

# ALEX AVENUE PUBLIC SCHOOL

Alex Avenue, Schofields NSW 2762  
NCC 2016 Section J JV3 Report

05<sup>th</sup> April 2019

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**Prepared For:**

Richard Crooks

Level 3, 4 Broadcast Way,

Artarmon NSW 2064

**Meinhardt**

Level 12, 501 Swanston Street  
Melbourne, Vic 3000

P. 03 8676 1200 | F. 03 8676 1201  
[www.meinhardtgroup.com](http://www.meinhardtgroup.com)

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## Document Amendments

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# 1. Executive Summary

Meinhardt has been engaged to review the proposed Alex Avenue Public School at Schofield NSW, against the requirements for the National Construction Code 2016 provisions for energy efficiency under Section J (NCC 2016 Volume 1, Part J).

Further to the Section J *Deemed-to-Satisfy* assessment conducted by Meinhardt, this report provides the outcome of the Section J assessment using the performance method of verification (JV3) in order to allow for glazing and insulation variations within the development.

Energy simulation was undertaken to provide a performance method of verification (JV3) in relation to NCC Section J. This assessment considered the feasibility of insulation and glazing performance variations in selected areas, compensation for the reduced performance has been achieved through improved glazing performance in areas where the DTS glazing requirements were not very stringent and now benefit from a more uniform glazing performance (as proposed under JV3).

The JV3 method of verification requires the comparison of a reference building (Case 1) to two proposed building models, one having the same services as the reference building (Case 2) and one having the proposed services (Case 3).

The following table details the computer simulation results for the simulation cases undertaken in compliance with the JV3 Verification Method. The simulation process is detailed as part of this report.

	<b>CASE 1 Reference Building [DTS Fabric and DTS services]</b>	<b>CASE 2 Proposed Building [Proposed Fabric and DTS services] *</b>	<b>CASE 3 Proposed Building [Proposed Fabric and Proposed services] *</b>
<b>Annual Energy Consumption (normalised consumption)</b>	884 MJ/m2	822 MJ/m2	822 MJ/m2

*\* The proposed building services design is not yet finalised, in compliance with the JV3 protocol, the 'proposed services' under the modelling case 3 have been conservatively set at the 'DTS services' level. The results of modelling cases 2 and 3 are therefore the same (822 MJ/m2).*

The results show that the total annual energy consumption of the Proposed Building models is less than the annual energy consumption of the Reference Building (DTS) which benefits from a more uniform glazing performance. The proposed building is therefore compliant with the performance requirement of JP1 under JV3 method of verification.

The following table outlines the glazing and thermal insulation levels utilised in the Proposed Building simulations. Based on this assessment, systems with performance level of equal or better will achieve NCC Part J compliance under the JV3 method of verification.

<b>Item</b>	<b>Required minimum total system R-Value and glazing performance</b>
Ceiling / Roof	R4.0
External walls	R2.8
Internal walls	R1.8
Floor	<ul style="list-style-type: none"> <li>Concrete slab on ground: No thermal insulation required</li> <li>Internal floor slabs between conditioned space: No thermal insulation required</li> <li>Suspended floors above un-conditioned: R2</li> </ul>
Glazing performance (AFRC - Total system performance values)	<b>Addressed through JV3 assessment (identical glazing performance has been nominated to improve consistency)</b> <ul style="list-style-type: none"> <li>Total U-value <math>\leq</math> 4.0 and total Solar Heat Gain Coefficient (SHGC) <math>\leq</math> 0.37</li> </ul>

**A summary of the NCC Section J requirements is provided in section 7 of this report.**

Subject to satisfaction of the provisions outlined in this report, this development will comply with the requirements of Section J of NCC 2016.

## 2. Introduction

Meinhardt has been engaged to review the proposed Alex Avenue Public School at Schofield NSW, against the requirements for the National Construction Code 2016 provisions for energy efficiency under Section J (NCC 2016 Volume 1, Part J).

Energy simulation was undertaken to provide a performance method of verification (JV3) in relation to NCC Section J. This assessment considered the feasibility of insulation and glazing performance variations in selected areas, compensation for the reduced performance has been achieved through improved glazing performance in areas where the DTS glazing requirements were not very stringent and now benefit from a more uniform glazing performance (as proposed under JV3).

The assessment process under JV3 requires a comparison of simulated annual energy consumption of a reference building to the proposed building utilising the required assumptions and inputs for JV3. The reference building is based on the proposed building with the performance of all features set to the minimum performance in order to achieve DTS compliance with the provisions of Part J1 to J8.

The proposed building in this assessment also utilises DTS compliance performance of the provisions of Part J3 to J7 excluding those of Part J2 in relation to the glazing requirements as outlined in section 7 of this report.

On this basis, the outcome of this JV3 assessment demonstrates achievement of compliance for the proposed glazing and insulation variations for the building (outlined in section 7). Compliance with the DTS provisions for all the other parts is therefore required by all the applicable design trades of the development.

A summary of the NCC Section J requirements for the development is provided in section 7 of this report.

Compliance with JP1 has been verified in accordance with JV3 requirements and utilising Carrier E20-II HAP energy modelling software package that is ABCB protocol compliant.

The Reference and Proposed Building computer models were generated using an ABCB compliant energy simulation software and strictly in accordance with the following guidelines:

- NCC Section J Part JV3 Verification Using a Reference Building.
- NCC Section J – Energy Efficiency JV3 Handbook 2018.



Location – Alex Avenue Public School, Schofields NSW– Source: Google Map

### 3. National Construction Code - Section J

The climate zone is defined by the NCC as 'an area for specific locations, having energy efficiency provisions based upon a range of similar climatic characteristics.'

The National Construction Code (NCC) 2016 includes mandatory minimum energy performance requirements for buildings in Section J. The objective is to reduce building greenhouse gas emissions by efficiently using operational energy. Section J is focused on establishing minimum acceptable practice in the building industry.

To meet the performance requirements JP1 and JP3 of Section J of the NCC, compliance of the design and function of the building can be demonstrated with the Deemed-To-Satisfy (DTS) provisions of Section J Parts J1 to J8. Alternatively, achievement of the performance requirements can be demonstrated through Verification Method JV3 in lieu of individual provisions for some or all the provisions under Parts J1 to J8.

- Part J1 Building Fabric relates to the building fabric and minimum thermal performance for constructions according to climate zone for roofs, ceilings, roof lights, walls, and floors.
- Part J2 Glazing relates to the control of heat loss and heat gain within specified limits through vision glazing that forms part of the envelope.
- Part J3 Building Sealing details requirements in order to restrict unwanted infiltration into a building.
- Part J5 Air-Conditioning and Ventilation Systems details requirements to ensure these services are used and use energy in an efficient manner.
- Part J6 Artificial Lighting and Power details requirements for lighting and power to ensure energy is used efficiently by these systems.
- Part J7 Hot Water Supply and Swimming Pool & Spa Pool Plant details requirements for hot water supply design.
- Part J8 Facilities for Energy Monitoring

### 3.1 NCC JV3 - Verification using a reference building

To demonstrate compliance with Verification Method JV3, a thermal calculation method must be used to demonstrate that the annual energy consumption of the proposed building is not more than the annual energy consumption of a reference building where the buildings have been modelled in accordance with the requirements of NCC Section J JV3.

The following section summarises the process of performing the NCC Section J Alternative Solution JV3 used in this study:

**Modelling Case 1** (Reference Building): Calculated the theoretical annual energy consumption allowance by modelling a reference building. This was the DTS complying building based on the criteria in JV3 (d)(i) in the following table.

**Modelling Case 2:** Calculated the theoretical annual energy consumption of the proposed Alternative Solution with the services modelled as if they were the same as those of the reference building [JV3 (a)(ii)].

**Modelling Case 3:** Calculated the theoretical annual energy consumption of the proposed Alternative Solution (building and services) based on the criteria in JV3 (a)(i).

The theoretical annual energy consumption calculated in cases 2 and 3 was then compared to the annual energy consumption allowance calculated in case 1 to ensure that in both cases, the annual energy consumption of the reference building in case 1 is not exceeded by that in cases 2 and 3.

The following table outlines the BCA requirements for the JV3 method of verification considered in all the modelling runs for the modelled areas.

<p>(a) Compliance with JP1 is verified when it is determined that the <i>annual energy consumption</i> of the proposed building with its <i>services</i> is not more than the <i>annual energy consumption</i> of a <i>reference building</i> when—</p> <ul style="list-style-type: none"> <li>(i) the proposed building is modelled with the proposed <i>services</i>; and</li> <li>(ii) the proposed building is modelled with the same <i>services</i> as the <i>reference building</i>.</li> </ul>
<p>(b) The <i>annual energy consumption</i> of the proposed building in (a) may be reduced by the amount of energy obtained from—</p> <ul style="list-style-type: none"> <li>(i) an on-site <i>renewable energy</i> source; or</li> <li>(ii) another process as reclaimed energy.</li> </ul>
<p>(c) The <i>annual energy consumption</i> calculation method must comply with the ABCB Protocol for Building Energy Analysis Software.</p>
<p>(d) The <i>annual energy consumption</i> in (a) must be calculated—</p> <ul style="list-style-type: none"> <li>(i) for the <i>reference building</i>, using— <ul style="list-style-type: none"> <li>(A) the <i>Deemed-to-Satisfy Provisions</i> for Parts J1 to J7 but including only the minimum amount of mechanical ventilation <i>required</i> by Part F4; and</li> <li>(B) a solar absorptance of 0.6 for <i>external walls</i> and 0.7 for roofs; and</li> <li>(C) the maximum <i>illumination power density</i> without any increase for a control device <i>illumination power density</i> adjustment factor; and</li> <li>(D) <i>air-conditioning</i> with the <i>conditioned space</i> temperature within the range of 18° CDB to 26° CDB for 98% of the plant operation time; and</li> <li>(E) the profiles for occupancy, <i>air-conditioning</i>, lighting and internal heat gains from people, hot meals, appliances, equipment and hot water supply systems— <ul style="list-style-type: none"> <li>(aa) of the actual building— <ul style="list-style-type: none"> <li>(AA) if the operating hours per year are not less than 2500; or</li> <li>(BB) if the daily operating profiles are not listed in Specification JV; or</li> </ul> </li> <li>(bb) of Specification JV; and</li> </ul> </li> <li>(F) infiltration values— <ul style="list-style-type: none"> <li>(aa) for a perimeter zone of depth equal to the floor-to-ceiling height, when pressurising plant is operating, 1.0 air change per hour; and</li> <li>(bb) for the whole building, when pressurising plant is not operating, 1.5 air change per hour; and</li> </ul> </li> </ul> </li> <li>(ii) for both the proposed building and the <i>reference building</i> using the same— <ul style="list-style-type: none"> <li>(A) <i>annual energy consumption</i> calculation method; and</li> <li>(B) location, being either the location where the building is to be constructed if appropriate climatic data is available, or the nearest location with similar climatic conditions, for which climatic data is available; and</li> </ul> </li> </ul>

<ul style="list-style-type: none"><li>(C) adjacent structures and features; and</li><li>(D) environmental conditions such as ground reflectivity, sky and ground form factors, temperature of external bounding surfaces, air velocities across external surfaces and the like; and</li><li>(E) orientation; and</li><li>(F) building form, including—<ul style="list-style-type: none"><li>(aa) the roof geometry; and</li><li>(bb) the floor plan; and</li><li>(cc) the number of <i>storeys</i>; and</li><li>(dd) the ground to lowest floor arrangements; and</li><li>(ee) the size and location of <i>glazing</i>; and</li></ul></li><li>(G) external doors; and</li><li>(H) testing standards including for insulation, <i>glazing</i>, water heater and package <i>air-conditioning</i> equipment; and</li><li>(I) thermal resistance of air films including any adjustment factors, moisture content of materials; and</li><li>(J) dimensions of external, internal and separating walls; and</li><li>(K) surface density of <i>envelope</i> walls over 220 kg/m<sup>2</sup>; and</li><li>(L) quality of insulation installation; and</li><li>(M) assumptions and means of calculating the temperature difference across <i>air-conditioning</i> zone boundaries; and</li><li>(N) floor coverings and furniture and fittings density; and</li><li>(O) internal shading devices, their colour and their criteria for operation; and</li><li>(P) number, sizes and floors served by lifts and escalators; and</li><li>(Q) range and type of <i>services</i> and energy sources other than energy generated on-site from sources that do not emit greenhouse gases such as solar and wind power; and</li><li>(R) internal artificial lighting levels; and</li><li>(S) internal heat gains including people, lighting, appliances, meals and other electric power loads; and</li><li>(T) <i>air-conditioning</i> system configuration and zones; and</li><li>(U) daily and annual profiles of the—<ul style="list-style-type: none"><li>(aa) building occupancy; and</li><li>(bb) operation of <i>services</i>; and</li></ul></li><li>(V) range of internal temperatures and plant operating times; and</li><li>(W) supply hot water temperature and rate of use; and</li><li>(X) infiltration values unless there are specific additional sealing provisions or pressure testing to be undertaken; and</li><li>(Y) unit capacity and sequencing for water heaters, refrigeration chillers and heat rejection equipment such as cooling towers; and</li><li>(Z) metabolic rate for people; and</li><li>(iii) for the proposed building using a solar absorptance for the roof and walls 0.05 higher than that proposed; and</li></ul>
<p>(e) Where the <i>annual energy consumption</i> of the hot water supply or the lifts and escalators are the same in the proposed building and the <i>reference building</i>, they may be omitted from the calculation of both the proposed building and the <i>reference building</i>.</p>
<p>(f) A lift in a building with more than one classification may be proportioned according to the number of <i>storeys</i> of the part for which the <i>annual energy consumption</i> is being calculated.</p>
<p>(g) The design must include—</p> <ul style="list-style-type: none"><li>(i) the ability to achieve all the criteria used in the <i>annual energy consumption</i> calculation method such as having an automatic operation controlling device capable of turning lighting, and <i>air-conditioning</i> plant on and off in accordance with the occupancy and operating profiles used; and</li><li>(ii) compliance with—<ul style="list-style-type: none"><li>(A) J1.2 for general thermal construction; and</li><li>(B) J1.3(c) for compensation for a loss of ceiling insulation; and</li><li>(C) J1.6(a)(ii), J1.6(c) and J1.6(d) for floor edge insulation; and</li><li>(D) BS 7190 for testing a water heater; and</li><li>(E) AS/NZS 3823.1.2 at test condition T1 for testing package <i>air-conditioning</i> equipment; and</li><li>(F) AHRI 550/590 for testing a refrigeration chiller.</li></ul></li></ul>

## 3.2 General Definitions

### Envelope

In the NCC, this term is not limited to the building's outer shell, but also includes those continuous elements that separate a conditioned space from a non-conditioned space. For example, the floor between a plant room and an office space may be part of the envelope, rather than the outer shell. A non-conditioned space may be included within the envelope under certain circumstances.

### Glazing

The glazing definition needs to be read in conjunction with the definition of a window and roof light. It can include a glazed door. For the purposes of Section J, the glazing provides an aperture by which light and energy can flow into or from the conditioned space. Glazing includes the glass and any frame system.

### Annual energy consumption

This is the amount of energy calculated to be consumed under certain specific conditions in consideration of operating profiles, internal loads and plant efficiencies. It is used in Verification Method JV3 that compares the calculated energy consumption with that of a complying reference building. It should not be considered a prediction of the actual energy consumption of an actual building as there could be major differences in the conditions such as the internal loads of the building and the hours of operation. It differs from annual energy load because it is affected by the type of heating or cooling appliance used, for example, heating by a reverse cycle air-conditioner uses less than half the energy that a gas fired heater would use to meet the same annual energy load.

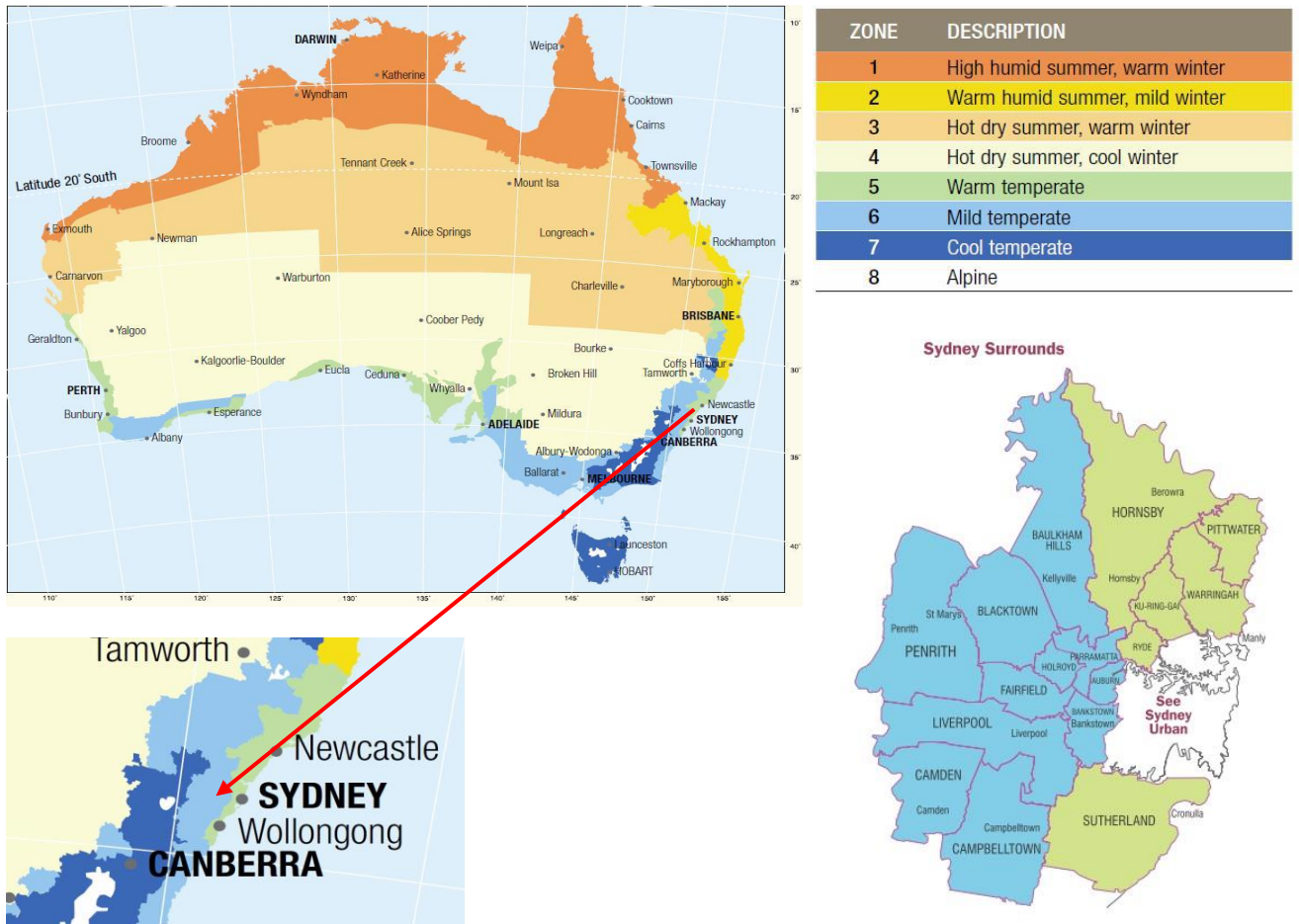
### Conditioned space

A conditioned space is one likely to be air-conditioned and not limited to the areas that are actually air-conditioned. In some cases, chilled and hot water may be reticulated through duct risers as part of the building design to enable conditioning to be provided as part of a later fitout. A conditioned space may include a ceiling or under-floor space that is open to the conditioned space such as a space separated by only a perforated or grille ceiling or floor where the space is a supply air or return air plenum.

## 4. Building Description

The climate zone is defined by the NCC as ‘an area for specific locations, having energy efficiency provisions based upon a range of similar climatic characteristics.

The development will be located in Schofield NSW which is within Climate Zone 6 of National Construction Code (Figure A1.1 - NCC 2016).



Climate Zone for the development – Source: NCC Climate Zone Map

### Building Classification:

NCC CLASSIFICATION	VERIFICATION METHOD
9b	JV3 (Performance Solution)



## 4.1 Scope of Analysis

The scope of this report is based on;

1. Review and interpretation architectural drawings provided by the project architect to determine the Section J envelope and orientation of the building for assessment.
2. Part J2 Glazing compliance (see sections 4 and 7.2 of the report)
  - Review and interpretation of façade and glazing dimensions based on architectural drawings
  - Establish glazed areas of building envelope to conduct Part J2 DTS analysis.
  - Input parameters (façade area, external shading devices and glazing dimensions) into the NCC Glazing Calculator spreadsheet.
3. JV3 compliance (see Section 5)
  - Conduct energy modelling for a reference building using the DTS results of the Part J2 assessment and inputs reflecting achievement of minimum performance under the DTS provisions of Part J1-J8. The energy modelling conducted is based on geometry development from the architectural and facade documentation.
  - Conduct two energy modelling runs for a proposed building using glazing system thermal performances to reflect products in alignment with the architectural design intent.
  - Comparison of the annual energy consumption to determine JV3 compliance for the building with proposed level of glazing and wall insulation performance.

## 4.2 Information Used

The assessment within the report presents the requirements of Section J Part JV3 with respect to the documented design of the development. The assessment format generally follows the layout of Clauses within NCC Section J, to demonstrate the compliance requirements for each clause of Part J2.

Our review is based on the following architectural drawings provided by the project architect.

DRAWING LIST - DETAIL DESIGN							
Sheet Number	Sheet Name	Scale	Sheet Issue Date	Current Revision	Discipline	Package	
0000 - 0999 - TITLE PAGE/LOCATION PLAN							
0000	COVER SHEET / DRAWING INDEX	NTS	05.03.2019	A	ARCHITECTURE	DETAILED DESIGN	
0100	LEGENDS & ABBREVIATIONS	NA	05.03.2019	A	ARCHITECTURE	DETAILED DESIGN	
1100 - 1199 - SITE PLANS							
1100	SITE PLAN	1:300	05.03.2019	A	ARCHITECTURE	DETAILED DESIGN	
1150	GROUND LEVEL PLAN	1:300	05.03.2019	A	ARCHITECTURE	DETAILED DESIGN	
1151	SITE PLAN - LEVEL 1	1:300	05.03.2019	A	ARCHITECTURE	DETAILED DESIGN	
2000 - 2099 - GENERAL ARRANGEMENT PLANS							
2000	GENERAL ARRANGEMENT PLAN - GROUND LEVEL - BLOCK C	1:100	05.03.2019	A	ARCHITECTURE	DETAILED DESIGN	
2001	GENERAL ARRANGEMENT PLAN - GROUND LEVEL - BLOCK A	1:100	05.03.2019	A	ARCHITECTURE	DETAILED DESIGN	
2002	GENERAL ARRANGEMENT PLAN - GROUND LEVEL - BLOCK B1	1:100	05.03.2019	A	ARCHITECTURE	DETAILED DESIGN	
2003	GENERAL ARRANGEMENT PLAN - GROUND LEVEL - BLOCK B2	1:100	05.03.2019	A	ARCHITECTURE	DETAILED DESIGN	
2004	GENERAL ARRANGEMENT PLAN - GROUND LEVEL - BLOCK B3	1:100	05.03.2019	A	ARCHITECTURE	DETAILED DESIGN	
2005	GENERAL ARRANGEMENT PLAN - GROUND LEVEL - BLOCK B4	1:100	05.03.2019	A	ARCHITECTURE	DETAILED DESIGN	
2011	GENERAL ARRANGEMENT PLAN - LEVEL 1 - BLOCK A	1:100	05.03.2019	A	ARCHITECTURE	DETAILED DESIGN	
2012	GENERAL ARRANGEMENT PLAN - LEVEL 1 - BLOCK B1	1:100	05.03.2019	A	ARCHITECTURE	DETAILED DESIGN	
2013	GENERAL ARRANGEMENT PLAN - LEVEL 1 - BLOCK B2	1:100	05.03.2019	A	ARCHITECTURE	DETAILED DESIGN	
2014	GENERAL ARRANGEMENT PLAN - LEVEL 1 - BLOCK B3	1:100	05.03.2019	A	ARCHITECTURE	DETAILED DESIGN	
2015	GENERAL ARRANGEMENT PLAN - LEVEL 1 - BLOCK B4	1:100	05.03.2019	A	ARCHITECTURE	DETAILED DESIGN	
2020	ROOF PLAN - BLOCK C	1:100	05.03.2019	A	ARCHITECTURE	DETAILED DESIGN	
2021	ROOF PLAN - BLOCK A	1:100	05.03.2019	A	ARCHITECTURE	DETAILED DESIGN	
2022	ROOF PLAN - BLOCK B1	1:100	05.03.2019	A	ARCHITECTURE	DETAILED DESIGN	
2023	ROOF PLAN - BLOCK B2	1:100	05.03.2019	A	ARCHITECTURE	DETAILED DESIGN	
2024	ROOF PLAN - BLOCK B3	1:100	05.03.2019	A	ARCHITECTURE	DETAILED DESIGN	
2025	ROOF PLAN - BLOCK B4	1:100	05.03.2019	A	ARCHITECTURE	DETAILED DESIGN	
3000 - 3099 - ELEVATIONS							
3000	ELEVATIONS - BLOCK C	1:100	05.03.2019	A	ARCHITECTURE	DETAILED DESIGN	
3001	ELEVATIONS - BLOCK A	1:100	05.03.2019	A	ARCHITECTURE	DETAILED DESIGN	
3002	ELEVATIONS - BLOCK B1	1:100	05.03.2019	A	ARCHITECTURE	DETAILED DESIGN	
3003	ELEVATIONS - BLOCK B2	1:100	05.03.2019	A	ARCHITECTURE	DETAILED DESIGN	
3004	ELEVATIONS - BLOCK B3	1:100	05.03.2019	A	ARCHITECTURE	DETAILED DESIGN	
3005	ELEVATIONS - BLOCK B4	1:100	05.03.2019	A	ARCHITECTURE	DETAILED DESIGN	
Grand total: 28							

Computer simulations were conducted using the NCC compliant energy simulation software and according to the following provisions and guidelines:

- NCC Section J Part JV3 Verification Using a Reference Building.
- NCC Section J – Energy Efficiency JV3 Handbook 2018.

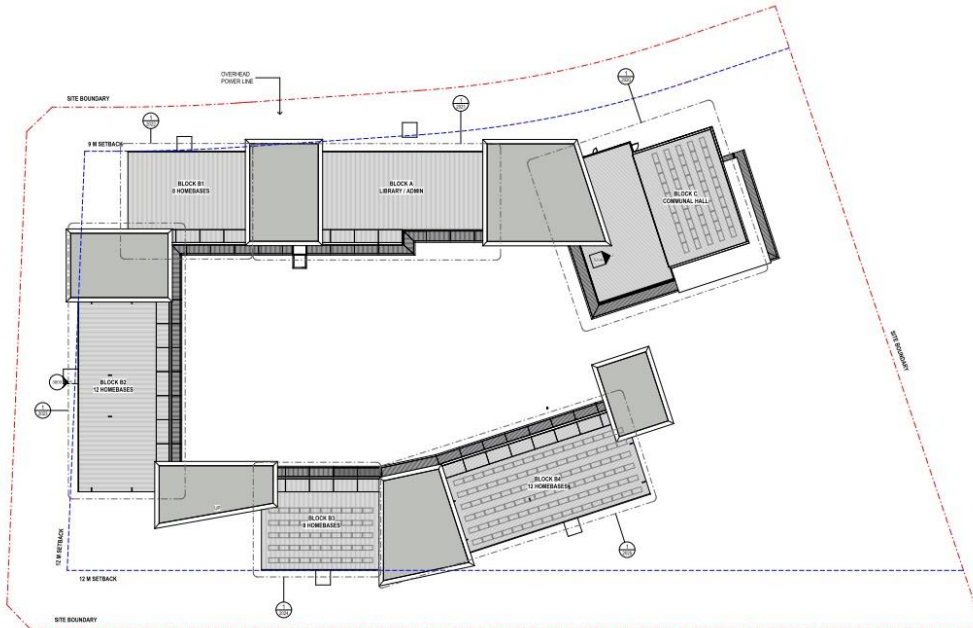
## 4.3 General Assumptions for Glazing and JV3 Analysis

- Glazing areas defined as glazing in the building envelope (as per Section J) include the area of any associated framing.
- The glazing thermal performance properties are inclusive of frame effects (Total system: Glass + Frame).
- Relevant shading must comply with the requirements of J2.5 (a) of the NCC 2016.
- With the exception of Part J1-2 (outlined in section 7.2 of this report), all other elements of the building design are required to achieve the DTS compliance provisions of NCC 2016 under Section J.

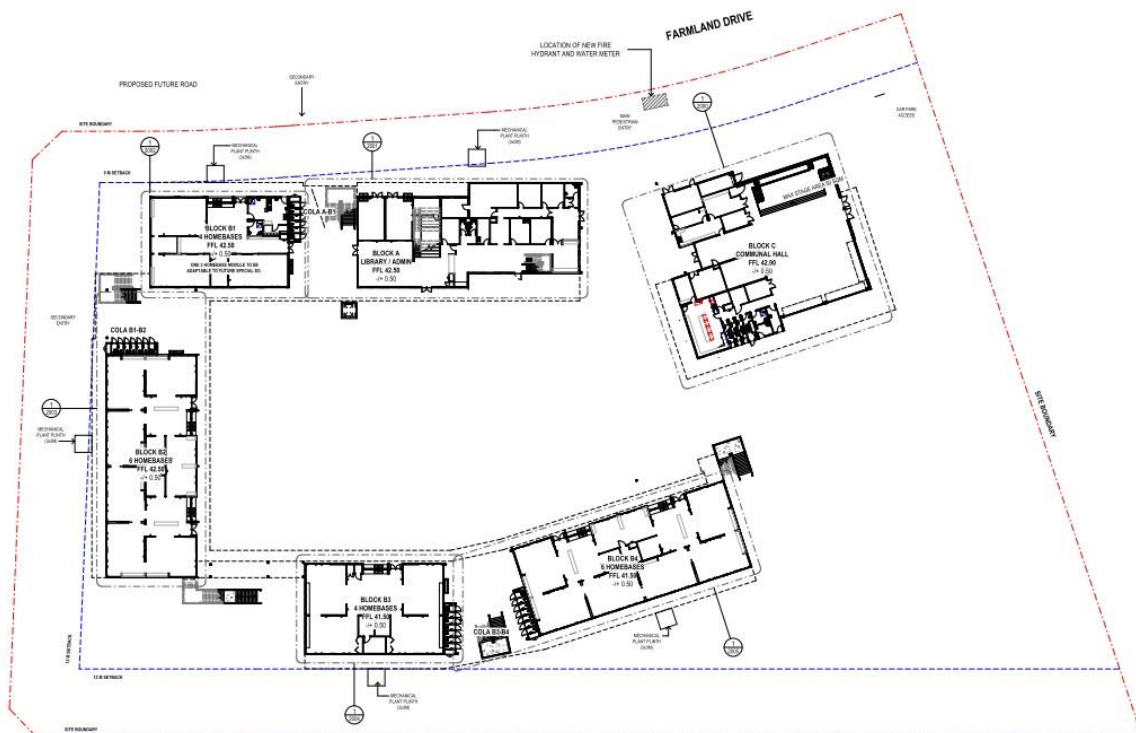
## 4.4 Architectural Drawings

Selected architectural plans and elevations for the proposed development are provided below.

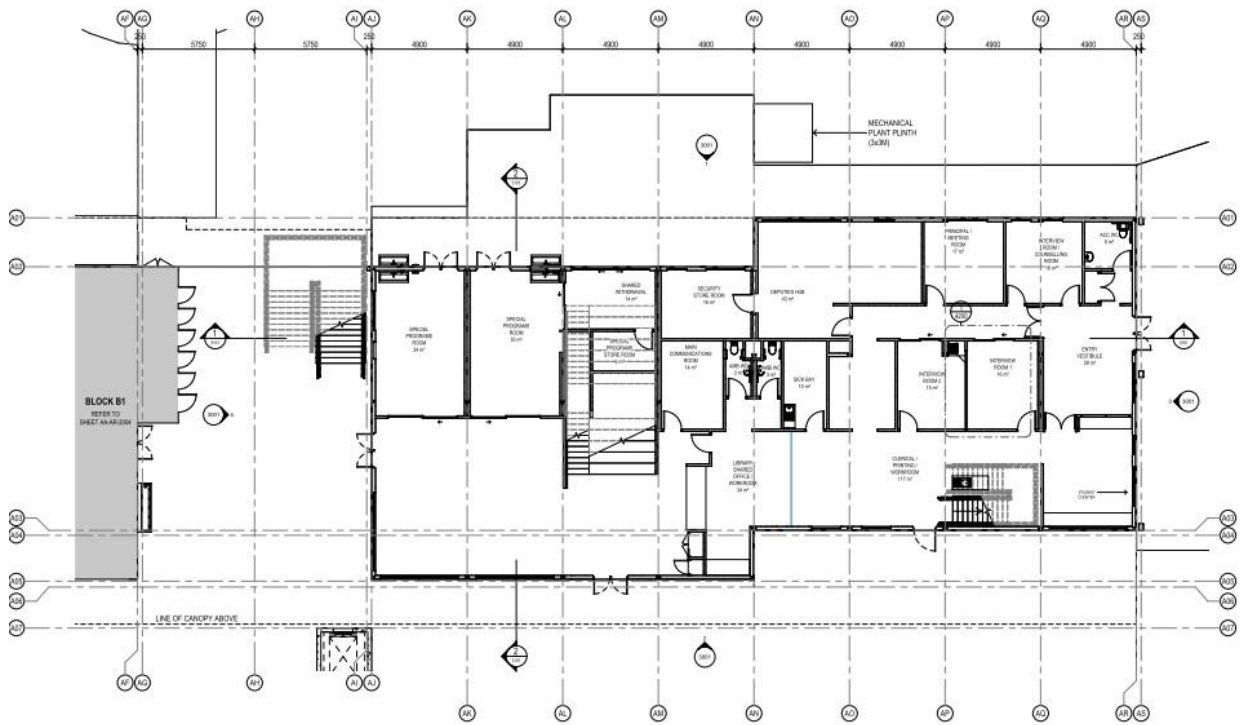
### Proposed Site Plan:



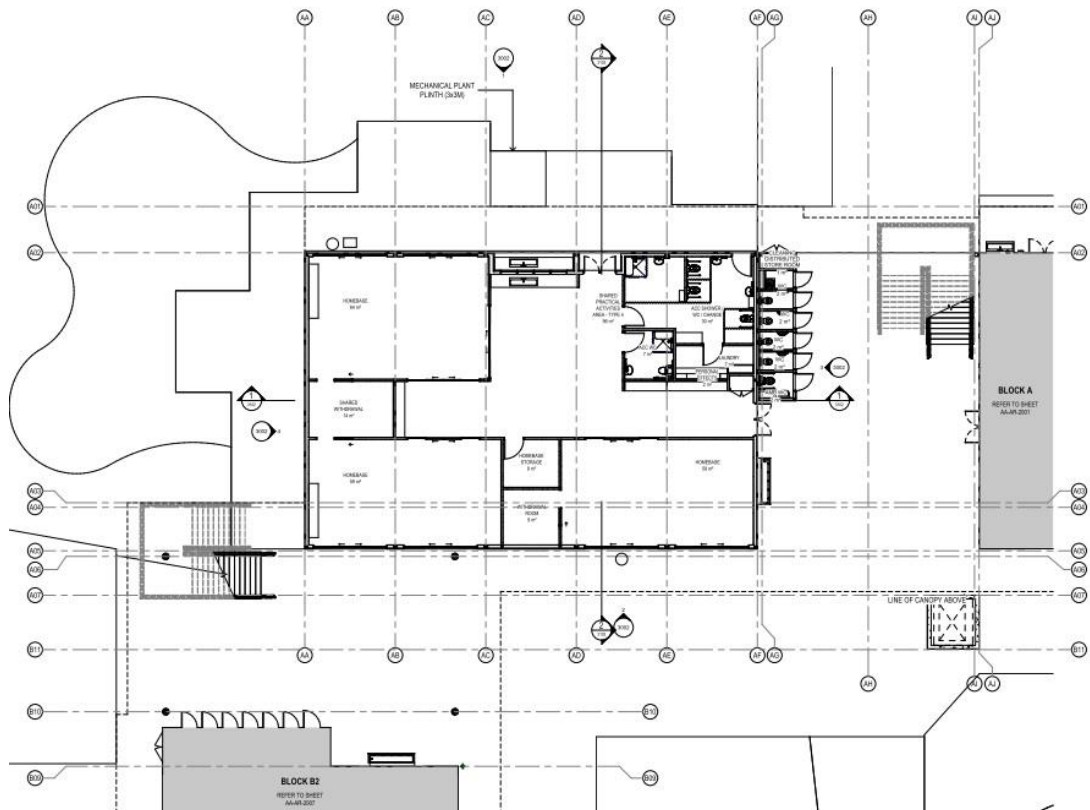
### Ground Floor Plan:



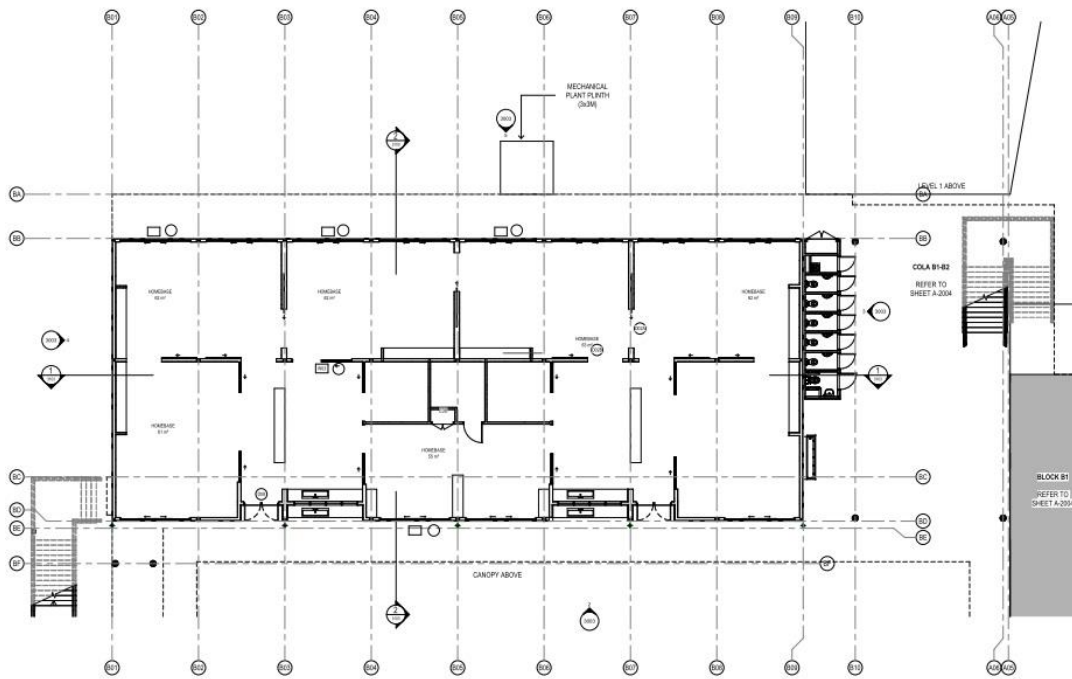
**Ground Floor – Block A:**



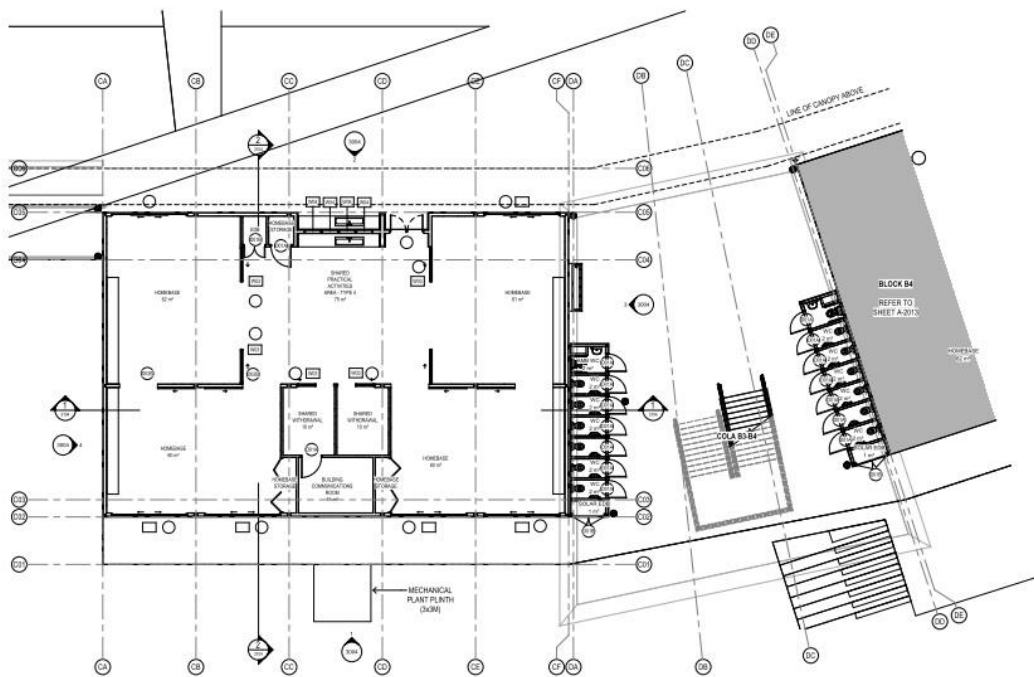
**Ground Floor – Block B1:**



**Ground Floor – Block B2:**

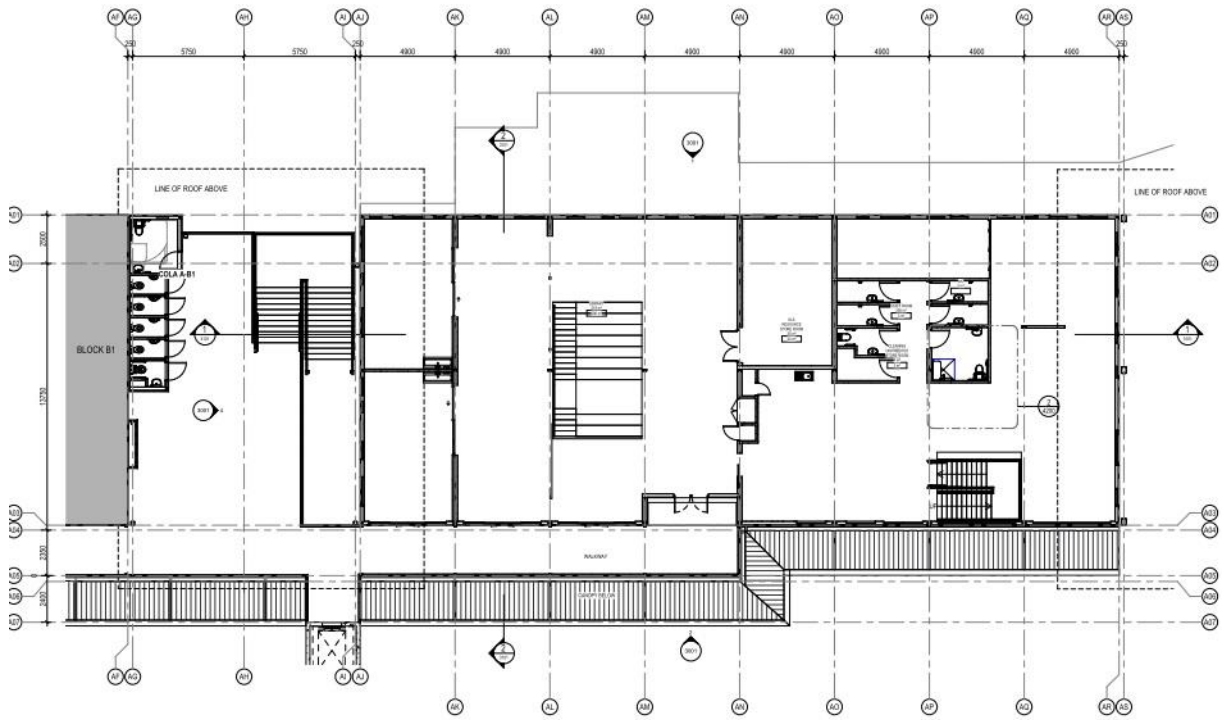


**Ground Floor – Block B3:**

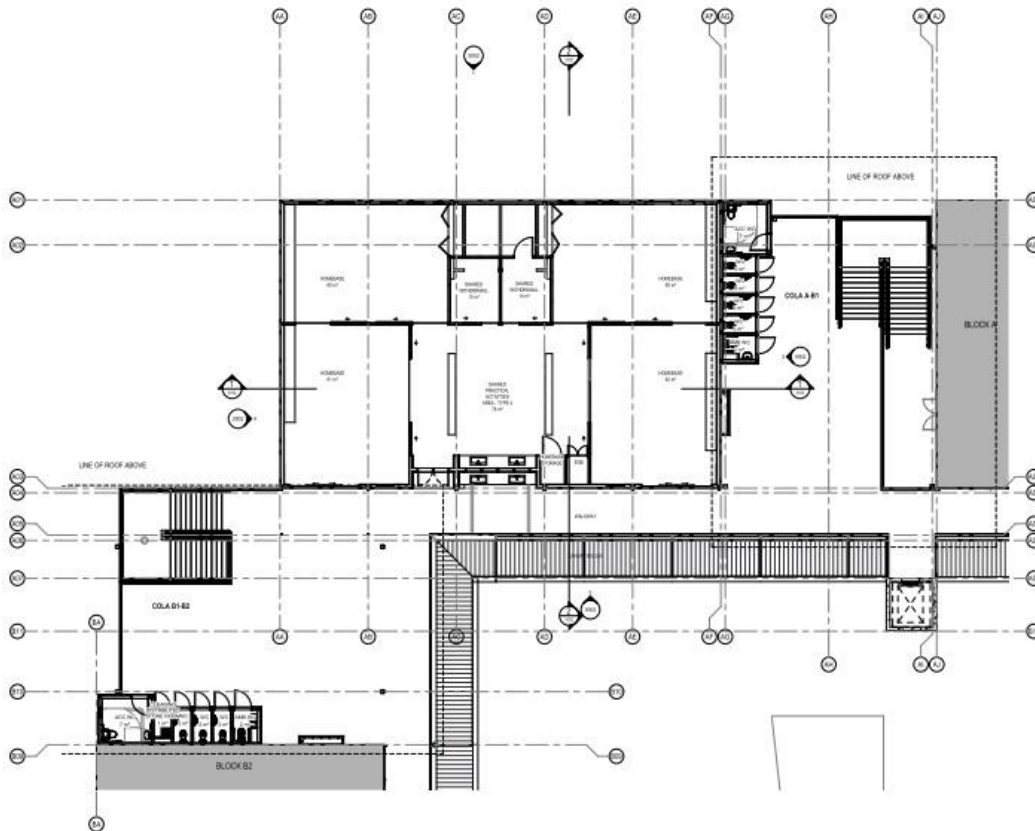




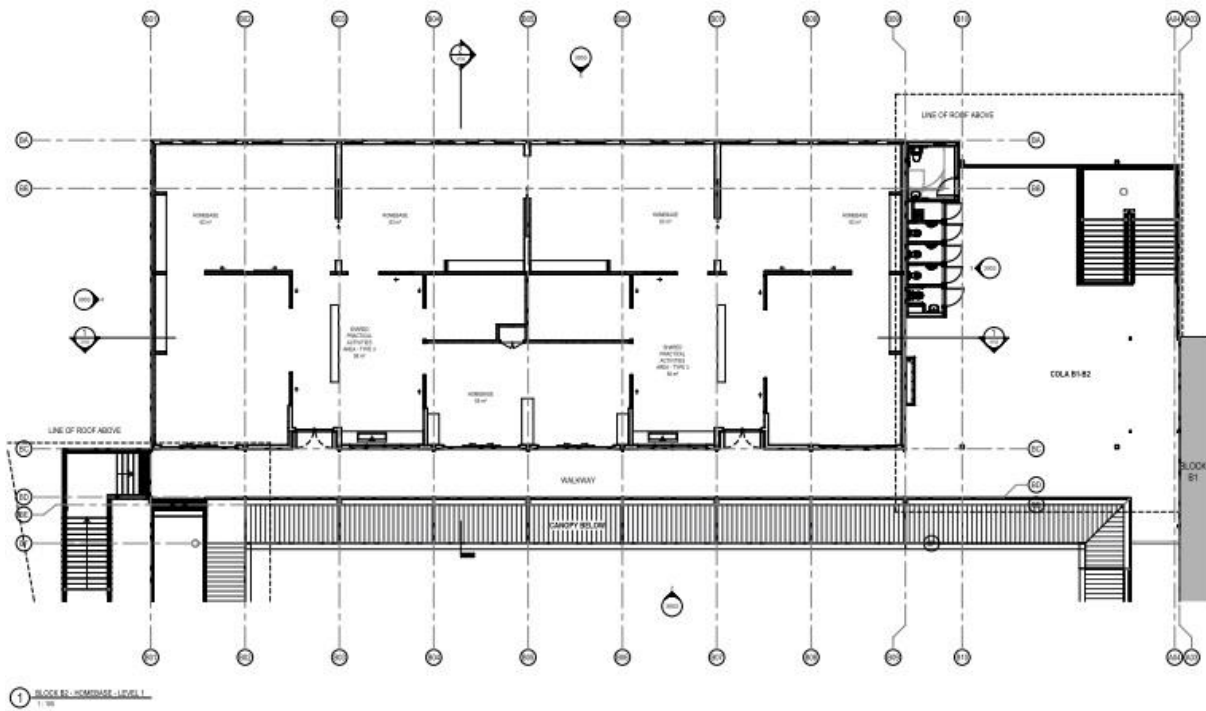
### Level 1 Floor – Block A:



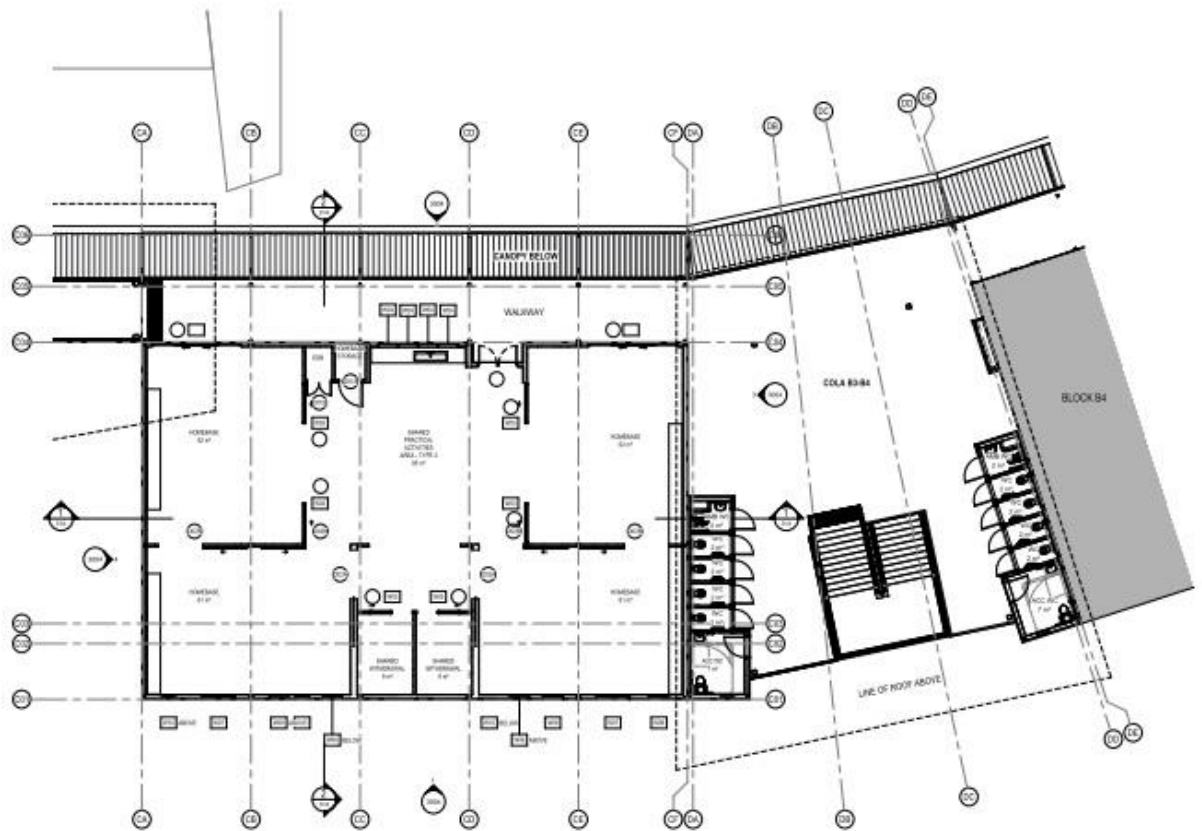
### Level 1 Floor – Block B1:



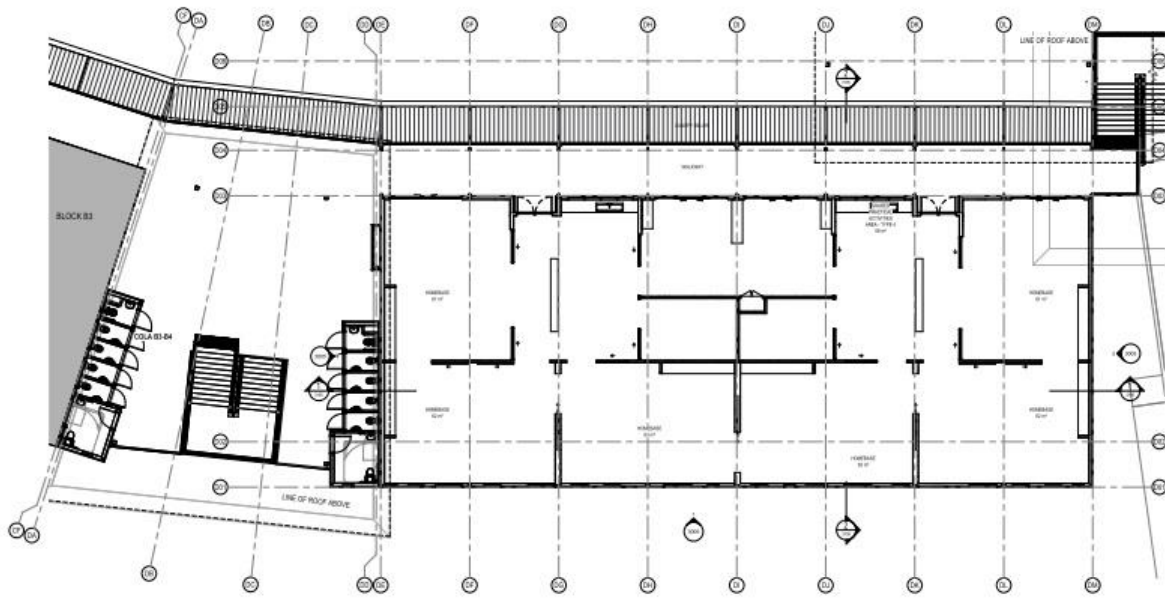
**Level 1 Floor – Block B2:**



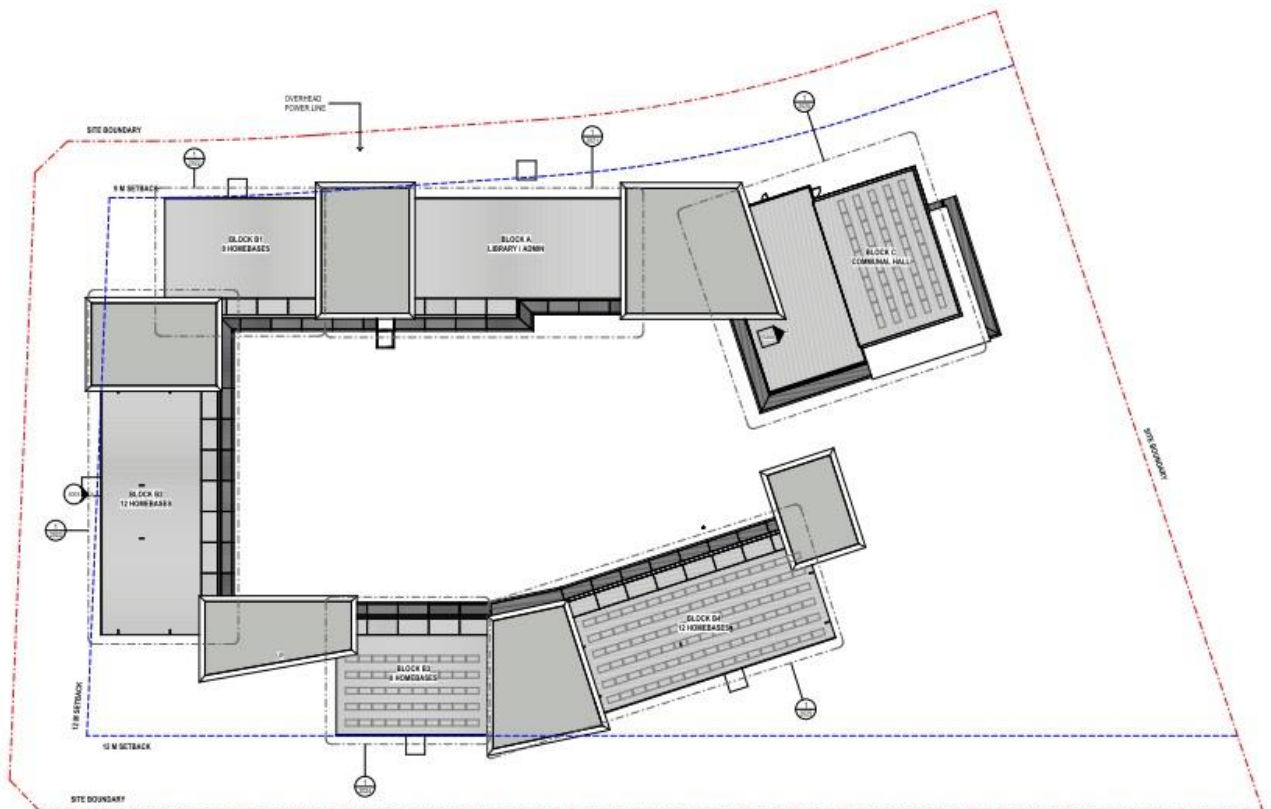
**Level 1 Floor – Block B3:**



**Level 1 Floor – Block B4:**



**Roof Plan:**



### Elevation – Block A:



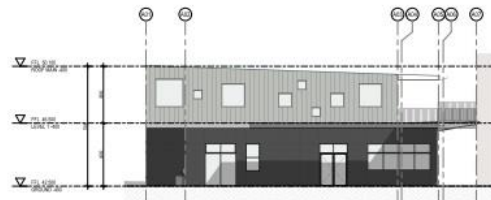
1 Block A - North Facade  
1:100



2 Block A - South Facade  
1:100



3 Block A - East Facade  
1:100



4 Block A - West Facade  
1:100

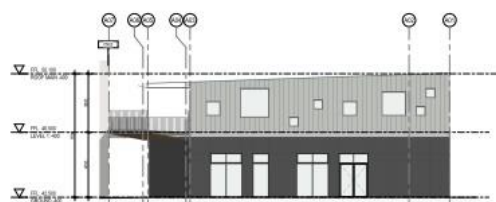
### Elevation – Block B1:



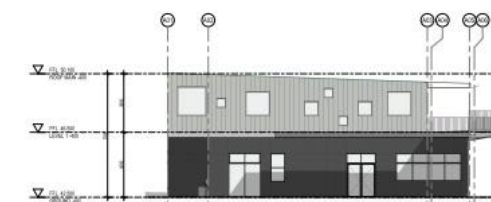
1 Block B1 - North Facade  
1:100



2 Block B1 - South Facade  
1:100

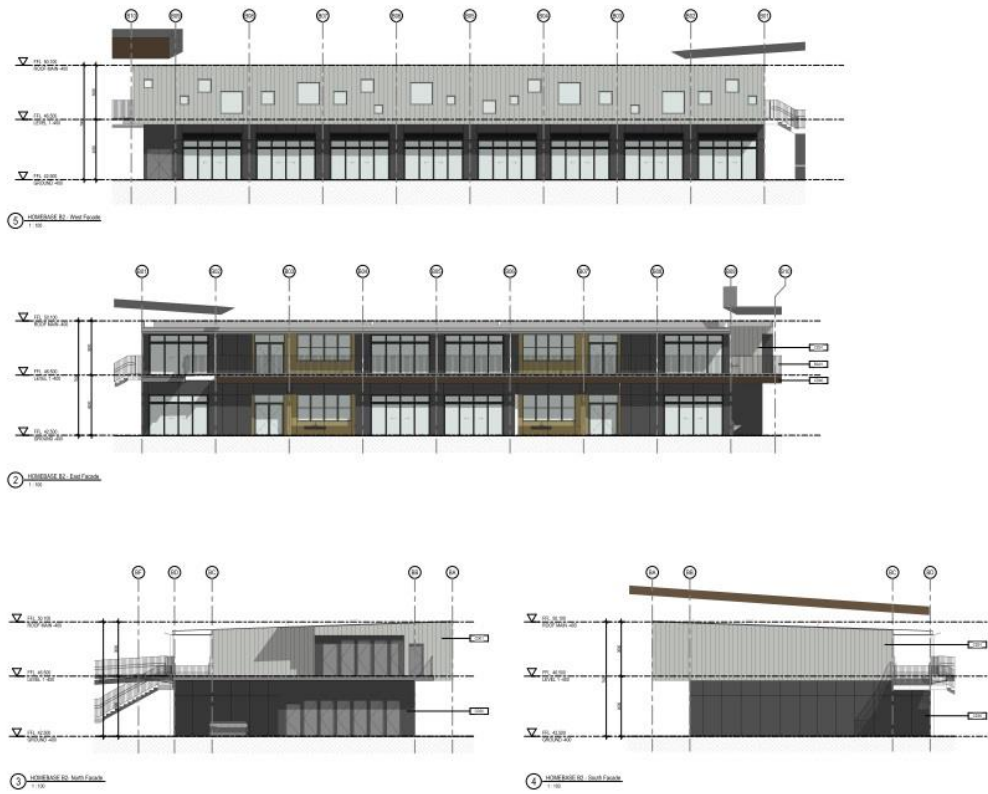


3 Block B1 - East Facade  
1:100

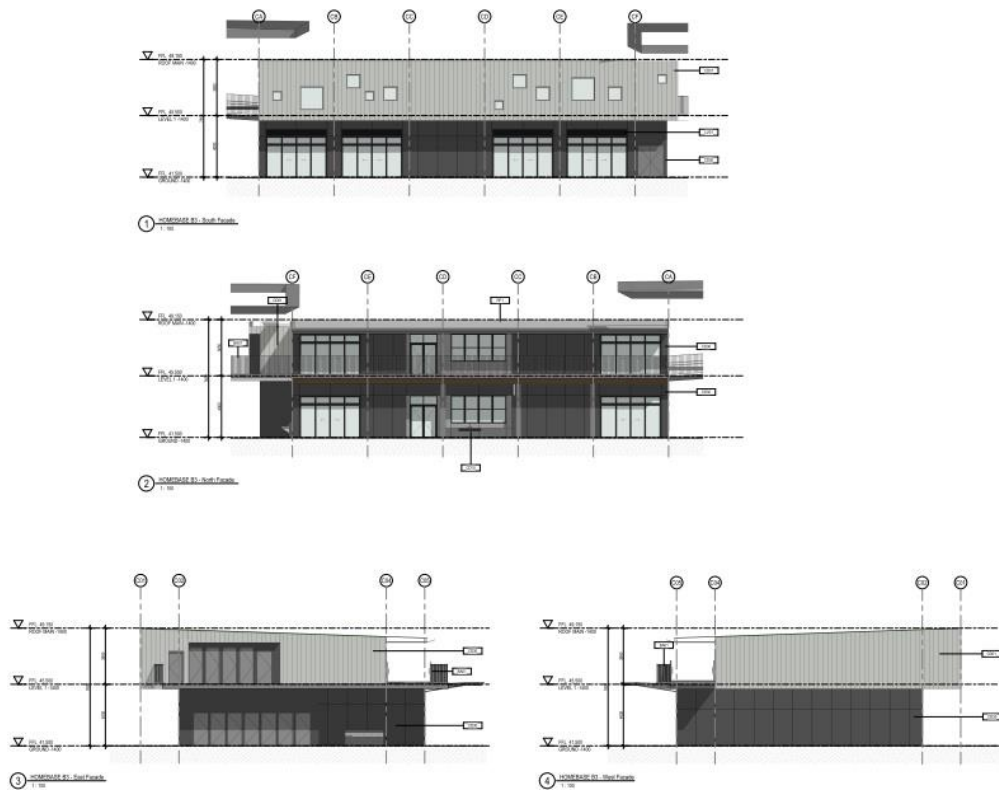


4 Block B1 - West Facade  
1:100

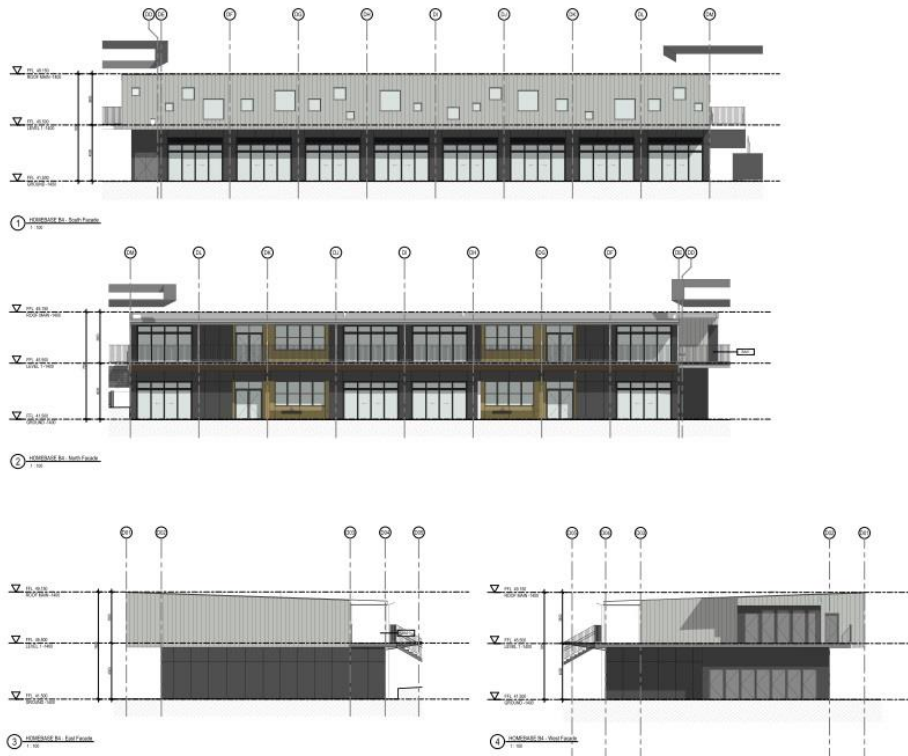
### Elevation – Block B2:



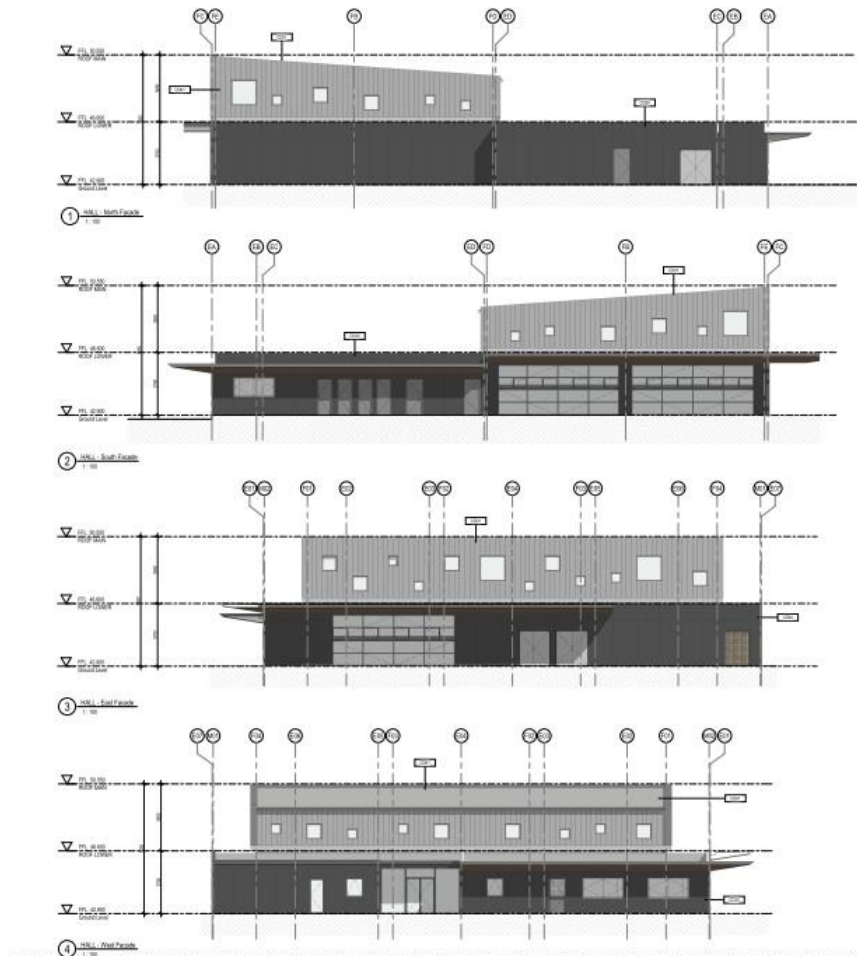
### Elevation – Block B3:



### Elevation – Block B4:



### Elevation – Block C:



## 5. Energy Modelling

### 5.1 Process

A Reference Building energy model was generated using the NCC compliant energy simulation software (Carrier E20-II HAP). This model was based on the deemed to satisfy provisions (J1-8) and solar absorbance of 0.6 for external walls and 0.7 for roofs. This reference model provided the annual energy target for JP1 verification. This target was measured in MJ/m<sup>2</sup>.

The following two modelling cases were generated and compared with the reference building:

- The proposed building as modelled with the proposed design services.
- The proposed building as modelled with the same services used in modelling of the Reference Building.

The above process has been detailed in the following sections of the report.

#### 5.1.1 Computer Simulation

Computer modelling was performed using the Carrier E-II HAP software to predict the annual mechanical energy consumption requirements for the building. This program uses a dynamic simulation to determine the building envelope's performance as well as space and surface temperatures, internal loads and energy consumption. To ensure appropriate results are derived from the software package, ABCB requires that the software conform to appropriate BESTEST validation test or be certified in accordance with ANSI/ASHRAE Standard 140-2001: "Standard Method of Test for Evaluation of Building Energy Analysis Computer Programs". Carrier E-II HAP satisfies this requirement. The Carrier E20-II HAP program models the heat exchange between the air-conditioned space and the external environment to the space, hot or cold bodies in the space including people, lighting, and machines, and the air-conditioning system. The external environment includes the external ambient conditions and adjacent spaces.

The software addressed all the main aspects of thermal modelling such as:

- Energy flow through the building's envelope, including at adiabatic surfaces and also including thermal storage effects;
- Performance of the air-conditioning and ventilation systems, including plant and equipment using their energy input ratios, coefficients of performance, or efficiency at full and part load;
- Control strategies, sequencing of plant and equipment, controlled settings and types of controls;
- Relative humidity range; and
- Use of different energy types.

The energy consumption outputs from the program were used as inputs to this assessment.

### 5.2 Modelling Input Data - General

In accordance with Verification Method JV3, the following input data were used to calculate the annual energy consumption for the reference building.

#### 5.2.1 Weather Data

Historical hourly local weather data, in the form of twelve months' data, was used to represent the building external ambient data at the building location and to accurately model the dynamic nature of building thermal response. The weather data contains hourly records of radiation, temperature, humidity, sunshine duration and wind speed and direction for a typical meteorological year.

#### 5.2.2 Area

The building geometry is based on the latest architectural drawing provided by JDH Architects.

#### 5.2.3 Air Conditioning, Zoning and Simulation

The HVAC systems used in both the Proposed Building and Reference Building models were predefined in Carrier E20-II HAP, for all air-conditioned spaces, a temperature range of 18°CDB to 26°CDB for 98% of the plant operation time was adopted as required by NCC JV3 for both the "reference" and "proposed" models. The mechanical systems for both the Proposed Building and Reference Building models were simulated with the input parameters in accordance with the DTS Requirements of NCC Part J5.

#### Infiltration Rates

The infiltration into the building through the building fabric has been included in both the “reference” and proposed” models as per Table 21 NCC JV3 (d) (i) (F): infiltration rates.

Description	ACH/Hr
For a perimeter zone of depth equal to the floor-to-ceiling height, when pressurising plant is operating	1.0
For the whole building, when pressurising plant is not in operation.	1.5

## 5.2.4 Internal Loads & NCC Default Values

### 5.2.4.1 Stable Energy Consumption Items and Parameters

In compliance with NCC section J, the annual energy consumption of various items that are not impacted by the glazing system selection or the simulation modelling has not been included within the assessment as these items are the same for all simulation cases. This includes items such as internal lighting, hot water supply/generation, lifts, car park ventilation & lighting, miscellaneous ventilation and small AC systems.

In compliance with NCC Section J requirements, there are parameters that must be the same in all modelling runs (i.e. the reference building as well as the proposed building). This is to avoid using energy efficiency criteria or calculations that could result in a more generous allowance using the reference building and then criteria or calculations that result in lower annual energy consumption values for the proposed building.

<b>In compliance with NCC Section J, the following parameters remained unchanged in all the simulation runs:</b>
The annual energy consumption calculation method itself.
The location;
Adjacent structures and features
The environmental conditions (such as ground reflectivity, sky and ground form factors, temperature of external bounding surfaces, air velocities across external surfaces and the like.)
The building orientation
The building form
The external doors (e.g. numbers, types, etc)
The testing standards, including for insulation, glazing, water heater and package air-conditioning equipment.
The thermal resistance of air films including any adjustment factors, moisture content of materials and the like.
The dimensions of external, internal and separating walls.
The surface density of envelope walls over 220 kg/m <sup>2</sup> .
The quality of the insulation installation.
Assumptions and means of calculating the temperature difference across air-conditioning zone boundaries.
The floor coverings and furniture and fittings density.
The internal shading devices, their colour and their criteria for operation.
The number and sizes of lifts and escalators and the floors served.
The range and type of services and energy sources other than energy generated on-site from sources that do not emit greenhouse gases such as solar and wind power.
The internal artificial lighting levels.
The internal heat gains including people, lighting, appliances, meals and other electric power loads.
The air-conditioning system configuration and zones.
The daily and annual profiles of the building occupancy and operation of services.
The range of internal temperatures and plant operating times.

The supply hot water temperature and rate of use.
The infiltration values;
The unit capacity and sequencing for water heaters, refrigeration chillers and heat rejection equipment such as cooling towers.
The metabolic rate for people.

#### 5.2.4.2 Internal heat loads, lighting loads and occupancy density

The internal heat loads applied to both the “reference” and “proposed” models are provided in the following table. The occupancy, lighting and equipment loads have been uniformly distributed throughout the simulated areas.

Item	Details
Internal heat gains for appliances and equipment (as per JV3 requirements for class 9b)	5 W/m <sup>2</sup>
People Load	75 W sensible heat gain and 55 W latent heat gain
Hourly Profile	The schedule is provided in section 5.2.4.6 – based on Specification JV Table 2g of part J of NCC.

#### Onsite Energy Generation

JV3 allows the renewable energy generated on-site or the “free” energy derived from another process (e.g. heat from cogeneration) to be deducted from the annual energy consumption of the proposed building. This means that the “annual energy consumption” is the sum of the energy drawn annually from the electrical grid, the gas network or fuel brought in by road transport and not the total of the energy consumed by the services that use energy. Based on the architectural drawings and electrical plans, we understand that a Solar PV system will be installed for the school at a later stage.

#### Shading

All external shading has been incorporated in the model based on the provided architectural sections and elevations.

#### Schedules of Usage

The internal load schedules used in the model are as per the *Specification JV Annual Energy Consumption Criteria* provided in NCC Section J. Details of the schedules used are contained in the following tables;

<p>The annual energy consumption—</p> <p>(a) for <i>air-conditioning</i>, must be calculated on the basis of—</p> <ul style="list-style-type: none"> <li>(i) the daily occupancy and operation profiles in Table below; and</li> <li>(ii) plant serving public areas of a Class 3 being available on thermostatic control 24 hours per day;</li> <li>(iii) the internal heat gains in a building— <ul style="list-style-type: none"> <li>(A) from occupants and hot meals, in accordance with one of the options in Table 2j of Part J; and</li> <li>(B) from appliances and equipment, in accordance with Table 2h of Part J; and</li> <li>(C) from artificial lighting, that is calculated in (b); and</li> </ul> </li> </ul> <p>(b) for artificial lighting, must be calculated on the basis of the proposed level of artificial lighting in the building with the daily profile in Tables 2a to 2g of Part J; and</p> <p>(c) for heated water supply, must be calculated on the basis of the consumption rates of Table 2i of Part J.</p>
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### Occupancy and operation profiles

The following table provides the occupancy and operation profiles used in modelling runs for the Class 9b areas in accordance with Table 2g of the NCC Section J:

Time period	Occupancy	Artificial lighting	Appliances and equipment	Air-conditioning
	(Monday to Friday)	(Monday to Friday)	(Monday to Friday)	(Monday to Friday)
12:00am to 1:00am	0%	5%	5%	Off
1:00am to 2:00am	0%	5%	5%	Off
2:00am to 3:00am	0%	5%	5%	Off
3:00am to 4:00am	0%	5%	5%	Off
4:00am to 5:00am	0%	5%	5%	Off
5:00am to 6:00am	0%	5%	5%	Off
6:00am to 7:00am	0%	5%	5%	Off
7:00am to 8:00am	5%	30%	30%	On
8:00am to 9:00am	75%	85%	85%	On
9:00am to 10:00am	90%	95%	95%	On
10:00am to 11:00am	90%	95%	95%	On
11:00am to 12:00pm	90%	95%	95%	On
12:00pm to 1:00pm	50%	80%	70%	On
1:00pm to 2:00pm	50%	80%	70%	On
2:00pm to 3:00pm	90%	95%	95%	On
3:00pm to 4:00pm	70%	90%	80%	On
4:00pm to 5:00pm	50%	70%	60%	On
5:00pm to 6:00pm	20%	20%	20%	Off
6:00pm to 7:00pm	20%	20%	20%	Off
7:00pm to 8:00pm	20%	20%	20%	Off
8:00pm to 9:00pm	10%	10%	10%	Off
9:00pm to 10:00pm	5%	5%	5%	Off
10:00pm to 11:00pm	5%	5%	5%	Off
11:00pm to 12:00am	5%	5%	5%	Off

#### Notes:

1. General - The occupancy profile is expressed as a percentage of the maximum number of people that can be accommodated in the building. The artificial lighting profile is expressed as a percentage of the maximum *illumination power density* permitted under Part J6. The appliances and equipment profile is expressed as a percentage of the maximum internal heat gain in Table 2h. The *air-conditioning* profile is expressed as the plant status.
2. Class 9b - Saturday and Sunday profiles are 5% continuous artificial lighting and 5% continuous appliances and equipment. There is no occupancy and the *air-conditioning* is "off".

### 5.3 Modelling Case 1 - Reference Building with DTS Services

#### 5.3.1 Inputs

**Building Fabric:** The building fabric was modelled based on the minimum Deemed to Satisfy (DTS) provisions outlined in the NCC Part J1 and J2 for building fabric.

**Building Services:** Based on the minimum NCC part J Deemed to Satisfy provisions.

The following table further outlines the DTS building fabric thermal performance and services used within the simulation model 1 (reference case).

Item		Reference Building Case (Model 1)
	<b>Roof / Ceiling</b>	Total R-Value: R3.2 (Minimum NCC 2016 DTS).
	<b>External Walls</b>	Total R-Value: R2.8 (Minimum NCC 2016 DTS).
	<b>Internal Walls</b>	Total R-Value: R1.8 (Minimum NCC 2016 DTS).
	<b>Floors</b>	<ul style="list-style-type: none"> <li>Concrete slab on ground: No thermal insulation required</li> <li>Internal floor slabs between conditioned space: No thermal insulation required</li> <li>Suspended floors above un-conditioned: Total R-value: R2</li> </ul>
<b>J2 (DTS)</b>	<b>Glazing</b>	Total U-Value and SHGC used for the modelling based on NCC 2016 DTS minimum requirements. <b>Process:</b> <i>As expected, the "proposed" glazing did not meet the NCC part J2 deemed to satisfy calculators. Specification of the DTS external glazing were refined to be as close as possible to 100% to ensure the highest possible energy consumption figure was achieved for the reference building.</i>
<b>J3-8 (DTS)</b>	<b>Building Services</b>	Set at the minimum of NCC 2016 DTS requirements.
<b>Other</b>	<b>Solar Absorptance:</b>	Solar absorptance of 0.6 for external walls and 0.7 for roofs, in accordance with JV3.

#### 5.3.2 Results

The outcome for the Reference Building with DTS services is 884 MJ/m<sup>2</sup> per annum.

## 5.4 Modelling Case 2 - Proposed Building with DTS Services

### 5.4.1 Inputs

**Building Fabric:** The building envelope and glazing was modelled based on the proposed fabric which is the same as the NCC part J deemed to satisfy provisions with the following exceptions:

- J1 & J2 – Building Fabric & Glazing: based on the proposed thermal insulation & insulation requirements (provided in the following table and summarised in section 7.1 of the report);

**Building Services:** Based on the minimum NCC part J Deemed to Satisfy provisions.

The following table further outlines the performance inputs applied to the simulation model 2 (proposed building with DTS services):

Item		Proposed Building Case (Model 2)
	<b>Roof / Ceiling</b>	Total R-Value: R4.0 (exceeding minimum NCC 2016 DTS).
	<b>External Walls</b>	Total R-Value: R2.8 (minimum NCC 2016 DTS).
	<b>Internal Walls</b>	Total R-Value: R1.8 (minimum NCC 2016 DTS).
	<b>Floors</b>	<ul style="list-style-type: none"> <li>• Concrete slab on ground: No thermal insulation required</li> <li>• Internal floor slabs between conditioned space: No thermal insulation required</li> <li>• Suspended floors above un-conditioned: Total R-value: R2</li> </ul>
<b>J2 (Proposed)</b>	<b>Glazing (addressed through JV3)</b>	<p><b>Addressed through JV3 assessment (identical glazing performance has been nominated to improve consistency)</b></p> <ul style="list-style-type: none"> <li>• Total U-value <math>\leq 4.0</math> and total Solar Heat Gain Coefficient (SHGC) <math>\leq 0.37</math></li> </ul>
<b>J3-8 (DTS)</b>	<b>Building Services</b>	<p>As required by NCC JV3 method: Set at the minimum of NCC 2016 DTS requirements (Similar to Case 1-Reference Building)</p>

### 5.4.2 Results

The outcome for the Proposed Building with DTS services is 822 MJ/m<sup>2</sup> per annum.

## 5.5 Modelling Case 3 - Proposed Building with Proposed Services

### 5.5.1 Inputs

**Building Fabric:** The building envelope and glazing was modelled based on the proposed fabric which is the same as the NCC part J deemed to satisfy provisions with the following exceptions:

- J1 & J2 – Building Fabric & Glazing: based on the proposed thermal insulation & insulation requirements (provided in the following table and summarised in section 7.1 of the report);

**Building Services:** Based on the proposed building services. Since the proposed building services design is not yet finalised, the “proposed services” under the modelling case 3 have been conservatively set at the “DTS services” level. The results of modelling cases 2 and 3 are therefore identical.

The following table outlines the performance inputs applied to the simulation model 2 (proposed building with proposed services):

Item		Proposed Building Case (Model 3)
	<b>Roof / Ceiling</b>	Total R-Value: R4.0 (exceeding minimum NCC 2016 DTS).
	<b>External Walls</b>	Total R-Value: R2.8 (minimum NCC 2016 DTS).
	<b>Internal Walls</b>	Total R-Value: R1.8 (minimum NCC 2016 DTS).
	<b>Floors</b>	<ul style="list-style-type: none"> <li>• Concrete slab on ground: No thermal insulation required</li> <li>• Internal floor slabs between conditioned space: No thermal insulation required</li> <li>• Suspended floors above un-conditioned: Total R-value: R2</li> </ul>
<b>J2 (Proposed)</b>	<b>Glazing (addressed through JV3)</b>	<p><b>Addressed through JV3 assessment (identical glazing performance has been nominated to improve consistency)</b></p> <ul style="list-style-type: none"> <li>• Total U-value <math>\leq 4.0</math> and total Solar Heat Gain Coefficient (SHGC) <math>\leq 0.37</math></li> </ul>
<b>J3-8 (Proposed)</b>	<b>Building Services</b>	Since the proposed building services design is not yet finalised, the “proposed services” under the modelling case 3 have been conservatively set at the “DTS services” level. The results of modelling cases 2 and 3 are therefore the same.

### 5.5.2 Results

The outcome for the Proposed Building with proposed services is 822 MJ/m<sup>2</sup> per annum.

Note: The proposed building services design is not yet finalised, therefore, the “proposed services” under the modelling case 3 have been conservatively set at the “DTS services” level. The results of modelling cases 2 and 3 are therefore the same.

## 6. Summary of the Simulation Results and Conclusion

The following table summarises the total annual energy consumption for the simulation cases of the development.

	<b>CASE 1 Reference Building [DTS Fabric and DTS services]</b>	<b>CASE 2 Proposed Building [Proposed Fabric and DTS services] *</b>	<b>CASE 3 - ACTUAL BUILDING Proposed Building [Proposed Fabric and Proposed services] *</b>
<b>Annual Energy Consumption (normalised consumption)</b>	884 MJ/m <sup>2</sup>	822 MJ/m <sup>2</sup>	822 MJ/m <sup>2</sup>

*\* The proposed building services design is not yet finalised, therefore, the “proposed services” under the modelling case 3 have been conservatively set at the “DTS services” level. The results of modelling cases 2 and 3 are therefore the same.*

A reference building was modelled having minimum DTS envelope characteristics as well as minimum DTS services. The annual energy consumption of the reference building and services was estimated to be 884 MJ/m<sup>2</sup>.annum. The annual energy consumption of the proposed building with the proposed services (set conservatively at minimum DTS requirement) is calculated at 822 MJ/m<sup>2</sup>.annum.

The Proposed Building therefore meets the criteria for Verification Method JV3 as 822 MJ/m<sup>2</sup>.annum is less than the 884 MJ/m<sup>2</sup>.annum estimated for the Reference Case.

**The proposed insulation and glazing system as outlined within the report (see section 7) are therefore compliant with the performance requirement of NCC Section J 2016.**

## 7. Summary of the Section J Requirements

### 7.1 Part J 1 – Building Fabric Requirements

#### 7.1.1 Overview

Section J part J1 outlines the minimum requirements of building envelope. The envelope is defined by the NCC as parts of a building's fabric that separate a conditioned space or habitable room from the exterior of the building or a non-conditioned space.

The recommended thermal insulation requirements are as provided below.

Building Envelope	Minimum Total System R-Value Required and roof light glazing performance requirements
Roofs / Ceiling	R4.0
External Wall	R2.8
Internal Wall	R1.8
Floor	<ul style="list-style-type: none"> <li>• Concrete slab on ground: No thermal insulation required</li> <li>• Internal floor slabs between conditioned space: No thermal insulation required</li> <li>• Suspended floors above un-conditioned: R2.0</li> </ul>

#### 7.1.2 Part J1.1 – Application

The deemed-to-satisfy provisions of Part J1 apply to the building elements forming the envelope of a Class 2 to 9 building. Part J1 is therefore applicable to all works within the development.

#### 7.1.3 J1.2 Thermal Construction General

All insulation installed are required to meet J1.2 and AS/NZ 4859.1. Builder is to ensure compliance, during construction.

Care should be taken when installing insulation to ensure a continuous envelope between a conditioned space and either the outside environment or a non-conditioned space.

Insulation is to be fitted tightly to each side of framing members but need not be continuous over the framing member. The total R-value requirements for roof, walls and floors are calculated for parts of the roof, walls or floor that are clear of any framing members.

The installation of insulation should not interfere with the safety or performance of domestic services and fittings such as heating flues, recessed light fittings, transformers for low voltage lighting, gas appliances and general plumbing and electrical components. This includes providing appropriate clearance as detailed in relevant legislation and referenced standards such as for electrical, gas and fuel oil installations. Low voltage lighting transformers should not be covered by insulation and be mounted above the insulation rather than on the ceiling. Expert advice may also be needed on how much bulk insulation can be placed over electrical wiring.

Addition of insulation to other building elements may alter the fire properties of those elements. Re-testing or re-appraisal of these elements may be required.

For reflective insulation to achieve its tested R-value, the airspace adjoining the insulation needs to be a certain width. This width varies depending on the particular type of reflective insulation and the R-value to be achieved.

Where the width of airspace is to be achieved in a wall cavity or the like, care should be taken to ensure compliance with all other applicable NCC provisions. For example, the provisions relating to weatherproofing masonry may require a greater width of cavity.

The R-value of bulk insulation is reduced if it is compressed. The allocated space for bulk insulation is therefore to allow the insulation to be installed so that it maintains its correct thickness unless exempted such as at wall studs. This is particularly relevant to wall and cathedral ceiling framing whose members can only accommodate a limited thickness of insulation. In some instances, larger framing members or thinner insulation material, such as polystyrene boards, may be necessary to ensure that the insulation achieves its required R-value.

The thermal insulation performance requirements outlined in this report nominate the Section J compliance requirements only. The specified performance values therefore do not consider requirements for any other disciplines such as Acoustics, thermal comfort, Fire or Safety compliance. Where required, the development shall comply with any additional requirements related to other disciplines in addition to the Section J compliance requirements detailed in this report.

### 7.1.4 J1.3 Roof and Ceiling Construction

Roof and ceiling construction works are required to meet J1.3 requirements.

To achieve NCC compliance and further improve thermal performance, **it is required that minimum total thermal insulation of R4.0 is installed as part the roof/ceiling construction separating conditioned and non-conditioned zones.**

### 7.1.5 J1.4 Roof Lights

No roof lights are shown within the conditioned areas on the Architectural plans, Section J1.4 of the BCA is therefore no applicable.

Under any other conditions and should the design incorporate a roof light serving a conditioned space, the roof light must meet the following criteria (Table J1.4 Roof Lights – Thermal Performance of transparent and translucent elements).

Roof light shaft index (see Note 2)	Constant	Total area of roof lights serving the room or space as a percentage of the floor area of the room or space			
		Up to 2%	More than 2% to and up to 3%	More than 3% and up to 4%	More than 4% and up to 5%
Less than 0.5	SHGC	Not more than 0.83	Not more than 0.57	Not more than 0.43	Not more than 0.34
	Total U-Value	Not more than 8.5	Not more than 5.7	Not more than 4.3	Not more than 3.4
0.5 to less than 1.0	SHGC	Not more than 0.83	Not more than 0.72	Not more than 0.54	Not more than 0.43
	Total U-Value	Not more than 8.5	Not more than 5.7	Not more than 4.3	Not more than 3.4
1.0 to less than 2.5	SHGC	Not more than 0.83	Not more than 0.83	Not more than 0.69	Not more than 0.55
	Total U-Value	Not more than 8.5	Not more than 5.7	Not more than 4.3	Not more than 3.4
2.5 and more	SHGC	Not more than 0.83	Not more than 0.83	Not more than 0.83	Not more than 0.83
	Total U-Value	Not more than 8.5	Not more than 5.7	Not more than 4.3	Not more than 3.4

#### Notes:

- The total area of a roof light serving the space as a percentage of the floor area of the space must not exceed 5%.
- The roof light shaft index is determined by measuring the distance from the centre of the shaft at the roof to the centre of the shaft at the ceiling level and dividing it by the average internal dimension of the shaft opening at the ceiling level in the same units of measurement.
- The total area of roof lights is the combined area for all roof lights serving the room or space.
- The area of a roof light is the area of the roof opening that allows light to enter the building.
- The thermal performance of an imperforate ceiling diffuser may be included in the Total U-Value and SHGC of the roof light.
- If the roof lights is required for compliance with NCC Part F4, it must
  - Have an area not more than 150% of the minimum area required by F4.6; and
  - Have transparent and translucent elements, including any imperforate ceiling diffuser, with a combined performance of not more than: SHGC: 0.29 and U-Value: 2.9
- The performance of the total glazing system (glass + frame) must be demonstrated and verified based on AFRC requirements and in compliance with the NCC.

### 7.1.6 J1.5 Walls

#### External Wall Construction

All new external wall construction (separating the conditioned space from the non-conditioned space) should be designed and constructed to meet J1.5.

**NCC compliance shall be achieved with a minimum total thermal insulation of R2.8 for external walls separating the conditioned space from the non-conditioned space.**

**Internal Wall Construction**

All new internal wall constructions that form part of the building envelope separating conditioned and non-conditioned spaces in this climate zone are required to achieve a minimum thermal resistance of 1.8 m<sup>2</sup> K/W. This is assuming that the mechanical ventilation of the space is more than 1.5 air changes per hour.

**NCC compliance shall be achieved with a minimum total thermal insulation of R1.8 for internal walls separating the conditioned space from the non-conditioned space.**

**7.1.7 J1.6 Floors**

**There are no requirements for floor insulation for the floors which are concrete slab on ground.**

Internal floor slabs between conditioned zones: No thermal insulation required

NCC compliance shall be achieved with a minimum added thermal insulation of R2 for suspended floors separating conditioned and non-conditioned zones.

**7.2 Part J2 Glazing (addressed through JV3)**

Part J2 requires established minimum glazing system performance requirements, which vary depending on the climate zone and the orientation and shading of the glazing. The glazing conductance (U-value) and Solar Heat Gain Coefficient (SHGC and shading) are assessed together and calculated for each façade orientation.

The DTS provisions of Part J2 related to glazing performance requirements (i.e. U-value and SHGC) do NOT apply to this development since compliance is verified through an alternative method of verification (JV3) detailed in this report. All glazing works shall comply with the Part J2 requirements of the NCC other than the U-value and SHGC. The following table provides the proposed glazing performance for different facades, the performance specifications were assessed based on the NCC JV3 method of compliance assessment.

The performance specifications provided in the following table are the minimum requirements that the selected AFRC tested glazing (glass and frame) must achieve for JV3 compliance. The performance of the total glazing system (glass + frame) must be verified based on AFRC requirements and in compliance with the NCC.

Glazing performance (AFRC - Total system performance values must be lower or equal to the U-Value and SHGC values provided)	<p><b>Addressed through JV3 assessment (identical glazing performance has been nominated to improve consistency)</b></p> <ul style="list-style-type: none"> <li>• Total U-value ≤ 4.0 and total Solar Heat Gain Coefficient (SHGC) ≤ 0.37</li> </ul>
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The glazing performance requirements outlined in this report nominate the Section J compliance requirements only. The specified performance values therefore do not consider requirements for any other disciplines such as Acoustics, thermal comfort, Fire or Safety compliance. Where required, the development shall comply with any additional requirements related to other disciplines in addition to the Section J compliance requirements detailed in this report.

## 7.3 Part J3 – Building Sealing

### 7.3.1 J3.1 Application of Part

If the air conditioning or ventilation system provides sufficient outside air to pressurize the space and prevent infiltration, then **Part J3 is not applicable.**

By not applying Part J3 outside air infiltration will occur whenever the ventilation systems are not operating and will put additional load on the air-conditioning systems during start up. It is our recommendation to apply the deemed to satisfy provisions of Part J3 to satisfy the intent of Section J.

The deemed to satisfy provisions of Part J3 Building Sealing apply to building elements forming the *envelope* of the building. The envelope of the building is the fabric and elements that separates the conditioned spaces to the exterior of the building.

### 7.3.2 J3.2 Chimneys and Flues

Where applicable.

### 7.3.3 J3.3 Roof Lights

Where applicable.

### 7.3.4 J3.4 Windows and Doors

- a. A seal to restrict air infiltration must be fitted to each edge of a door, openable window or the like that is part of--
  - i. the envelope of a conditioned space; or
  - ii. the external fabric of a habitable room or public area
- b. The requirements of (a) do not apply to a window complying with AS2047, a fire door or smoke door, or a roller shutter, roller shutter grille or other security door or device installed only for out-of-hours security.
- c. A seal required by (a) for the bottom edge of an external swing door, must be a draft protection device and for the other edges of an external door or the edges of an openable window or other such opening, may be a foam or rubber compression strip, fibrous seal or the like.
- d. An entrance to a building, if leading to a conditioned space must have an airlock, self-closing door, revolving door or the like, other than---
  - i. Where the conditioned space has a floor area of not more than 50m<sup>2</sup>

### 7.3.5 J3.5 Exhaust Fans

A miscellaneous exhaust fan, such as a bathroom or domestic kitchen exhaust fan must be fitted with a sealing device such as a self-closing damper or the like when serving a conditioned space or a habitable room in climate zones 4, 5, 6, 7 and 8.

All toilet and kitchen exhaust fans must be fitted with a sealing device such as a self-closing damper or the like.

### 7.3.6 J3.6 Construction of Roof, Floors and Walls

- e. Roofs, ceilings, walls, floors and any opening such as a window frame, door frame, roof light frame or the like must be constructed to minimise air leakage in accordance with (b) when forming part of—
  - i. the envelope; or
  - ii. the external fabric of a habitable room or a public area in climate zones 4, 5, 6, 7 or 8.
- f. Construction required by (a) must be---
  - i. enclosed by internal lining systems that are close fitting at ceiling, wall and floor junctions; or
  - ii. sealed by caulking, skirting, architraves, cornices or the like.
- g. The requirements of (a) do not apply to openings, grilles and the like required for smoke hazard management

### 7.3.7 J3.7 Evaporative Coolers

An evaporative cooler must be fitted with a self-closing damper or the like when serving---

- a) a heated space; or
- b) a habitable room or a public area of a building

## 7.4 Part J4

Part J4 of the NCC 2016 (formerly known as Air Movement) is blank and therefore not applicable to this development.

## 7.5 Part J5 – Air Conditioning and Ventilation Systems

Part J5 of the NCC outlines the performance requirements for air conditioning and ventilation systems to ensure these services operate in an efficient manner.

All services consultants and contractors shall design the air conditioning and ventilation systems to ensure compliance with Part J5 of the NCC Section J and all subsections associated therein.

## 7.6 Part J6 – Artificial Lighting and Power

Part J6 of the NCC outlines the performance requirements for illumination power density and the efficient use of lighting power and controls.

All services consultants and contractors shall design the artificial lighting systems to ensure compliance with Part J6 of the NCC Section J and all subsections associated therein with regards to power.

## 7.7 Part J7 – Hot Water Supply

Part J7 of the NCC outlines the provisions for the energy efficient use of hot water supply systems.

Clause J7.2 of Part J7 states that a hot water supply system for food preparation or sanitary purposes must be designed and installed in accordance with Section 8 of AS/NZS 3500.4.

All services consultants and contractors shall design the Hot Water supply systems to ensure compliance with Part J7 of the NCC Section J and all subsections associated therein.

## 7.8 Part J8 – Facilities for Energy Monitoring

Part J8 of the NCC outlines the provisions of facilities for energy monitoring. Facilities for energy monitoring shall be provided in accordance to Part J8 of the NCC.

A building or sole-occupancy unit with a floor area of more than 500 m<sup>2</sup> must have the facility to record the consumption of gas and electricity.

A building with a floor area of more than 2,500m<sup>2</sup> must have the facility to record individually the energy consumption of:

- i. air-conditioning plant including, where appropriate, heating plant, cooling plant and air handling fans;
- and
- ii. artificial lighting; and
- iii. appliance power; and
- iv. central hot water supply; and
- v. internal transport devices including lifts, escalators and travelators where there is more than one serving the building; and
- vi. other ancillary plant.

All services consultants and contractors shall design for access for maintenance and facilities for monitoring to ensure compliance with Part J8 of the NCC Section J and all subsections associated therein.

## 8. Disclaimer

This report is prepared using the information described above. Whilst Meinhardt has endeavoured to ensure the information used is accurate, no responsibility or liability to any third party is accepted for any loss or damage arising out of the use of this report by any third party. Any third party wishing to act upon any material contained in this report should first contact Meinhardt for detailed advice which will take into account that party's particular requirements.

Computer performance assessment provides an estimate of building performance. This estimate is based on a necessarily simplified and idealised version of the building that does not and cannot fully represent all the intricacies of the building once built. As a result, simulation results only represent an interpretation of the potential performance of the building. No guaranty or warranty of building performance in practice can be based on simulation results alone. Meinhardt and its employees and agents shall not be liable for any loss arising because of, any person using or relying on the Report and whether caused by reason or error, negligent act or omission in the report.

Performance of the completed building may be significantly affected by the quality of construction; the quality of commissioning, ongoing management of the building, and the way the building is operated, monitored and maintained. Building fabric inputs require verifiable manufacturer data to confirm thermal properties. This assessment has been prepared based on the preliminary building services and architectural design documents, it is required that a detailed assessment is performed once the design progresses to the final stage. This report is intended as a guide to assist with the application of the NCC Section J. It should be read in conjunction with the NCC 2016 and specific applications may vary during the design development of the project.

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