634-652 HIGH STREET AND 87-91 UNION ROAD

PENRITH, NSW

DA REPORT

FOR

ESD SERVICES

TOGA

Client

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INDEX

SECTION 1.0 INTRODUCTION 1
1.1 BUILDING DESCRIPTION 1

SECTION 2.0 ESD INITIATIVES OVERVIEW 3

SECTION 3.0 ESD INITIATIVES 4
3.1 ECOLOGICAL IMPACT OF THE PROJECT 4
3.2 INTEGRATION AND CELEBRATION OF THE COMMUNITY AND ITS HISTORY 6
3.3 SUSTAINABLE MANAGEMENT OF MATERIALS 7
3.4 ACCOUNTABILITY AND TRANSPARENCY 7
3.5 PENRITH LEP 7

SECTION 4.0 BASIX AND SECTION J COMPLIANCE 9
4.1 RESIDENTIAL COMPONENTS 9
4.2 NON-RESIDENTIAL COMPONENTS 9

SECTION 1.0 INTRODUCTION

EMF Griffiths has been engaged by TOGA as the Sustainability Consultants for the proposed development of Penway Place, 634-652 High Street and 87-91 Union Road, Penrith NSW.

Our role is to develop and implement Environmentally Sustainable Design (ESD) strategies into the project that address the sustainability targets outlined in the Penrith Local Environmental Plan (LEP) 2010 and the Penrith Development Control Plan (DCP) Principles 2014. The report outlines the project's commitment to the principles of ESD and demonstrate compliance with Clause 7.4 Sustainable Development of the Penrith Local Environmental Plan 2010. This report will demonstrate how the proposed development protects, manages, and enhances natural systems and promotes the efficient use of materials, water, and energy to minimise environmental impacts for the community and the occupants of the project. It will illustrate the project's specific energy efficiency initiatives to satisfy the Council's energy efficiency performance requirements for the residential, and commercial components which have been adopted from Section J and BASIX, thereby demonstrating a "best practice" ESD framework. Further development and reporting will be undertaken for the subsequent stages.

The project is subject to the following minimum regulatory requirements: -

- BASIX for residential components; and
- NCC 2019 Section J Energy Efficiency for commercial components.

This report includes descriptions of: -

- Proposed building envelope and fabric requirements as well as the use of passive shading elements.
- Proposed building services energy efficiency measures.
- ESD initiatives incorporated in the project in line with the Penrith Council LEP and DCP principles.

1.1 BUILDING DESCRIPTION

The development application subject to these proceedings is amended by way of changes detailed below: -

- Podium - Reduction in the scale of the podium from five (5) storeys to four (4) storeys in the middle section and two (2) storeys at the northern and southern ends; decrease in the number of car parking spaces provided within the podium; increased 'sleeving' of car parking provided in the Podium with apartments; and enhanced articulation.
- Basement - Increased Basement car parking from one (1) to three (3) levels.
- Ground Level - Enhanced activation of the Ground Floor through relocation of the through site pedestrian link, redistributing and enlarging commercial floorspace, providing stepped sitting edges to the western colonnade facing John Tipping Grove, and increased landscaping.
- Levels 1 to 3 – Increased activation and connection to Ground Level through additional apartments and enhanced design of communal open space area.
- Towers - Reduction in the height of Tower 2 from thirty-seven (37) to thirty-five (35) storeys, reduction in height of Tower 1 from fourteen (14) storeys to thirteen (13) storeys, and redesign to increase building articulation.

The proposed development DA20/0148 seeks consent for a mixed-use development comprising two (2) towers of thirty-five (35) and thirteen (13) storeys located above a Part 4 and Part 2 storey Podium providing three hundred and fifty-seven (357) residential dwellings with Ground Level commercial tenancies, three (3) levels of Basement car parking, a new public road and associated site works on the land at 634-638 High Street and 87-93 Union Road, Penrith NSW.

The proposed development adopts different building heights and forms across the site and consists of: -

- Car parking: -
  - Non-Residential = Ten (10) commercial car spaces, nine (9) service car spaces with two (2) staff bicycle spaces.
  - Residential = Three hundred and thirty-four (334) residential car spaces including thirty-seven (37) tandem and thirty-five (35) accessible, and twenty (20) visitor bicycle spaces.
  - There are fifty-one (51) visitor car spaces and two (2) car wash spaces being provided.

- Total Residential GFA (Building A and Building B) – 8,044m^2 + 23,350m^2 = 31,394m^2.
- Total Commercial GFA – 1,036m^2.

Total GFA – 32,430m^2.

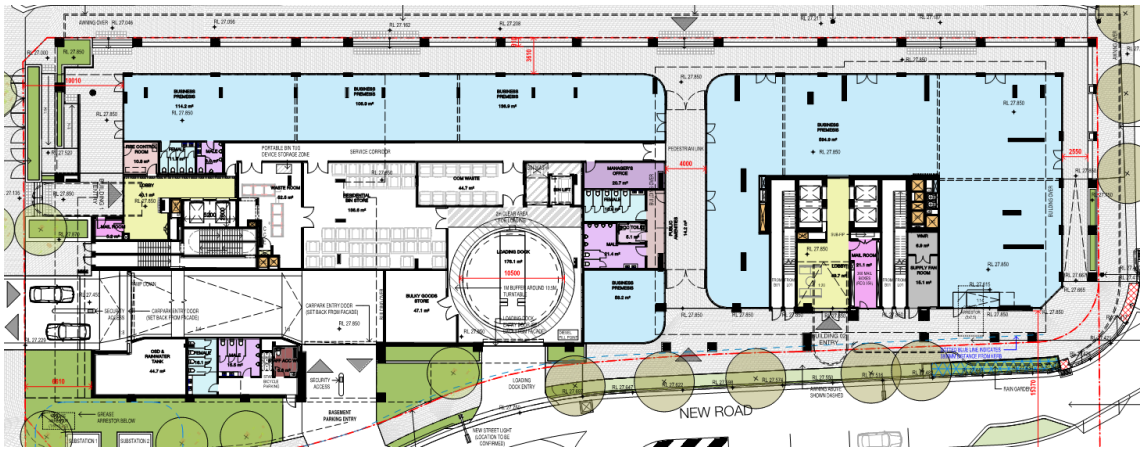

Figure 1: Ground Floor Commercial Layout

Figure 2 : Level 4 Typical Residential Floor Layout

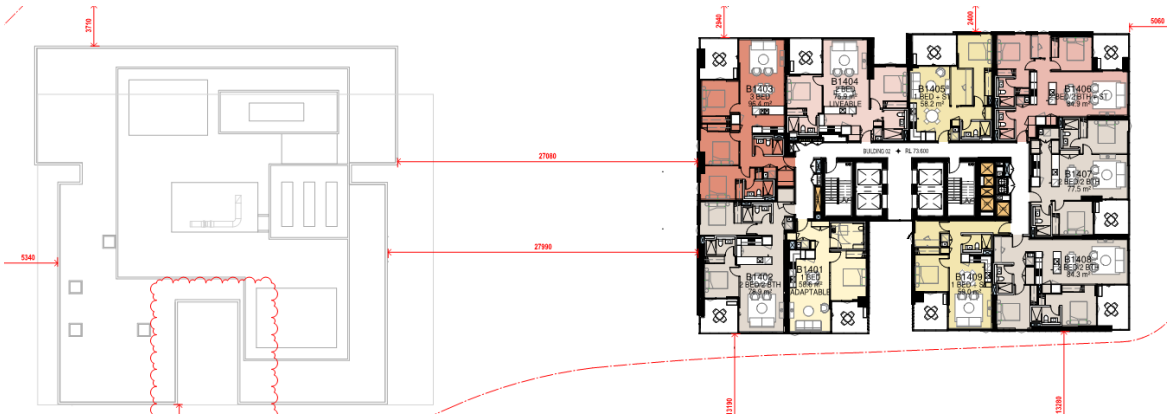

Figure 3 : Level 14 Typical Residential Layout

SECTION 2.0 ESD INITIATIVES OVERVIEW

The proposed development is committed to good practice sustainability outcomes that provide whole-of-life benefits for the site and surrounding environment. As well as being driven by environmental aspirations, there is a commercial imperative that the development operates as efficiently and with as low an environmental impact as possible. As part of the Penrith DCP and LEP, developments are to ensure they incorporate key sustainable development initiatives.

Sustainable development has been described as: -

> '*Using, conserving and enhancing the natural resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased*'

An integrated approach to sustainable development, whereby all design team members are aware of the incremental effect of their actions on the overall project, is by far the most effective path to achieving a strong ESD outcome. Active systems can be implemented to enhance a building's performance, but unless the fundamentals have been addressed, the optimum outcome cannot be assured. In addition, occupant health and wellbeing are of utmost consideration in today's buildings.

The Penrith DCP Principles describe ten (10) key principles created by the Penrith City Council to support their commitment to sustainability articulated in the Sustainable Penrith Program. Further to this, the Penrith LEP contains additional environmentally sustainable development requirements under Clause 7.4 Sustainable Development. This report addresses each of these principles for the development as well as other ESD initiatives which are detailed under Section 3.0. The project has considered the efficient use of materials (both resources and waste), water and energy to minimise their environmental impacts on the site, the community, and its users.

The Penrith LEP describes a "good-practice" intent for sustainable development. In response, a broad suite of ESD initiatives have been embedded into the development and align with the stated objectives, namely, to minimise water use, reduce the use of energy and greenhouse gas emissions in the design, construction, and operation of the development, including: -

- An abundance of natural daylight is provided to the residential apartments to increase occupant amenity, health, and well-being.
- Substantial shading to prevent excessive heat loads within the apartments.
- Effective façade openings and provision of operable windows to the apartments promoting natural crossflow ventilation to provide comfort conditions without reliance on energy intensive air-conditioning.
- A mix of high performance single and double glazing has been selected for its visible light transmitting and solar control properties, whilst managing the uncomfortable impacts of radiant heat and improving occupant comfort.
- High efficiency LED lighting.
- High efficiency air-conditioning systems for both residential and commercial spaces.
- Development that enhances the ecological value of the site by introduction of new trees and soft landscaped areas.
- On-site renewable power generation through deployment of solar panels.
- Efficient electric or solar pool water heating system, or no pool heating system.
- Water conservation through high WELS rated fixtures and fittings.
- Capture and reuse of rainwater for landscape irrigation and car washing.
- Drought tolerant planting, endemic species plating, and efficient irrigation systems.
- Avoidance of toxic and finishes damaging to health, such as VOCs and formaldehyde.
- Support of materials reuse and recycling through purchase of products carrying environmental stewardship declarations and low embodied energy.
- Low ozone depleting potential refrigerants.

Over and beyond the Penrith Council's ESD requirements, the development is also required to comply with BASIX (Water, Energy and Thermal Comfort) targets for the residential components, and to NCC 2019 Section J for the non-residential components. The BASIX and Section J ESD measures are described in Section 4.0.

SECTION 3.0 ESD INITIATIVES

The project is targeting a best practice sustainable outcome. Multiple sustainability categories have been considered to capture an extensive list of measures for the project to incorporate or consider. Such considerations have been adopted from the Penrith LEP and DCP principles. The project is committed to implementing these measures to ensure such sustainability outcomes are both cost-effective and support reduced operational costs, while addressing climate change and occupant health and wellbeing. The Penrith DCP Principles have been identified and reclassified as follows: -

- Ecological Impact: protecting and restoring the local habitat (Principle 3, Principle 4, Principle 5).
- Integration and celebration of the community and its local history (Principle 1, Principle 2, Principle 6, Principle 7, Principle 8).
- Sustainable management of material resources and waste (Principle 9).
- Accountability and transparency (Principle 10).

To best respond to this, initiatives on the project are arranged as follows: -

- Ecological impact of the project: -
  - Land and nature.
  - Water consumption.
  - Passive design.
  - Greenhouse gas emissions.
- Integration and celebration of the community and its local history: -
  - Culture and community.
  - Equity and local economy.
  - Indoor Environmental Quality.
- Sustainable management of material: -
  - Materials and products.
  - Waste.
- Accountability and transparency: -
  - Tracking and ratings.

3.1 ECOLOGICAL IMPACT OF THE PROJECT

3.1.1 **Land and Nature**

The project is committed to reducing its impact on the environment. The following initiatives have been included: -

- Ecological landscaping initiatives will be incorporated into the design, such as extensive planting and landscaped areas among the Ground Floor and Level 4 communal areas. The design will be optimised to reduce run off water impacting the stormwater system.
- The project will target best practice water quality performance objectives set out in the Urban Stormwater Best Practice Environmental Management Guidelines for the following: -
  - Suspended Solids – 80% retention of typical urban annual load.
  - Total Nitrogen – 45% retention of typical urban annual load.
  - Total Phosphorus – 45% retention of typical urban annual load.
  - Litter – 70% reduction of typical urban annual load.
- Landscaping has been integrated into the design to reflect the surroundings and will also reduce heat island effect of the development. The additional landscaping on and around the building will contribute to increasing the site's ecological value.

- All external lighting luminaires will be carefully considered to minimise obtrusive lighting effects and where necessary additional shielding to be considered to reduce light pollution.

3.1.2 **Water Consumption**

The project will incorporate the following design initiatives to minimise potable water usage, including: -

- An onsite rainwater tank will be installed for landscape irrigation.
- Water efficient fixtures and appliances will be selected for the residential dwellings: -
  - Minimum WELS 4-star rated dual-flush toilets.
  - Minimum WELS 3-star (> 6 but <= 7.5 L/min) showerheads.
  - Minimum WELS 4-star taps.
  - Minimum WELS 4-star dishwashers.
- Taps and toilets in common areas will be minimum WELS 4-star.
- Native or drought tolerant landscaping species will be selected so they require less water for irrigation.
- Potable water used for fire system testing will be reduced through use of a closed loop sprinkler system and re-use of fire test water.

3.1.3 **Passive Design**

The project has considered how the development can reduce its energy consumption. Passive design measures can prevent excessive solar gains during summer or heat loss during winter and will also reduce the need for internal lighting by maximising daylighting. The following principles have been implemented on the project as follows: -

- Apartments are provided with adequate solar access and daylight in accordance with ADG requirements. Windows are oriented for maximum solar access to living rooms. Building elements such as shading devices, projecting overhangs and balconies maximise solar access in winter and sun shading in summer.
- Apartments are provided with sufficient window openings to allow natural light into living spaces. These spaces are also provided elements such as balconies and sunshades to maximise solar access in winter but also reduce radiant heat in summer.
- High performance single and double glazing has been carefully selected to ensure a good balance between visual light transmittance and solar control properties.
- Window openings are located in opposite walls and in line with each other to provide natural cross ventilation for the apartments. Occupants have the ability to open windows and sliding doors to increase natural ventilation and reduce reliance on air-conditioning.
- The carpark on Levels 1 to 3 is designed to be naturally ventilated via external louvre openings.
- Building fabric insulation and glazing will be designed to meet NCC 2019 Section J performance requirements, reducing the heat gain and loss of the building, as per Section 4.0.
- Thermal bridging through all studs and construction junctions will be reduced by ensuring insulation is continual around sensitive areas.
- All doors, windows and fabric will be sealed.

3.1.4 Greenhouse Gas Emissions

With passive design optimised, the project has focused on further minimising the energy demand through optimised systems: -

- High performance glazing and building fabric to the apartments together with effective natural ventilation will reduce reliance on air-conditioning. Energy efficient appliances, LED light fittings and air-conditioning systems (minimum EER 3.0-3.5) will also be installed.
- At least 20kW solar photovoltaic panel system will be installed to reduce energy consumption and associated emissions.
- Common areas, retail and commercial spaces will be provided with energy efficient LEDs with motion sensors. Air-conditioning and ventilation systems will be on time clocks and equipped with highly efficient variable speed drives (VSDs) to fans and pumps.
- Elevators will be highly efficient and incorporate regenerative braking technology to reduce energy consumption High efficiency external and internal light fittings such as LED with highest practical efficacy will be installed throughout the project.
- An automatic power factor correction unit will be installed to reduce losses and improve voltage regulation.
- Energy efficient pool pumps will be installed.

3.2 INTEGRATION AND CELEBRATION OF THE COMMUNITY AND ITS HISTORY

3.2.1 Culture and Community

The project will incorporate the following design initiatives to support the community and local culture, including: -

- Biophilia will be included throughout the external design to showcase the beautiful natural habitat of the Penrith area.
- Native vegetation around the site will be selected to suit the surrounding location.
- Locally sourced materials and onsite staff will be favoured during construction.

3.2.2 Equity and Local Economy

The project will incorporate the following design initiatives to support the equity and local economy, including: -

- There will be a preference for Forest Stewardship Council (FSC) or Australian Forestry Standard (AFS) certified timber products.

3.2.3 Indoor Environmental Quality

The project will incorporate the following design initiatives to achieve a high level of IEQ and improves building occupants' health and well-being, including: -

- Low VOCs for all internally applied paints, adhesives, sealants, and carpets, as well as any new furnishings, and low formaldehyde emission levels for all engineered wood products will be preferred during detailed design.
- Acoustic treatments will be installed to ensure acoustic comfort is achieved as well as acoustic privacy.
- Ductwork will be thoroughly cleaned and/or sealed prior to installation and considered for maintenance of services.
- All outside air filtered will have at least F6 filters.
- Connection to nature will be established through the use of natural finishes – timber, exposed natural concrete elements, decorative pebbles.

3.3 SUSTAINABLE MANAGEMENT OF MATERIALS

3.3.1 Materials and Products

The project will incorporate the following design initiatives to reduce the environmental impact of the products and materials, including: -

- New material will be reduced, and sustainable materials will be favoured, including consideration for recycled content in concrete, timber, and PVC minimisation.
- Embodied energy of materials will be considered throughout the design and selection of materials as well as through construction processes.
- Forest Stewardship Council (FSC) or Australian Forestry Standard (AFS) certified timber products will be favoured during construction.
- Certified products (e.g. Environmental Product Declarations (EPDs), GreenTag or GECA) will be favoured during construction.

3.3.2 Waste

The project will incorporate the following design initiatives to reduce waste to landfill: -

- Adequate spaces for waste recycling bins will be provided throughout the development to ensure operational waste can be managed. A dedicated waste room will also be designed to ensure there is sufficient space for recycling.
- Separate waste facilities will be provided for the commercial components.

3.4 ACCOUNTABILITY AND TRANSPARENCY

3.4.1 Tracking and Ratings

The project has identified multiple areas where sustainable targets will be managed throughout the life of the development and will consider their feasibility: -

- Energy and greenhouse gas emissions targets will be monitored and tracked.
- Water targets to be monitored and tracked.
- Waste targets to be addressed through waste sorting and monitoring.

3.5 PENRITH LEP

The Penrith LEP Clause 4.2 Sustainable Development outlines ESD initiatives to be incorporated into the development. The project's responses to these requirements are outlined in Table 1 below: -

Objective	Response
Conserving energy and reducing carbon dioxide emissions.	The provision of highly energy efficient technology will enable the reduction of energy and reduce carbon emissions. Energy efficient appliances, light fittings and air-conditioning and ventilation systems throughout the development afford reductions in energy consumption and thus contribute to lowering emissions. At least 20kW solar photovoltaic system will be provided which will also reduce carbon dioxide emissions.
Embodied energy in materials and building processes	Where possible, low embodied carbon construction materials and practices will be employed. This will be demonstrated through the use of concrete and steel with high recycled content as well as those with Environmental Product Declarations. The use of recycled content in such materials reduces the embodied carbon footprint of the proposed development. Internal finishes with lox toxic chemicals (e.g., VOC and formaldehyde) and high recycled content will also be chosen.

Objective	Response
Building design and orientation	Apartments are provided with adequate solar access and daylight in accordance with ADG requirements. Windows are oriented for maximum solar access to living rooms. Building elements such as shading devices, projecting overhangs and balconies maximise solar access in winter and sun shading in summer. To be further addressed by Architect.
Passive solar design and day lighting	Apartments are provided with sufficient window openings to allow natural light into living spaces. These spaces are also provided elements such as balconies and sunshades to maximise solar access in winter but also reduce radiant heat in summer. High performance single and double glazing has been carefully selected to ensure a good balance between visual light transmittance and solar control properties. This ensures that apartments have effective natural light but also improves occupant comfort.
Natural ventilation	Within the apartments, window openings are located in opposite walls and in line with each other to provide natural cross ventilation for the apartments. Occupants have the ability to open windows and sliding doors to increase natural ventilation and reduce reliance on air-conditioning. The carpark on Levels 1 to 3 is designed to be naturally ventilated via external façade openings.
Energy efficiency and conservation	The project features numerous energy efficient technologies and systems to reduce energy consumption during operation. High performance glazing and building fabric to the apartments together with effective natural ventilation will reduce reliance on air-conditioning. Energy efficient appliances, LED light fittings and air-conditioning systems (minimum EER 3.0-3.5) will also be installed. Elevators will be highly efficient and incorporate regenerative braking technology to reduce energy consumption. Common areas, retail and commercial spaces will be provided with energy efficient LEDs with motion sensors. Air-conditioning and ventilation systems will be on time clocks and equipped with highly efficient variable speed drives (VSDs) to fans and pumps. At least 20kW solar photovoltaic system will be provided for the residential apartments to reduce energy consumption and associated emissions.
Water conservation and water reuse	Water efficient taps, showerheads and appliances will be provided to the residential apartments and common areas. The swimming pool will be provided with efficient filtration systems to reduce water consumption. A 20-kL rainwater tank is provided to capture rainwater which will be reused for landscape irrigation and car washing.

SECTION 4.0 BASIX AND SECTION J COMPLIANCE

The Penrith DCP requires proposed residential and non-residential developments to meet certain energy efficiency targets, pursuant to BASIX certification and Section J compliance. Significant measures and initiatives are to be implemented into the design as follows:

4.1 RESIDENTIAL COMPONENTS

The proposed development is located in West Sydney (Climate Zone 28) which requires a BASIX Energy Score of twenty-five (25) and a Water Score of forty (40). A number of initiatives have been implemented to ensure these BASIX targets are met, such as LED lighting, high Energy Star rated appliances, and high WELS rated taps and fixtures. Residential apartments are also provided with a 20 kW PV system to reduce peak electricity demand.

4.2 NON-RESIDENTIAL COMPONENTS

The non-residential components of the proposed development (including ground floor commercial areas, and Level 4 communal gym facilities) will demonstrate compliance with NCC 2019 Section J via the JV3 Verification Method once the design has progressed. The process for establishing JV3 compliance is as follows: -

1. Construct an energy model of the proposed building;
2. Construct and energy model of a building of same basic configuration complying with the Deemed-To-Satisfy provisions and including services as outlined in the JV Specification identified in the NCC. (This is referred to as the “Reference Building”);
3. Run the energy models to compare annual greenhouse gas emissions results. Compliance is met when the annual greenhouse gas emissions from the “Proposed Building” is less than that of the “Reference Building”; and
4. Run thermal comfort assessment for the Proposed Building.

This method is mainly proposed to offset the glazing performance requirements against other building elements that exceed the DTS requirements. It is expected that the higher performing elements of the architectural design will enable a reduction in glazing performance and therefore allow the building to achieve Section J compliance.

The JV3 modelling will be undertaken in the later stages of the development. Based on current architectural design, and for non-residential buildings in Climate Zone 6, the following building constructions and energy efficiency measures will be required to comply with the DTS provisions of NCC 2019 Section J.

4.2.1 **External Glazing**

- Retail “display glazing” on ground floor will require a maximum system (glass and frame) U-value of 5.8 and SHGC of 0.81. Display glazing being glazing used to display retail goods in a shop or showroom directly adjacent to a walkway or footpath, but not including that used in a café or restaurant.
- The DTS glazing requirements for other commercial areas is expected to be very stringent given the high window-wall ratio (WWR) percentages. Due to the high level of glazing performance required by the DTS provisions, the potentially unappealing resulting aesthetics, and associated costs, the JV3 Verification Method will be adopted.
- As part of the JV3 approach, more acceptable and cost-effective glazing will be proposed to these non-residential spaces. It is intended that the remaining building fabric insulation requirements may be increased to offset the lesser glazing performance.
- The inclusion of passive shading elements, such as, the projection of Level 1 to the North, East and West, will help minimise the amount of direct sunlight to the retail spaces and thus assist with Section J compliance. Adjacent buildings to the East will also provide some overshadowing to these areas.

4.2.2 **Building Fabric**

- For the purposes of Section J, the building envelope means the parts of the building's fabric that separate a conditioned space or habitable room from the exterior of the building or a non-conditioned space. At a later stage, floor plans will be marked up to identify conditioned spaces of this development to be assessed under Section J.
- The following building construction performances will be required for the development and anticipated to be met in the final design. The below Total system values are inclusive of insulation and account for the effects of thermal bridging: -
  - External Walls (between conditioned space and outside): Total R-value = R1.40.
  - Internal Walls (between conditioned and non-conditioned spaces): Total R-value = R1.40.
  - Exposed Roof (above conditioned spaces): Total R-value = R3.20, with a solar absorptance < 0.45 (Colorbond 'Shale Grey' or lighter).
  - Internal Floor/Ceiling (between conditioned and non-conditioned spaces): Total R-value = R2.0.
  - Floor on Ground (underneath conditioned spaces): Total R-value = R2.0 (inclusive of soil-contact R-value).
  - Exposed Suspended Floor (below conditioned spaces): Total R-value = R2.0.
- In order to offset the glazing, the remaining building fabric and minimum insulation requirements will be made compliant with Section J. This will include maximising the installation of additional insulation to the Basement 1 soffit, external walls, and internal walls to non-conditioned spaces.

4.2.3 **Building Services**

- At a minimum, the proposed building services are to be compliant with the DTS provisions of the Section J as outlined below.
- Adequate building sealing is to be provided at doors, windows, walls, and fabric construction. Automatic dampers to exhaust fans and air intakes are also required.
- Air-conditioning and ventilation systems are to be compliant with Part J5 and/or MEPS where applicable.
- Lighting and power control devices are to be incorporated and be compliant with Part J6.
- Swimming pool heating and pumping are to be implemented and made compliant with Part J7.
- Metering and monitoring systems and vertical transportation, as required by Part J8, are to be implemented and made compliant with Section J.