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MIXED USE DEVELOPMENT
2b-6 Hassall Street, Parramatta

Ecologically Sustainable Development Report for Development Application

Prepared for:

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MIXED USE DEVELOPMENT **18255**
2b-6 HASSALL STREET, PARRAMATTA

ECOLOGICALLY SUSTAINABLE DEVELOPMENT REPORT

This register identifies each issue of and each amendment to this document by Revision No, Page No, the details of each amendment and date of issue.

AMENDMENT REGISTER						
Rev. No	**Section & Page No**	**Issue/Amendment**	**Author**	**Project Engineer**	**Checked**	**Date**
P1	-	Preliminary DA Issue	RC	TB	TB	20/03/19
02		DA Issue	RC	TB	TB	20/03/19

Disclaimer

This report undertaken at concept/schematic design stage describes the intended development design features and desired outcomes. Design features and outcomes provided herein are preliminary in nature and are subject to further review during design development.

EXECUTIVE SUMMARY

This Ecological Sustainable Development (ESD) report has been prepared by Floth and is submitted to the City of Parramatta Council to accompany a Development Application (DA) for a mixed development at 2b-6 Hassall Street, Parramatta.

Incorporating leading sustainable design and construction features, the project is proposed to incorporate the following:

- Basement Carpark Level, university tenancy and supporting services,
- Ground - Entry foyer, university tenancy, retail/café tenancies, plantrooms and loading dock,
- Podium Levels 01 & 02 - University tenancy,
- Low Rise Levels 03 to 09- University tenancy,
- High Rise Levels 10 to 17 - Commercial office tenancy,
- Roof Level 18 - Plantroom.

The building design team has incorporated both passive design features and energy efficiency initiatives which will achieve a significant reduction in energy and water usage of the building. It will create an ecologically sustainable development with significantly reduced greenhouse gas emissions.

Some of the proposed ESD key initiatives to be committed for the proposed development are listed below:

- Green Star Design & As Built v1.2 rating with a 5 star target
- Sufficient exposure to daylight
- Appropriate construction and glazing selection
- Energy efficient high performance air conditioning systems
- LED luminaires
- Efficient water fixtures
- Stormwater management plan
- Waste management plan
- Cliamte Adaptation Plan

Consideration has been made to optimise the sustainability of materials and building components. It is recommended that ESD initiatives continue to develop and be implemented during the detailed design stage of the project.

The proposed development will comply with National Construction Code (NCC) Section J Energy Efficiency by means of a Deemed-To-Satisfy Solution or Performance Solution as appropriate.

RESPONSE TO SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS

This report has been prepared to accompany the EIS for the proposed development. It responds to the infrastructure and water management issues addressed in the SEARs as outlined in the table below.

Relevant SEARs	Item discussed at
3. Built Form and Urban Design • ESD principles including sustainability targets and integration of these in design approach	Section 4.1 & 4.2
7. Ecologically Sustainable Development (ESD) • Detail how ESD principles (as defined in clause 7(4) of Schedule 2 of the Regulation) will be incorporated in the design and ongoing operation phases of the development.	Section 4.2, 4.3 & 4.4
• Include a framework for how the future development will be designed to consider and reflect national best practice sustainable building principle to improve environmental performance and reduce ecological impact. This should be based on a materiality assessment and include waste reduction design measures, future proofing, use of sustainable and low carbon materials, energy and water efficient design (including water sensitive urban design) and technology and use of renewable energy.	Section 4.2, 4.3, 4.4, 4.6 & 4.7
• Include preliminary consideration of building performance and mitigation of climate change, including consideration of Green Star Performance.	Section 4.2 & 4.9
• Provide a statement regarding how the design of the future development is responsive to the CSIRO projected impacts of climate change, specifically: - hotter days and more frequent heatwave events - extended drought periods - more extreme rainfall events - gustier wind conditions - how these will inform landscape design, material selection and social equity aspects (respite/shelter areas).	Section 4.9

CONTENTS

1. INTRODUCTION

This report addresses the environmentally sustainable design (ESD) proposed for the mixed-use development at 2b-6 Hassall Street, Parramatta NSW 2150. The development is located in Zone B4 Mixed Use within the City of Parramatta Local Government Area (LGA) where Parramatta Local Environmental Plan 2011 applies.

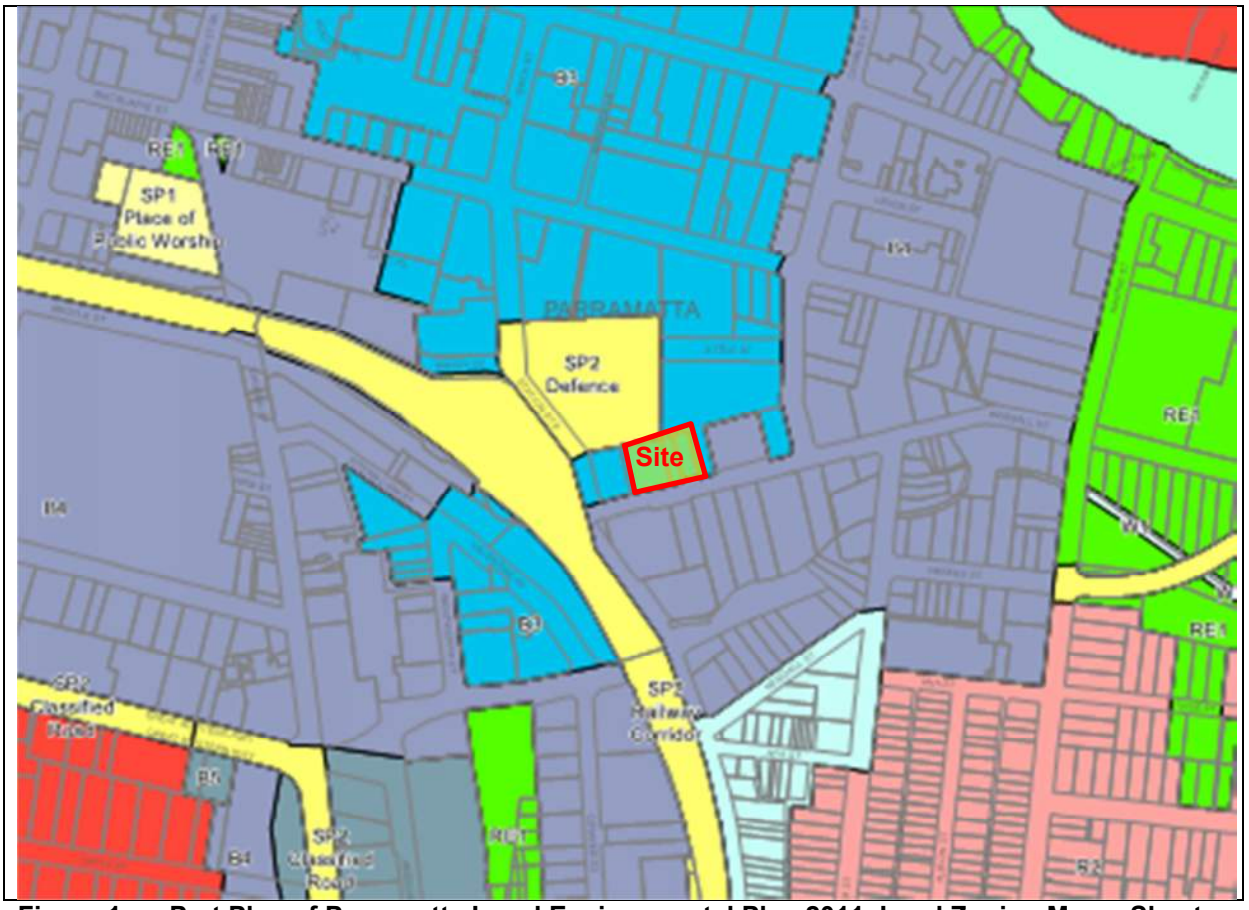

Figure 1 Part Plan of Parramatta Local Environmental Plan 2011, Land Zoning Map – Sheet LZN_010

The ESD initiatives are based on the City of Parramatta Development Control Plan (DCP) 2011 - 3.2.4 Energy Efficient Design.

This report details sustainable design strategies for the development, the building services and the construction to achieve the required sustainability performance.

2. DESCRIPTION OF BUILDING

This ESD report has been prepared by Floth and is submitted to the City of Parramatta Council to accompany a State Significant Development Application (SSDA) for a mixed-use development at 2b-6 Hassall Street, Parramatta.

The proposed mixed-use development comprises:

- Site preparation works including bulk excavation and tree removal;
- Construction and use of two basement levels;
- Construction and use of a twenty-one storey building comprising:
  - Ground level university and retail tenancies;
  - Two podium levels for university tenancy;
  - Lowrise levels with seven levels (Levels 3 – 9) of university tenancy;
  - Highrise levels with eight levels (Levels 10 – 17) of commercial tenancy and
  - Rooftop terrace.

- Landscaping and public domain works including the provision of a public plaza on ground level; and
- Extension and augmentation of services and infrastructure as required.

The building classifications defined in the NCC 2016 Building Code of Australia are:

▪ Carpark areas	Class 7a
▪ Retail areas	Class 6
▪ Office areas	Class 5
▪ Educational use	Class 9b

3. GENERAL

The design and construction measures of the project will be undertaken in accordance with:

- City of Parramatta DCP 2011 – 3.2.4 Energy Efficient Design
- National Construction Code (NCC) 2016 Section J

The building construction will feature materials that have advantageous thermal properties to ensure that the air conditioning systems use less energy.

Intelligent design and material selection ensure that thermal comfort is not entirely achieved by a mechanical means. Passive design initiatives such as performance glazing, building orientation and use of insulation will reduce demand on the mechanical air conditioning systems resulting in a reduction of energy consumption and greenhouse gas emissions.

4. ESD INITIATIVES

The ESD initiatives to be committed for the proposed development are outlined in sections below.

4.1 Building Elements

4.1.1 Site Location

The subject site is located in the suburb of Parramatta surrounded by existing educational, commercial, residential buildings and the rail corridor.

The location of the proposed mixed-use development is shown in Figure 2 below.

Figure 2 Site Location and surrounding developments

The building's positioning and internal layout combined with other energy efficiency features are key elements that can help minimise the energy consumption of the air-conditioning systems required for heating and cooling, reducing greenhouse gas emissions and improving comfort. The aim is to achieve an optimum balance between capturing sunlight and cool breeze access.

4.1.2 Solar Access

To create a pleasant working environment and have a positive effect on human health, it is important to have a sufficient exposure to daylight.

The site shall be designed to receive direct sunlight and minimise the need for artificial lighting during the daytime and improve the thermal comfort of employees, customers and visitors.

4.1.3 Natural Ventilation

Adequate natural air movement makes an important contribution in creating a comfortable indoor environment and reducing the need for mechanical ventilation by carrying accumulated heat out and replacing it with cooler external air. This is important during the summer months where heat build-up in the building can be quickly removed with the availability of suitable breeze at the site.

The architectural design encompasses an atrium which proposed to be operable at the top and bottom to facilitate natural ventilation via the atrium under suitable environmental conditions.

4.1.4 Building Fabric

The proposed development is to be designed to exceed the NCC 2016 for building envelope.

CLASS 5, 6 AND 9 AREAS

a) Construction

The minimum performance requirements for the building form and construction of air-conditioned areas at the proposed development location as per the NCC 2016 Section J- Energy Efficiency are:

- Roof and Ceiling R3.2
- External Walls R2.8
- Internal Walls R1.8
- Floor R2.0
- Glazing as per Part J2 of the NCC 2016 and the BCA glazing calculator, or Performance Solution.

This will necessitate the use of insulation in the walls, floor and roof. Insulation reduces heat flow and consequent heat loss in winter and heat gain in summer. This minimises the heating and cooling load demand on the air conditioning systems.

Slab and external walls will be concrete. Concrete is a high density material and a reasonably good conductor in comparison with other building products. For high density materials a large amount of heat energy is required to change the temperature. This means that it has high thermal mass and excellent properties for absorbing, storing and releasing heat energy it to the room. It is advantageous in damping daily temperature variations within conditioned spaces, resulting in both heating and cooling loads reductions.

Light coloured roof material is recommended to be used to reflect more sunlight and reduce summer heat gain.

b) Glazing

It is recommended that windows for air-conditioned areas of the development be high performance glazing systems. Performance glazing substantially reduces heat transmission. This particularly reduces heat loss in winter; therefore, internal heat gain from equipment, lighting and people are better contained. Also, performance glazing absorbs the infrared portion of sunlight and reduces the amount of heat transferred into the conditioned space. This will correspond in a reduction of both heating and cooling loads.

The glazing will comply with NCC Section J Energy Efficiency by means of Deemed-To-Satisfy Solution or Performance Solution as appropriate. The assessment to show compliance will be carried out during the detailed design development stage of the project.

CLASS 7

The car park areas will not be air-conditioned. Therefore, there are no construction and/or glazing performance requirements for these areas in NCC Section J1 and J2.

c) North façade reflection to Common Open Space

The design competition jury for the building required that the speculative reflective surfaces on the north façade should be 30% shaded at 1pm AEDT on 21st Dec.

The shading on the north façade was projected on the building's 3D model and the shaded speculative reflective surface areas were measured and compared to the total speculative reflective surface area.

The percentage of shaded speculative surface areas to the total speculative surface area is found to be 32%. This satisfies the requirements of the design competition jury.

The north façade elevation with the shadow at 1pm of summer solstice is attached in Appendix B.

4.2 Green Star

The project team endeavour to design and achieve a Green Star Design & As Built v1.2 Rating of 5 stars.

The project is registered with the Green Building Council of Australia (GBCA).

4.3 Energy Efficiency

Each climate zone under the National Construction Code (NCC) has different design and conditioning requirements to minimise energy use for heating and cooling. Good balance of heating and cooling reduction techniques are required to create an energy efficient development.

4.3.1 Rating Systems

Low energy consumption levels will be achieved by exceeding compliance requirements of the NCC Section J Energy Efficiency.

A NCC 2016 Section J Energy Efficiency assessment of the proposed development will be carried out to show compliance. A preliminary Section J report is included in the Appendix of this report.

4.3.2 Air-conditioning and Mechanical Ventilation

Air conditioning for office, retail tenancy, commercial tenancy and educational areas is provided via energy efficient high-performance air conditioning systems. Cooling will provide via a chilled water system with high performance chillers, with condenser water heat rejection provided via cooling towers.

The air-conditioning systems shall be designed to comply or exceed the minimum requirements of NCC 2016 Section J5.

Heating will be provided by a heating water system utilising gas-fired hot water heaters to achieve compliance with NCC 2016 Section J5.

A building management and control system (BMCS) is proposed for the control of the building services to enhance energy efficiency. The BMCS will include smart controllers for time scheduling, occupancy sensors and/or after hours run-on timers, etc. incorporated to switch on and off for spaces requiring air conditioning and other services as required when a space is occupied only.

Thermal energy metering will be used in combination with power sub-metering and other monitoring devices to assist in fine-tuning and optimising the combined plant efficiency considering chillers, gas-fired hot water heaters, cooling towers, pumps and air handling units (AHU).

Mechanical ventilation will satisfy or exceed the DTS requirements of the NCC.

Ductwork and pipework systems will be designed to reduce system pressure losses to reduce fan and pump motor power. This includes the selection of equipment for reduced coil and vessel pressure drops and being generous with ductwork and pipework sizes to reduce friction losses.

These initiatives will provide significant savings in energy use.

4.3.3 Lighting System

Fittings incorporating the latest lamp technologies will be installed to minimise energy use and provide efficient artificial lighting systems.

The proposed development will allow plenty of natural daylight access to minimise the use of artificial lighting where possible.

Lighting will be designed to comply with or exceed the minimum requirements of NCC 2016 Section J6.

The proposed developments shall be illuminated using LED fittings and be controlled via local motion detector or time switch to ensure lights are not left on when not required.

A lighting control system is proposed to control the lighting systems with smart controllers to enhance energy efficiency by zone programming, time scheduling, enabling daylight harvesting and occupancy detection.

4.3.4 Metering

To help each tenant understand the effect that their behaviour has on the energy consumption, separate light and power metering will be provided in each tenancy.

4.3.5 Emission Intensity Target

The City of Parramatta DCP requires developments with a construction cost of over $5 million to demonstrate a commitment to achieve no less than 4 stars under the NABERS Rating system or equivalent.

The project team endeavour to meet or exceed this requirement with an emission intensity equivalent to a NABERS Energy rating of 4 starand an aspirational target of 5 stars.

The design emission intensity of the building is 140 kg CO_2 / m^2 .pa.

4.3.6 Hot Water System

Energy efficient high performance hot water systems utilising centralised gas fired hot water heaters, hot water circulating pumping system, and insulated hot water piping system will be installed. The BMCS will monitor the gas consumption, leak detection in the piping system to minimise wastage and achieve energy efficiency.

4.4 Water Conservation

Water is one of our most precious resources. Water restrictions have been applied across the greater Sydney area.

The following initiatives are proposed to ensure that significant water savings are achieved.

4.4.1 Fittings and Fixtures

All water fittings and fixtures such as showerheads, water tap outlets and toilet cisterns are to have and/or exceed the following WELS star ratings:

Water Fittings / fixtures	Proposed Rating	Highest Available Rating (AS/NZS 6400-2016)
Shower head rating	3	4
Kitchen tap ratings general taps	4	6
Urinals	4	6
Toilet cistern	4	6
Bathrooms - sink tap ratings	4	6
Retail kitchen tap ratings general taps	3	6
Retail kitchen tap ratings spray / rinse taps	3	6

4.4.2 Water Consumption Target

The project team endeavour to achieve a water consumption target of 0.65 kL/m2.pa which is better than an equivalent water consumption of NABERS Water rating of 4 stars (0.684 kL/m2.pa).

4.5 Stormwater Management

It is important to improve water quality, ensure that public health and safety is maintained and protect the development from stormwater inundation.

Well-managed stormwater in urban areas will minimise impacts on the natural water cycle by litter, chemical pollutants and sediments to waterways.

A Stormwater management plan has been prepared to demonstrate how stormwater is proposed to collected, stored and discharged from the development site.

4.6 Waste Management

Waste collection and disposal plays an important role in the protection of the environment and the health of the population in the modern world.

Waste management plans (WMPs) including construction and operational WMPs has been prepared by EcCell Environmental Management Pty Ltd in accordance with City of Parramatta's requirements to assess and monitor the waste management process during construction and demolition, as well as waste produced during occupation within the development.

A simple user guide will be provided for each tenancy to inform them of waste management arrangements.

4.7 Materials

Construction material selection is an important part of environmental strategy. Every material consumes natural resources during its manufacture and transportation to site. The selection of materials and finishes also impacts ongoing maintenance by susceptibility to weathering, deterioration and replacement cycles contributing to energy consumption and greenhouse gas emissions.

Where possible, it is recommended that building materials, fittings and finishes have been recycled or incorporate recycled materials and have environmental certification recognized by a third party certification scheme.

The proposed ESD initiatives for materials to be utilised on this project comprise:

- Paint and floor covering containing low levels of volatile organic compounds (VOC).
- Design of building components, including the structural framing, roofing and facade cladding for optimal durability and longevity.
- Waste cupboard or storage areas for recycling and garbage.

It is recommended that recycled steel be used in construction where possible.

4.8 Biodiversity and Landscape design

Good landscaping and planting design in conjunction with existing natural systems can make a major contribution to the natural cycle of the local environment. It can help improve the overall quality, health and well-being of the users of the development.

It is a council requirement that landscaping design is to conserve significant natural features of the site and contribute to effective management and biodiversity, and to promote energy efficiency by enhancing solar access and shade.

The Landscape architect will prepare documentation in accordance with City of Parramatta's requirements for landscaping and tree management for the proposed development site.

4.9 Climate Adaptation Plan

A Climate Adaptation Plan is in development to facilitate resilence of the building to the impacts of a changing climate and natural disasters.

The Climate Adaptation Plan is being prepared as per Green Star Design & As Built V1.2 – 03 Adaptation and Resilience and AS 5334:2013 Climate Change Adaptation for Settlements and Infrastructure.

The Climate Adaption Plan will Contain the following information:

- Summary of the project's characteristics (site, location, climatic characteristics);
- Assessment of climate change scenarios and impacts on the project using at least two time scales, relevant to the projects anticipated lifespan. This will include a summary of potential direct and indirect climate change impacts (environmental, social and economic) on the project;
- Identification of the potential risks (likelihood and consequence) for the project and the potential risks to people;
- A list of actions and responsibilities for all 'high' and 'extreme' risks identified; and
- Details of stakeholder consultation that will be undertaken during plan preparation and how the issues raised will have been incorporated.

APPENDIX A – PRELIMINARY SECTION J REPORT

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SUSTAINABLE BUILDING CONSULTANTS
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COMMERCIAL OFFICE TOWER DEVELOPMENT
2b - 6 Hassall Street, Parramatta

BCA Section J Architectural Compliance Report
Development Application

Prepared for:

Charter Hall

Project Manager:

SOLUTIONS CONSULTING AUSTRALIA

Architect:

architectus™

Project No: 18255
Revision Date: 12 April 2019
Revision: 2

COMMERCIAL OFFICE TOWER DEVELOPMENT
2b – 6 Hassall Street, PARRAMATTA

18255

BCA SECTION J ARCHITECTURAL COMPLIANCE REPORT

This register identifies each issue of and each amendment to this document by Revision No, Page No, the details of each amendment and date of issue.

AMENDMENT REGISTER

Rev. No	Section & Page No	Issue/Amendment	Author	Project Engineer	Checked	Date
P1	-	Original	MN/RC	TB	AM	15/03/2019
2		DA Issue	RC	TB	TB	12/04/2019

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EXECUTIVE SUMMARY

This BCA Section J report has been prepared by Floth and has been prepared for the proposed commercial office tower development located at 2b – 6 Hassall Street, Parramatta.

The building classifications defined in the NCC 2016 Building Code of Australia are:

▪ Carpark areas	Class 7a
▪ Retail areas	Class 6
▪ Office areas	Class 5
▪ University	Class 9b

This report outlines the deemed-to-satisfy requirements within Section J of the BCA as they apply to the architectural components of the building and the associated methods of deemed-to-satisfy compliance to achieve the intent of Section J and Clause JP1.
The development is in Climate Zone 6 under the Building Code of Australia (BCA) 2016.

The deemed to satisfy building envelope requirements is summarised as;

- External heavyweight walls (150mm+ concrete with internal insulation) require overall thermal performance R 2.3
- External lightweight walls (including curtain wall spandrel panels) require overall thermal performance R 2.8
- Internal walls to non-conditioned spaces (such as plant rooms or carpark) require overall thermal performance R 1.8
- Exposed floors require overall thermal performance R 2.0
- Roof requires overall thermal performance R 3.2
- Deemed to satisfy glazing performance – As per glazing calculators

No skylights are shown on the current architectural plans, and hence no DTS performance for skylights is presented here.

To comply with Section J requirements for Building sealing, the openable doors to terraces should be self-closing and include reed switches to enable deactivation of adjacent air-conditioning in the event they are held open. Louvre windows, if installed, shall be sealed to equivalent standard of the main curtain wall. This is critical for building airtightness testing, air-conditioning efficiency and to allow the building pressurisation system to operate effectively.

While the building will comply with Section J via a *prescriptive* approach where the building envelope thermal performance detailed in this report is met in all instances, it is anticipated that the project will seek to comply by the *performance* method (JV3).

CONTENTS

1. INTRODUCTION

1.1 BUILDING GENERAL DESCRIPTION

This Section J report has been prepared by Floth and is submitted to the City of Parramatta Council for the proposed commercial office tower development located at 2b – 6 Hassall Street, Parramatta.

The proposed Hassall Street Project consists of the construction of a commercial office tower at 2-6 Hassall Street in Parramatta Sydney. Incorporating leading sustainable design and construction features, the project is proposed to incorporate the following:

- Basement Carpark Level, university tenancy and supporting services,
- Ground – Entry foyer, university tenancy, retail/café tenancies, plantrooms and loading dock,
- Podium Levels 01 & 02 – University tenancy,
- Low Rise Levels 03 to 09– University tenancy,
- High Rise Levels 10 to 17 – Commercial office tenancy,
- Roof Level 18 - Plantroom.

1.2 TERMS OF ENGAGEMENT

This report was commissioned to outline the requirements of the Building Code of Australia 2016 Section J deemed-to-satisfy architectural solutions for the 2b – 6 Hassall Street, Parramatta development.

1.3 BASIS AND LIMITATION OF REPORT

This report only considers architectural design solutions for the proposed building for their deemed-to-satisfy compliance with BCA Section J.

It is not intended to cover the compliance requirements of the building services engineering designs.

Compliance with other regulations, statutory requirements, good engineering practices, performance modelling, etc. is not included in the scope of this report and is not assessed.

The intent of Section J is to promote efficient use of energy within a building and the intent of the Section is outlined in part of Clause JP1 *"A building, including its services, must have, to the degree necessary, features that facilitate the efficient use of energy appropriate to the function and use of the building and services."*

Table 1 Project location and Climate Zone

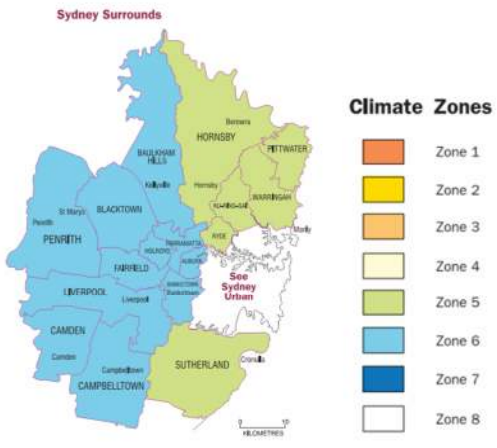


Figure 1: 2b-6 Hassall Street is in Climate Zone 6

Figure 2: 2b-6 Hassall Street site, aerial view

2. SECTION J PERFORMANCE REQUIREMENTS

The performance requirements specified in Part J of the BCA are JP1 and JP3 as detailed below.

2.1 JP1

A building, including its services, must have, to the degree necessary, features that facilitate the efficient use of energy appropriate to:

a) the function and use of the building and services;

b) the internal environment;

c) the geographic location of the building;

d) the effects of nearby permanent features such as topography, structures and buildings;

e) Solar radiation being:

- Utilised for heating.
- Controlled to minimize energy for cooling.

f) the sealing of the building envelope against air leakage.

g) the utilisation of air movement to assist heating and cooling.

h) the energy source of the services.

2.2 JP2

This clause has been deliberately left blank, this is noted here for completeness.

2.3 JP3

Heating such as for a conditioned space must, to the degree necessary, obtain energy from:

a) a source that has a greenhouse gas intensity that does not exceed 100g CO_2 – e/MJ of thermal energy load; or

b) a source that is renewable on-site such as solar, geothermal or wind; or

c) another process as reclaimed energy.

Compliance with the BCA Part J can be achieved by using Deemed-To-Satisfy construction methods.

The proposed Hassall Street commercial office tower redevelopment will meet Section J architectural requirements incorporated within JP1 using the Deemed-To-Satisfy method when the recommendations in this report are incorporated.

3. BASIS OF ASSESSMENT

3.1 GENERAL

The commercial office tower development is located at 2b-6 Hassall Street, Parramatta in Metropolitan Sydney, which is in BCA Climate Zone 6.

3.2 BUILDING CLASSIFICATION

The table below shows the areas assessed and the BCA building class (to be confirmed by the building certifier).

Table 2 Building Classifications

Building/Area	NCC Class
Carpark areas	7a
Retail areas	6
Office areas	5
University	9b

3.3 DESIGN DOCUMENTS

The report is based upon the current architectural design drawings of the project as per the below table:

Table 3 Referenced Documents

Drawing No.	Drawing Name	Revision
A05.00	BASEMENT	D
A05.01	GROUND LEVEL	D
A05.03	LEVEL 01	D
A05.04	LEVEL 02	D
A05.05	LEVEL 03	D
A05.06	LEVELS 04-06	D
A05.07	LEVELS 07-09	D
A05.08	LEVEL 10	D
A05.09	LEVELS 11	D
A05.10	LEVELS 12 – TERRACE-	D
A05.11	LEVELS 13	D
A05.12	LEVELS 14-17	D
A05.13	LEVEL 18 – PLANT	D
A05.14	LEVEL 19 – PLANT (COOLING TOWERS)	D
A05.15	ROOF PLAN	D

4. COMPLIANCE WITH SECTION J REQUIREMENTS

4.1 PART J0 ENERGY EFFICIENCY

A building can comply with performance requirements JP1, JP2 and JP3 listed previously using a *Deemed-to-satisfy* solution by complying with the following Part J clauses:

4.1.1 Clause J1

J1 pertains to building fabric energy efficiency requirements. This clause is outlined further in this report.

4.1.2 Clause J2

This clause outlines glazing performance requirements. This clause is outlined further in this report.

4.1.3 Clause J3

J3 refers to building sealing requirements for energy efficiency. This clause is outlined further in this report.

4.1.4 Clause J4

This part is deliberately left blank. This is noted here for completeness.

4.1.5 Clause J5

J5 refers to the air conditioning and ventilation compliance requirements. This is the responsibility of the mechanical services consultant and not included in the scope of this report.

4.1.6 Clause J6

J6 pertains to artificial lighting and power requirements, which is the responsibility of the electrical services consultant and not included in the scope of this report.

4.1.7 Clause J7

Clause J7 outlines the hot water supply and swimming pool and spa plant energy efficiency requirements. There is no swimming pool or spa in this development and the hot water supply is the responsibility of the hydraulic services consultant and is not included in the scope of this report.

4.1.8 Clause J8

J8 refers to the requirements for facilities for energy monitoring. This is the responsibility of the engineering services consultants and not included in the scope of this report.

5. BCA SPECIFIC CLAUSES

5.1 PART J1 BUILDING FABRIC

5.1.1 J1.1 Application of Part

The clauses below only apply to building elements forming the envelope of the building of a conditioned space. This includes walls, roofs, ceilings, slabs etc.

5.1.2 J1.2 Thermal Construction General

Table 4 J1.2 Thermal construction general requirements

General thermal construction requirements			
(a)	Insulation must comply with AS/NZS 4859.1 and be installed appropriately as per this BCA clause.		
	(i)	The insulation must abut or overlap adjoining insulation; or butt against supporting members.	
	(ii)	The insulation must form a continuous barrier with ceiling, walls, bulkheads, floors or the like.	
	(iii)	The insulation must not affect the safe or effective operation of a service or fitting.	
(b)	Reflective insulation must be installed with -		
	(i)	The necessary airspace to achieve the required R-value between a reflective side of the reflective insulation; and	
	(ii)	The reflective insulation closely fitted against any penetration, door or window opening; and	
	(iii)	The reflective insulation adequately supported by framing members; and	
	(iv)	Each adjoining sheet of roll membrane being –	
		(A)	Overlapped not less than 50mm; or
		(B)	Taped together
(c)	Where Required, Bulk insulation must be installed so that -		
	(i)	It maintains its position and thickness, other than where it crosses roof battens, water pipes, electrical cabling or the like; and	
	(ii)	In a ceiling, where there is no bulk insulation or reflective insulation in the wall beneath, it overlaps the wall not less than 50mm.	

Thermal properties of building components forming the building's envelope are required to have the thermal properties listed in BCA Specification J1.2.

The Architect is requested to confirm specifications of thermal constructions to meet the requirements.

5.1.3 J1.3 Roof and Ceiling Construction

A roof or ceiling that is part of the envelope must achieve a minimum R-Value (m^2.K/W) for the downward direction of heat flow as specified in Table J1.3a.

Table 5 Typical roof thermal performance

Table J1.3a Compliance Requirements	
Roof Upper Surface Solar Absorptance	**Minimum Total R-value** **Heat flow down**
Not more than 0.4	3.2
More than 0.4 but not more than 0.6	3.2
More than 0.6	3.2

Where there are penetrations requiring insulation clearance around them, the minimum R-Value of the roof must be increased as described in Table J1.3b.

Roof and ceiling construction thermal performance is assessed using material thermal properties listed in BCA Specification J1.3.

a) Method of Compliance

A typical roof with ceiling construction that can achieve the minimum R-Value required is outlined in the table below.

Table 6 Typical metal roof thermal performance

Construction	R Value [m^2.K/W]
Outside	
Outside air film	0.04
Metal Cladding	0.00
R2.0 reflective roof blanket 90mm (requires 80mm spacer)	2.00
Air Gap with reflective surface (0.9 outer emittance & 0.05 inner emittance)	1.06
Plasterboard Ceiling.	0.06
Inside air film	0.16
Total R-value (unventilated)	**3.32**

The above ceiling construction complies with the requirement to achieve a minimum R-Value of 3.2(m^2.K/W).

The following calculation for a plant room roof construction shows the recommended insulation levels for protection of plant and equipment maintenance staff in a plant room with metal roof.

Table 7 Plant room metal roof

Construction	R Value [m^2.K/W]
Outside air film	0.04
Metal Cladding	0.00
R2.3 roof blanket 100mm (requires 80mm spacer)	2.30
Inside air film	0.16
Total R-value (unventilated)	**2.50**

A typical concrete roof and ceiling construction that can achieve the minimum R-Value required is outlined in the table below.

Table 8 Heavyweight roof with suspended ceiling– Occupied areas to roof/terrace thermal performance

Construction	R Value [m^2.K/W]
Outside	
Outdoor air film	0.04
200mm Concrete	0.14
40mm Reflective Soffit Board	1.90
Horizontal Reflective Airspace 0.9/0.05	1.06
Suspended Ceiling	0.07
Indoor Air Film	0.16
TOTAL R value	**3.37**

Table 9 Heavyweight roof – Occupied areas to terrace thermal performance – No ceiling

Construction	R Value [m^2.K/W]
Outside	
Outdoor air film	0.04
200mm Concrete	0.14
R3.57 Soffit Board	3.57
Indoor Air Film	0.16
TOTAL R value	**3.91**

This ceiling construction complies with the requirement to achieve a minimum R-Value of 3.2(m^2.K/W) downwards. For WELL Compliance, the insulation selected must also comply with the California Department of Public Health (CDPH) Standard Method v1.1-2010.

Insulation products which may be used to comply with this requirement include the below or equal and approved:

Table 10 Roof/Ceiling insulation products

Manufacturer	Product	R-Value	Thickness (mm)
Owens Corning	Foamular Board	3.57	100
Bradford	Anticon 90 R2.0 Reflective roof blanket	2.0*	90

Product Information regarding these insulation products is included in Appendix C.

The Architect is requested to provide compliant thermal roof construction details for review in order to achieve certification for Building Approval.

5.1.4 J1.4 Roof lights

Roof lights, including any associated shaft and diffuser, that form part of the envelope must comply with table J1.4 of the BCA. Table J1.4 of the BCA outlines the total SHGC requirements and total U-value requirements of the roof lights depending on ratio of the area of roof lights to the floor area of the space being served.

Roof lights are required to have the thermal properties listed in BCA Table J1.4.

The Architect is requested to provide details of any rooflights or skylights for review, if they are to be installed.

5.1.5 J1.5 Walls

Each part of an external wall that is part of the envelope must satisfy one of the options in Table J1.5a. This clause does not apply to opaque non-glazed openings in external walls such as doors, vents, shutters, etc and glazing.

Table 11 J1.5a Compliance requirements

Table J1.5a Compliance Requirements		
Wall Type		**Minimum R-Value**
External Envelope Wall with Surface Density Greater than 220kg/m^2		2.3
External Envelope Wall with A Southern Orientation		2.3
External Envelope Wall Shaded in Compliance with BCA Figure J1.5	Shade angle > 30° to Shade Angle ≤ 60°	2.3
	Shade Angle > 60°	1.8

Table J1.5a Compliance Requirements	
Any External Envelope Wall Other than Described Above	**2.8**
Any Envelope Wall Other than an External Wall	1.8
Where the only space for insulation is provided by a furring channel, top hat section, batten or the like. Thermal resistance requirement in conjunction with glazing energy index Option B.	1.4

a) Method of Compliance

A typical masonry veneer external wall construction that complies with the deemed-to-satisfy requirements is outlined below:

Table 12 Typical heavyweight external wall thermal performance

Construction	R Value [m^2.K/W]
Outdoors	
Outdoor air film	0.04
90mm Concrete Block	0.09
R2.0 Insulation batt	2.00
Plasterboard	0.06
Vertical Indoor Air Film	0.12
TOTAL	**2.31**

This heavyweight wall construction complies with the requirement to achieve a minimum R-Value of 2.3 (m^2.K/W) for an external envelope wall with surface density greater than 220 kg/m^2 as per BCA figure J1.5.

A typical metal cladding external wall construction that complies with the deemed-to-satisfy requirements is outlined below:

Table 13 Typical lightweight external wall thermal performance

Construction	R Value [m^2.K/W]
Outdoors	
Outdoor air film	0.04
Metal cladding	0.00
Air Gap (20mm to 40 mm non-reflective and unventilated)	0.17
R2.5 Insulation Batt	2.50
Plasterboard	0.06
Vertical Indoor Air Film	0.12
Total R-value	**2.89**

This lightweight wall construction complies with the requirement to achieve a minimum R-Value of 2.8 (m^2.K/W) for an external wall as per BCA figure J1.5.

A lightweight external cladding wall that is fixed to a metal frame must have a thermal break, consisting of a material with an R-value of not less than R0.2, installed between the cladding and the metal frame.

The total thermal resistance of the lightweight metal-clad wall assembly may be reduced from R 2.8 by R 0.5 to R 2.3 where the wall is shaded by a projection angle that is 30 to 60 degrees.

A typical spandrel panel construction is outlined in the following table. A 90mm R2.5 insulation batt will be required to achieve the overall centre pane R value of 2.8 that is required for DTS compliance.

Table 14 Typical spandrel panel

Construction	R Value [m^2.K/W]
Outdoors	
Outdoor Air Film	0.04
Glass	0.01
Cavity airspace	0.17
R2.5 Insulation Batt	2.50
Aluminium sheeting	0.00
Vertical Indoor Air Film	0.12
Total R value	**2.84**

These wall constructions require additional minimum insulation of R2.5 which may be achieved using the following products, or equal and approved:

Table 15 External wall insulation products

Manufacturer	Product	R-Value	Thickness (mm)
Knauf	Earthwool HD	2.0	75
Knauf	Earthwool HD	2.5	90
Bradford	Gold HP Wall batts	2.0	75

Wall construction thermal performance must be assessed using the material thermal properties listed in BCA Specification J1.3.

Provide compliant thermal constructions of external walls for review in order to achieve certification for Building Approval.

A typical internal wall which separates an air-conditioned space from a non-air-conditioned space must be insulated to a minimum of R1.8. A typical internal wall construction that complies with the deemed-to-satisfy requirements is outlined below.

Table 16 Typical internal wall thermal performance

Construction	R Value [m^2.K/W]
Unconditioned space	
Vertical Indoor Air Film	0.12
Plasterboard	0.06
R1.5 Insulation Batt	1.50
Plasterboard	0.06
Vertical Indoor Air Film	0.12
Total R-value	**1.86**

This wall construction complies with the requirement to achieve a minimum R-Value of 1.8 (m^2.K/W) for an internal envelope wall which separates an air-conditioned space from a non-air-conditioned space. This wall will require a minimum of R1.8 thermal Insulation which may be achieved using the following products, or equal and approved.

Table 17 Example wall insulation products

Manufacturer	Product	R-Value	Thickness (mm)
Knauf	Earthwool	1.5	75
Johns Manville	Formaldehyde-Free Glass Wool Insulation with bio based binder	1.5	75

The locations of these walls are outlined on the mark ups of architectural floor plans found in Appendix B.

Provide compliant thermal constructions of external walls for review in order to achieve certification for Building Approval.

5.1.6 J1.6 Floors

A floor that is part of the envelope of conditioned spaces, including a floor separating a conditioned space from a non-conditioned space (above or below), must achieve **a total R-value of not less than R2.0**.

This occurs where any floor steps in and out and also above unconditioned space or outside air.

a) Method of Compliance

A typical suspended floor construction that complies with the deemed-to-satisfy requirements is outlined below:

Table 18 Floor 1 - Conditioned space to outside air - insulated external soffit

Construction	R Value [m^2.K/W]
Occupied space	
Indoor Air Film	0.16
Carpet+Underlay	0.10
200mm Concrete	0.14
40mm R1.9 PIR Soffit Board	1.90
Outdoor air film	0.04
TOTAL	**2.34**

Table 19 Floor 3 – Retail space to unconditioned below

Construction	R Value [m^2.K/W]
Occupied space	
Indoor Air Film	0.16
200mm Concrete	0.14
R1.78 Soffit Board	1.78
Indoor Air Film	0.16
TOTAL	**2.24**

This suspended floor construction complies with the requirement to achieve a minimum R-Value of 2.0(m^2.K/W). For WELL Compliance, the insulation selected must also comply with the California Department of Public Health (CDPH) Standard Method v1.1-2010.

Insulation products which may be used to comply with this requirement include the below or equal and approved:

Table 20 Example floor insulation products

Manufacturer	Product	R-Value	Thickness (mm)
Owens Corning	Foamular Board	1.78	50

Floor construction thermal performance must be assessed using material thermal properties listed in BCA Specification J1.3.

Floors are required to have the thermal properties listed in BCA Specification J1.6.

The Architect is requested to provide compliant thermal constructions of suspended floors for review in order to achieve certification for Building Approval.

5.1.7 Deemed-to-satisfy/prescriptive approach and performance method (JV3)

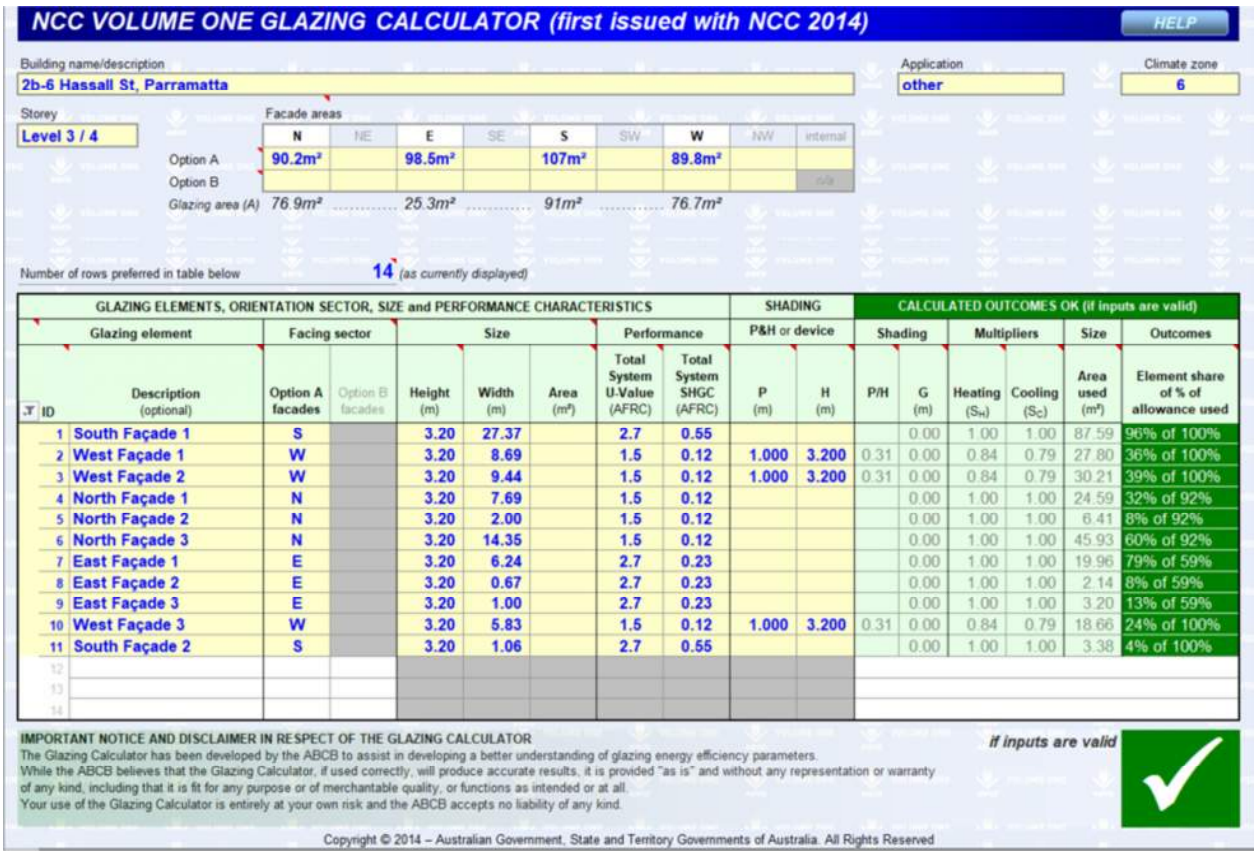
While the Hassall Street commercial office tower development will comply with Section J via a *prescriptive* approach where the building envelope thermal performance detailed in this report is met in all instances, it is anticipated that the project will seek to comply by the *performance* method (JV3).

5.2 PART J2 GLAZING

Section J2 of the BCA has deemed-to-satisfy requirements for glazing size, U-value and SHGC aimed at minimising the amount of energy used on heating and cooling for the building. The requirements vary depending on BCA Classification of the space use, BCA climate zone, façade area, façade orientation, shading, and glazed area.

5.2.1 Analysis

The Australian Building Codes Board has released a spreadsheet calculator that allows glazing properties to be determined by entering the façade characteristics of a given building. An example screenshot of the calculator can be seen below.



NCC VOLUME ONE GLAZING CALCULATOR (first issued with NCC 2014) — HELP

Building name/description: 2b-6 Hassall St, Parramatta | Application: other | Climate zone: 6

Storey: Level 3 / 4

Facade areas

	N	NE	E	SE	S	SW	W	NW	internal
Option A	90.2m²		98.5m²		107m²		89.8m²		
Option B									n/a
Glazing area (A)	76.9m²		25.3m²		91m²		76.7m²		

Number of rows preferred in table below: 14 (as currently displayed)

GLAZING ELEMENTS, ORIENTATION SECTOR, SIZE and PERFORMANCE CHARACTERISTICS								SHADING		CALCULATED OUTCOMES OK (if inputs are valid)					
Glazing element		Facing sector		Size			Performance		P&H or device		Shading		Multipliers		Size	Outcomes
ID	Description (optional)	Option A facades	Option B facades	Height (m)	Width (m)	Area (m²)	Total System U-Value (AFRC)	Total System SHGC (AFRC)	P (m)	H (m)	P/H	G (m)	Heating (S_H)	Cooling (S_C)	Area used (m²)	Element share of % of allowance used
1	South Façade 1	S		3.20	27.37		2.7	0.55				0.00	1.00	1.00	87.59	96% of 100%
2	West Façade 1	W		3.20	8.69		1.5	0.12	1.000	3.200	0.31	0.00	0.84	0.79	27.80	36% of 100%
3	West Façade 2	W		3.20	9.44		1.5	0.12	1.000	3.200	0.31	0.00	0.84	0.79	30.21	39% of 100%
4	North Façade 1	N		3.20	7.69		1.5	0.12				0.00	1.00	1.00	24.59	32% of 92%
5	North Façade 2	N		3.20	2.00		1.5	0.12				0.00	1.00	1.00	6.41	8% of 92%
6	North Façade 3	N		3.20	14.35		1.5	0.12				0.00	1.00	1.00	45.93	60% of 92%
7	East Façade 1	E		3.20	6.24		2.7	0.23				0.00	1.00	1.00	19.96	79% of 59%
8	East Façade 2	E		3.20	0.67		2.7	0.23				0.00	1.00	1.00	2.14	8% of 59%
9	East Façade 3	E		3.20	1.00		2.7	0.23				0.00	1.00	1.00	3.20	13% of 59%
10	West Façade 3	W		3.20	5.83		1.5	0.12	1.000	3.200	0.31	0.00	0.84	0.79	18.66	24% of 100%
11	South Façade 2	S		3.20	1.06		2.7	0.55				0.00	1.00	1.00	3.38	4% of 100%
12																
13																
14																

IMPORTANT NOTICE AND DISCLAIMER IN RESPECT OF THE GLAZING CALCULATOR

The Glazing Calculator has been developed by the ABCB to assist in developing a better understanding of glazing energy efficiency parameters. While the ABCB believes that the Glazing Calculator, if used correctly, will produce accurate results, it is provided "as is" and without any representation or warranty of any kind, including that it is fit for any purpose or of merchantable quality, or functions as intended or at all. Your use of the Glazing Calculator is entirely at your own risk and the ABCB accepts no liability of any kind.

if inputs are valid

Figure 3 Deemed to Satisfy glazing calculator for Level 02 –East Wing

5.2.2 Building Class

The glazing requirements for a deemed-to-satisfy solution will change depending on the class of building being assessed.

See Appendix A for the DTS Glazing Calculators for a typical office floor that include Levels 3-4.

5.2.3 Glazing Assumptions

The glazing for all areas will be assumed to be the size shown on current drawings. The intended construction method is assumed to be double glazing with aluminium frames for all office areas unless otherwise advised by the architect.

5.2.4 Glazing Analysis

For the purposes of Concept Design, a preliminary assessment undertaken on Level 3 and 4 indicates the following:

- The minimum total system U-value for all glazing types is 1.5 W/ (m^2K) based on standard aluminium framed double glazing assumed as described above.
- The maximum total system Solar Heat Gain Coefficient (SHGC) of 0.12 will be applicable for the anticipated worst case glazing

The preliminary glazing calculator analysis for the above test cases can be found in Appendix A and are subject to further review and refinement during Design Development.

All of the glazing in the design is required to be assessed at later design stages to meet the requirements of Part J2.

While the project will comply with Section J via a *prescriptive* approach where the building envelope thermal performance detailed in this report is met in all instances, it is anticipated that the project will seek to comply by the *performance* method (JV3).

5.3 PART J3 BUILDING SEALING

The clauses below only apply to building elements forming the envelope of the building or a conditioned space. This includes walls, roofs, slabs, etc.

The Architect is requested to provide compliant thermal constructions of building sealing for review in order to achieve certification for Building Approval.

5.3.1 J3.1 Application of Part

Building sealing is applicable to the conditioned spaces within the building.

5.3.2 J3.2 Chimneys and flues

The chimney or flue of an open solid fuel burning appliance must be provided with a damper or flap that can be closed to seal the chimney or flue.

5.3.3 J3.3 Roof Lights

A roof light must be sealed, or capable of being sealed, when serving a conditioned place. A roof light required to be sealed must be constructed with either:

a) An imperforate ceiling diffuser or the like installed at the ceiling or internal lining level; or
b) A weatherproof seal; or
c) A shutter system readily operated either manually, mechanically or electronically by the occupant.

The Architectural drawings do not show any roof lights or skylights. If any roof lights or skylights are included in the design, the thermal performance shall meet or exceed the requirements in Section J1.4.

5.3.4 J3.4 Windows and Doors

Openable external windows and doors serving a conditioned space are to be sealed on all edges. The bottom edge of an external swing door must have 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. This does not apply to windows complying with AS2047, fire doors or smoke doors, roller shutters or any device installed for after-hours security.

An entrance to the building, if leading to a conditioned space must have an airlock, self-closing door, revolving door or the like, other than:

a) Where the conditioned space is less than 50m^2; or
b) Where a café, restaurant, open shopfront or the like has a 3m deep un-conditioned zone between the main entrance and the conditioned space and at all other entrances to the café, restaurant, open front shop or the like self-closing doors are used.

5.3.5 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.

5.3.6 J3.6 Construction of Roofs, Walls and Floors

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 when forming part of the envelope. The construction required to minimise air leakage must be either:

- Enclosed by internal lining systems that are close fitting at ceiling, wall and floor junctions, or
- Sealed by caulking, skirting, architraves, cornices or the like.

The above requirements do not apply to grilles, openings and the like that are required for smoke hazard management.

5.3.7 J3.7 Evaporative Coolers

An evaporative cooler must be fitted with a self-closing damper or the like when serving a heated space or habitable room in Climate Zone 6.

APPENDIX A: GLAZING CALCULATORS

NCC VOLUME ONE GLAZING CALCULATOR (first issued with NCC 2014)

Building name/description: **2b-6 Hassall St, Parramatta**

Application: **other**

Climate zone: **6**

Storey: **Level 3 / 4**

Facade areas

	N	NE	E	SE	S	SW	W	NW	internal
Option A	90.2m²		98.5m²		107m²		89.8m²		
Option B									n/a
Glazing area (A)	*76.9m²*	.....	*25.3m²*	.....	*91m²*	.....	*76.7m²*		

Number of rows preferred in table below: **14** *(as currently displayed)*

GLAZING ELEMENTS, ORIENTATION SECTOR, SIZE and PERFORMANCE CHARACTERISTICS									SHADING		CALCULATED OUTCOMES OK (if inputs are valid)					
Glazing element		Facing sector		Size			Performance		P&H or device		Shading		Multipliers		Size	Outcomes
ID	Description (optional)	Option A facades	Option B facades	Height (m)	Width (m)	Area (m²)	Total System U-Value (AFRC)	Total System SHGC (AFRC)	P (m)	H (m)	P/H	G (m)	Heating (S_H)	Cooling (S_C)	Area used (m²)	Element share of % of allowance used
1	South Façade 1	S		3.20	27.37		2.7	0.55				0.00	1.00	1.00	87.59	96% of 100%
2	West Façade 1	W		3.20	8.69		1.5	0.12	1.000	3.200	0.31	0.00	0.84	0.79	27.80	36% of 100%
3	West Façade 2	W		3.20	9.44		1.5	0.12	1.000	3.200	0.31	0.00	0.84	0.79	30.21	39% of 100%
4	North Façade 1	N		3.20	7.69		1.5	0.12				0.00	1.00	1.00	24.59	32% of 92%
5	North Façade 2	N		3.20	2.00		1.5	0.12				0.00	1.00	1.00	6.41	8% of 92%
6	North Façade 3	N		3.20	14.35		1.5	0.12				0.00	1.00	1.00	45.93	60% of 92%
7	East Façade 1	E		3.20	6.24		2.7	0.23				0.00	1.00	1.00	19.96	79% of 59%
8	East Façade 2	E		3.20	0.67		2.7	0.23				0.00	1.00	1.00	2.14	8% of 59%
9	East Façade 3	E		3.20	1.00		2.7	0.23				0.00	1.00	1.00	3.20	13% of 59%
10	West Façade 3	W		3.20	5.83		1.5	0.12	1.000	3.200	0.31	0.00	0.84	0.79	18.66	24% of 100%
11	South Façade 2	S		3.20	1.06		2.7	0.55				0.00	1.00	1.00	3.38	4% of 100%
12																
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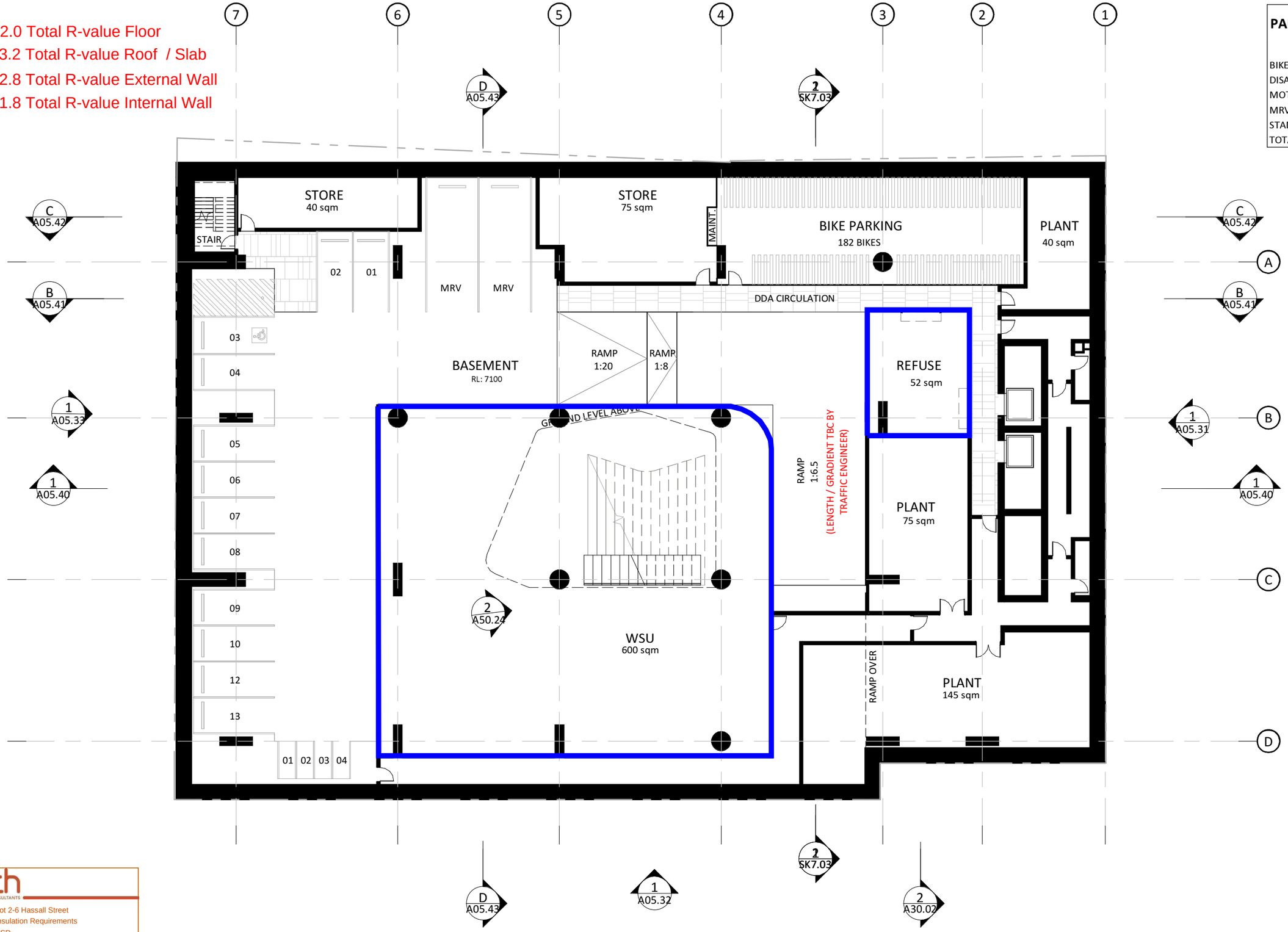
if inputs are valid

APPENDIX B: INSULATION REQUIREMENT MARKUPS

R2.0 Total R-value Floor
R3.2 Total R-value Roof / Slab
R2.8 Total R-value External Wall
R1.8 Total R-value Internal Wall

PARKING SCHEDULE

TYPE	QTY
BIKE PARKING BAY	91
DISABLE CAR BAY	1
MOTORCYCLES	4
MRV BAY	2
STANDARD CAR BAY	11
TOTAL	109



floth
SUSTAINABLE BUILDING CONSULTANTS

Project Name: Lot 2-6 Hassall Street
Sketch Name: Insulation Requirements
Sketch No: ESD
Job No: 18255
Date: 08-03-2019
By: MN

Rev	Description	Consultant	Date	Issued by
A	For Information	BRT	25.01.19	
B	For Information	BRT	08.02.19	
C	For Information	BRT	14.02.19	
D	For Information	BRT	26.02.19	

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T: 61 7 3905 6500
E: info@blightrayner.com.au

Project Name
Hassall Street, Parramatta

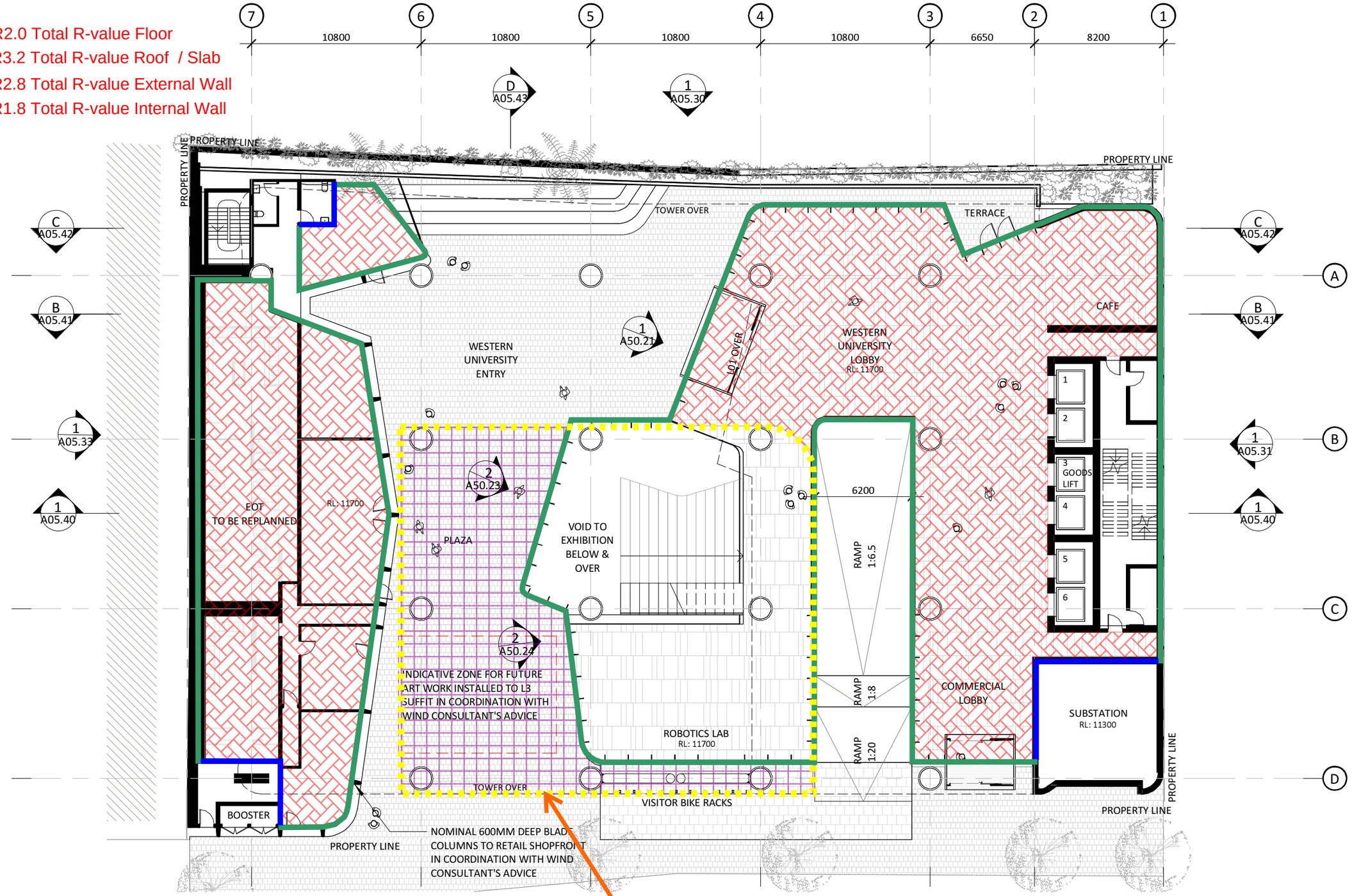
Project Address
2-6 Hassall Street, Parramatta, NSW, 215

Sheet Name
BASEMENT

Project No. 18032
Drawing No. A05.00
Revision D
Date 26.02.19
Drawn by Author
Checked by Checker
SCALE @A3 1 : 250

26/02/2019 7:09:41 PM

R2.0 Total R-value Floor
R3.2 Total R-value Roof / Slab
R2.8 Total R-value External Wall
R1.8 Total R-value Internal Wall



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Project Name
Hassall Street, Parramatta
Project Address
2-6 Hassall Street, Parramatta, NSW, 215

Sheet Name
GROUND LEVEL

Project No. 18032
Drawing No. A05.01
Revision D
Date 26.02.19
Drawn by Author
Checked by Checker
SCALE @A3 1 : 250
0 1 3
26/02/2019 7:09:45 PM

R2.0 Total R-value Floor
R3.2 Total R-value Roof / Slab
R2.8 Total R-value External Wall
R1.8 Internal Wall

Total R3.2 roof

7 6 5 4 3 2 1

D A05.43
1 A05.30
C A05.42
B A05.41
1 A05.33
1 A05.40
1 A50.21
2 A50.23
2 A50.24
D A05.43
1 A05.32
2 SK7.03
C A05.42
B A05.41
1 A05.31
1 A05.40
A
B
C
D

PROPERTY LINE
PROPERTY LINE
PROPERTY LINE
PROPERTY LINE
PROPERTY LINE
TOWER OVER
TOWER OVER
PLANTER

WESTERN UNIVERSITY SPACE
VOID TO AMPHITHEATRE BELOW
VOID TO ROBOTICS LAB
FEATURE STAIR TO L2 BY FIT OUT. BASE BUILD TO PROVIDE STANDARD STAIR
PODIUM MECHANICAL RISERS SIZES TO BE PROVIDED

RISER
WC
AWC
P
STAIR
RISER
WC

floth
SUSTAINABLE BUILDING CONSULTANTS

Project Name: Lot 2-6 Hassall Street
Sketch Name: Insulation Requirements
Sketch No: ESD
Job No: 18255
Date: 08-03-2019
By: MN

Rev	Description	Consultant	Date	Issued by
A	For Information	BRT	25.01.19	
B	For Information	BRT	08.02.19	
C	For Information	BRT	14.02.19	
D	For Information	BRT	26.02.19	

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Brisbane, Qld, 4000
W: blightrayner.com.au
T: 61 7 3905 6500
E: info@blightrayner.com.au

Project Name
Hassall Street, Parramatta
Project Address
2-6 Hassall Street, Parramatta, NSW, 215

Sheet Name
LEVEL 01

Project No. 18032
Drawing No. A05.03
Revision D
Date 26.02.19
Drawn by Author
Checked by Checker
SCALE @A3 1 : 250
0 1 3

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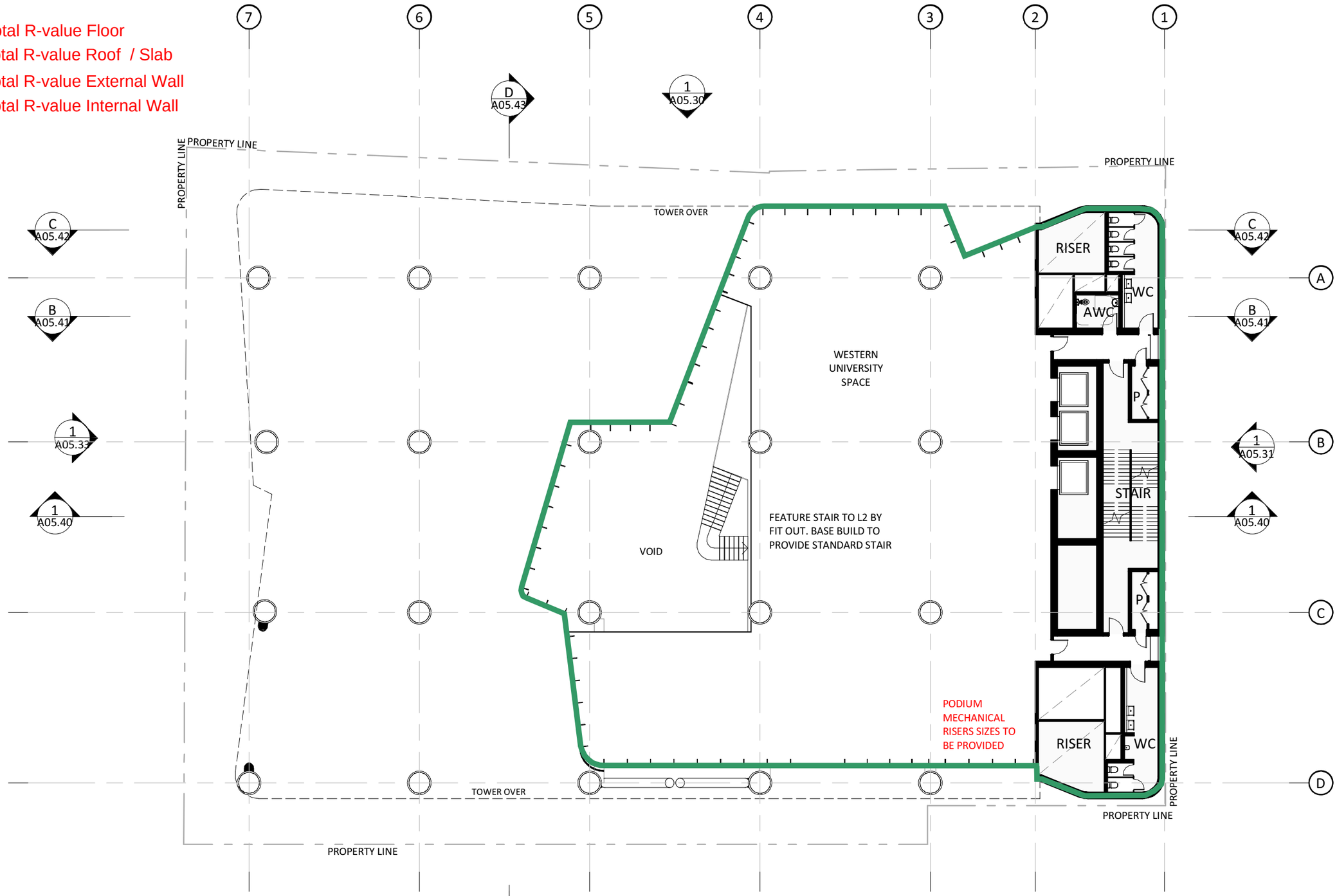
R3.2 Total R-value Roof / Slab
R2.8 Total R-value External Wall
R1.8 Internal Wall



floth
SUSTAINABLE BUILDING CONSULTANTS

Project Name: Lot 2-6 Hassall Street
Sketch Name: Insulation Requirements
Sketch No: ESD
Job No: 18255
Date: 08-03-2019
By: MN

Rev	Description	Consultant	Date	Issued by
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Project Name
Hassall Street, Parramatta
Project Address
2-6 Hassall Street, Parramatta, NSW, 215

Sheet Name
LEVEL 02

Project No. 18032
Drawing No. A05.04
Revision D
Date 26.02.19
Drawn by Author
Checked by Checker
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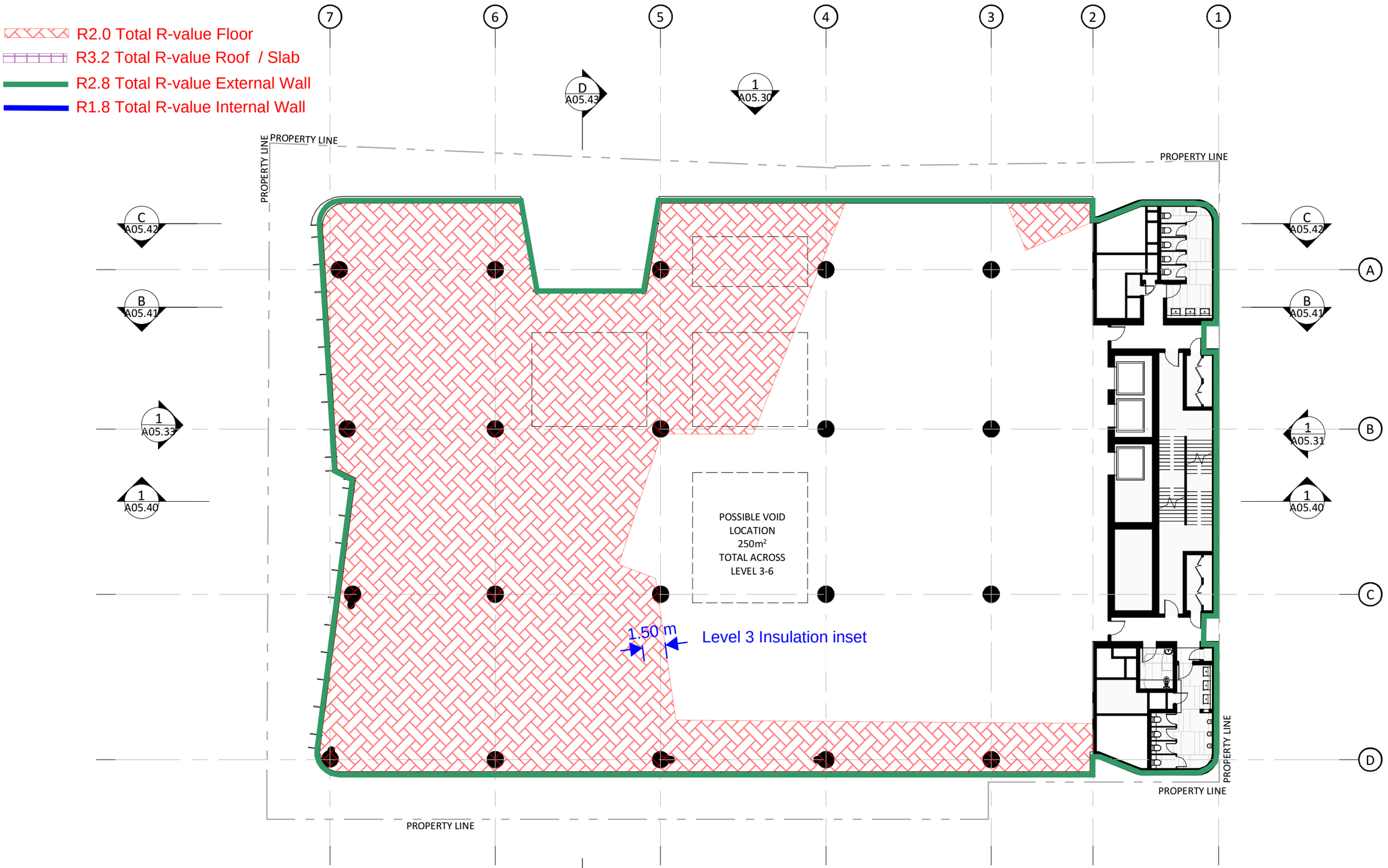

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SUSTAINABLE BUILDING CONSULTANTS

Project Name: Lot 2-6 Hassall Street
Sketch Name: Insulation Requirements
Sketch No: ESD
Job No: 18255
Date: 08-03-2019
By: MN

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Project Name
Hassall Street, Parramatta
Project Address
2-6 Hassall Street, Parramatta, NSW, 215

Sheet Name
LEVEL 03

Project No. 18032
Drawing No. A05.05
Revision D
Date 26.02.19
Drawn by Author
Checked by Checker
SCALE @A3 1 : 250
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26/02/2019 7:10:04 PM

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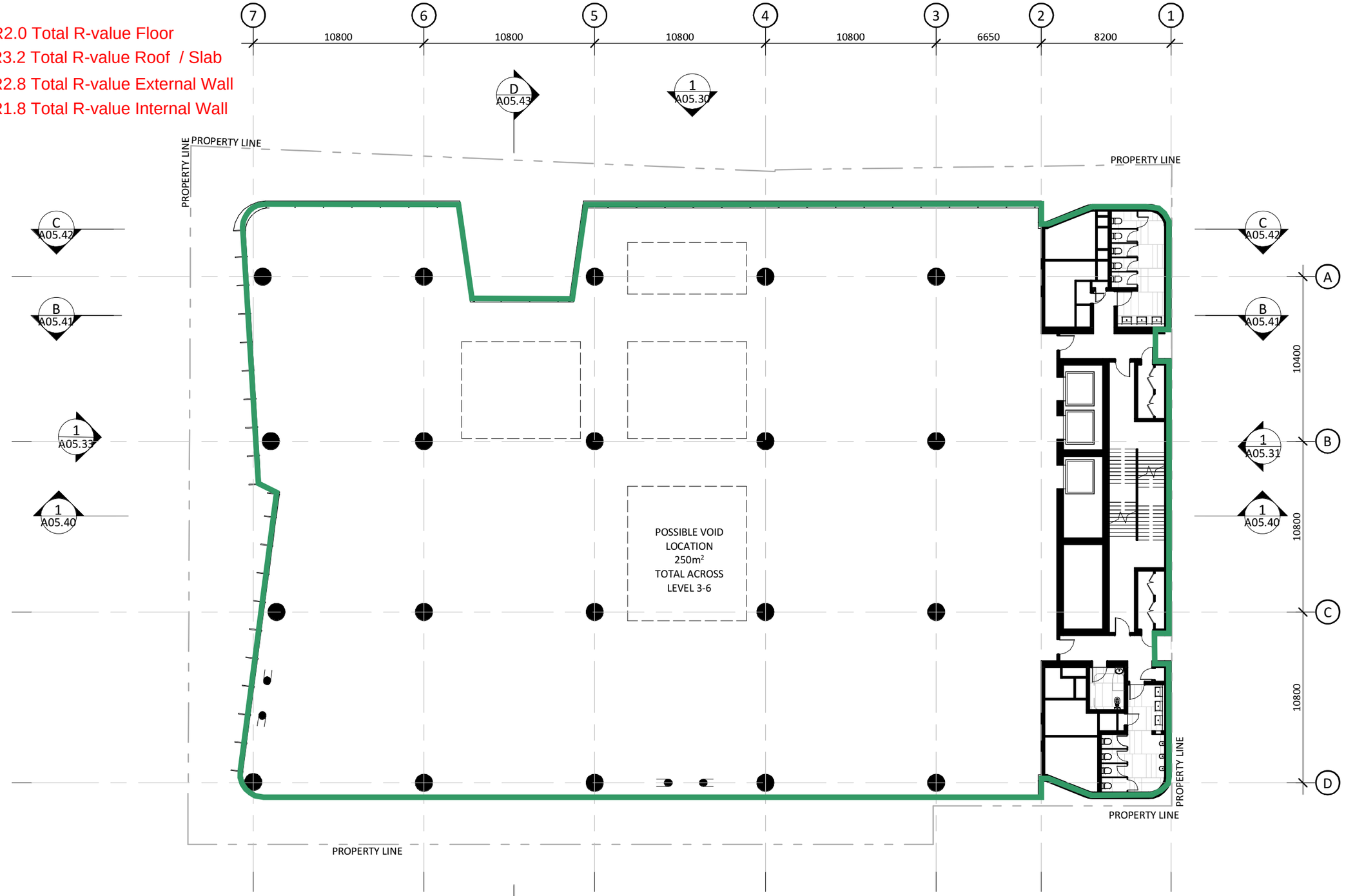
R3.2 Total R-value Roof / Slab
R2.8 Total R-value External Wall
R1.8 Internal Wall



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SUSTAINABLE BUILDING CONSULTANTS

Project Name: Lot 2-6 Hassall Street
Sketch Name: Insulation Requirements
Sketch No: ESD
Job No: 18255
Date: 08-03-2019
By: MN

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Project Name
Hassall Street, Parramatta
Project Address
2-6 Hassall Street, Parramatta, NSW, 215

Sheet Name
LEVELS 04-06

Project No. 18032
Drawing No. A05.06
Revision D
Date 26.02.19
Drawn by Author
Checked by Checker
SCALE @A3 1 : 250
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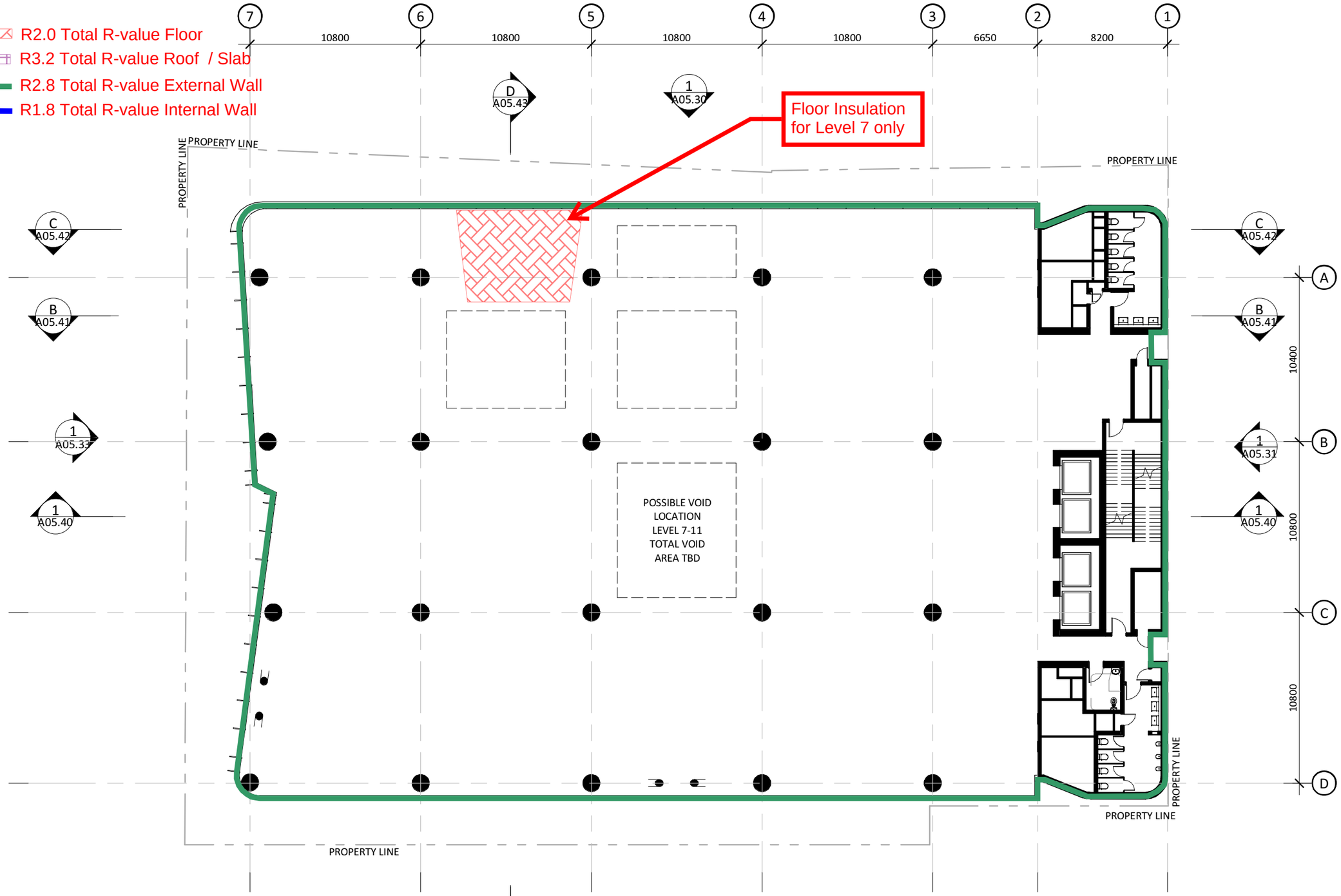
R2.0 Total R-value Floor
R3.2 Total R-value Roof / Slab
R2.8 Total R-value External Wall
R1.8 Internal Wall



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SUSTAINABLE BUILDING CONSULTANTS

Project Name: Lot 2-6 Hassall Street
Sketch Name: Insulation Requirements
Sketch No: ESD
Job No: 18255
Date: 08-03-2019
By: MN

Rev	Description	Consultant	Date	Issued by
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Project Name
Hassall Street, Parramatta

Project Address
2-6 Hassall Street, Parramatta, NSW, 215

Sheet Name
LEVELS 07-09

Project No. 18032
Drawing No. A05.07
Revision D

Date 26.02.19
Drawn by Author
Checked by Checker

SCALE @A3
1 : 250
0 1 3

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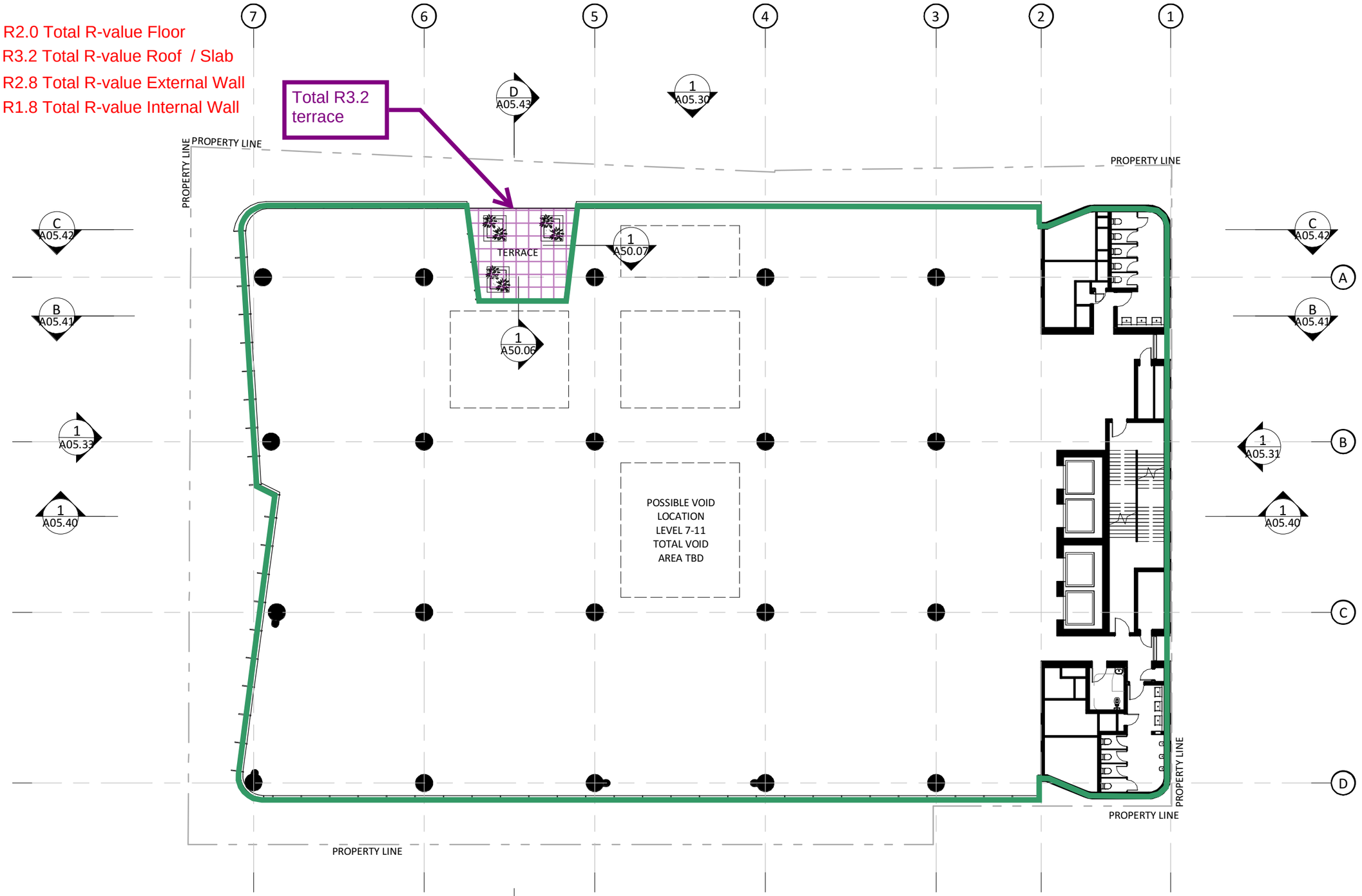
R2.0 Total R-value Floor
R3.2 Total R-value Roof / Slab
R2.8 Total R-value External Wall
R1.8 Internal Wall



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SUSTAINABLE BUILDING CONSULTANTS

Project Name: Lot 2-6 Hassall Street
Sketch Name: Insulation Requirements
Sketch No: ESD
Job No: 18255
Date: 08-03-2019
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Rev	Description	Consultant	Date	Issued by
D	For Information	BRT	26.02.19	

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Project Name
Hassall Street, Parramatta

Project Address
2-6 Hassall Street, Parramatta, NSW, 215

Sheet Name
LEVEL 10

Project No. 18032
Drawing No. A05.08
Revision D
Date 26.02.19
Drawn by Author
Checked by Checker
SCALE @A3 1 : 250

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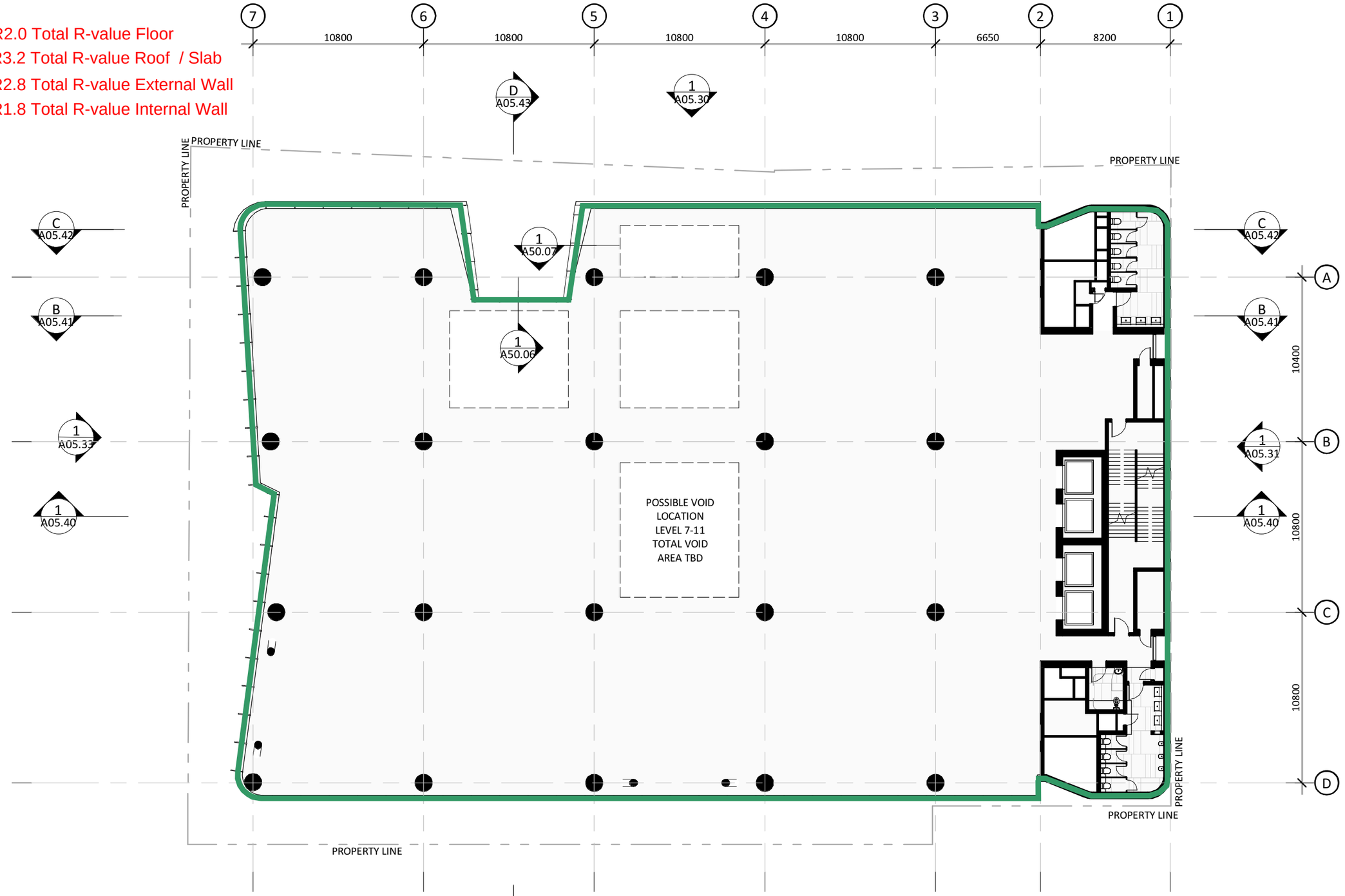
R3.2 Total R-value Roof / Slab
R2.8 Total R-value External Wall
R1.8 Internal Wall



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SUSTAINABLE BUILDING CONSULTANTS

Project Name: Lot 2-6 Hassall Street
Sketch Name: Insulation Requirements
Sketch No: ESD
Job No: 18255
Date: 08-03-2019
By: MN

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Project Name
Hassall Street, Parramatta
Project Address
2-6 Hassall Street, Parramatta, NSW, 215

Sheet Name
LEVELS 11

Project No. 18032
Drawing No. A05.09
Revision D
Date 26.02.19
Drawn by Author
Checked by Checker
SCALE @A3 1 : 250
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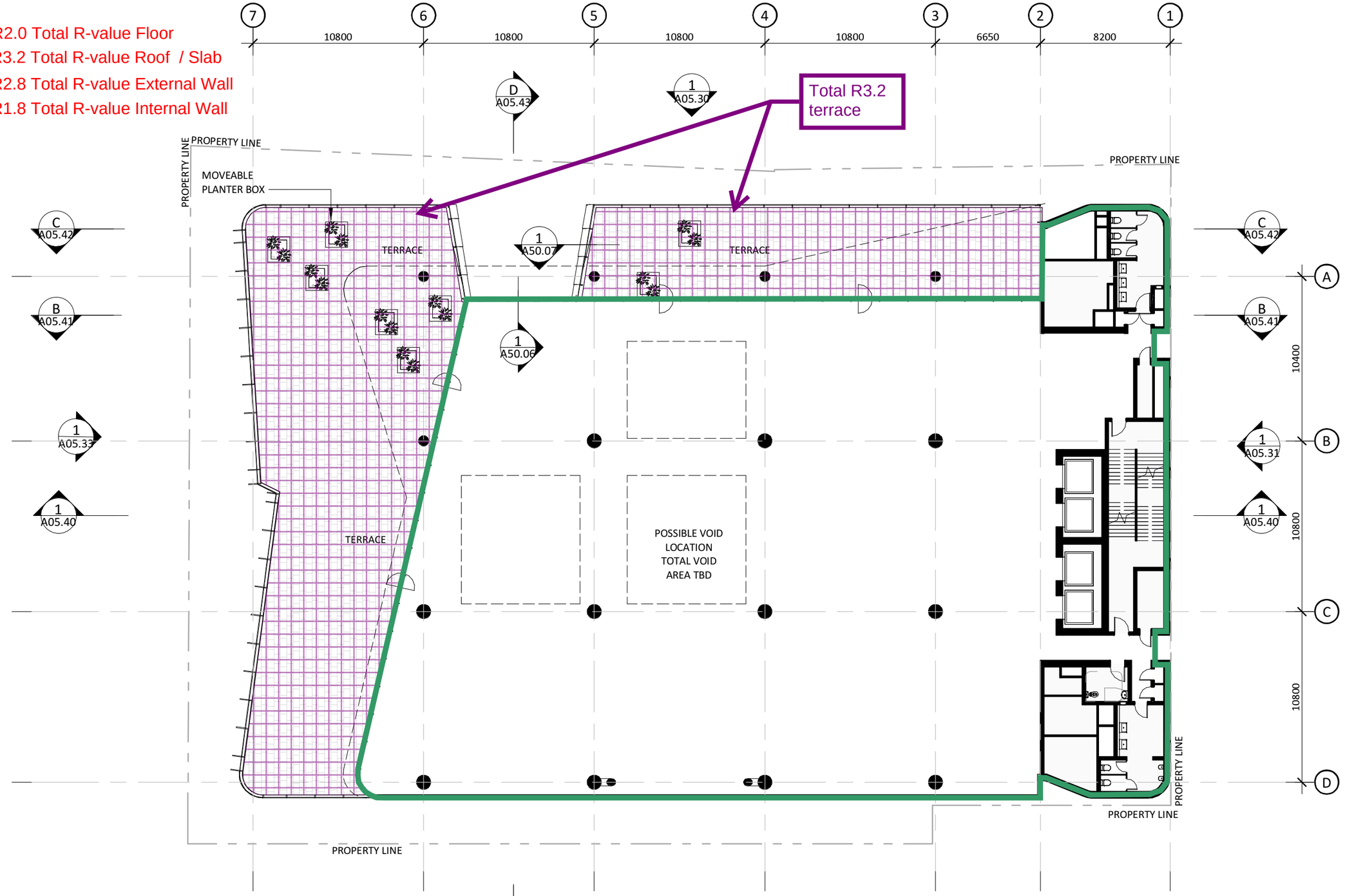
R3.2 Total R-value Roof / Slab
R2.8 Total R-value External Wall
R1.8 Internal Wall



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SUSTAINABLE BUILDING CONSULTANTS

Project Name: Lot 2-6 Hassall Street
Sketch Name: Insulation Requirements
Sketch No: ESD
Job No: 18255
Date: 08-03-2019
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Project Name
Hassall Street, Parramatta
Project Address
2-6 Hassall Street, Parramatta, NSW, 215

Sheet Name
LEVELS 12 - TERRACE

Project No. 18032
Drawing No. A05.10
Revision D
Date 26.02.19
Drawn by Author
Checked by Checker
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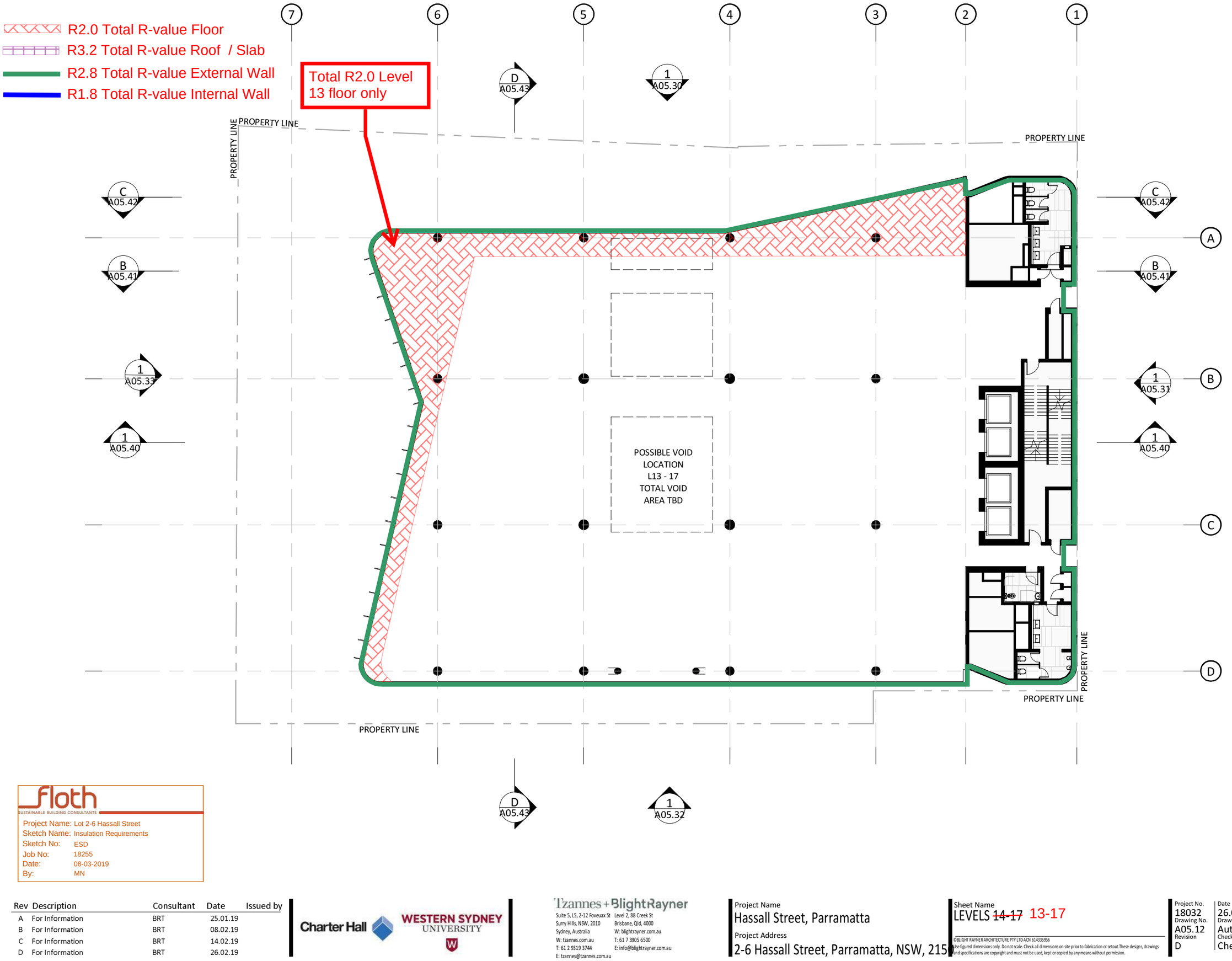

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SUSTAINABLE BUILDING CONSULTANTS

Project Name: Lot 2-6 Hassall Street
Sketch Name: Insulation Requirements
Sketch No: ESD
Job No: 18255
Date: 08-03-2019
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Rev	Description	Consultant	Date	Issued by
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Project Name
Hassall Street, Parramatta

Project Address
2-6 Hassall Street, Parramatta, NSW, 215

Sheet Name
LEVELS ~~14-17~~ 13-17

Project No. 18032
Drawing No. A05.12
Revision D

Date 26.02.19
Drawn by Author
Checked by Checker

SCALE @A3
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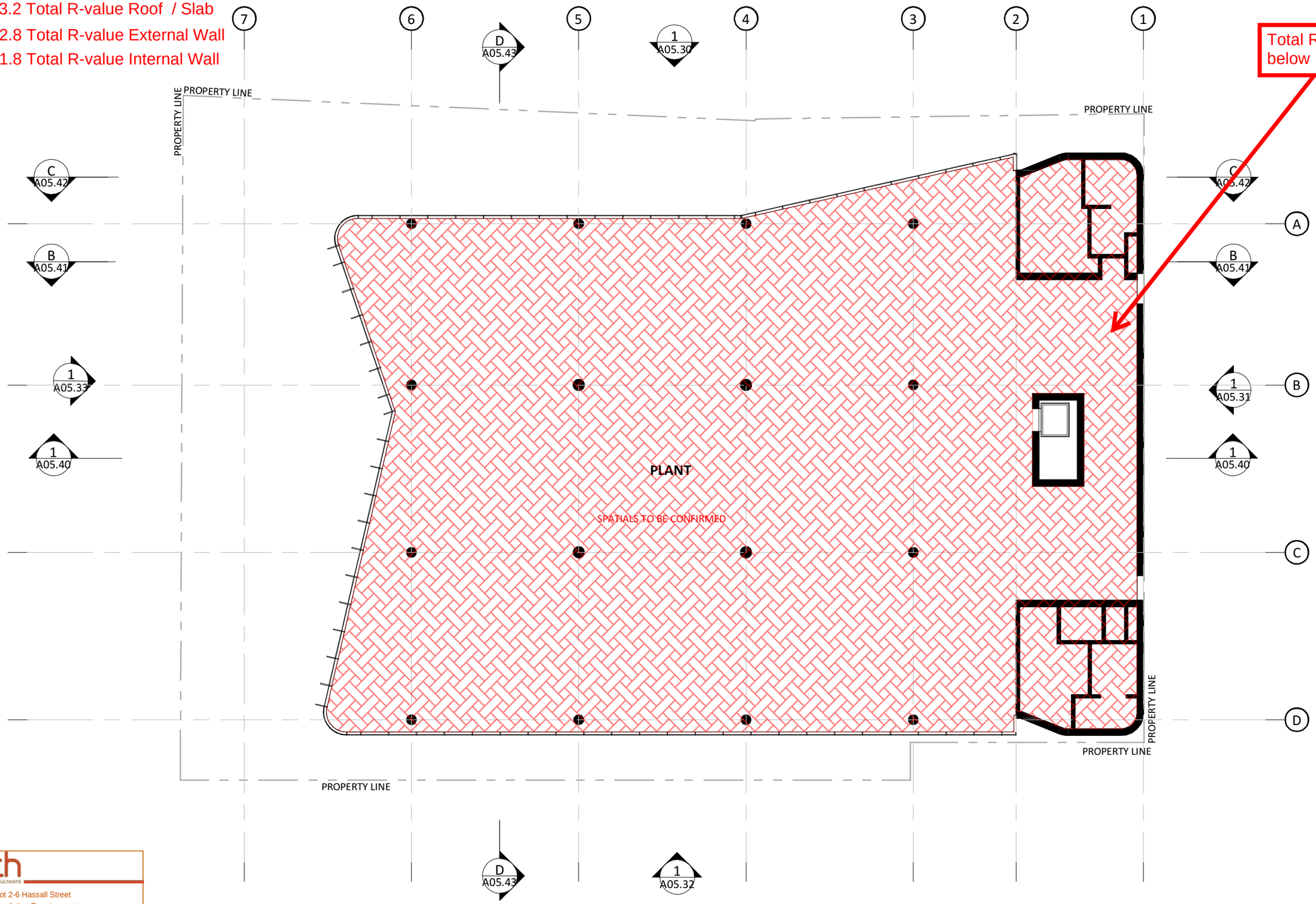
R2.0 Total R-value Floor
R3.2 Total R-value Roof / Slab
R2.8 Total R-value External Wall
R1.8 Total R-value Internal Wall



floth
SUSTAINABLE BUILDING CONSULTANTS

Project Name: Lot 2-6 Hassall Street
Sketch Name: Insulation Requirements
Sketch No: ESD
Job No: 18255
Date: 08-03-2019
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Project Name
Hassall Street, Parramatta
Project Address
2-6 Hassall Street, Parramatta, NSW, 215

Sheet Name
LEVEL 18 - PLANT

Project No. 18032
Drawing No. A05.13
Revision D
Date 26.02.19
Drawn by Author
Checked by Checker
SCALE @A3 1 : 250
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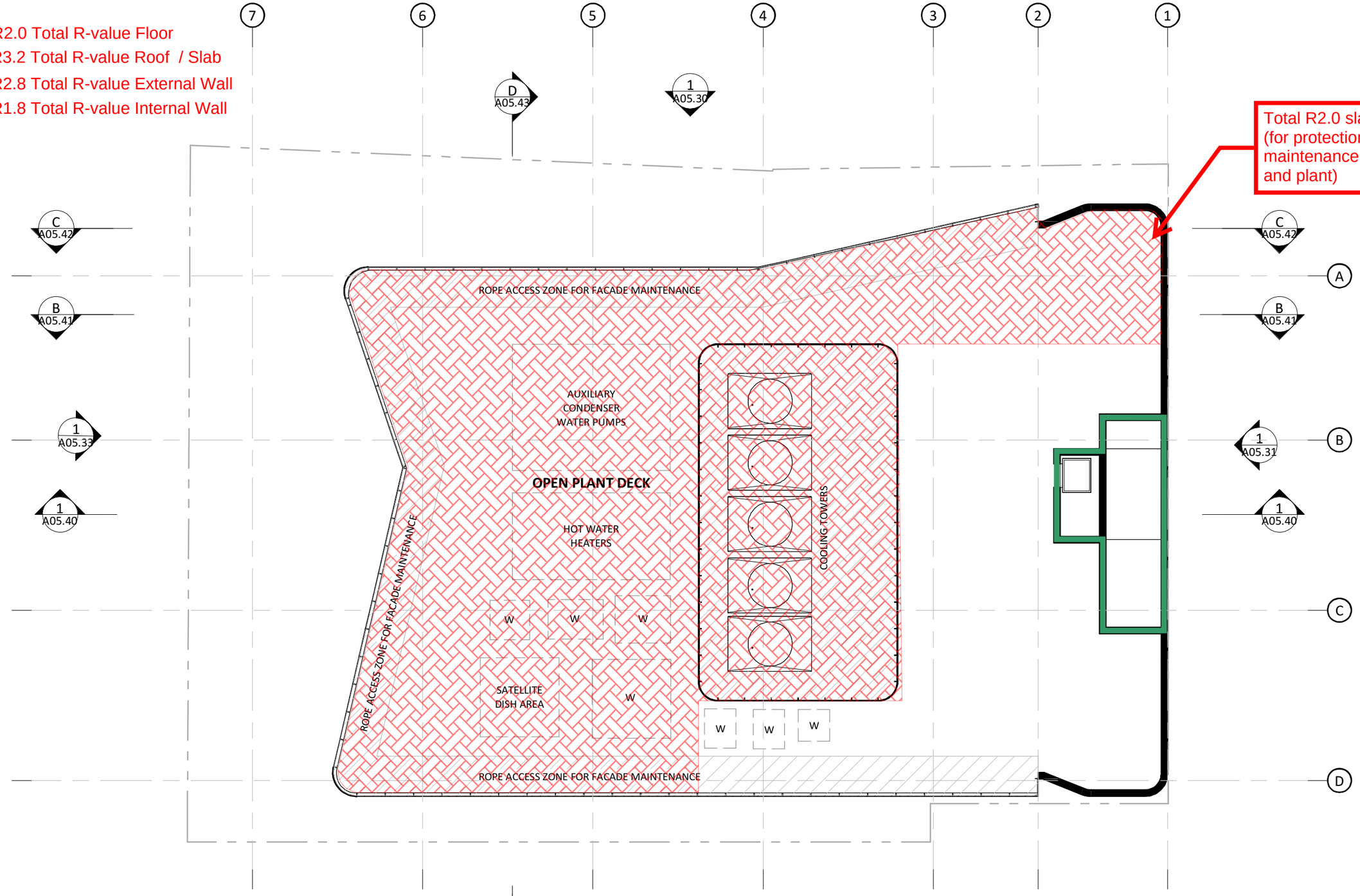
R1.8 Total R-value Internal Wall



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SUSTAINABLE BUILDING CONSULTANTS

Project Name: Lot 2-6 Hassall Street
Sketch Name: Insulation Requirements
Sketch No: ESD
Job No: 18255
Date: 08-03-2019
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Project Name
Hassall Street, Parramatta
Project Address
2-6 Hassall Street, Parramatta, NSW, 215

Sheet Name
LEVEL 19 - PLANT (COOLING TOWERS)

Project No. 18032
Drawing No. A05.14
Revision D
Date 26.02.19
Drawn by Author
Checked by Checker
SCALE @A3 1 : 250
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26/02/2019 7:10:40 PM

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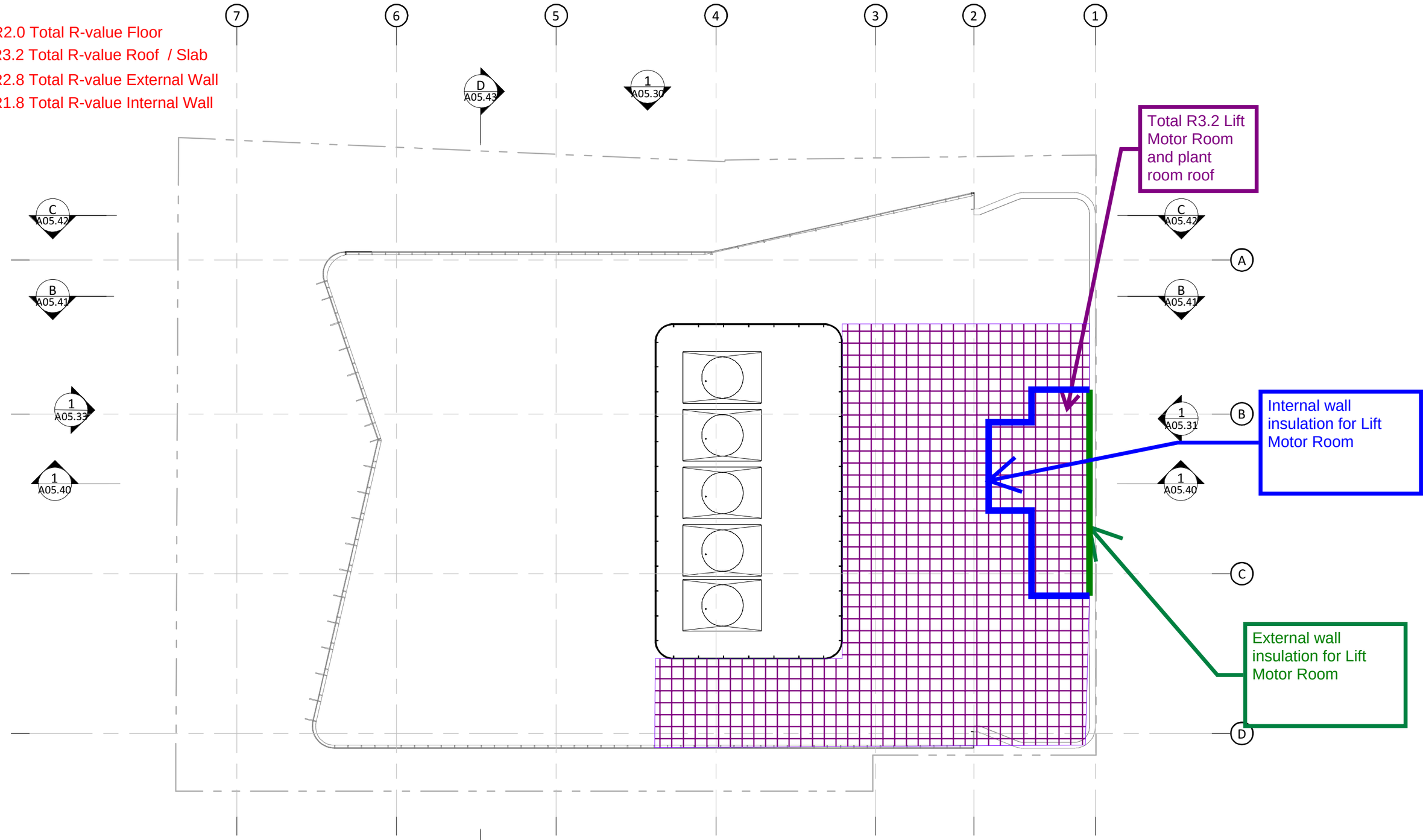
R3.2 Total R-value Roof / Slab
R2.8 Total R-value External Wall
R1.8 Total R-value Internal Wall



floth
SUSTAINABLE BUILDING CONSULTANTS

Project Name: Lot 2-6 Hassall Street
Sketch Name: Insulation Requirements
Sketch No: ESD
Job No: 18255
Date: 08-03-2019
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Project Name
Hassall Street, Parramatta
Project Address
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Sheet Name
ROOF PLAN

Project No. 18032
Drawing No. A05.15
Revision D
Date 26.02.19
Drawn by Author
Checked by Checker
SCALE @A3 1 : 250
0 1 3

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APPENDIX C: PRODUCT INFORMATION

ROXUL AFB®

Acoustical Fire Batt

Product Description & Application

ROXUL AFB® is a mineral wool batt insulation for interior partitions in commercial constructions where superior fire resistance and acoustical performance is required.

	Performance	Test Standard
Compliance	Mineral Fiber Thermal Insulation for Buildings, Type 1 Compliant	CAN/ULC S702
	Mineral Fiber Blanket Thermal Insulation, Type 1 Compliant	ASTM C665
	Mineral Fiber Blanket Thermal Insulation, Type 7 Compliant	ASTM C553
	MEA Approval, New York City Approval	338-97-M
	City of Los Angeles Approval	RR 25444
Reaction to Fire	Flame spread index = 0 ; Smoke developed index = 0	ASTM E84 (UL 723)
	Flame spread index = 0 ; Smoke developed index = 0	CAN/ULC S102
	Determination of Non Combustibility of Building Materials - Non Combustible	CAN/ULC S114
	Behaviour of materials at 750°C - Non Combustible	ASTM E136
	Smoulder Resistance - 0.09%	CAN/ULC S129
Density	Actual Density - 2.8 lbs/ft³ (45 kgs/m³)	ASTM C303
Corrosion Resistance	Stress Corrosion Cracking Tendency of Austenitic Stainless Steel - Passed	ASTM C795
	Corrosion of Steel - Passed	ASTM C665
Air Erosion	Maximum Air Velocity 1000 fpm (5.08 m/s)	UL 181
Thickness Dimensions	1” through 4” (25.4mm - 101.6mm) in 1/2" increments as well as 5" (127mm) and 6" (152.4mm) 16" x 48" (413mm x 1219mm), 24" x 48" (610mm x 1219mm)	

Acoustical Performance — ASTM C423

Thickness	125 Hz	250 Hz	500 Hz	1000 Hz	2000Hz	4000 Hz	NRC
1.0"	0.14	0.25	0.65	0.9	1.01	1.01	0.7
1.5"	0.18	0.44	0.94	1.04	1.02	1.03	0.85
2"	0.28	0.6	1.09	1.09	1.05	1.07	0.95
3"	0.52	0.96	1.18	1.07	1.05	1.05	1.05
4"	0.86	1.11	1.2	1.07	1.08	1.07	1.1

Please contact ROXUL for STC ratings on tested wall assemblies — ASTM E90

Fire Rated Designs

ULC Classification Code: BZJZC
UL Classification Code: BZJZ

Issued 04-01-16
Supersedes 10-27-14

NOTE: *Mast Format 1995 Edition **Master Format 2004 Edition. As ROXUL Inc has no control over installation design and workmanship, accessory materials or application conditions, ROXUL Inc. does not warranty the performance or results of any installation containing ROXUL Inc's products. ROXUL Inc's overall liability and the remedies available are limited by the general terms and conditions of sale. This warranty is in lieu of all other warranties and conditions expressed or implied, including the warranties of merchantability and fitness for a particular purpose.

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8024 Esquesing Line
Milton, On. L9T 6W3
tel: 800-265-6878
fax: 800-991-0110
www.roxul.com

ROXUL®
The Better Insulation™

Technical Product Information

BATT INSULATION 07210 & 09820*
BLANKET INSULATION 07 21 16**
ACOUSTIC BLANKET INSULATION 09 81 16**

ROXUL AFB™

General Product Information:

ROXUL® products are mineral wool fibre insulations made from basalt rock and slag. This combination results in a non-combustible product with a melting point of approximately 2150°F (1177°C), which gives it excellent fire resistance properties. ROXUL mineral wool is a water repellent yet vapour permeable material.

Description & Common Applications:

ROXUL AFB™(Acoustical Fire Batt) is a batt insulation product designed specifically for application in wall/floor systems where acoustical performance and fire resistance are the primary concerns. This non-combustible lightweight product has excellent acoustical dampening properties and is dimensionally stable which makes it ideal for friction fit into wall partitions and system applications from party walls to plant/manufacturing walls. The product is chemically inert which means that it will not promote corrosion. The AFB product comes in a number of thicknesses to meet the requirements of both retrofit and new construction applications.

Compliance and Performance:

CAN/ULC-S702-97	Mineral Fibre Thermal Insulation for Buildings	Type 1, Complies
CAN/CGSB-51.10-92	Mineral Fibre Board Thermal Insulation	Type 2, Class 4, Complies
ASTM C 665	Mineral-Fiber Blanket Thermal Insulation	Type 1, Complies
ASTM C 553	Mineral Fiber Blanket Thermal Insulation	Complies
MEA Approval	New York City Approval	338-97-M
City Of Los Angeles approval		RR 25444
ULC Design Nos.	U311, W406, W408, W419, W423, W440, W441, W442, W508, W600, Z500	
UL Design Nos.	U305, U311, U317, U411, U412, U448, U465, V417, V418, V419	

Fire Performance:

CAN4 S114	Test for Non-Combustibility	Non-Combustible
ASTM E 136	Behaviour of Materials at 750°C (1382°F)	Non-Combustible
CAN/ULC S102	Surface Burning Characteristics	Flame Spread = 0 Smoke Developed = 0
ASTM E84 (UL 723)	Surface Burning Characteristics	Flame Spread = 0 Smoke Developed = 0
CAN/ULC S 129	Smoulder Resistance	0.09%

Acoustical Performance:

ASTM E 90	Airborne Sound Transmission Loss	Tested
ASTM E 413	Rating Sound Insulation	Tested
ASTM C 423	Sound Absorption Coefficients	Tested
ASTM E 1050	Impedance and Absorption of Acoustical Materials (Please contact us for Rated Wall System Designs)	Tested

Corrosion Resistance:

ASTM C 665	Corrosiveness	Passed
ASTM C 795 *	Stainless Steel Stress Corrosion Specification as per Test Methods C871 and C692: U.S. Nuclear Regulatory Commision, Reg. Guide #1.36: U.S. Military Specifications MIL-I-24244 (all versions including B and C)	Conforms

*MASTER FORMAT 1995 EDITION **MASTER FORMAT 2004 EDITION

ROXUL AFB™

Thermal Performance:

ASTM C 518 (C 177)	R-value/inch @ 75°F	4.3 hr.ft².F/Btu
	RSI value/25.4 mm @ 24°C	0.76 m²K/W

Acoustical Performance:

ASTM C423

CO-EFFICIENTS AT FREQUENCIES

Thickness	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	NRC
1.0"	0.14	0.25	0.65	0.90	1.01	1.01	0.70
1.5"	0.18	0.44	0.94	1.04	1.02	1.03	0.85
2.0"	0.28	0.60	1.09	1.09	1.05	1.07	0.95
3.0"	0.52	0.96	1.18	1.07	1.05	1.05	1.05
4.0"	0.86	1.11	1.20	1.07	1.08	1.07	1.10

Density:

Thickness ≤ 1.5" = 3.0 lbs/ft³
Thickness ≥ 2.0" = 2.5 lbs/ft³

Dimensions:

16.25" (width) x 48" (length)
24.25" (width) x 48" (length)

Product thickness is available in 1" to 3.5" with 1/2" increments as well as 4", 5" and 6" offerings.
For additional sizes, please contact Roxul by phone at 1-800-265-6878.

Key Application Qualifiers:

- Easily cut
- Non-combustible
- Excellent sound absorbency
- Chemically inert
- Does not rot or sustain vermin
- Does not promote growth of fungi or mildew
- Low moisture sorption
- Water resistant
- CFC and HCFC free product and process
- Made from natural & recycled materials

Other ROXUL Products:

Please consult ROXUL for all your insulation needs. We have an extensive range of products for all applications from pipe insulation to commercial products to residential batts. ROXUL invites all inquiries and will act promptly to service all of your requirements.

* "Provisions for lot testing may be required, consult manufacturer."

Note:

As ROXUL Inc. has no control over installation design and workmanship, accessory materials or application conditions, ROXUL Inc. does not warranty the performance or results of any installation containing ROXUL Inc's. products. ROXUL Inc's. overall liability and the remedies available are limited by the general terms and conditions of sale. This warranty is in lieu of all other warranties and conditions expressed or implied, including the warranties of merchantability and fitness for a particular purpose.

ROXUL INC. 551 Harrop Drive, Milton, Ontario L9T 3H3 Tel: 905 878-8474 Fax: 905 878-8077
www.roxul.com Sales Office - Tel: 1-800-265-6878, Fax: 1-800-991-0110

Revised: May 16, 2006
Supercedes: May 1, 2006

Commercial Underslab Insulation

Foamular Foil Faced XPS Insulation is a Group 1 material as per part C.1.10A of the BCA. (Part 3, walls and ceilings)

Foamular Foil Faced 50mm has an R Value of R2.0 at 24°C *

*Guaranteed for 20 years, 90% minimum retention.

Lightweight yet tough and durable, Foamular is easy to handle and quick to fit.

Fixing using Hiltie XIE or Ramset Systems are proven cost effective methods.

Adhesive fixing is also quite acceptable as Foamular has a tensile strength of 300 kpa.

AUSTECH
EXTERNAL BUILDING PRODUCTS
Supporting you with Smart Solutions

For technical information on Foamular, or any other Austech product contact:
sales@austech.com.au
Ph: 02 9831 1623 Fax: 02 9831 1623

www.austech.com.au

Foamular Metric 250 Extruded Polystyrene Insulation

Underslab / Under Floor Insulation
Residential and Commercial

Foamular Metrics physical strength long term thermal performance and rigidity make it an ideal insulation material for underslab application.
Whether residential on ground slabs or commercial car parks, shopping centres, and or warehouse situations.

Commercial Application
As an effective thermal barrier, Foamular Metric has many cost saving advantages, both with initial fixing / fit out and long term on going energy savings.

The tough yet lightweight sheet allows quick fixing from scaffold or scissor lift with minimal risks handling.

Fixing is usually by a mechanical method such as Hilti Xie, or ramsets rigid insulation pin/washers systems.

Due to its high tensile strength (300 kPa) Foamular can also be fixed using construction adhesives ready available in the market place.
Direct fix to slab or to furring channel are options.

Note contact should be made with adhesives manufacturers to confirm compatibility and suitability for the specific use prior to installation.
Foamular metric 250 – 50mm and 75mm.

Examples – Mega poxy PF, Enerbond, 3M VHB adhesives and tapes, Bostik construction adhesives.

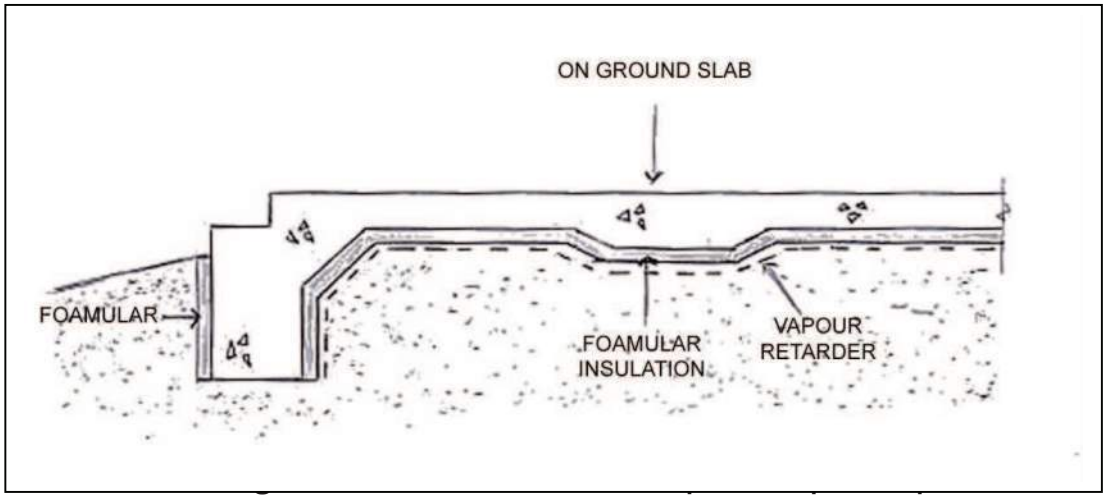
Foamular Metric 250 Extruded Polystyrene Insulation

Residential on Ground slabs

When heated on ground concrete slabs are specified the energy efficiency of the heating systems is greatly improved by using Foamular as a thermal barrier under the slab and adhered to the exposed slab edges.

In simple terms heat will transfer to cooler medium such as the ground and or external air. To keep the slab warm a continual supply of energy is required to replace escaping heat. Minimising heat loss by fixing Foamular as a thermal barrier, less energy is required to maintain slab temperature.
Long term energy efficiency is achieved by this simple application.

Foamular Metric 250/30mm (R-value 1.03) or FM250/50mm (R-value 1.78) are recommended for this application.



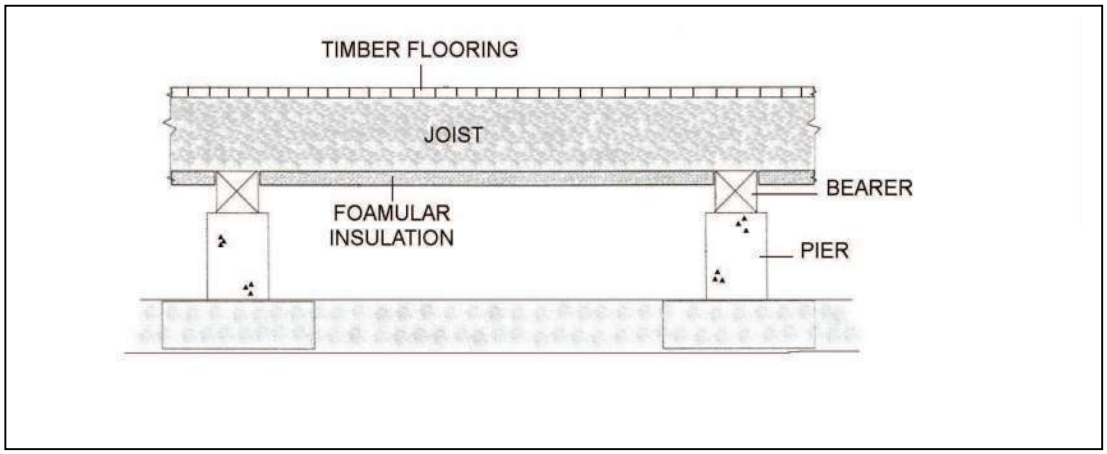
The Foamular is laid directly over the slab area with supports and reinforcement placed on the Foamular.

The Foamular around slab perimeter should be fixed using a compatible construction adhesive such as mega poxy, liquid nails fast, Enerfoam etc.

As Foamular is not effected by moisture, soil born bacteria or mould it can be back filled against for gardens etc. with no less of thermal a physical properties.

Foamular Metric 250 Extruded polystyrene Insulation:

Flooring Applications



Timber floors.
Heat loss from your floor can be up to 25% of the total heat lost from your home.
Older tongue and groove flooring and flooring of pole homes are very susceptible to heat loss.

Foamular Metric 250 extruded polystyrene is an excellent insulation for under timber floors. Foamular Metric250 is a lightweight rigid board that is extremely easy to use. Simply screw fix the insulation under the floor with 6 to 8 galvanized screws per sheet.
Screw fix the insulation to the joists butting them up to the bearers. Keep edges tightly butted together. Boards can be cut to size using a straight edge and utility knife.

The Thermal Resistance (R rating) of Foamular Metric 250 Insulation is very good even in areas exposed to moisture. Its closed cell construction gives it excellent moisture resistant properties. 30mm = R.1.03, 50mm = R 1.78

The composite R-value of a common construction timber floor with 30mm Foamular Metric butted to bearers and nailed to joists can be calculated as follows:

R value of	
30mm Foamular Metric Insulation board	R 1.03
Airspace between floor (bearers & joists)	R 0.64
Timber flooring, 19mm tongue & groove	R 0.12
Air films indoor and outdoor (total)	R 0.32
Total R-value of insulated floor	R 2.11
Less assumed frame area approx. 15% Total =	R 1.79

(One should refer to BCA requirements for different climate zones as these require different R-values).

Foamular Metric 250 Extruded Polystyrene Insulation will not rot, shrink, saturate or crumble and it has no nutritional value to insects or rodents.
Foamular is guaranteed to maintain its physical properties and minimum of 90% thermal retention for a period of twenty (20) years.

GreenStuf®

Thermal Batts

PROUDLY MADE IN AUSTRALIA

GreenStuf® Thermal Batts are 100% polyester thermal insulation segments pre-cut to fit common timber framed walls, ceilings and mid-floor joist spacings.

Applications

GreenStuf® Thermal Batts are designed for the thermal insulation of residential and commercial buildings. GreenStuf® Thermal Batts can be used in ceilings, internal and external walls and mid-floor cavities. To ensure Building Code compliance Autex Insulation recommends that Architects and building designers consult the relevant Australian Standards before specifying thermal insulation products.

Building Regulations: GreenStuf® Insulation will support and assist in meeting the following provisions of the BCA:

BCA Volume One - Class 2-9 Buildings
Section J - Energy Efficiency: Performance requirement JP1
BCA Volume One - Class 2-3 and 9c Buildings
Section F - Health and Amenity: Sound Transmission and Insulation.
Performance requirement FP5.1, FP5.2, FP5.4 and FP 5.5.
BCA Volume Two - Class 1 and Class 10 Buildings
Part 2.6 -Energy Efficiency: Performance requirement P2.6.1
Part 3.8.6 - Health and Amenity, Sound Insulation: Performance requirements P2.4.6

Technical

Acoustic Performance: GreenStuf® insulation will assist sound reduction by reducing the resonating noise inside the construction cavity. Typical improvement in sound transmission loss through walls with the use of GreenStuf® R2.0 Wall insulation is an increase of 5-6 Rw points. For information and assistance on Thermal and Acoustic design please contact your Autex Account Manager.

PRODUCT	NOMINAL THICKNESS (mm)	DIMENSIONS (mm)	BATTS PER PACK	m²/PACK
R1.5 Wall Batts	90mm	430mm x 1160mm 580mm x 1160mm	16	7.98m² 10.76m²
R2.0 Wall Batts	90mm	430mm x 1160mm 580mm x 1160mm	12	5.99m² 8.07m²
R2.5 Wall Batts	90mm	430mm x 1160mm 580mm x 1160mm	6	2.99m² 4.04m²
R2.0 Ceiling Batts	120mm	430mm x 1160mm 580mm x 1160mm	12	5.99m² 8.07m²
R2.5 Ceiling Batts	165mm	430mm x 1160mm 580mm x 1160mm	8	3.99m² 5.38m²
R3.0 Ceiling Batts	185mm	430mm x 1160mm 580mm x 1160mm	8	3.99m² 5.38m²
R3.5 Ceiling Batts	200mm	430mm x 1160mm 580mm x 1160mm	6	2.99m² 4.04m²
R4.0 Ceiling Batts	210mm	430mm x 1160mm 580mm x 1160mm	4	2.00m² 2.69m²
R4.5 Ceiling Batts	210mm	430mm x 1160mm 580mm x 1160mm	4	2.00m² 2.69m²

Hazardous Building Materials: GreenStuf® is non hazardous.

VOC Emission Safe:
VOC concentration: 0.01 mg/m³ (7 days).
GECA/GreenGuard Limit: 0.25 mg/m³ (7 days).
Cetec Pty Ltd (Report:RCV080408)

Durability: GreenStuf® has a 50 Year Durability Warranty. GreenStuf® thermal insulation when installed in accordance with the manufacturer's instructions will satisfy the 50 year durability criteria for minimum design life as set out in the ABCB guidance document Durability in Buildings 2006 (Section 2.4).

Moisture: GreenStuf® is not affected by moisture. Exposure to an atmosphere of 50°C at 90% relative humidity for four days showed moisture absorption by weight of less than 0.03%.

Non Flammable: GreenStuf® is classified non flammable.

Fire ratings:
AS ISO 9705 - 2003
Australian Group Number: Group 1
SMOGRARC: less than 100m^2/s^2
Report Number: FAR4045

AS1530.3
Ignitability Index (0-20) 0
Heat Evolved Index (0-10) 0
Spread of Flame Index (0-10) 0
Smoke Developed Index (0-10) 3
APL Report 98055

IEC 60695-11-5 (Downlight Fire Test Standard)
GreenStuf® has been tested and certified non-flammable and complies with the requirements of IEC 60695-11-5.

Certificates available from our website.

Non Corrosive: GreenStuf® polyester is pH7.8 (pH7 is neutral)

Non Toxic, Non Allergenic, Non Irritant: There are no known hazards with the use or handling of GreenStuf® polyester.

Vermin: GreenStuf® is naturally resistant to insect and vermin attack.

Installation: Autex recommends that all thermal and acoustic insulation be installed in accordance with the manufacturers instructions (included on each GreenStuf® pack) and AS 3999:1992 Thermal Insulation of Dwellings - Bulk insulation, installation requirements.

MSDS: Material Safety Data Sheets (MSDS) are available on request from your Autex Account Manager or by visiting our website **www.autex.com.au**

Specification & Substitution: Autex specification documents can be downloaded from our website **www.autex.com.au**

Substitution of any products should not be accepted and we recommend this be made clear in all specification and tender documents.

Take Back Programme: GreenStuf® is recyclable. Autex will gladly recycle used, uncontaminated GreenStuf® insulation to help keep it out of landfill. For more information on recycling GreenStuf® contact Autex on freephone 1800 678 160.

ISO Standards: Autex is committed to Quality and Environmental best practice through our ISO 9001 & ISO 14001 certified Quality and Environmental Management Systems.

AUTEX

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KNAUF INSULATION
it's time to save energy

October 2015

Earthwool® Wall Batts

Description

Earthwool Wall batts are made using recycled glass and with ECOSE® Technology, a revolutionary binder based on rapidly renewable materials instead of petro-based chemicals. ECOSE Technology reduces binder embodied energy and contains no added phenol, formaldehyde, acrylics or artificial colours.

Application

Earthwool Wall batts provide a cost-effective thermal and acoustical barrier for energy-efficient construction. The consistent quality, low dust, and clean-cutting resilient glasswool makes installation fast. Earthwool Wall batts can be used in timber frame applications in residential and commercial structures. Knauf Insulation offers Earthwool Wall batts in a wide range of sizes.

Specification Compliance

AS/NZS 4859.1: 2002 Materials used in the Thermal Insulation of Buildings and comply with the Building Code of Australia (BCA) requirements.

Performance

Thermal Conductivity
ASTM C 518 and AS/NZS 4859.1: 2002

Thermal Resistance
ASTM C 653 and AS/NZS 4859.1: 2002

Technical Data

Water Vapour Absorption (ASTM C 1104)
- Less than 5% by weight.

Corrosion Resistance (ASTM C 665)
- No greater than sterile cotton.

Microbial Growth (ASTM C 1338)
- Does not support microbial growth.

Fire Hazard Properties (AS/NZS 1530.3)
- Ignitability: 0, Spread of flame: 0, Heat Evolved: 0, Smoke Developed: 0-1.

Combustibility (AS 1530.1)
- Non-combustible

EARTHWOOL the feel good glasswool insulation

BRANZ Appraised
Appraisal No.648 [2009]
Wall, Ceiling and Acoustic

NATURALLY NO ADDED FORMALDEHYDE BROWN

with ECOSE® TECHNOLOGY

Earthwool® Wall Batts

Bio-solubility
The formulation used for Earthwool insulation has been independently assessed to meet the requirements of the stringent Note Q standard (and is therefore consistent with the highest Australian and New Zealand industry standards), and also assessed by Knauf Insulation against the criteria of the Australian Safety and Compensation Council ASCC Approved Criteria for Classifying Hazardous Substances [NOHSC: 1008 3rd Edition]. As a result of this assessment, Earthwool insulation is not classified as hazardous according to the NOHSC criteria.

Features and Benefits

Proven Performance
- Preferred by professional installers concerned with quality, appearance and productivity.
- Excellent acoustical properties reduce sound transmission in the home when properly installed.

Durability
- Earthwool Wall batts are odourless, rot proof, non-hygroscopic, does not sustain vermin and will not encourage the growth of fungi, mould or bacteria.

Superior Handling
- Highly resilient insulation recovers quickly to full thickness for a snug fit and superior finished aesthetics.
- Consistent quality materials feel good, cut easily and install fast.
- Low dust for easier handling and increased productivity.

Convenient Packaging, Easier Handling
- Earthwool Wall batts are packaged in a strong, white poly bag that offers excellent protection from abuse, dust and moisture.
- Earthwool Wall batt packages feature easy to follow installation instructions.
- MasterBag insulation units (containing multiple packs) ensure reduced handling costs with improved compression – more square metres per bag, more square metres per truck load, fewer trips to the job site and less warehouse space for storage.

Superior Service and Support
- Knauf Insulation is totally focused on providing first class customer service, producing high quality product and 'on time in full' deliveries.
- Knauf Insulation recognises the need to establish, develop and support a professional network of distributors and re-sellers in order to service a growing insulation market.
- Knauf Insulation is committed to providing a comprehensive range of relevant sales and marketing literature and web-based technical information to support specifiers and customers.

Environmental
Earthwool Wall batts are free from CFCs, HCFCs and any other material with ozone depletion potential in the manufacture and content and represent no known threat to the environment. Earthwool Wall batts' manufacture has low impact on the environment and is classified as Zero ODP and Zero GWP.

Knauf Insulation's Earthwool products with ECOSE® Technology benefit from a formaldehyde-free binder based on rapidly renewable materials instead of petro-based chemicals which is up to 70% less energy intensive. The technology has been developed for Knauf Insulation's glass and rock mineral wool products, enhancing their environmental credentials without affecting the thermal, acoustic or fire performance. Earthwool products made with ECOSE Technology contain no dye or artificual colours - the colour is completely natural.

Specification Guide
The external wall insulation shall be Earthwool External Wall batts R*, *mm thick, BRANZ appraised to meet the provisions of the BCA. The product will be non-combustible, CFC/HCFC free, zero ODP and GWP, Global GreenTag Cert™ Level A certified, glasswool insulation with high post-consumer recycled glass content and with ECOSE® Technology. It will be manufactured under Quality Assurance Standards ISO 9001:2008 and ISO 14001:2004 by Knauf Insulation and shall be installed in accordance with the instructions issued by them.

*architect to insert details of products used.

For more information please visit
www.knaufinsulation.com.au

Earthwool® Wall Batts

Wall Batts – Timber Frame

E-Code	Thickness (mm)	R-Value (m^2K/W)	Dimensions (mm)	Pieces per Pack	Area Per Pack (m^2)	Weight Per Pack (kg)
E2253	75	1.5	430x1160	42	20.9	11.6
E2255	75	1.5	580x1160	42	28.3	15.6
E3591	75	2.0 HD	430x1160	20	10.0	13.0
E3592	75	2.0 HD	580x1160	20	13.5	17.5
E2259	90	2.0	430x1160	32	16.0	13.5
E2261	90	2.0	580x1160	32	21.5	18.3
E4332	90	2.5 HD	430x1160	14	7.0	11.6
E4333	90	2.5 HD	580x1160	14	9.4	17.0
E4473	90	2.7 SHD	430x1160	10	5.0	12.2
E4335	90	2.7 SHD	580x1160	10	6.7	16.5
E4340	140	3.1	580x1160	22	14.8	19.4

HD = High Density SHD = Super High Density

Wall Batts – Metal Frame

E-Code	Thickness (mm)	R-Value (m^2K/W)	Dimensions (mm)	Pieces per Pack	Area Per Pack (m^2)	Weight Per Pack (kg)
E2254	75	1.5	450x1200	42	22.7	12.5
E2257	75	1.5	600x1200	42	30.2	16.7
E3594	75	2.0	450x1200	20	10.8	14.1
E3595	75	2.0	600x1200	20	14.4	18.8
E2260	90	2.0	450x1200	32	17.3	14.7
E2262	90	2.0	600x1200	32	23.0	19.6

BRANZ Appraised
Appraisal No.648 (2009)
Wall, Ceiling and Acoustic

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Technical Advisory Centre
Email: tech.au@knaufinsulation.com

www.knaufinsulation.com.au

For more information please visit
www.knaufinsulation.com.au

KIAU0315173DS

Formaldehyde-Free™ Glass Wool Insulation Enhanced with Bio-Based Binder

SOUND CONTROL & HIGH DENSITY BATTS

PRODUCT DATA SHEET FOR AUSTRALIA AND NEW ZEALAND

COMPANY

Johns Manville is committed to creating more comfortable, healthier and energy-efficient indoor environments throughout the world. We revolutionized the building insulation industry by pioneering the development of Formaldehyde-free™ glass wool building insulation over a decade ago. We continue to build on our legacy of innovation with a new Formaldehyde-free™ glass wool sound control solution that utilizes an innovative bio-based binder, made mostly with rapidly renewable plant-based materials. It continues to offer high performance noise reduction as well as improved handling, easier cutting and less dust than our previous product. At JM, we believe that in every detail, materials matter.

DESCRIPTION

JM Formaldehyde-free™ sound control insulation is made of long, resilient glass fibers bonded with our bio-based binder. A wide range of noise-reduction products are available to provide sound control for both vertical and horizontal applications. JM sound control batts provide maximum sound control effectiveness if installed completely filling the wall cavity. JM insulation is available unfaced in Australia and New Zealand.

USE

JM Formaldehyde-free™ thermal and acoustical insulation can be used in a wide variety of timber-frame, engineered-wood and steel-frame construction applications, including:

New Construction: residential homes and commercial buildings' interior and exterior walls, floors and ceilings for sound control, as well as basement wall insulation.

INSTALLATION

JM sound control insulation cuts easily with an ordinary utility knife and installs easily by simply pressing in place between studs or joists in standard framing.

PACKAGING

JM insulation is compression-packaged for savings in storage and freight costs.

SPECIFICATION COMPLIANCE

AS/NZS 4859.1 for thermal performance
AS1530.1/1994 = Non-combustible as per CSIRO report F-11-054 from 22 September 2011
AS1530.3/1994 = 0;0;0;1 (as per CSIRO report F-11-054 from 22 September 2011)*
ASTM C665, Type I
ASTM E136 = Noncombustible
ASTM E84 = Flame Spread = 10 / Smoke Developed = 10
ASTM C1104 = Water Vapor Absorption = Less than 5% by weight
ASTM C665 = Noncorrosive
ASTM C1338 = Does not support microbial growth

DESIGN CONSIDERATIONS

Check your local Australian or New Zealand building codes for specific building and insulation requirements.

Refer to JM guide specifications for further design considerations and required installation instructions.

LIMITATIONS OF USE

Check applicable building codes.

PERFORMANCE ADVANTAGES

Formaldehyde-free: will not off-gas formaldehyde in the indoor environment.

Sound Control: reduces transmission of sound through exterior and interior walls and floor or ceiling assemblies.

Thermal Efficiency: also provides effective resistance to heat transfer with Thermal Resistance Values up to R2.5.

Fire Resistant and Noncombustible: see Specification Compliance.

Durable Inorganic Glass: will not rot, mildew or deteriorate and is noncorrosive to pipes, wiring and metal studs.

Superior Performance: bonded glass fibers are dimensionally stable and will not slump within the wall cavity, settle or break down during normal applications.

INTERNATIONAL APPROVALS OR RECOGNITION

Formaldehyde-Free™ Glass Wool Insulation Enhanced with Bio-Based Binder

PRODUCT DATA SHEET FOR AUSTRALIA AND NEW ZEALAND **SOUND CONTROL & HIGH DENSITY BATTS**

PRODUCT CHARACTERISTICS - SOUND CONTROL BATTS

PROD CODE	DESCRIPTION	WIDTH (mm)	LENGTH (mm)	BAG PIECES	BAG m^2	EST/COV m^2	
S04123	14kg/m^3 x 75	430	1160	24	11.97	13.44	
S04124	14kg/m^3 x 75	580	1160	24	16.15	18.13	
EXBT14	14kg/m^3 x 75	450	1200	24	12.96	14.55	
EXBT15	14kg/m^3 x 75	600	1200	24	17.28	19.41	
EXBT16	14kg/m^3 x 90	430	1160	20	9.98	11.20	
EXBT17	14kg/m^3 x 90	580	1160	20	13.46	15.11	

PRODUCT CHARACTERISTICS - HIGH DENSITY BATTS

PROD CODE	DESCRIPTION	WIDTH (mm)	LENGTH (mm)	BAG PIECES	BAG m^2	EST/COV m^2	
S79111	R2.0 x 75HD	430	1160	20	9.98	11.20	
S79112	R2.0 x 75HD	580	1160	20	13.46	15.11	
S79103	R2.5 x 90HD	430	1160	14	6.98	7.84	
S79104	R2.5 x 90HD	580	1160	14	9.42	10.58	

* R-Value (m^2 K/W at 23 Degrees Celcius)

* We recommend you use high density gypsum plasterboard in conjunction with our high density batts.

* ASTM E 136-09 is a very similar test to that of AS 1530.1-1994, using very similar equipment, having the same temperature exposure and very similar performance requirements. The values presented in Report Number F-11-054 would not deem the product combustible according to the test criteria specified in Clause 3.4 of AS 1530.1-1994. Both ASTM E 136-09 and AS 1530.1-1994 are much more severe than AS/NZS 1530.3-1999. Any product that has even a small amount of combustible content will deem the product combustible according to AS 1530.1. A product that is not deemed combustible according to AS 1530.1 will not ignite when subjected to the test regime of AS/NZS 1530.3. It will also emit very little smoke, as a consequence of no significant pyrolysing constituents present in the product. Consequently, this Division would expect the product to achieve test indices of 0;0;0;1 or better when tested in accordance with AS/NZS 1530.3-1999. Based on the fire performance of your glass-fibre insulation, at 16.8 kg/m^3 density, when tested to ASTM E 136-09, it is the opinion of this Division that your "Johns Manville Formaldehyde-free Fiber Glass Insulation", at a density of 16.8 kg/m^3 or less, would not be deemed combustible if subjected to the test conditions of AS 1530.1-1994, and would achieve test indices of 0;0;0;1 or better when tested in accordance with AS/NZS 1530.3-1999.

Visit our website at **www.JM.com** | Contact your Australian and New Zealand local distributor.

BID-0159 03/14

Formaldehyde-Free™ Glass Wool Insulation Enhanced with Bio-Based Binder

SUPA-THERM ROOFING BLANKET

PRODUCT DATA SHEET FOR SUPA-THERM ROOFING BLANKET

COMPANY

AGM Insulations is committed to providing premium products and creating more comfortable, healthier and energy efficient indoor environments. Our Supa-Therm roofing blanket now includes Johns Manville new Formaldehyde-free™ insulation. Johns Manville revolutionized the building insulation industry by pioneering the development of Formaldehyde-free TM insulation over a decade ago, they continue to build on their legacy of innovation with a new Formaldehyde-free TM Glasswool insulation solution that utilizes an innovative bio-based binder, made mostly with rapidly renewable plant based materials. It offers excellent thermal and acoustical performance as well as improved handling, easier cutting and less dust than their previous product.

DESCRIPTION

Supa-Therm roofing blanket consists of Johns Manville Formaldehyde-free™ bulk insulation adhered to a range of light, medium and heavy duty reinforced laminating foils. It is available in a range of thicknesses to meet BCA energy efficiency standards for residential and commercial projects It comes with a 150mm overlap of foil for easy installation and should be sealed with a foil or double sided tape when required.

USE

Supa-Therm roofing blanket is designed to provide excellent thermal and acoustical benefits, and helps reduce condensation under metal roofing . It can be used in a wide variety of timber frame or steel frame construction applications. The product performs best when the insulation recovers to it's nominal thickness and R-Value.

INSTALLATION

Supa-Therm roofing blanket cuts easily with an ordinary utility knife and installs easily on your residential or commercial roofing projects.

PACKAGING

Supa-Therm roofing blanket is packaged in strong poly bags.

SPECIFICATION COMPLIANCE

AS/NZS 4200.1	Compliance of AL. Foil
AS/NZS 4859.1	For Thermal Performance
AS1530.1/1994	Non-combustible as per CSIRO report F-11-054 from 22 September 2011
AS1530.3/1994	0;0;0;1 (as per CSIRO report F-11-054 from 22 September 2011)*
ASTM C665	Type I
ASTM E136	Noncombustible
ASTM E84	Flame Spread = 10 / Smoke Developed = 10
ASTM C1104	Water Vapor Absorption = Less than 5% by weight
ASTM C665	Noncorrosive
ASTM C1338	Does not support microbial growth

DESIGN CONSIDERATIONS

Check your local Australian building codes for specific building and insulation requirements.

LIMITATIONS OF USE

Check applicable codes.

PERFORMANCE ADVANTAGES

Formaldehyde-free: will not off-gas formaldehyde in the indoor environment.

Thermal Efficiency: provides effective resistance to heat transfer with Thermal Resistance Values up to R2.5.

Sound Control: reduces transmission of noise through exterior roofing and wall cladding.

Condensation Control: Helps reduce condensation occurrance under metal roofs and walls.

Fire Resistant & Noncombustible: see Specification Compliance.

Durable Inorganic Glass: will not rot, mildew or deteriorate and is noncorrosive to pipes, wiring and metal studs.

Superior Performance: bonded glass fibers are dimensionally stable and will not slump, settle or break down during normal applications.

Bio-Soluble Formulation: Johns Manville's 901 fibers Glass recently passed the European Union's fiber biopersistence test. The glass fibers have been tested at the Research and Consulting Company (RCC Switzerland) in compliance with EU protocol (published in EC/TM/26 rev. 6, 1997).

Formaldehyde-Free™ Glass Wool Insulation Enhanced with Bio-Based Binder

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PRODUCT CHARACTERISTICS - SUPA-THERM ROOFING BLANKET

PROD CODE	DESCRIPTION	WIDTH (mm)	LENGTH (mm)	BAG PIECES	BAG m^2	EST/COV m^2
STMW55	R1.3 x 55	1200	15000	1	18	18
STMW75A	R1.5 x 75	1200	15000	1	18	18
STMW75	R1.8 x 75	1200	15000	1	18	18
STMW100	R2.5 x 100	1200	11000	1	13.2	13.2

Cut to size available pending volumes and timeframes. Light duty, medium duty, and heavy duty aluminum facings available.

* R-Value (m^2 K/W at 23 Degrees Celcius)

* ASTM E 136-09 is a very similar test to that of AS 1530.1-1994, using very similar equipment, having the same temperature exposure and very similar performance requirements. The values presented in Report Number F-11-054 would not deem the product combustible according to the test criteria specified in Clause 3.4 of AS 1530.1-1994. Both ASTM E 136-09 and AS 1530.1-1994 are much more severe than AS/NZS 1530.3-1999. Any product that has even a small amount of combustible content will deem the product combustible according to AS 1530.1. A product that is not deemed combustible according to AS 1530.1 will not ignite when subjected to the test regime of AS/NZS 1530.3. It will also emit very little smoke, as a consequence of no significant pyrolysing constituents present in the product. Consequently, this Division would expect the product to achieve test indices of 0;0;0;1 or better when tested in accordance with AS/NZS 1530.3-1999. Based on the performance of your glass-fibre insulation, at 16.8 kg/m^3 density, when tested to ASTM E 136-09, it is the opinion of this Division that your "Johns Manville Formaldehyde-free Fiber Glass Insulation", at a density of 16.8 kg/m^3 or less, would not be deemed combustible if subjected to the test conditions of AS 1530.1-1994, and would achieve test indices of 0;0;0;1 or better when tested in accordance with AS/NZS 1530.3-1999.

Properly insulating a structure using Johns Manville building insulation helps preserve our environment by reducing energy consumption for heating and cooling, reducing the pollution resulting from fuel burning, reducing the emission of hazardous air pollutants during manufacturing and reducing waste through the utilization of recycled materials. Look for the cross and globe emblem on Johns Manville building insulation, which indicates independent certification by Scientific Certification Systems, Inc of 25% or more recycled glass content.

INTERNATIONAL APPROVALS OR RECOGNITION

SCScertified INDOOR AIR QUALITY Indoor Advantage | Building Materials GOLD

CERTIFIED EcoLogo™

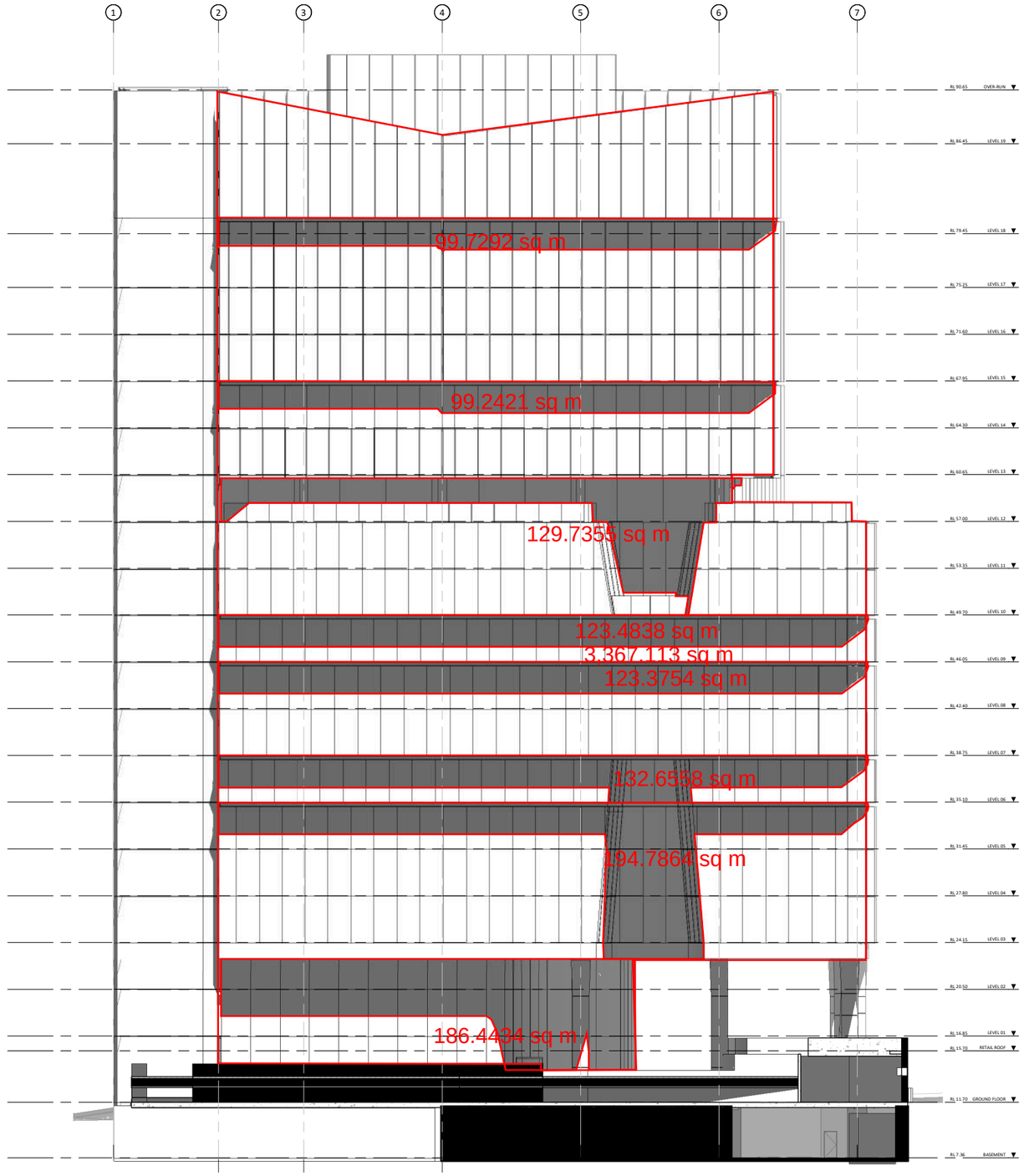
SCS certified AVERAGE 35% POST CONSUMER RECYCLED CONTENT

energy ENERGY STAR PARTNER

UL GREENGUARD GOLD

Visit our website at **www.jminsulation.com.au**

APPENDIX B – NORTH FAÇADE DIAGRAN ON 1PM OF SUMMER SOLSTICE



Total facade area = 3367 sqm

Shadow Area = 1089 sqm

Shadow percentage = 32%