/kWh
    - other periods - 20c/kWh.
- the building may wish to also utilise the features of an EV load management system to limit billable demand by reducing charging speeds in this time (even if there is capacity available) to save money.

1.2.3 Status of current electrical infrastructure

There appears to be sufficient electrical capacity in the building's main electrical infrastructure to service EV charging. There are 5 x 100A spare circuit breaker spaces in the MSB, of which 3 may be used to supply an EV-DB on each level of the carpark. This will provide a total of 300A capacity (100A per level) for dedicated EV charging.

When determining the required electrical capacity, the key factor to be considered is how many kilometres will need to be replenished across all vehicles in the carpark during working hours.

According to the Australian Bureau of Statistics, in 2019-20, NSW vehicles travelled an average of 32 km per day and the average daily commute in Sydney is 15.4 km each way.

The 3 proposed 100A EV-DBs will be able to provide up to 14 km of range per hour to all 74 residential parking spaces, equivalent to 140 km overnight (10 hours). This is the absolute worst-case scenario, with all vehicles plugged in and chargers throttled down using active load management. In most cases the chargers will be able to deliver full power (7.2 kW single-phase) and charge vehicles at approximately 36 km-45 km per hour (depending on the vehicle).

The building may wish to implement a system where residents can elect to pay for VIP charging which maintains full charging power even in times of high demand. This would be at a premium price and can be programmed by the charging software provider.

1.2.4 Routing options for power supplies to EV chargers

The consultant recommends the building install a flat cable busway system (or equivalent) throughout the car park to service up to 25 car spaces per EV flat cable string.

This option negates the need for any cable tray network for submain cables, sub-DBs and final sub-circuits to each EVSE.

As and when residents decide to install a dedicated EV charger in their exclusively allocated space, they can do so by connecting their EVSE directly to the busway using tap-off connectors. This is the lowest cost option to the resident to connect to the managed network because it represents an option with the least amount of cabling and installation labour.

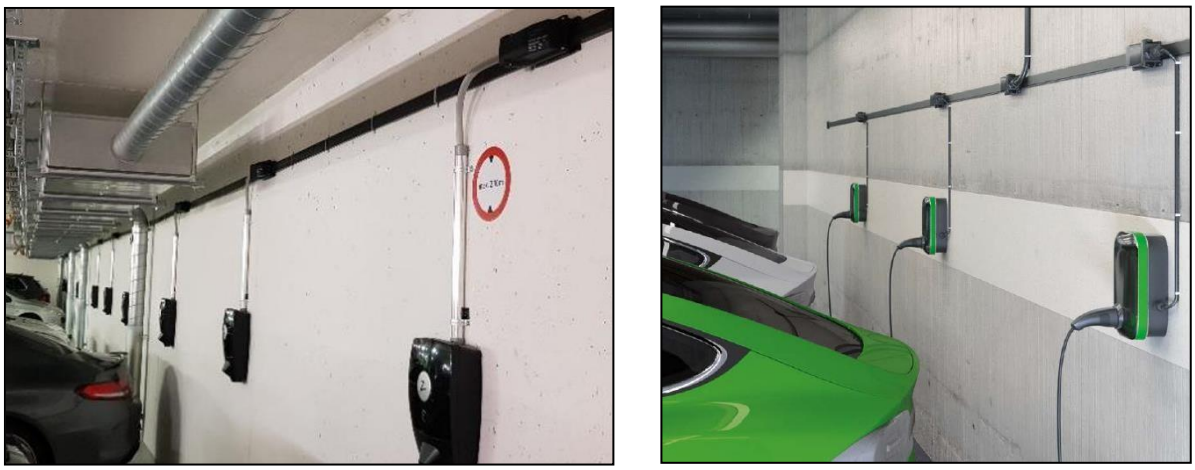


Figure 5: MSB – House Non-Safety Services

There is sufficient clear space on the existing car park ceilings and walls to facilitate the installation of a flat cable busway system between the proposed EV-DBs and parking spaces.

The flat cable will run above the existing services, such as sprinkler mains, already installed on the ceiling. This is demonstrated in the photo below in which a conventional cable tray is mounted to the ceiling.

Figure 6: Level B1 – Carpark ceiling

1.2.5 Potential new EV sub-distribution boards and control equipment requirements.

The provision for connection of EV charging equipment throughout the carpark will require new dedicated EV sub-distribution boards (EV-DBs) on each of the parking levels. Each EV- DB will service a network of flat cable in which residents may connect their chargers.

Due to the use of a flat cable system, the EV-DBs will only be required to have 12 poles and may therefore be small load centres which are very affordable.

Each EV-DB will have:

- 100A 3-phase main switch
- x 3 phase circuit breakers for connection of flat cable
- spare poles for additional circuits if required.

Each of the EV-DBs will service:

- EV-DB1 – 21 Spaces
- EV-DB2 – 27 Spaces
- EV-DB3 – 33 Spaces

To minimise cable run from the MSB, EV-DBs should be installed in the South West corner of each parking level as this is location is immediately below the cable path to distribution board HS-B1 on level B1.

Wi-Fi connectivity throughout all carpark levels will be required to facilitate charger monitoring, load control and session activation. The building has investigated this already and received a quote of $16,000 + GST to install Wi-Fi access throughout. Installing Wi-Fi will have external benefits to residents as well as facilitate EV charging functionality.

The EV charging control equipment will facilitate remote billing, load monitoring and control of all EVSEs within the carpark. Charging sessions may be initiated by either mobile app (another requirement for internet access) or physical RFID cards.

The schematic below shows an indicative layout of the proposed electrical infrastructure throughout the carpark.

There will be one 100A EV-DB installed on each level of the basement carpark.

Each EV-DB will be fed separately from a new 100A circuit breaker on the MSB.

Core holes will need to be drilled between levels B1 and B2 and levels B2 and B3 to facilitate the cable run to EV-DB2 and EV-DB3.

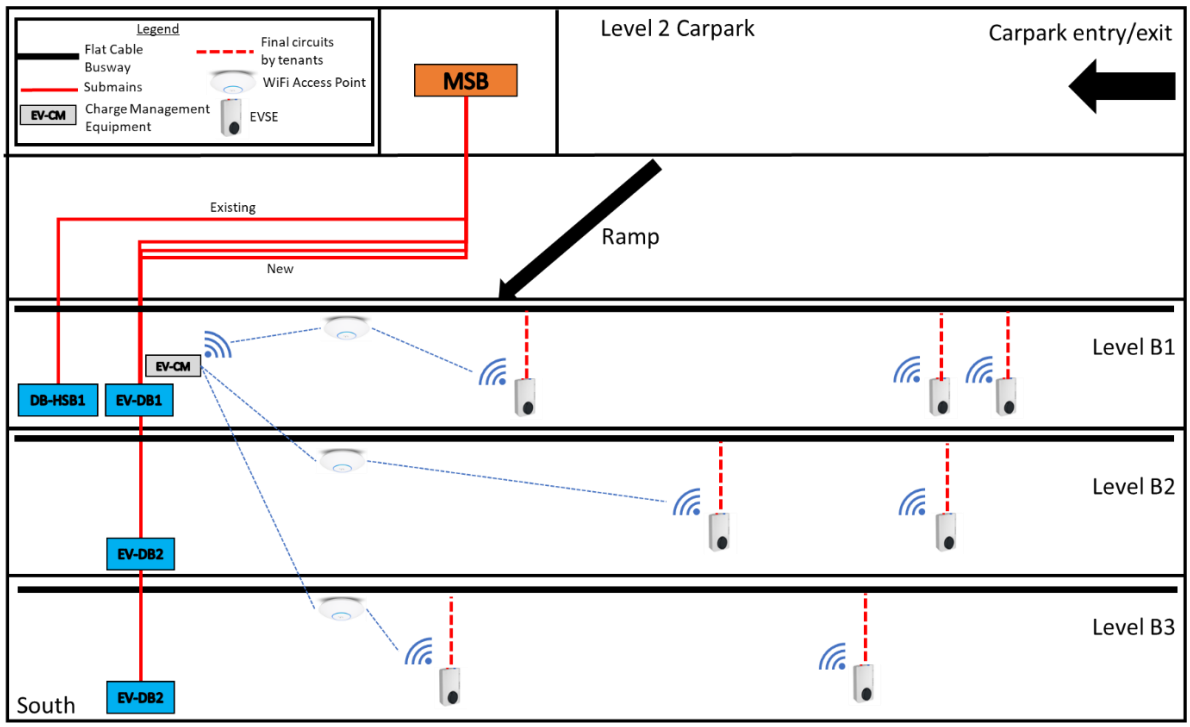


Figure 7: Indicative Carpark Electrical Infrastructure Layout

An indicative layout of the proposed EV-DB locations and flat cable routes is provided in the figures below. Final locations will need to be determined by the charging provider in consultation with the building.

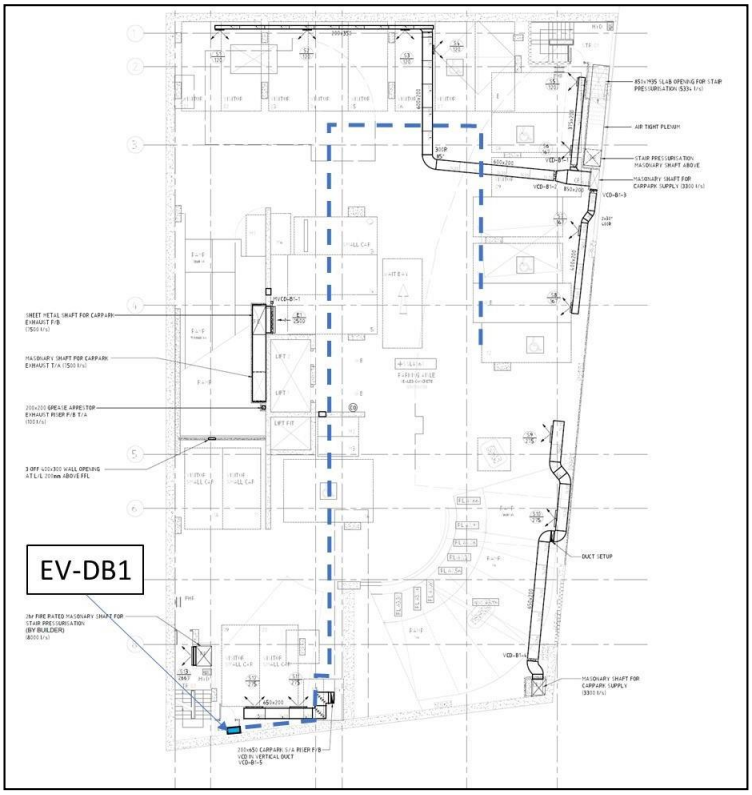


Figure 8: Level B1 - Indicative Electrical Infrastructure Layout

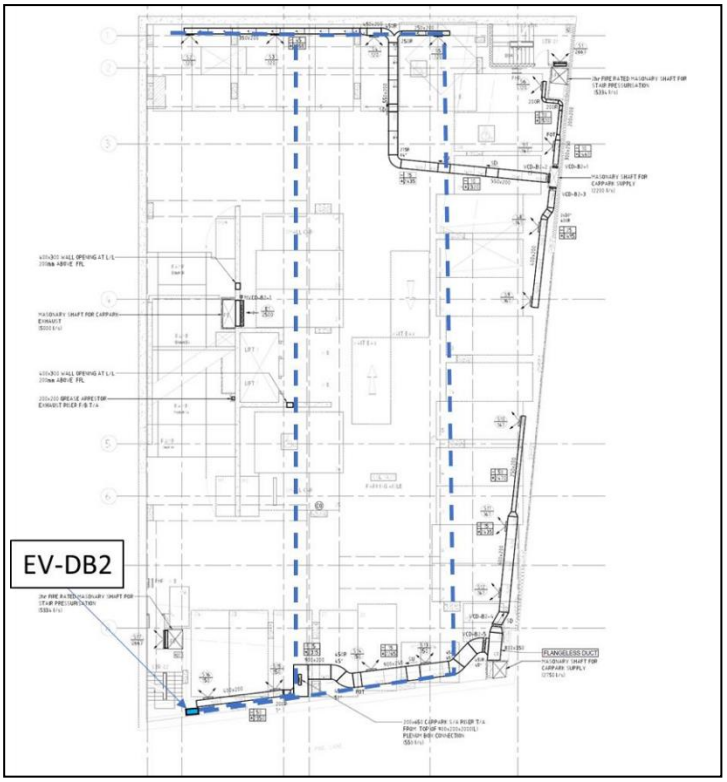


Figure 9: Level B2 Indicative Electrical Infrastructure Layout

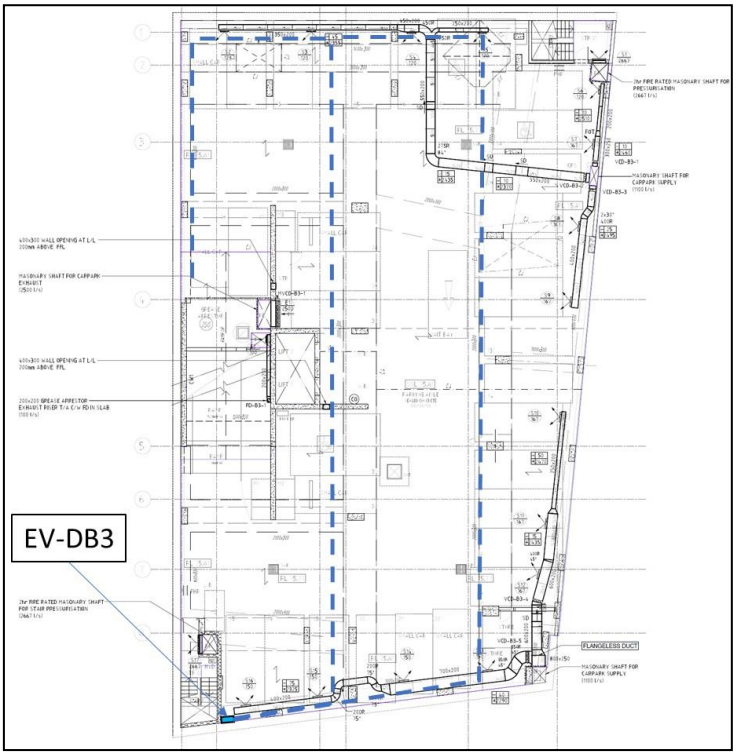


Figure 10: Level B3 Indicative Electrical Infrastructure Layout

An indicative layout of the proposed EV-DB locations and flat cable routes is provided in the figures below. Final locations will need to be determined by the charging provider in consultation with the building.

1.2.6 Identify metering options

The main switchboard has a metered section for house services and an unmetered section servicing the main electrical risers to residents.

Each of the EV-DBs should be connected to the metered section of the MSB such that all energy used for EV charging is included in the electricity bill for the house services.

A dedicated EV charging management and billing system should be configured to bill each user's credit or debit card for EV charging to facilitate cost-recovery for the owner's corporation.

The electricity tariff charged to residents for EV charging should be based on the actual cost of electricity plus a fair and reasonable administration charge and paid to the building manager.

The building may also wish to build-in an infrastructure cost recovery levy to the billing for EV charging such that each user progressively contributes to a predetermined levy cost for their portion of the common EV charging infrastructure. This may take the form of a percentage of the electricity cost of each charging session or a fixed cost per charging session.

1.2.7 Identify car space layouts and how chargers can be located

The mounting location for EVSEs throughout the car park will vary as not all car spaces have suitable adjacent wall space.

The figure below shows the concrete wall that borders several walls throughout the carpark. This is suitable for mounting EVSEs. Alternatively, the concrete columns may be used.

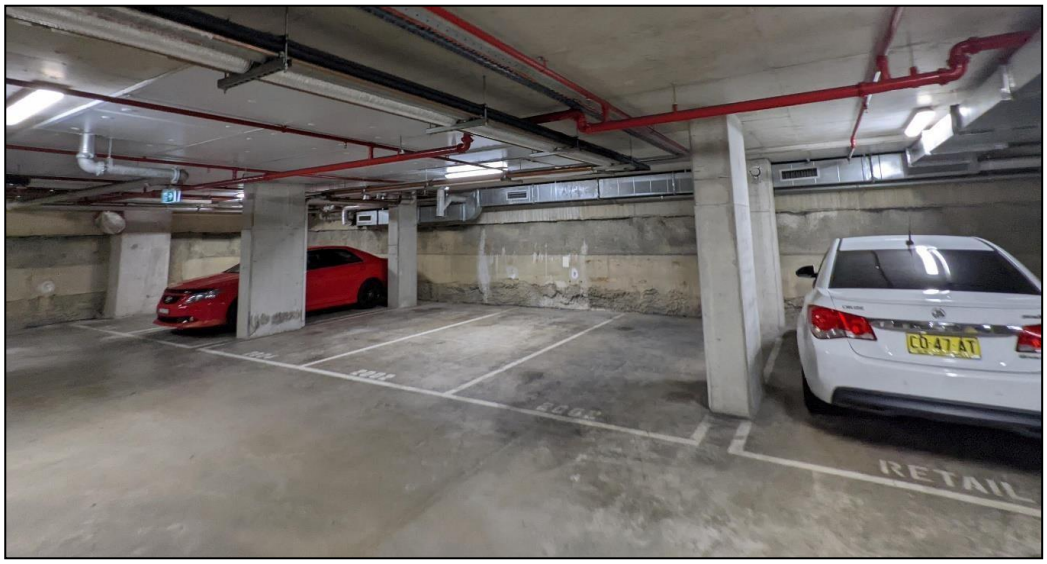


Figure 11: EVSE Locations – Concrete Wall

There are some locations throughout the carpark with no suitable walls or columns for mounting EVSEs. These spaces will require a post mounted solution.

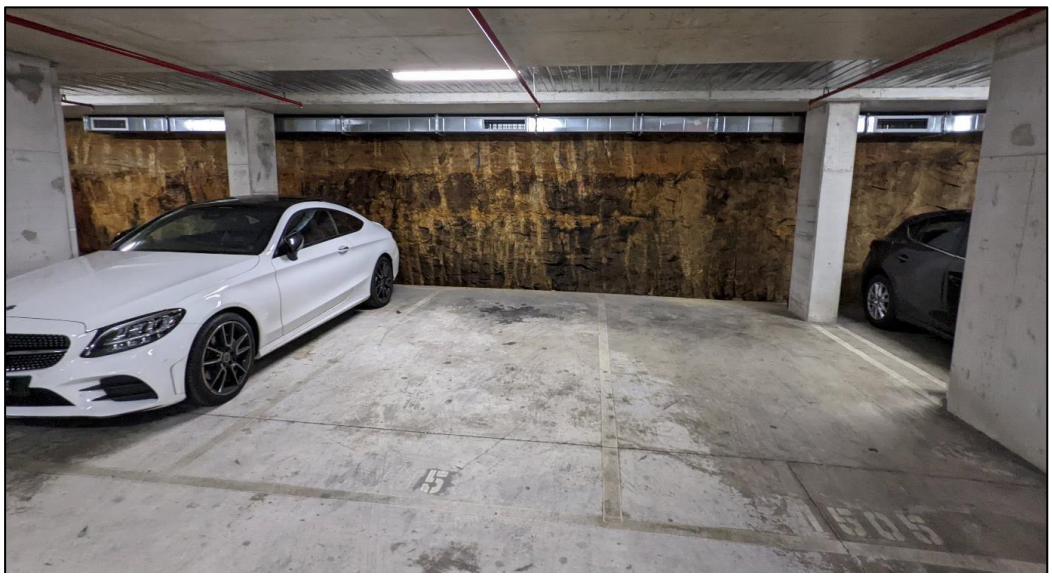


Figure 12: EVSE Location – Rock Wall

2.0 EV charging roadmap

2.1 Provision of all necessary switchboards and cable trays

The consultant recommends that the building provide flat cable busway electrical services infrastructure for the connection of EVSEs in up to 74 car parking spaces on levels B1, B2 and B3.

This method covers both the short and long-term EV charging requirements for the site. It is the lowest cost option to provide the electrical services infrastructure required for any resident to connect to with their EVSE as and when required.

It limits the cost to the building to providing the common electrical infrastructure and places the costs for the supply, installation, and commissioning of each EVSE onto each resident needing this equipment.

This option includes the provision of:

- x 100A EV DBs (Load centre on each level of the carpark)
- a flat cable busway network throughout each level
- Wi-Fi connection point on each level of the carpark.

As and when residents decide to install a dedicated EVSE in their private space they can do so at relatively low cost and integrate into the holistically managed solution that accommodates both load management and cost recovery.

This option is to include an open charge point protocol (OCPP) enabled charge management system to provide these necessary features.

Charger locations	Individual EVSEs shall be located in residents allocated car parking spaces as and when required.
Charger types	Electric vehicle supply equipment (EVSE). Individual - electrical services **provision to all spaces**. Resident pays to connect their EVSE as needed.
Proposed EVSE specifications and capability	All individual EVSEs for each resident to be: ○ single-phase ○ rated to a maximum capacity of 7.2kW (32A) ○ OCPP enabled and networked to facilitate load management, metering and billing using strata's load management system.
Load management	This is an essential requirement to provide individual charging capability for all residents. The building is to engage a charge management provider to manage the OCPP network.

Metering	EVSEs will all be connected to the house services meter. Each EVSE will have internal metering to allocate costs per charging session.
Billing	EVSE charging sessions will be phone-app or RFID activated with the app/RFID card linked to customers credit or debit card. The cost for EV charging will be billed to the user based on energy used (kWh) with the rate set to cover actual electricity cost to the house services plus system administration cost associated with system provider and strata management.
Timeframe or challenges to approve and implement	Upfront cost (despite the long-term benefit) is a key challenge. Installing all the infrastructure in one go may take some time to implement following the approval by the owner's corporation. Detailed design, tender, procurement and installation could take up to 6 months. There appears to be no technical obstacles to implementing this comprehensive "EV ready" option.
Costings	The estimated cost for this option based on indicative quotations is **$50,000-$60,000 + $16,000 for internet.** Each resident will need to cover the cost to supply, install, connect and commission their individual EVSE. The average cost for each resident's individual EVSE system is $2000-3000. This may vary depending on the EVSEs selected and the location in the carpark relative to the nearest EV-DB.

By electing to install all common electrical infrastructure in one go, strata will:

- provide economies of scale leading to lowest overall cost
- provide homogenous infrastructure throughout the carpark
- simplify procurement
- simplify project management

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For more information

To access the guidelines and additional supplementary information visit Electric vehicle ready buildings grants webpage.

Questions can be emailed to evrb@environment.nsw.gov.au