Submission to ABCB with reference to NCC 2022 public comment draft provisions for EV charging - J9D4

ELECTRIC VEHICLE COUNCIL

October 15, 2021

Introduction

The Electric Vehicle Council (EVC) welcomes the opportunity to contribute to the public comment draft (PCD) process on the National Construction Code (NCC), administered by the Australian Building Codes Board (ABCB). Our comments are specific to section J9D4, Facilities for electric vehicle charging equipment.

The transition from petrol and diesel vehicles to electric vehicles in our road vehicle fleet will create many new challenges and requirements across our economy. In the built environment, the key new requirement will be the ability to recharge the vehicles at times and places convenient to the drivers, without placing undue strain on upstream electrical infrastructure.

The model of routinely attending a petrol station will give way to a future where the majority of vehicle refuelling is done at the home or the workplace, with high-power fast charging at public locations filling in the gaps. This home and workplace charging will typically be relatively slow charging, because it costs less to deploy slow charging than fast charging, and the vehicles will be routinely be physically present in these locations for long periods of time.

The buildings we erect today will be with us as workplaces and accommodation for decades. Long before the buildings reach end of life, we can expect to have achieved a transition to near-100% EVs, so we need to plan accordingly. An apartment building that gets erected today, without readiness for EV charging to be deployed in future, guarantees expensive challenges for its residents in future.

We also need to be mindful of the cost of housing. Minimum building code requirements always come at a cost, so we need to ensure that any requirements imposed have been reduced to the minimum necessary to achieve the goal.

Broadly, the NCC draft provisions to support EV charging are sound in the view of the EVC, with some exceptions detailed below. We've taken the liberty of redrafting J9D4 to incorporate these exceptions and provided some justification/rationale for these variations in the following pages.

The EVC would welcome the opportunity to continue to be involved in the development of these provisions. In particular, the EVC would be well placed to aid in the development of reference material to support those using the code to inform their planning and design work.

Specific variations to the NCC draft requirements

Class 2 buildings should be provisioned at 100% readiness, rather than 25% (clause J9D4 (2) (b))

Making provision for 100% of parking spaces to be 'EV ready' is feasible at a technical and economic level.

The core rationale behind providing 100% readiness in class 2 buildings is that it is the class 2 buildings where many people live and where their cars are parked for long periods of time. It is in the car parks of class 2 buildings in particular where the EVC sees the greatest challenge in retrofitting suitable EV charging equipment, coupled with the greatest capacity to support the lowest total cost and highest consumer convenience outcome in a future where the majority of the cars are electric.

It is the firm view of the EVC that section J9D4 2(b) in the proposed NCC draft provisions should be amended accordingly, in keeping with the earlier draft of the provisions shared with stakeholders during the drafting process.

The key reason we're able to recommend 100% EV readiness in apartment complexes, and other residential settings, without significant cost impacts, is that these buildings have upstream electrical assets (main switchboard and network connection) sized to support a particular level of peak load.

This peak load incorporates high demand appliances which are often used co-incidentally (such as air conditioning), but which are known to not be used heavily overnight, which is when the EV charging energy delivery requirements are applied in the NCC. There is therefore spare capacity to charge cars in every parking space in buildings of this type, up to a particular level of delivered energy per parking space, without increasing the size of the network connection or the capacity of the main switchboard.

Analysis of data from many apartment buildings, supplied by Distribution Network Service Providers (DNSPs) across Melbourne, Sydney, and Brisbane, consistently supports this viewpoint, and was an input into the Australian Building Codes Board (ABCB) drafting process.

It is the EVC's understanding that the revision from the previously shared readiness level of 100% to 25% level has come from a concern for fire safety, expressed late in the drafting process. The view seems to be that by reducing the provision of readiness for EV charging in buildings, we can thereby reduce the fire risk.

The simple truth is that regardless of whether we provision apartment buildings today with 25% readiness or 100% readiness, the future outcome is going to be the same from the point of view of fire risk. The risk comes from the presence of the vehicles, not the presence of the chargers, and the vehicles are almost all going to transition to electric within the design life of the buildings.

While reducing the EV readiness requirements from 100% to 25% in apartment complexes cannot address the fire risk, it will meaningfully impact consumers attempting to install EV charging equipment in their allocated parking spaces over the coming years. Electric vehicles will still displace petrol vehicles in these buildings, but the consumer will either need to charge at high power charging stations outside their dwelling, which will likely be more expensive and less convenient, or they will need to work through the process of securing modification to their building with their owners corporation.

The challenge the majority of consumers in the 25% scenario will face may actually be worse than the split incentive problem today, because the 25% of unit holders (apartment owners) who got in early and made complete use of the available provision will have no incentive at all to fund a building upgrade that will support the laggard 75%.

With respect to fire safety, it is the intention of the EVC to work with stakeholders in the fire safety and construction sectors to address these concerns. We are open to the idea that some additional fire safety requirements may be applied to buildings as our vehicle mix changes, but we do not yet

have the data to define what these requirements might be. Rather than compromising readiness for EV charging for hundreds of thousands of consumers, we would very much prefer to see the well understood electrical readiness requirements put in place, and then work towards any provisions needed from a fire safety standpoint as the data on which to base sound requirements emerges.

Class 9c buildings should be treated as per class 2 buildings

Class 9c buildings are similar in many respects to class 2 buildings, in that they are a large residential development where people live. To the extent that these developments have car parking spaces, it will make sense to provision them comparably to class 2 buildings.

Class 3 buildings where they are to be hotels or motels

The provision for buildings of this type should be 25% of parking spaces, capable of delivering 48kWh between 11pm and 7am, with similar load management considerations as addressed in the existing NCC provisions for class 2 buildings.

The provisions around class 2 buildings provide for 12kWh delivered overnight, which amounts to ~50-60km of driving. As a daily top-up, this will be ample for the vast majority of apartment dwellers while at home. In a hotel or motel, the guest might well be looking for 250km or more worth of range top-up overnight, so the provisions and settings used for Class 2 buildings might not be as useful.

Providing for 25% readiness for parking spaces to deliver 48kWh per evening between 11pm and 7am will enable a ~250km top-up overnight in served parking spaces, with a very similar impact in terms of total energy requirement, management of maximum demand, and upfront cost as is imposed on class 2 and 9c buildings. As with the approach for class 2 buildings, this approach will avoid the need for bigger network connections or larger main switchboards and hence avoid excessive upfront cost impact.

Cable tray spatial allowance

Clause 3 of the PCD creates a requirement for spatial allowance to be made for cable tray in class 2 buildings.

The EVC is of the view that spatial allowance for cable tray in class 2 and 9c buildings should be to within 5m of car parking spaces intended to support EV charging in future, rather than the 20m provided for in the PCD.

Given the requirement is for spatial allowance, rather than for the actual installation of EV charging equipment, there should be negligible cost impact associate with this change. For the avoidance of doubt, the EVC is not of the view that the installation of cable tray should be a mandated minimum requirement at time of construction.

Further, it is the view of the EVC that this requirement should be limited to undercover parking spaces. Where there is no ceiling as part of the design of the car parking area, requiring spatial allowance for cable tray could be construed as requiring a roof or other equivalent structure to be installed that was not originally planned for, which would have the potential to create unintended cost impacts.

Timing of availability of charging in building classes 5-9 and buildings of class 3 where they are not hotels or motels

The existing clause J9D4 (2eiB) calls for availability of charging between 11pm and 7am, as per the requirements for class 2 buildings.

In class 2 buildings, class 9c buildings, and class 3 buildings where they are hotels or motels this is sound, because it is overnight when access to EV charging is most likely to be needed by the drivers.

In buildings of other classes, access to EV charging is most likely to be required during the day. For this reason, the EVC suggests amending this requirement to 9am to 5pm for these building types, in order that the charging equipment installed in future be available when the driver needs it.

Expansion of clause 1 to include multiple building classes

Clause 1 in the PCD specifies the provision of dedicated distribution boards for class 2 buildings, but not for other types. The absence of the other building classes in this clause would mean that building classes other than class 2 would not be subject to the remaining provisions of J9D4, unless the designer chooses to include dedicated distribution boards for EV charging.

The intent of the J9D4, to require EV readiness across multiple building classes, is best served by adding those additional building classes to clause 1.

Spatial requirement for metering in class 2 and 9c

The EVC notes that the trade-based metrology requirements, managed by the National Measurement Institute (NMI), are currently under review with respect to EV charging.

It is probable (though not certain) that EV chargers in future will be widely available with trade-certified metering built in and compatible with Australian legal frameworks, which would potentially obviate the need for upstream sub-circuit metering.

The explanatory materials that support the code should make clear that the spatial requirement is there in case it is needed to meet the needs of the building owners/operators, not because it is necessarily required in every building.

Under today's legal framework, it is possible for an Owners Corporation in a Class 2 building to deploy of a wide range of approaches, some of which require external metering apparatus, and some of which do not. For example, an apartment complex could elect to run a 'fee for access' model, rather than a 'billing by kWh' model, in which case no metering of individual chargers would be needed – but this model would run the risk of being perceived as insufficiently fair by the residents, so it cannot be assumed as a viable pathway for all buildings.

Further, the EVC is of the view that definition around the spatial allowance would be very helpful. In the absence of definition around spatial allowance required, the market will be confused as to how much spatial allowance needs to be made to meet this provision. This is similar in concept to the definition around spatial requirements for cable tray. The spatial allowance suggested is 36mm of DIN rail space per outgoing circuit in the distribution board.

This clearest pathway to compliance with J9D4 in class 2 and class 9c buildings where spatial allowance for metering is called for will be the use of 24-way distribution boards. A typical 24 way distribution board is 900mm high and 600mm wide. The addition of 36mm of DIN rail space per outgoing circuit noted here will typically add nothing to the width of the distribution board, but would add approximately 450mm of height to the distribution board.

The cost of this spatial allowance is trivial in the scheme of things, so if it is ultimately not used it does not present a serious cost burden. The absence of this spatial allowance, however, may adversely impact the ability of an owners corporation to deploy a suitable cost recovery solution, depending on the forthcoming changes in the NMI requirements.

Additional recommendations:

Reference examples to enable compliance

Compliance with the requirements of this clause will require electrical system designers to be able to interpret the requirements and design and install a compliant solution for all building types covered.

In some cases, this design will involve engineering consulting firms, but in others the design will be left to the electrical contractors awarded the scope of electrical installation for the building as a whole. The practice of 'design and construct' consultant documents will tend to increase the degree to which electrical contractors undertake the design work.

Given the provisions are new and many electrical engineers and electrical contractors do not have experience in making provision for them, reference materials designed to enable electrical engineers and electrical contractors to demonstrate compliance will be crucial.

These documents should not mandate any specific method of compliance but should serve to make it easy for industry to comply with the requirements.

The EVC and various EVC members are very keen to be involved in the development of these materials, alongside other industry experts.

General notes for consideration:

Busway-style solutions

One EVC member has raised the potential of electrical busway style solutions as an alternative to distribution board based solutions, particularly for class 2 buildings.

In the time available, the EVC and the member involved have not been able to adequately work through all the implications of the alternative pathway to make a solid recommendation around this, but we strongly believe there is merit in further work in this area.

Busway style solutions are likely to be higher cost up-front than the distribution board approach as conceived in the PCD but have the potential to result in lower cost individual installations in future, to the benefit of the end consumer.

For clarity, the existing PCD as adjusted by with our amendments included is written such that it would support the deployment of busway solutions post-construction if that is desired by the building owners.

The challenge presented for proponents of busway solutions in greenfield buildings is that the code as written requires the deployment of distribution boards, which are a very well established and understood approach within the electrical industry.

Some of the function that the distribution boards are intended to deliver in J9D4 could potentially be addressed with alternative architectures such as busway systems, but these are unlikely to be considered given the prescriptiveness of the code.

With regard to smart chargers

The nature of the type of EV charging equipment designed to be supported by these readiness measures (7kW AC) is that it can be built with significant smarts on board in order to support requirements such as load management, scheduling, and energy usage reporting.

It is possible that the EV charging equipment determined as acceptable for installation in the building by the owners corporation in future will handle load management and billing requirements locally with a smart in-building solution, or with a cloud based solution. Multiple suppliers exist in the Australian market providing solutions of this type, and more are emerging every month as the commercial opportunity grows.

It is also possible that the owners corporation will allow individual residents to install a wide variety of chargers, which may or may not be smart or interoperable. The minimum viable wall mounted equipment for charging an EV is a standard powerpoint. It is expected that some residents and buildings may elect to go this way on the basis of cost saving.

The key reason for making the performance requirements based on energy delivery and times of day, rather than mandating a smarter solution, is that we are not requiring the installation of the EV chargers at time of construction.

In the absence of a smart end-point to communicate with, avoidance of the requirement to increase the size of the electrical switchboard and network connection requires a load management system that will operate with a degree of certainty in a more basic manner, such as timer and meter based control.

The expectation we have is that simple load management approaches deployed to comply with these requirements may be bypassed in future, in favour of smarter solutions as smart chargers are deployed.

The core electrical infrastructure required by these provisions will be used regardless of whether the load management arrangement is ‘smart’ or ‘simple’. The function of the sub mains and the distribution boards required in J9D4 is to create a pathway to bring the electrical energy from the main switchboard to the car parking areas and make it available to feed EV charging equipment.

Existing text as written in the PCD:

J9D4 Facilities for electric vehicle charging equipment

(1) A carpark in or serving a Class 2 building must be provided with electrical distribution boards dedicated to electric vehicle charging-

(a) in accordance with Table J9D4 in each storey of the carpark; and

(b) labelled to indicate use for electric vehicle charging equipment

(2) Electrical distribution boards dedicated to serving electric vehicle charging in a car park must

(a) when part of or serving a Class 2 building, be fitted with a charging control system with the ability to-

(i) manage and schedule charging of electric vehicles; and

(ii) have each circuit support an electric vehicle charger able to deliver a minimum of 12kWh from 11:00pm to 7:00am daily; and

(b) be sized to support the future installation of a 7 kW (32 A) type 2 electric vehicle charger in 25% of the car parking spaces; and

(c) contain space for individual sub-circuit electricity metering to record electricity use of electric vehicle charging equipment; and

(d) be labelled to indicate the use of the space required by (c) is for the future installation of metering equipment; and

(e) when part of or serving a Class 3 or Class 5 to 9 building-

(i) be fitted with a charging control system with the ability to-

(A) manage and schedule charging of electric vehicles in response to total building demand; and

(B) have each circuit support an electric vehicle charger able to deliver not less than 12 kWh from 11:00 pm to 7:00 am daily: and

(ii) be sized to support the future installation of a 7 kWh (32 A) type 2 electric vehicle charger in-

(A) 10% of car parking spaces in a Class 5 or 6 building: or

(B) 20% of car parking spaces in a Class 3, 7b, 8 or 9 building.

3) A carpark in or serving a Class 2 building must contain a designated space for cable trays to support the future installation of 32 A single phase final sub-circuits to each car parking space-

(a) from the electrical distribution boards required by (1) to within 20 m of the nearest edge of each car parking space to be served by that distribution board: and

(b) with a width equal to at least 40 mm multiplied by the number of 32 A single phase final sub-circuits to be served by that section of the cable tray.

(4) The area required for cable trays in (3) must be labelled to indicate use for electric vehicle charging.

Limitations

J9D4 does not apply to a stand-alone Class 7a building.

Table J9D4: Electric vehicle distribution board requirement for each storey of a carpark

Carpark spaces per *storey* for electric vehicles	Electrical distribution boards for electric vehicle 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

Table Notes

Where there are more than 168 *carpark* spaces per *storey*, 1 additional distribution board must be provided for each additional 24 spaces or part thereof.

Recommended amended text to capture the EVC variations:

J9D4 Facilities for electric vehicle charging equipment

(1) A carpark in or serving a Class 2, 3, 5, 6, 7b, 8, or 9 building must be provided with electrical distribution boards dedicated to electric vehicle charging-

(a) in accordance with Table J9D4 in each storey of the carpark; and

(b) labelled to indicate use for electric vehicle charging equipment

(2) Electrical distribution boards dedicated to serving electric vehicle charging in a car park must

(a) when part of or serving a Class 2 or 9c building

(i) be fitted with a charging control system with the ability to-

(A) manage and schedule charging of electric vehicles; and

(B) have each circuit support an electric vehicle charger able to deliver a minimum of 12kWh from 11:00pm to 7:00am daily;

(ii) be sized to support the future installation of a 7 kW (32 A) type 2 electric vehicle charger in 100% of the car parking spaces; and

(iii) contain space for individual sub-circuit electricity metering to record electricity use of electric vehicle charging equipment; and

(iv) be labelled to indicate the use of the space required by (iii) is for the future installation of metering equipment; and

(v) with the space allocation required by (iii) to be at minimum 36mm width of DIN rail in the distribution board per outgoing circuit.

(b) when part of or serving a Class 3 building that is intended to operate as a hotel or motel,

(i) be fitted with a charging control system with the ability to-

(A) manage and schedule charging of electric vehicles; and

(B) have each circuit support an electric vehicle charger able to deliver a minimum of 48kWh from 11:00pm to 7:00am daily;

(ii) be sized to support the future installation of a 7 kW (32 A) type 2 electric vehicle charger in 25% of the car parking spaces

(c) when part of a Class 5, 6, 7b, 8, 9a or 9b building, or a Class 3 building that is not intended to operate as a hotel or motel,

(i) be fitted with a charging control system with the ability to-

(A) manage and schedule charging of electric vehicles; and

(B) have each circuit support an electric vehicle charger able to deliver not less than 12 kWh from 9:00 am to 5:00 pm daily;

(ii) be sized to support the future installation of a 7 kW (32 A) type 2 electric vehicle charger in-

(A) 10% of car parking spaces in a Class 5 or 6 building; or

(B) 20% of car parking spaces in a Class 7b, 8, 9a or 9b building.

3) An undercover carpark in or serving a Class 2, or 9c building must contain a designated space for cable trays to support the future installation of 32 A single phase final sub-circuits to each car parking space-

(a) from the electrical distribution boards required by (1) to within 5 m of the nearest edge of each car parking space to be served by that distribution board: and

(b) with a width equal to at least 40 mm multiplied by the number of 32 A single phase final sub-circuits to be served by that section of the cable tray.

(4) The area required for cable trays in (3) must be labelled to indicate use for electric vehicle charging.

Limitations

J9D4 does not apply to a stand-alone Class 7a building.

Table J9D4: Electric vehicle distribution board requirement for each storey of a carpark

Carpark spaces per *storey* for electric vehicles	Electrical distribution boards for electric vehicle charging per *storey*
0 - 9	0
10 - 24	1
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Table Notes

Where there are more than 168 *carpark* spaces per *storey*, 1 additional distribution board must be provided for each additional 24 spaces or part thereof.