NHP Electrical Engineering Products

Energy monitoring according to the National Construction Code

New changes to Section J9 and what they mean for you

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Australian National Construction Code 2022 - new changes to Section J9

What do they mean for you?

Focusing on Section J9 of the Australian National Construction Code (NCC), this document provides readers with greater insight into important changes released in May 2023.

Introduction to the National Construction Code

The Australian Building Codes Board (ABCB) produces and maintains the NCC on behalf of the Australian Government and each state and territory government. Its purpose is to outline the minimum performance-based requirements for a new and refurbished building's safety, accessibility, health, amenity and sustainability. To cover these requirements in detail for the design, construction and performance aspects of all building types, the NCC publishes the Plumbing Code of Australia (PCA) and the Building Code of Australia (BCA) Volume One and Volume Two[1].

Volume One of the BCA focuses on large buildings that are likely to include multiple stakeholders such as apartment buildings, public assembly areas and all other commercial buildings. Volume Two covers small scale buildings such as residential houses.

Who is affected by the change?

Any building in the design stage that has not proved its compliance with the NCC 2020 BCA – Volume One by May 2023 may need comply with the NCC 2022 BCA – Volume One. Grace periods vary based on different sections of the NCC and different jurisdictions. For the most accurate transition period, check with your local governing body.

What is Section J?

Section J outlines the minimum requirement level of sustainability and energy efficiency of a building's performance. This section includes a set of guidelines that facilitate the building's compliance, which have been subdivided into parts as listed below. This section also outlines the methods of verifying the building's conformance.

- Energy monitoring and on-site distribution of energy resources facilities.
- Lighting control systems.
- Temperature control and ventilation systems.
- Other requirements (e.g., structural requirements and water heating).

The amendments to Section J of the 2022 NCC aim to further improve the building's performance with respect to energy efficiency without compromising performance or the comfort level of its occupants. These changes utilise the technology available today to reduce the building's greenhouse gas emissions by better monitoring and controlling its loads. The full list of amendments can be found on page 23 of the NCC 2022 BCA – Volume One standards.

Energy monitoring and on-site distributed energy resources (Part J9)

The new Part 9 contains the energy monitoring requirements, which were previously in section J8 'Facilities for energy monitoring'. It also now contains provisions for either containing or retrofitting on-site renewable energy and electric vehicle chargers.

1) NCC 2022 Building Code of Australia - Volume One, page 9

Energy monitoring (Part J9D3)

Part J9D3 outlines the energy monitoring requirements for new and refurbished buildings based on the building class and floor area (total and common area considered).

For small buildings (e.g., floor area less than 500m^2), an energy meter must be installed to capture electricity and gas usage in accordance with J9D3(1). This is usually captured by default by the utility meters installed by the energy retailer.

For larger buildings, J9D3(2) requires building class 2 to 9, with floor area more than 2,500m^2 and a common area above 500m^2, to record the energy consumption of the following loads[2]:

- Air-conditioning plants including, where appropriate, heating plants, cooling plants and air handling fans .
- Artificial lighting.
- Appliance power.
- Central hot water supply.
- Internal transport devices including lifts, escalators and moving walkways where there is more than one serving the building.
- Other ancillary plant.
- NEW - on-site renewable energy equipment.
- NEW - on-site battery systems.
- NEW - electric vehicle charging equipment.

One of the challenges in utilising the energy data captured required by J9D3(2) is the ability to access this information quickly and easily.

Therefore, the criteria J9D3(3) requires the energy data captured as per J9D3(2), to be centralised via a single-user interface where this information is to be time-stamped and stored, analysed and reviewed. This clause will assist in ensuring data gathered by the individual meters is not lost or stored in an unreachable database and is made easily accessible to stakeholders for better analysis.

2) NCC 2022 Building Code of Australia - Volume One Part J9D3, page 505

Key takeaways

- All energy meters must have the facility to communicate to the single user interface (i.e., through a common method such as MODBUS communication).
- The single user interface must be able to collate information from various types of energy meters (meter type and brand).
- The information captured must be time stamped. (i.e., energy consumption recorded with reference to time and date).
- Ideally the information captured should be easily identifiable (i.e., loads outlined in J9D3(2) should be grouped and/or labelled appropriately within the single user interface. e.g., lighting, power, HVAC, EV, solar).
- The single user interface must have the facility to store energy consumption information for a reasonable period of time (data storage capacity not specified).

Electrical vehicle charging (Part J9D4)

The NEW Part J9D4 outlines the requirement for dedicated electrical distribution boards to accommodate for electrical vehicle (EV) charging equipment. These requirements vary depending on building class, carpark size and whether EV charging equipment will be included at the completion of the building or retrofitted at a later stage. Part J9D4 (1) requires that carparks associated with building Class 2, 3, 5, 6, 7b, 8 or 9 must have dedicated EV charging distribution boards. The number of EV dedicated boards required in each storey of the carpark is outlined in table J9D4.

Table J9D4: Electric vehicle distribution board requirements for each storey of a carpark[3]

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

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

3) NCC 2022 Building Code of Australia - Volume One Part J9D4, page 506, Table J9D4

The increase of EV chargers on site also inevitably increases the load demand on the site. To meet this challenge Part J9D4 (2a) requires the EV dedicated distribution board to have a charging control system that can manage and schedule charging of electric vehicles in response to total building demand. Part J9D4 (2b-e) lists the minimum capacity requirements for the dedicated distribution board and the load management system in accordance with the building class, which is summarised in the table below.

Building class	Daily minimum capacity per circuit[4]
Class 2	12 kWh from 11:00 pm to 7:00 am
Class 3	48 kWh from 11:00 pm to 7:00 am
Class 5 to 9	12 kWh from 9:00 am to 5:00 pm

Table 2: Summary of daily minimum charging capacity per circuit

For buildings that have the capacity to include EV chargers in the future, the dedicated EV distribution boards must be sized to support a 7 kW (32 A) Type 2 EV charger with the ability to service the carpark spaces summarised in the table below. In order to accommodate for the energy monitoring requirement for future EV chargers stated in Part J9D3 (2), Part J9D4 (2f&g) requires for the EV distribution board to contain a labelled space of at least 36 mm width of DIN rail per outgoing circuit for individual sub-circuit energy metering.

Building class	Future installation 7 kW (32 A) Type 2 EV charger[5]
Class 2	100% of the car parking spaces
Class 3, 7b, 8 or 9	20% of car parking spaces
Class 5 to 9	10% of car parking spaces

Table 3: Summary of carpark spaces that will require facilities for future EV installation

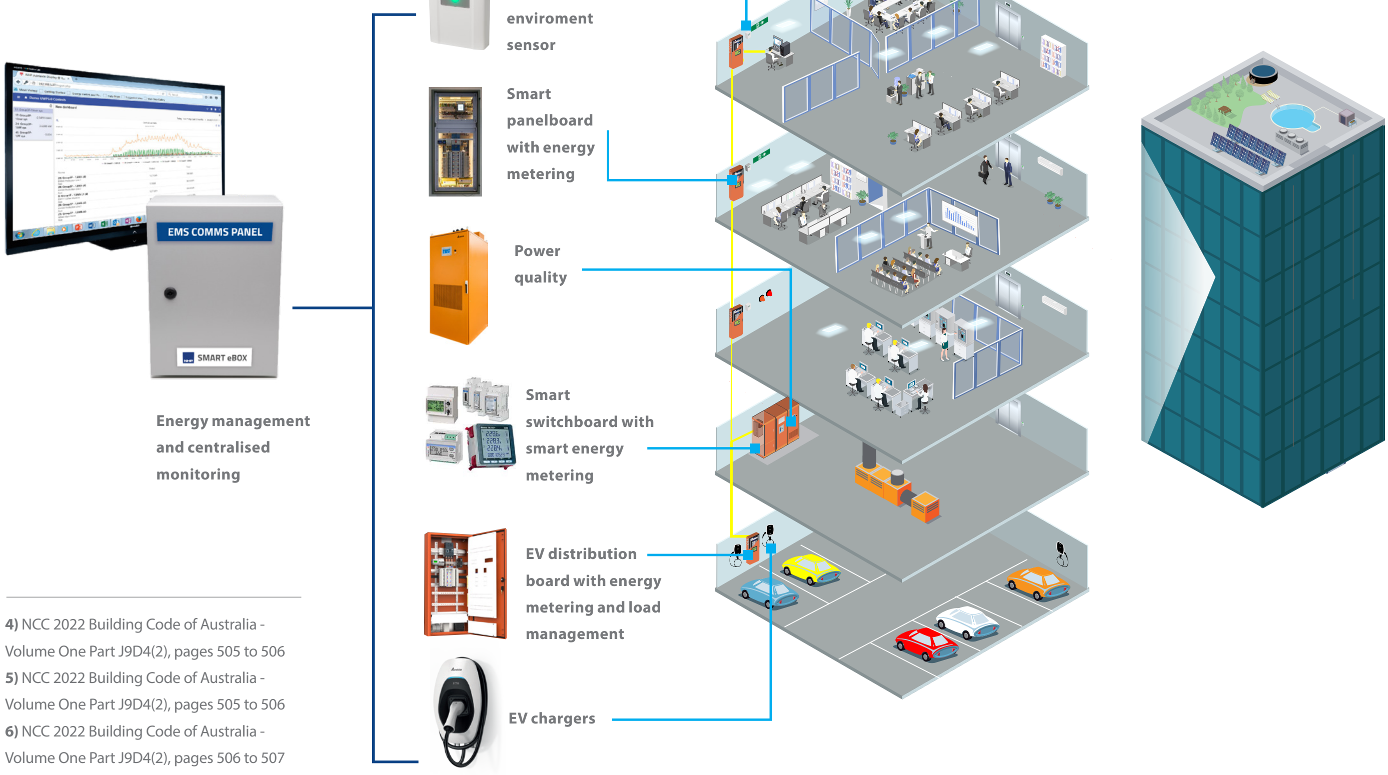
Key takeaways:

- Building Class 2, 3, 5, 6, 7b, 8 or 9 with 10 - 24 carpark spaces per storey require a dedicated EV distribution board with energy metering.
- For buildings with more than 24 carpark spaces per storey, additional metered distribution boards are required per 24 spaces.
- A charging control system must be able to manage the charging time and capacity in response to the total demand and Part J9D4 (2b-d).
- Buildings that will have EV chargers as part of a future upgrade must have a dedicated EV distribution board with capacity to support 7 kW (32 A) Type 2 electric vehicle chargers as well as including room for metering.

On-site PV solar panels and batteries (Part J9D5)

Another significant step towards reducing a building's carbon footprint is the addition of new Part J9D5. This part requires new buildings to add provisions for future on-site PV solar and batteries. The section includes adding labelled spare compartments in the electrical switchboard for protection and metering (Part J9D5 (1)) as well as, where possible, allowing for usable rooftop space for future PV installation in accordance with Part J9D5 (2).[6]

Architecture example - office



4) NCC 2022 Building Code of Australia - Volume One Part J9D4(2), pages 505 to 506
5) NCC 2022 Building Code of Australia - Volume One Part J9D4(2), pages 505 to 506
6) NCC 2022 Building Code of Australia - Volume One Part J9D4(2), pages 506 to 507

Why are the changes beneficial?

A constant overhead expense for a building is the energy costs. The old saying remains true - if you do not measure, you cannot improve. Understanding how a building is performing with respect to energy consumption begins with having access to the right information, which should be easy to find and interpret.

The integration of onsite renewable energy sources, battery storage and EV charger monitoring into a centralised single user interface alongside the other building's loads represents a significant advancement. This enables decision makers to not only gain a better insight into the acquisition and utilisation of energy within a building, but also to have the tools to take action. The data platform provides information which can be utilised for benchmarking against industry standards and business goals, as well as identifying additional energy efficiency opportunities. Provision to include infrastructure for EV charging, PV solar and batteries allows decision makers to act quicker and track the returns more efficiently.

A well-functioning energy monitoring system can provide benefits such as:

- Valuable insight into the building performance, with respect to energy targets and other requirements as highlighted by the NCC Section J;
- Facilitate the implementation of an energy plan and manage peak demand more effectively;
- Identify irregularities, which can assist to prevent downtime and proactive maintenance scheduling;
- Improved reliability and performance that can help achieve better returns and higher occupancy; and
- Greater visibility, which helps protect assets and improve capital value.

Improving building energy efficiency is one of the quickest and most cost-effective ways to reduce greenhouse gas emissions and help mitigate climate change. While there are many other important updates to other sections of the 2022 NCC, the amendments to Section J provide an important step towards raising the standards of Australian buildings and reducing the sector's carbon footprint.

NHP's energy monitoring solutions

NHP has a wide range of energy meters available to monitor all types of loads within your building. NHP's Concept Panelboards series includes single, double or triple -metered distribution boards fitted with NHP's dual energy meter EM270, which is capable of monitoring two three-phase loads or six single-phase loads within the single meter. This means that light, power and HVAC circuits within the panelboard can be monitored independently of one another, simplifying the analysis. HVAC, lighting and water storage control is also available via time clocks, PE cells and sensors reducing unnecessary consumption.

All these systems allow more efficient management of the technologies contained within the Concept Panelboard and provide switchgear health analytics. For greater granularity, the WM50 branch circuit energy meter can monitor up to 96x circuits from the single unit, giving the option to monitor energy usage down to a single circuit and appliance.

Centralising all the energy data into a single user interface is a key requirement of the 2022 NCC, as highlighted above in Part J9D3 (3). An easy solution to achieve this is NHP's SMART eBox, an all-in-one enclosed energy management system.

The SMART eBox is a powerful energy monitoring tool that collates, stores and displays data from various energy meters, smart Building Management System (BMS), power distribution devices and other webserver-based energy management systems (such as VMU-C). The data is displayed on an intuitive and configurable user interface accessible through any web browser. Featuring an in-built webserver, all captured information in the SMART eBox is remotely accessible via an internet connection.

Additionally, the SMART eBox can be used as a gateway to centralise and transfer the data to a Building Management System BMS or SCADA. It also offers flexibility to transfer data to Microsoft Azure or Amazon AWS cloud-based systems. The SMART eBox is built and commissioned by NHP, which means by combining with NHP's metered panelboards, it becomes a flexible, easy-to-use and quick-to-install solution that ticks all the boxes for Section J9D3.

For larger installations, the EM² provides an advanced system with valuable insights into building operations and improvement opportunities. It can integrate with energy, water and gas measuring devices along with other facility systems. EM² delivers a complete building intelligence platform, including advanced analytics, fault detection, smart alerts and in-built reporting capabilities.

NHP's electric vehicle charger facility solutions

NHP Concept Plus distribution boards have standardised models specifically dedicated for electric vehicle distribution. They can fit up to 24 single-phase chargers and options are available for three-phase charger versions or a mixture of both. NHP Concept Plus EV distribution boards have options to be fitted with an energy meter and our very own NHP Load Management System for EV chargers.

NHP's Load Management System optimises the charging process by dynamically distributing power among multiple chargers. This means that you can charge more vehicles in less time without overloading your power grid. It continuously monitors the power consumption of each charger and adjusts the charging rate in accordance with the total available power from the building, ensuring that each vehicle gets the power it needs without any disruption. The NHP Load Management System can be used to satisfy Part J9D4 (2a) as a charging control system that can manage charging of electric vehicles in response to total building demand.

NHP's EV chargers come in a wide range, are elegantly designed, flexible, practical, efficient and fast. The Delta AC Max 22kW is a market leader in both function and appearance and is well suited for both commercial and residential requirements. It is a single and three-phase compatible EV charger in one, meaning greater flexibility. Input wires can enter the charger from various points, enabling easier installation, regardless of concrete walls, plaster/timber walls or steel posts.

The Delta AC Max Smart also includes an in-built modem with Ethernet/Wi-Fi/SIM card slot connection types. This enables the charger to have the communication capability to remotely track its energy usage and send the data to a centralised user interface such as NHP's SMART eBox and manage charging through NHP's Load Management System.

Additional energy efficiency

Technologies for energy efficiency available from NHP

Aside from meeting the Section J NCC requirements, the benefits of achieving energy efficiency include the reduction of operational costs, the flexibility of building design and saving time on maintenance. Not all technologies that are currently available on the market have been utilised in this version of the NCC requirements. As the NCC covers provisions for all building types, the energy efficiency requirements have been kept to loads that buildings in all industries are likely to use. For sites that have larger energy usage, additional steps towards sustainability are worth considering in order to maximise savings on daily energy usage costs. Below is a list of technologies that can be utilised to reduce energy costs and greenhouse gas emissions of a business.

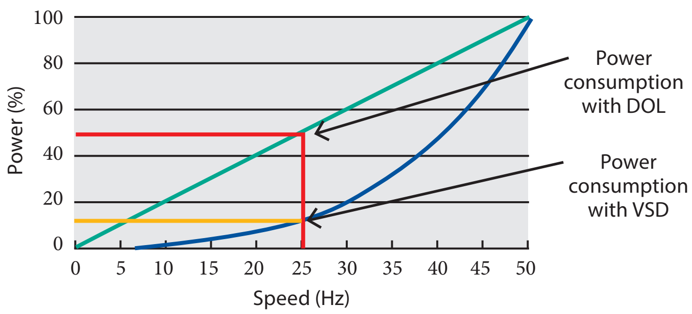
Soft starters

Designed to maximise the efficiency of motor starts and stops. Using a soft starter instead of a traditional starter solution can help reduce the amount of wear and tear on motors and equipment by reducing the energy supplied to the motor during startup. The SMC-50 soft starter from Allen-Bradley includes system maintenance and equipment health tracking for ease of maintenance management, as well as power factor calculations for energy consumption tracking.

Variable speed drives (VSDs)

By running motors at lower speeds, the use of a VSD can save up to 50% of the power usage. The Allen-Bradley PowerFlex range has communication capabilities, which allows it to monitor the motor's health to identify potential issues and opportunities for improvement.

Pump power versus speed



Smart switchboards

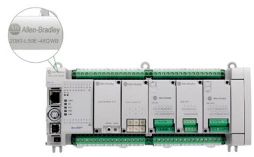
An AS/NZS 61439 design verified solution which allows for the integration of metering, circuit breakers and panel mount sub circuits to provide energy demand behaviour. The Terasaki air circuit breaker with a 'cluster on body' design allows for complete maintenance with minimal downtime. Terasaki's TemBreak Pro SMART Electronic MCCB combines protection and energy monitoring to take smart power distribution to the next level.

Power quality solutions

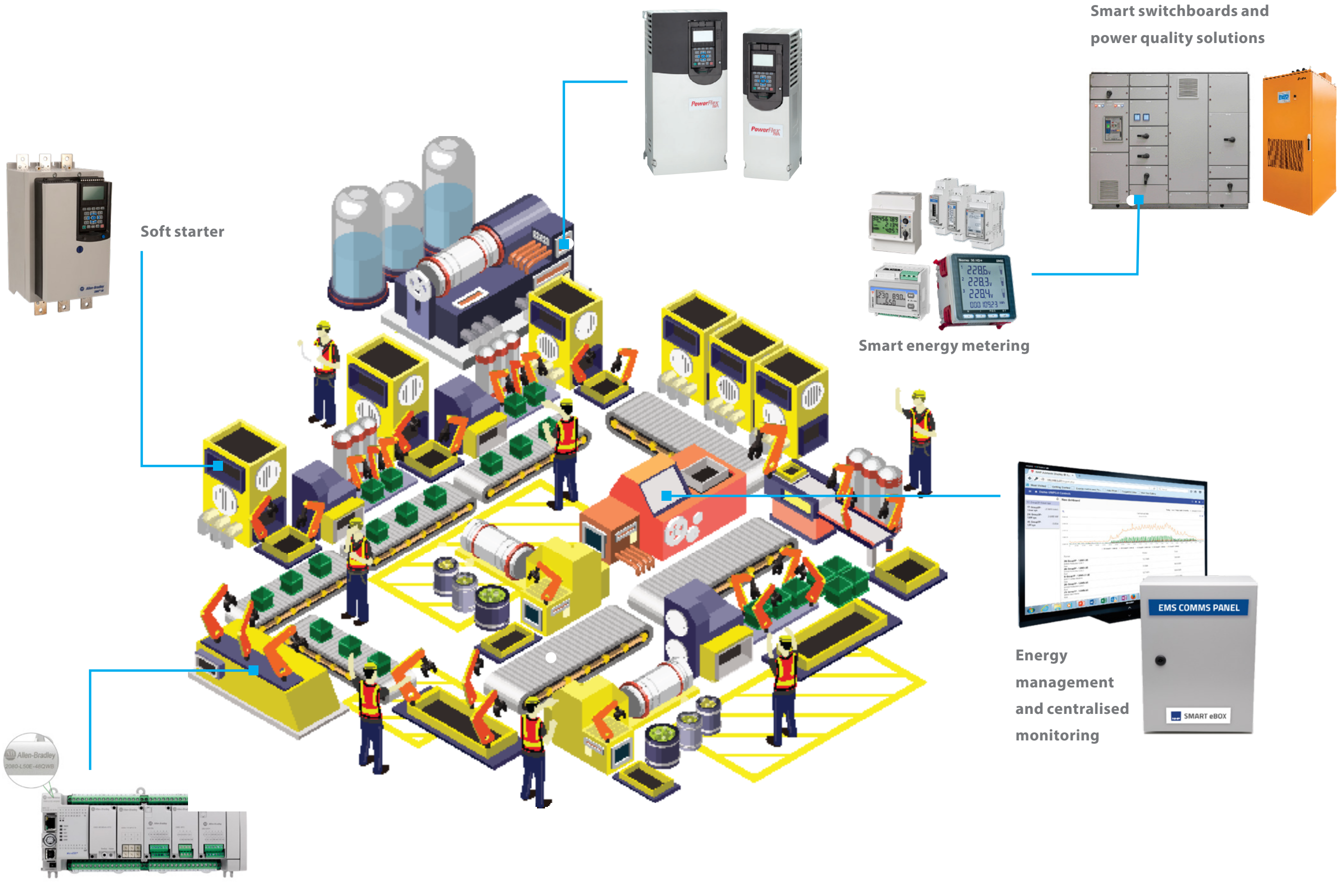
Power factor correction and harmonic mitigation ensures the site has clean, balanced power, which contributes to the longevity of the site's equipment lifecycle, as well as reducing the energy cost on wasted power (e.g., cost of power factor).

Allen-Bradley Micro800 controllers

These programmable logic controllers can be used in building automation systems to monitor and control various systems such as lighting, HVAC, security, fire protection and energy management. The Micro800™ controller can be programmed to minimise energy wasted when a building is occupied, such as auto switching of lights based on occupancy, ambient light levels or adjustment of temperature and humidity levels depending upon real time conditions. With its great I/O, integration and flexible communication capabilities, you can engineer an efficient building automation system!



Architecture example - factory



Appendix 1

NCC building classifications[6]	Description
Class 1	Single dwelling residential building (residential house)
Class 2	Multi-dwelling residential building or sole-occupancy unit (apartments)
Class 3	Accommodation building other than class 1, 2 and 9 (residential parts of hospitals, elderly living facilities, boarding houses and hostels)
Class 4	Residential part within a commercial building (caretaker's residence in a factory or storage facility)
Class 5	Office buildings (GP offices included in this class)
Class 6	Retail buildings or spaces
Class 7	Warehouses and storage buildings
Class 8	Factory and manufacturing buildings
Class 9	Public use buildings (schools, religious or civil buildings, hospitals and assisted living facilities with 24-hour care)

6) Understanding the NCC, Building classification - https://www.abcb.gov.au/Resources/Publications/Education-Training/Building-classifications

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11ADV 06/23