



DHL Horsley
ESD Report for DA
For DHL

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Executive Summary

This report supports a Development Application (DA) for DHL Horsley industrial development comprises of an ambient warehouse, main office, VAS office, dock office 1 and dock office 2 at 813 Wallgrove Road, Eastern Creek, NSW 2766.

This report will address the following requirements as outlined under of SSDA5248 Development Consent Conditions, Part B, Conditions B2 and B3:

- a) Condition B2: Future development applications must demonstrate how the Development incorporates the principles of Ecologically Sustainable Development (ESD) in the design, construction and on-going operation of the Development.
- b) Condition B3: Future development applications must set out how the development intends to comply with the Sustainable Strategy approved under Condition A12.

For reference, Condition A12 are as follows:

- c) Condition A12: Prior to the commencement of construction of Stage 1 development, the Applicant must submit a Sustainable Strategy for the Development to the Planning Secretary for approval. The Sustainability Strategy must:
 - a) Detail how the ESD and WSUD initiatives and energy efficiency measures outlined in the EIS will be implemented on site;
 - b) Identify the total greenhouse gas savings estimated to be achieved in comparison to a base case development (i.e. a development constructed in accordance with the minimum requirements of the latest version of Section J, Volume One of the National Construction Code (NCC) if the measures proposed under the Sustainability Strategy are implemented;
 - c) Include a calculation of water requirements and measures incorporated to reduce water use;
 - d) Include a program to monitor and report annually on the efficiency measures implemented; and
 - e) Ensure the development will continue to operate at industry best practice over time.

This report summarised the sustainable design principles for the development. Reference and benchmarking are made to the following standard and best practice guidelines:

- Green Star Design & As-Built v1.3 framework by the Green Building Council of Australia (GBCA)
- National Construction Code (NCC) 2019 Volume One Amendment One

Introduction

This report supports a Development Application (DA) for DHL Horsley industrial development comprises of an ambient warehouse, main office, VAS office, dock office 1 and dock office 2 at 813 Wallgrove Road, Eastern Creek, NSW 2766.

In this development, key sustainability (or ESD) design principles have been targeted in accordance with the 5 star Green Star Design & As-Built v1.3 rating framework. This shall ensure holistic ESD principles are being incorporated in design, construction and on-going operation of the development, in line with Conditions B2 and B3.

The development will seek 5 Star Green Star formal certification under the Green Star Design & As-Built v1.3 rating with the GBCA. The development has been registered with GBCA to formalise the Green Star formal certification process. Subsequent sections of this report will detail the sustainability pathway targeted for this development.

Reference Documents

This report is based on the following architectural drawings by:

Architect: Watson Young Architects
Level 11, 15 Blue Street, North Sydney NSW 2060

Relevant documents and drawings used in compiling this report are as follows:

Drawing/ Document No.	Revision	Title
21375_DA01	A	LOCALITY PLAN
21375_DA02	A	SITE PLAN
21375_DA05	A	MAIN OFFICE PLANS
21375_DA07	A	VAS OFFICE PLAN
21375_DA08	A	DOCK OFFICES- PLANS
21375_DA09	A	ROOF PLAN
21375_DA10	A	WAREHOUSE ELEVATIONS & SECTION
21375_DA11	A	MAIN OFFICE ELEVATIONS
21375_DA13	A	VAS OFFICE ELEVATIONS
SYD21574	P1	JV3 Compliance Report

Table 1: Reference documents

Project Overview

The industrial development is located at 813 Wallgrove Road, Eastern Creek, NSW 2766.



Figure 1: Satellite View of Project Site Location (source: Drawing DA01 Locality Plan)

The following table 2 provides a breakdown of Conditions requirements that will be addressed in this ESD report:

Condition No.	Requirements	Responses
B2	<ul style="list-style-type: none"> ○ Ecologically Sustainable Development: Future development applications must demonstrate how the Development incorporates the principles of Ecologically Sustainable Development (ESD) in the design, construction and on-going operation of the Development. 	<ul style="list-style-type: none"> ○ Responses have been addressed under Section 2.0 Green Star Design & As-Built Targeted Sustainability Pathway which covers holistic sustainability initiatives.
B3	<ul style="list-style-type: none"> ○ Sustainability Management Plan: Future development applications must set out how the development intends to comply with the Sustainable Strategy approved under Condition A12. <p>Ref: Condition A12</p> <ul style="list-style-type: none"> ○ Prior to the commencement of construction of Stage 1 development, the Applicant must submit a Sustainable Strategy for the Development to the Planning Secretary for approval. The Sustainability Strategy must: <ul style="list-style-type: none"> ○ Detail how the ESD and WSUD initiatives and energy efficiency measures outlined in the EIS will be implemented on site; ○ Identify the total greenhouse gas savings estimated to be achieved in comparison to a base case development (i.e. a development constructed in accordance with the minimum requirements of the latest version of Section J, Volume One of the National Construction Code (NCC) if the measures proposed under the Sustainability Strategy are implemented; ○ Include a calculation of water requirements and measures incorporated to reduce water use; ○ Include a program to monitor and report annually on the efficiency measures implemented; and ○ Ensure the development will continue to operate at industry best practice over time. 	<ul style="list-style-type: none"> ○ Responses have been addressed under Section 5.0 Green Star targeted sustainability initiatives, of this report. This also includes, but not limited to: <ul style="list-style-type: none"> ▪ Section 1.0, Page 8, Section 2.0 Page 8 – 9 of this report ▪ Section 2.0, page 9 of this report. ▪ Section 3.0, Page 10 of this report. ▪ Section 4.0, Page 10 of this report. ▪ Section 5.0, Page 11 – 22 of this report.

Table 2: Conditions B2 and B3 Summary

Requirements and Responses

1. ESD and WSUD Pollutants Reduction Targets

With reference to the Environmental Impact Statement (EIS) SSD package, stormwater management plan for the sitewide development have taken into consideration the requirements of the Fairfield Development Concept Plan (November, 2010); Urban Area Onsite Detention Handbook (February, 1997) for water quantity and Sydney Metropolitan Catchment Management Authority, Interim Reference Guidelines for South East Queensland Concept Design Guidelines for WSUD for water quality management. Further details of WSUD can be referenced from the Stormwater Report submitted as "Appendix K1 - Stormwater Concept Plan.pdf", "Appendix G3_ Updated Stormwater Report.pdf" and its associated documentations.

For DHL Horsley development, the project shall incorporate stormwater management plan measures to meet target pollutants reduction performance percentage that are in line with Green Star Credit 26.2 Stormwater Pollution Targets, Column B requirements. The following summarised the WSUD strategies:

- On-site detention (OSD) tank sized to reduce peak flows and manage stormwater quantity discharging from the site;
- On-site rainwater harvesting as part of stormwater management and water conservation strategy;
- Gross pollutant trap (GPT) treatment device such as OceanProtect or equivalent with associated filtration system to capture and remove pollutants such that the percentage reduction targets outlined in Table 2 can be met.

Detailed measures shall be addressed under the stormwater management plan report. Table 3 outline the targeted percentage pollutants reduction for the development:

Pollutants	DHL Horsley % Reduction Performance Targets based on Green Star Credit 26.2 Column B Reduction Targets
Total Suspended Solids (TSS)	80%
Gross Pollutants (GP)	90%
Total Nitrogen (TN)	45%
Total Phosphorus (TP)	60%
Total Petroleum Hydrocarbons	90%
Free Oils	90%

Table 3: Water Sensitive Urban Design performance targets

2. NCC Section J JV3 Energy Efficiency & Rooftop Solar Panels

Greenhouse gas emissions

The NCC 2019 Section J Volume One Amendment 1 contains mandatory requirements for the design of building envelope and features to minimise energy use. The proposed development in this project will be designed to comply with the minimum requirements as specified under NCC 2019 Section J, addressing the following.

- Building fabric
- Building sealing
- Air-conditioning and ventilation systems
- Artificial lighting and power
- Heated water supply
- Facilities for energy monitoring

Greenhouse gas emissions comparison between the base case ("reference DTS model") and proposed development ("proposed model") is summarised in Table 4. A copy of the Section J JV report is attached under Appendix B of this report.

Building Models	Reference Building	Proposed Building
Est. Annual greenhouse gas emissions (kgCO ₂ -e), excluding 1MWp solar photovoltaic	299,028	298,072
Est. Annual greenhouse gas emissions from 1MWp solar photovoltaic system	0	- 1,299,631
Percentage Improvement compared to DTS, before solar PV		0.32%
Percentage Improvement compared to DTS, after solar PV		≥ 100%
Compliance		YES

Table 4: Greenhouse gas emissions summary for Reference and Proposed Building

Solar photovoltaic (PV) system

The proposed development has included the provision for a 1MWp rooftop solar photovoltaic system to reduce reliance of grid electricity. Based on 450Wp PV module type and solar PV yield of 1,388 kWh/kWp, the solar energy generation is estimated to be 1,388 MWh/year.

Details and layout of the solar photovoltaic system shall be included in drawings and documentations during detailed design development.

3. Potable Water Use Reduction

Water Efficient Fittings, Rainwater Harvesting, Water Efficient Landscaping

The development shall consider the following water conservation strategies to reduce potable water use and reduce reliance on potable water source, where practical and feasible:

- d) Use of water efficient fittings with high WELS rating:
 - a) All toilets – 4 star WELS rating
 - b) All urinals – 6 star WELS rating
 - c) All indoor taps – 6 star WELS rating
 - d) All showers – 6 star WELS rating
- e) Onsite rainwater harvesting for landscape irrigation, toilet flushing and general washing
- f) Selection of low water demand landscape species
- g) Landscape irrigation to be fitted with subsurface drip irrigation system with moisture sensor control
- h) No water-based heat rejection system used
- i) Reuse at least 80% of fire protection system test water

4. NCC Section J8 & Green Star Requirements

Energy and Water Metering and Monitoring

The development will be designed to comply with the minimum requirements as specified under NCC 2019 Section Part J8 Facilities for Energy Monitoring and Green Star Credits 6.0 and 6.1 Metering and Monitoring requirements. The emphasis is such that building facilities manager or owner is able to maintain, set targets and improve the required performance level, and enable any excessive energy or water use to be automatically detected and alerted, which shall assist in efficient rectification process, if arise.

For effective monitoring, provision of dedicated metering interlinked to a central monitoring system are to be considered for the following:

- a) Dedicated energy meters for spaces with different functional use (e.g. office, kitchen and warehouse);
- b) Dedicated energy meter to be provided for each system (e.g. HVAC, hot water system, external lighting, internal lighting, general power, lift, specialist equipment, server and computer equipment), and where load of a system > 100kW;
- c) Dedicated energy meter for renewable energy generation (i.e. solar photovoltaic (PV));
- d) Dedicated water meters for common uses that consume 10% or more of the project's water use (e.g. kitchen, irrigation, sanitary system, general washing, incoming rainwater supply).

5. Green Star Design & As-Built v1.3 Targeted Sustainability Initiatives

The project has utilised the Green Star – Design & As Built v1.3 rating tool to guide the design towards this targeted outcome. The Green Star evaluates the sustainability initiatives of design, projects and/or buildings based on several criteria, including energy and water efficiency, indoor environmental quality (including occupants' visual, thermal and acoustic comfort), emission reduction (including stormwater management and pollutants reduction) and resource conservations (use of sustainable products and waste reduction).

Table 5 to 13 summarised the key sustainability strategy and approach for the development based on the nine Green Star categories, which include the targeted 5 star Green Star sustainability pathways and key responsibility parties. The targeted sustainability pathway for consideration will be progressively reviewed throughout each key project stages. Should there be any shortfall of points arise due to unforeseeable circumstances, alternative credits or pathways if required shall be considered to meet the 5 star rating requirements.

Green Star - Design & As Built Scorecard v1.3 - GS-6924DA			
Project (Ref. SYD21574):	DHL Wallgrove, Lot12, 813-913 Wallgrove Road, Horsley Park	Stage:	Pre-DA Coordination
Targeted Rating:	5 Star - Australian Excellence		Office 1,200m2, Ambient warehouse 32,000m2 (1MW Solar PV)

		<p>Primary Space: All areas where a person is expected to work, or remain for an extended period of time (e.g. classrooms, offices, kitchen and preparation areas where food is being sold etc)</p> <p>Secondary Space: All areas used to support the principal activity of the primary space. These spaces will be regularly occupied, however a single person is unlikely to remain within for more than 2 hours (e.g. meeting rooms, boardrooms, seminar rooms that are not intended for regular classes, lobbies and foyer where no staff are permanently based, cafeterias etc.)</p> <p>Tertiary Space: All areas which are either transient spaces or accessed intermittently. (e.g. BOH areas, corridors, hallways, plant rooms, storerooms, toilets, enclosed carparks etc)</p>
Core Points Available	Total Score Targeted	
100	69	(min. score for 5 Star is 60 points)

TOTALS	AVAILABLE	TOTAL TARGETED	TOTAL TARGETED
CORE POINTS	100	63.0	
CATEGORY PERCENTAGE SCORE			63.0
INNOVATION POINTS	10	6.0	6.0
TOTAL SCORE TARGETED		69.0	69.0

Management

The Management category aims to encourage the adoption of processes that encourage best practice sustainability outcomes.

CATEGORY / CREDIT	AIM OF CREDIT	CODE	CREDIT CRITERIA	APPLICATION	POINTS AVAILABLE	TARGETED POINTS	KEY RESPONSIBILITY PARTY	APPROACH/ STRATEGY
Management					14			
Green Star Accredited Professional	To recognise the appointment and active involvement of a Green Star Accredited Professional in order to ensure that the rating tool is applied effectively and as intended.	1.1	Accredited Professional	Whole Building	1	1	GSAP	Erbas is engaged as GSAP from Concept/ Schematic Design Stage.
Commissioning and Tuning	To encourage and recognise commissioning, handover and tuning initiatives that ensure all building services operate to their full potential.	2.0	Environmental Performance Targets	Whole Building	-	Complies	Owner	Owner's Project Requirements (OPR) and Project Design Intent or equivalent to include building system operational requirements, metering and monitoring requirements, and including targets for energy and water consumption.
		2.1	Services and Maintainability Review (SMR)	Whole Building	1	1	Builder	Builder to lead SMR review during design and prior to construction, addressing commissionability, controllability, maintainability, operability and safety for all building systems.
		2.2	Building Commissioning	Whole Building (Unconditioned Warehouse space can be excluded from Air Permeability Testing)	1	1	Builder	Note commissioning to include air permeability testing. Air permeability testing to demonstrate compliance with the maximum Green Star allowable air permeability. Any non-compliant to be addressed and validated via re-testing and demonstrate compliance in the final test results, with final test results to be signed off by builder.
		2.3	Building Systems Tuning	Whole Building	1	1	Builder Owner	- Upon project completion, a building tuning team (comprises of FM, Owner's Representative) will be formed. Tuning to commence with the attendance of builder and services design team for the first 12 months after occupation and include at least quarterly adjustments and measurements, and a review of building system manufacturer warranties.
		2.4	Independent Commissioning Agent	Whole Building	1			
Adaptation and Resilience	To encourage and recognise projects that are resilient to the impacts of a changing climate and natural disasters.	3.1	Implementation of a Climate Adaptation Plan	Whole Building	2	2	GSAP	- Climate adaptation plan will be prepared to ensure that the development is resilient to changing climate.
Building Information	To recognise the development and provision of building information that facilitates understanding of a building's systems, operation and maintenance requirements, and environmental targets to enable the optimised performance.	4.1	Building Information	Whole Building	1	1	Builder GSAP	- O&M and Building Logbook to be prepared by builder and submitted to owner before practical completion (PC). - Building user guide will be consolidated and prepared by GSAP.

Commitment to Performance	To recognise practices that encourage building owners, building occupants and facilities management teams to set targets and monitor environmental performance in a collaborative way.	5.1	Environmental Building Performance	Whole Building	1	1	Owner	Commitment to set targets and monitor at least energy and potable water targets.
		5.2	End of Life Waste Performance	B. Certified Operational Performance Rating	Whole Building	1	1	Owner
Metering and Monitoring	To recognise the implementation of effective energy and water metering and monitoring systems.	6.0	Metering	Whole Building	-	Complies	Electrical Mechanical Hydraulics	A minimum of 1 meter per system is to be provided and commissioned. This includes dedicated energy meter to spaces with different functional uses (e.g. office, warehouse, kitchen), dedicated metering to each system (e.g. HVAC, hot water system, internal lighting, external lighting, power, lift, specialist equipment), and where a system load exceeds 100kW and dedicated meter to onsite solar photovoltaic system.
		6.1	Monitoring Systems	Whole Building	1	1	Electrical Mechanical Hydraulics	All metering to connect to a central automatic monitoring system capable of continuous monitoring, producing alerts, and producing quarterly report that can be automatically emailed to building facilities manager.
Responsible Construction Practices	To reward projects that use best practice formal environmental management procedures during construction.	7.0	Environmental Management Plan	Whole Building	-	Complies	Builder	Builder to implement best practise Environmental Management Plan (EMP) at the start of construction (including any demolition or excavation works) in NSW Environmental Management Systems Guidelines.
		7.1	Environmental Management System	Whole Building	1	1	Builder	Builder to be ISO 14001 certified and implement EMS according to the ISO14001 standard.
		7.2	High Quality Staff Support	Whole Building	1	1	Builder GSAP	- Builder to carry out needs analyses, identify key 3 issues and address via policies/ programs for site staff (e.g. beyond blue, lifeline, nutrition organisation).
Operational Waste	A. Performance Pathway	8A	Performance Pathway: Specialist Plan	Whole Building	1	1	Waste auditor Architect	- Operational Waste management Plan (OWMP) to be prepared and incorporated into final architectural layout.
		8B	Prescriptive Pathway: Facilities		0			
Total					14	13		

Table 5: Proposed ESD Initiatives under Green Star Management Category

Indoor Air Quality

The Indoor Environment category aims to improve occupants' experience of the space to encourage occupant well-being.

CATEGORY / CREDIT	AIM OF CREDIT	CODE	CREDIT CRITERIA	APPLICATION	POINTS AVAILABLE	TARGETED POINTS	KEY RESPONSIBILITY PARTY	APPROACH/ STRATEGY
Indoor Environment Quality					17			
<input type="checkbox"/>	Indoor Air Quality To recognise projects that provide high air quality to occupants.	9.1	Ventilation System Attributes	Warehouse floor, Office spaces, Distribution, and Storage spaces	1	1	Mechanical	- Provision of pollution sources and outdoor air intakes compliant with ASHRAE 62.1:2013 to be included under Mechanical design consideration. - Builder's EMP to include cleaning requirements and letter of confirmation on ductwork cleaning prior to use.
<input type="checkbox"/>		9.2	Provision of Outdoor Air	<input type="checkbox"/> A. Comparison to Industry Standards	Warehouse floor, Office spaces, Distribution, and Storage areas	2		Warehouse area comprises of more than 95% of the total building GFA. Office needs to comply as it exceeds 1,000m ² . For mixed-mode or mechanically ventilated space, provision for ventilation demand control via CO ₂ sensors (maintain below 800ppm) installed with temperature sensors in each enclosed space and at a minimum area of no greater than 500m ² . For naturally ventilated area, quantity of outdoor air provided must comply with AS1668.4-2012.
<input type="checkbox"/>				<input checked="" type="checkbox"/> B. Performance Based Approach				
<input type="checkbox"/>		9.3	Exhaust or Elimination of Pollutants	Warehouse floor, Office spaces, Distribution, and Storage areas	1	1	Architect Mechanical Owner	- Kitchen adjacent to the office currently do not come with stove tops or ovens and hence, only equivalent to kitchenettes or tea points for tea/coffee making and simple reheat function. However, if a kitchen with cooking equipment is present, separate kitchen exhaust to be provided with ventilation systems complying to AS1668.2:2012. - Owner to commit on the procurement of only low-emission certified equipments for printing/photocopy machines. Test standards - ECMA-328, RAL-UZ 171 or GGPS.003.
<input type="checkbox"/>	Acoustic Comfort To reward projects that provide appropriate and comfortable acoustic conditions for occupants.	10.1	Internal Noise Levels	Office spaces	1	1	Acoustic	Internal ambient noise level no more than 5dBA above the lower figure in the range recommended in AS/NZS2107:2016 Table 1. Validation during commissioning to be carried out via acoustic measurement.
<input type="checkbox"/>		10.2	Reverberation	Warehouse floor, Office spaces, and Distribution.	1			
<input type="checkbox"/>		10.3	Acoustic Separation	A. Sound Reduction	Between office spaces, and any primary or secondary spaces adjacent to warehouse floors, or fully enclosed spaces within a warehouse or distribution floor.	1	1	Acoustic

<input type="checkbox"/>	Lighting Comfort	To encourage and recognise well-lit spaces that provide a high degree of comfort to users.	11.0	Minimum Lighting Comfort		Warehouse floor, Office spaces, Distribution, Storage and Refrigerated spaces, as applicable	-	Complies	Electrical	Provision of flicker free lighting LED (> 12 bit resolution driver) with CRI ≥ 80 and comply with AS1680.1 requirements. LED lighting provision for office and warehouse area.	
11.1 General Illuminance and Glare Reduction			11.1.1 General Illuminance	<input checked="" type="checkbox"/> A. Non Residential Spaces	Warehouse floor, Office spaces, Distribution, Storage and Refrigerated spaces	1	1	Electrical	-	-	All interior lighting at applicable areas shall be design in compliance with AS/NZS 1680.2 illuminance requirement and AS 1680.1:2006 uniformity requirement. As-installed lux plot to be provided for validation.
				<input type="checkbox"/> Residential Spaces							<input checked="" type="checkbox"/> Prescriptive Method 1
				11.1.2 Glare Reduction	<input checked="" type="checkbox"/> B. Prescriptive Method 2						All interior lighting at applicable areas are to be fitted with baffles, louvers, translucent diffusers to obscure direct light source from all viewing angle including upward views.
<input type="checkbox"/>			11.2	Surface Illuminance	<input type="checkbox"/> Performance Method <input type="checkbox"/> Prescriptive Method <input type="checkbox"/> Residential Spaces (Prescriptive Method)	Office spaces	1			-	
<input type="checkbox"/>			11.3	Localised Lighting Control		Office spaces	1	1	Electrical	All office lighting to be integrated with automated lighting control systems such that in open plan/ activity-based working environment occupants are able to switch on/off and adjust lighting levels of their immediate environment, or varied lighting zones is designed to to suit different task requirements	
<input type="checkbox"/>	Visual Comfort	To recognise the delivery of well-lit spaces that provide high levels of visual comfort to building occupants.	12.0	Glare Reduction	<input type="checkbox"/> Fixed Shading Devices	Warehouse floor, Office spaces (excluding secondary spaces within these), and External Loading dock areas.	-	Complies	Architect	-	
<input checked="" type="checkbox"/> Blinds or Screens											
<input type="checkbox"/> C. Daylight Glare Model											
<input type="checkbox"/>			12.1	Daylight	<input type="checkbox"/> Prescriptive Methodology <input checked="" type="checkbox"/> Compliance Using Daylight Factor <input type="checkbox"/> C. Compliance Using Daylight Autonomy	Warehouse floor, Office spaces (excluding secondary spaces within these)	2	1	GSAP	All glazing to have high VLT in other to maximise access to daylight.	
<input type="checkbox"/>			12.2	Views		Office spaces (excluding secondary spaces within these)	1	1	GSAP	The primary spaces within office spaces achieve more than 60% of high quality view i.e. approx. 74%)	
<input type="checkbox"/>	Indoor Pollutants	To recognise projects that safeguard occupant health through the reduction in internal air pollutant levels.	13.1 Paints, Adhesives, Sealants and Carpets	13.1.1 Paints, Adhesives and Sealants	<input checked="" type="checkbox"/> A. Product Certification	All internal applications	1	1	All Disciplines	-	
<input checked="" type="checkbox"/> B. Laboratory Testing											
<input type="checkbox"/> C. No Paints, Adhesives or Sealants											
<input type="checkbox"/>				13.1.2 Carpets	<input checked="" type="checkbox"/> A. Product Certification <input checked="" type="checkbox"/> Laboratory Testing <input type="checkbox"/> No Carpets					- All carpets to be GECA Green Tag Green Rate Level A certified or equivalent.	
<input type="checkbox"/>			13.2	Engineered Wood Products	<input checked="" type="checkbox"/> Product Certification <input checked="" type="checkbox"/> Laboratory Testing	All internal applications	1	1	Architect	- All engineered wood products (plywood, laminate, MDF, decorative wood panels, timber flooring) to be low formaldehyde emission limit and/or GECA 25-2011 v2 or equivalent certified.	
<input type="checkbox"/>	Thermal Comfort	To encourage and recognise projects that achieve high levels of thermal comfort.	14.1	Thermal Comfort	<input type="checkbox"/> Naturally Ventilated Spaces	Office spaces	1	1	GSAP	Thermal comfort PMV is within -1 to +1 range as shown via the thermal comfort modelling (refer Appendix B JV3 compliance report)	
<input checked="" type="checkbox"/> B. Mechanically Ventilated Spaces											
<input type="checkbox"/>			14.2	Advanced Thermal Comfort	<input type="checkbox"/> Residential Spaces <input type="checkbox"/> Naturally Ventilated Spaces <input type="checkbox"/> Mechanically Ventilated Spaces <input type="checkbox"/> Residential Spaces	Office Spaces, Warehouse floor (primary only)	1			-	
Total							17	11			

Table 6: Proposed Sustainability Initiatives under Green Star Indoor Environment Quality Category

Energy

The Energy category aims to reduce the operational energy consumption of the buildings below that of a comparable standard-practice building.

CATEGORY / CREDIT	AIM OF CREDIT	CODE	CREDIT CRITERIA	APPLICATION	POINTS AVAILABLE	TARGETED POINTS	KEY RESPONSIBILITY PARTY	APPROACH/ STRATEGY
Energy					22			
Greenhouse Gas Emissions	E. Reference Building Pathway	15E.0	Conditional Requirement: Reference Building Pathway <input type="checkbox"/>	Whole Building	-	Complies	GSAP	The project will attain at least 3 points under Credit 15E section. 1MWp solar photovoltaic (PV) will form part of the greenhouse gas emissions reduction strategies.
		15E.1	GHG Emissions Reduction: Building Fabric	Whole Building	4	0	GSAP	Energy modelling demonstrate 0.3% building fabric improvement can be achieved.
		15E.2	GHG Emissions Reduction	Whole Building	16	14	GSAP	Target to achieve at least 80% reduction in greenhouse gas emissions when compared against a benchmark building.
		15E.3	Off-Site Renewables		8			
		15E.4	District Services		7			
		15E.5 Additional Prescriptive Measures	15E.5.1 Transition Plan		1			
			15E.5.2 Fuel Switching		2			
			15E.5.3 On-Site Storage		1			
Peak Electricity Demand Reduction	B. Performance Pathway	16A	Prescriptive Pathway: On-Site Energy Generation		0			
		16B	Modelled Performance Pathway: Reference Building	Whole Building	2	2	GSAP	With onsite 1MWp of solar PV system, at least 30% reduction in peak electricity demand is achievable.
Total					22	16		

Table 7: Proposed Sustainability Initiatives under Green Star Energy Category

Transport

The Transport category aims to implement design and operational measures that reduce the carbon emissions arising from occupant travel to and from the project.

CATEGORY / CREDIT	AIM OF CREDIT	CODE	CREDIT CRITERIA	APPLICATION	POINTS AVAILABLE	TARGETED POINTS	KEY RESPONSIBILITY PARTY	APPROACH/ STRATEGY
Transport					10			
<input type="checkbox"/> <input type="checkbox"/> Sustainable Transport	A. Performance Pathway	17A	Performance Pathway		10	2	Transport Specialist	Sustainable transport plan with predicted mode split with targets to reduce emissions impacts from transport through strategies such as encourage increase of active transport options, provision of fuel efficient dedicated parking space.
		17C.1	Access by Public Transport	Regular Occupant of Buildings & Visitors	1			
		17C.2	Reduced Car Parking Provision	Regular Occupant of Buildings & Visitors	1			
		17C.3	Low Emission Vehicle Infrastructure	C. Parking for Car Share Vehicles	Regular Occupant of Buildings & Visitors	5		
				B. Parking for Electric Vehicles	Regular Occupant of Buildings & Visitors			
				A. Parking for Fuel-Efficient Vehicles	Regular Occupant of Buildings & Visitors			
		17C.4	Active Transport Facilities	Regular Occupant of Buildings & Visitors	2			
		17C.5	Walkable Neighbourhoods	A. Proximity to Amenities	Regular Occupant of Buildings & Visitors	2		
Total					7	2		

Table 8: Proposed Sustainability Initiatives under Green Star Transport Category

Water

The Water category aims to reduce the consumption of potable water through measures such as the incorporation of water efficient fixtures and water re-use.

CATEGORY / CREDIT	AIM OF CREDIT	CODE	CREDIT CRITERIA	APPLICATION	POINTS AVAILABLE	TARGETED POINTS	KEY RESPONSIBILITY PARTY	APPROACH/ STRATEGY
Water					12			
Potable Water	A. Performance Pathway	18A	Potable Water - Performance Pathway	Whole Building	12	7	GSAP ALL	<ul style="list-style-type: none"> - Selection of high WELS rated water fittings: --> Taps: 6 Star --> Urinals: 6 Star with sensors --> Toilet: 4 Star --> Showers: 6 Star --> Dishwasher & Clothing washing machines (if installed): 4.5 Star - Onsite rainwater tank - No water-based heat rejection system in use - Drip irrigation with moisture sensor for landscaping, with low water demand plant species selection - Reuse at least 80% of fire protection system test water
		18B.1	Sanitary Fixture Efficiency		0	0		
		18B.2	Rainwater Reuse		0	0		
		18B.3	Heat Rejection		0	0		
		18B.4	Landscape Irrigation		0	0		
		18B.5	Fire Protection System Test Water		0			
<input checked="" type="checkbox"/>	Total				12	7		

Table 9: Proposed Sustainability Initiatives under Green Star Water Category

Materials

The Materials category aims to reduce the impact of resource consumption as a result of construction activities in relation to the project.

CATEGORY / CREDIT	AIM OF CREDIT	CODE	CREDIT CRITERIA	APPLICATION	POINTS AVAILABLE	TARGETED POINTS	KEY RESPONSIBILITY PARTY	APPROACH/ STRATEGY
Materials					14			
Life Cycle Impacts	A. Performance Pathway - Life Cycle Assessment	19A.1	Comparative Life Cycle Assessment		6	3		Whole of life cycle assessment to be carried out to address environmental impacts from key elements such as materials, construction, waste disposal, operational energy and water.
		19A.2	Additional Reporting	<input checked="" type="checkbox"/> Additional Life Cycle Impact Reporting <input type="checkbox"/> Material Selection Improvement <input type="checkbox"/> Construction Process Improvement <input checked="" type="checkbox"/> LCA Design Review	4	2		LCA modelling to include additional reporting.
<input type="checkbox"/>	To reward projects that include materials that are responsibly sourced or have a sustainable supply chain.	20.1	Structural and Reinforcing Steel	20.1.0 Responsible Steel Maker	-	Complies	Structural Builder	All new structural and reinforcing steels used (by mass) must be sourced from a Responsible Steel Maker demonstrated through compliance with the following requirements: - Steel making facilities supplying the steels possess a currently valid ISO14001 certification; AND - Steel maker supplying the steels is a member of the World Steel Association's (WSA) Climate Action Programme (CAP) and possess a current CAP certificate from the WSA.
A. Responsible Steel Fabricator				1	1	Structural Builder	At least ≥ 60% (by mass) of the fabricated structural steelwork is supplied by a steel fabricator/steel contractor accredited to the Environmental Sustainability Charter of the Australian Steel Institute (ASI).	
<input checked="" type="checkbox"/>				20.2	Timber	<input checked="" type="checkbox"/> Certified Timber <input type="checkbox"/> B. Reused Timber	1	1
<input type="checkbox"/>	To encourage sustainability and transparency in product specification.	21.1	Product Transparency and Sustainability	B. Best Practice Guidelines for PVC	1	1	All Disciplines	All permanent formwork, pipes, flooring, blinds and cables to either: - Do not contain PVC (as reflected in product Safety Data Sheet or product Environmental Product Declaration (EPD)); OR - Certified under BEP PVC registry (https://www.vinyl.org.au/in-greenstar/best-practice-pvc-product-register)
<input type="checkbox"/>				20.3	Permanent Formwork, Pipes, Flooring, Blinds and Cables			
Sustainable Products	To encourage sustainability and transparency in product specification.			<input type="checkbox"/> Reused Products <input type="checkbox"/> Recycled Content Products <input type="checkbox"/> C. Environmental Product Declarations (EPDs) <input type="checkbox"/> D. Third Party Certification <input type="checkbox"/> E. Stewardship Programs	3			
Construction and Demolition Waste	B. Percentage Benchmark	22.0	Reporting Accuracy	B. Disclosure Statement	-	Complies	Builder Waste Contractor	Waste Contractor to fill in Disclosure statement issued by GBCA pertaining to: - Comparing onsite waste report with waste contractor's disposal dockets - Comparing waste contractor's disposal dockets with waste processing facility records
		22A	Fixed Benchmark		0			-
		22B	Percentage Benchmark		1	1	Builder Waste Contractor	Waste contractor to ensure > 90% of waste are diverted from landfill, recorded in monthly and cumulative waste report detailing the total weight of waste removed from construction site, and the waste processing facilities where all loads are disposed.
Total					12	9		

Table 10: Proposed Sustainability Initiatives under Green Star Materials Category

Land Use & Ecology

The Land Use & Ecology category aims to improve the site's ecological value.

CATEGORY / CREDIT	AIM OF CREDIT	CODE	CREDIT CRITERIA	APPLICATION	POINTS AVAILABLE	TARGETED POINTS	KEY RESPONSIBILITY PARTY	APPROACH/ STRATEGY
Land Use & Ecology					6			
Ecological Value	To reward projects that improve the ecological value of their site.	23.0	Endangered, Threatened or Vulnerable Species	A. EPBC	-			
		23.1	Ecological Value		3			
Sustainable Sites	To reward projects that choose to develop sites that have limited ecological value, re-use previously developed land and remediate contaminate land.	24.0	Conditional Requirement		-	Complies	Owner	With ref. to "Appendix F1 - Ecological Impact Assessment.pdf", the project satisfy all the following conditions: - Project is not on land containing old-growth forest; - Project is no on prime agriculture land; - Project does not have any wetland listed under the Ramsar Convention; - Project does not have a significant impact on 'Matters of National Significance' listed under the EPBC Act.
		24.1	Reuse of Land	A. Previously Developed Land	1			
		24.2	Contamination and Hazardous Materials	<input type="checkbox"/> Site Contamination <input type="checkbox"/> Hazardous Materials	1			
<input type="checkbox"/>								
Heat Island Effect	To encourage and recognise projects that reduce the contribution of the project site to the heat island effect.	25.1	Heat Island Effect Reduction		1	1	Architect	Required compliant area for UHI reduction is 75% of total project site area. The ambient warehouse and office roof is specified as Colorbond WhiteHaven Coolmax with SRI 95 (min. required SRI 82), with area comprises of approximately 58.5% of the total project site area. Carpark to the south of the building which is deemed to be compliant is approximately 10% of the project site area. Based on the current assessment, there is potential to comply with this credit requirements.
Total					6	1		

Table 11: Proposed Sustainability Initiatives under Green Star Land Use & Ecology Category

Emissions

The Emissions category aims to address the 'point source' pollution generated by the development.

CATEGORY / CREDIT	AIM OF CREDIT	CODE	CREDIT CRITERIA	APPLICATION	POINTS AVAILABLE	TARGETED POINTS	KEY RESPONSIBILITY PARTY	APPROACH/ STRATEGY
Emissions					5			
Stormwater	To reward projects that minimise peak stormwater flows and reduce pollutants entering public sewer infrastructure.	26.1	Stormwater Peak Discharge		1	1	Civil	Sitewide WSUD strategy is in place to ensure that the post-development peak flows do not exceed the pre-development peak flows.
		26.2	Stormwater Pollution Targets		1	1	Civil	The project shall incorporate stormwater management plan measures i.e. OSD tank, rainwater harvesting and gross pollutant trap (GPT) treatment device to achieve the following pollutants reduction targets, in line with Green Star Column B requirements: TSS: 80% GP: 90% TN: 45% TP: 60% Petroleum Hydrocarbons: 90% Free Oil: 90%
Light Pollution	To reward projects that minimise light pollution.	27.0	Light Pollution to Neighbouring Bodies		-	Complies	Electrical	Electrical design provision shall include the following considerations: - Exterior lighting to demonstrate compliance with maximum values AS4282:1997. Requirement for lux plot and validation with as-installed lighting onsite. - Automatic lighting control system that deactivates lights based on external lux levels for compliance during the relevant hours of operation.
		27.1	Light Pollution to Night Sky	A. Control of Upward Light Output Ratio (ULOR)	1	1	Electrical	Electrical design provision shall include the following considerations: - Exterior lighting selection to have ULOR ≤ 5% in relation to as-installed mounting angle and orientation. Requirement for lux plot and validation with as-installed lighting onsite.
Microbial Control	To recognise projects that implement systems to minimise the impacts associated with harmful microbes in building systems.	28	Legionella Impacts from Cooling Systems	B. Waterless Heat Rejection Systems	1	1	Mechanical	Proposed air-conditioning system comprises of waterless heat rejection systems.
Refrigerant Impacts	To encourage operational practices that minimise the environmental impacts of refrigeration equipment.	29.1	Refrigerants Impacts	A. Calculating TSDEI	1			-
Total					5	4		

Table 12: Proposed Sustainability Initiatives under Green Star Land Use & Ecology Category

Innovation

The Innovation category aims to encourage innovative sustainability initiatives and those that exceed the regular Green Star requirements.

CATEGORY / CREDIT	AIM OF CREDIT	CODE	CREDIT CRITERIA	APPLICATION	POINTS AVAILABLE	TARGETED POINTS	KEY RESPONSIBILITY PARTY	APPROACH/ STRATEGY
Innovation					10			
Innovative Technology or Process	The project meets the aims of an existing credit using a technology or process that is considered innovative in Australia or the world.	30A	Innovative Technology or Process	15% Onsite Renewable energy contribution (1 pt) 30% Onsite Renewable energy contribution (2 pts)	10	2	GSAP	Provision of 1MWp on-site solar photovoltaic (PV) system.
Market Transformation	The project has undertaken a sustainability initiative that substantially contributes to the broader market transformation towards sustainable development in Australia or in the world.	30B	Market Transformation					
Improving on Green Star Benchmarks	The project has achieved full points in a Green Star credit and demonstrates a substantial improvement on the benchmark required to achieve full points.	30C	Improving on Green Star Benchmarks	- Column B Stormwater Pollutants Reduction Targets (1 pt)		1	Civil	Refer Credit 26.2
				- Ultra low VOC paints for at least 50% of internal paints (1 pt)		1	Builder	Refer Credit 13.1
				- Construction & Demolition waste, 5kg/m2 fixed benchmark limit (1 pt)		1	Builder	Refer Credit 22
Innovation Challenge	Where the project addresses a sustainability issue not included within any of the Credits in the existing Green Star rating tools.	30D	Innovation Challenge	- Financial Transparency (1 pt)		1	Builder	Submit itemised cost information via Financial Transparency Disclosure template to GBCA to indirectly support GBCA in encouraging the uptake of sustainable buildings.
				- Powered by Renewables (2-4 pts)				
				- Responsible Carbon Impact				
Global Sustainability	Project teams may adopt an approved credit from a Global Green Building Rating tool that addresses a sustainability issue that is	30E	Global Sustainability					
Total					10	6		

Table 13: Proposed Sustainability Initiatives under Green Star Innovation Category

Appendix A – Green Star References

The following references the Green Star – Design and As Built v1.3 tool for indoor material emissions standards and high steel strength requirements.

Paints, Adhesives, Sealants, Carpets & Engineered Wood

At least 95% of all internally applied paints, adhesives, sealants (by volume) or carpets (by area) meet the TVOC limits detailed in Table 13.1.1.

Table 13.1.1: Maximum TVOC Limits for Paints, Adhesives and Sealants

Product Category	Max TVOC content in grams per litre (g/L) of ready to use product.
General purpose adhesives and sealants	50
Interior wall and ceiling paint, all sheen levels	16
Trim, varnishes and wood stains	75
Primers, sealers and prep coats	65
One and two pack performance coatings for floors	140
Acoustic sealants, architectural sealant, waterproofing membranes and sealant, fire retardant sealants and adhesives	250
Structural glazing adhesive, wood flooring and laminate adhesives and sealants	100

Carpets

At least 95% of all carpet products comply with the Total VOC (TVOC) limits for a selected compliance options, specified in the tables below. Either option is acceptable.

The product is certified under a recognised Product Certification Scheme (listed on the GBCA website <http://new.gbca.org.au/product-certification-schemes/>) or other recognised standards.

The certificate must be current at the time of project registration or submission and list the relevant product name and model.

Carpet Test Standards and TVOC Emissions Limits

Compliance option	Test protocol	Limit
ASTM D5116	ASTM D5116 - Total VOC limit*	0.5mg/m ² per hour
	ASTM D5116 - 4-PC (4-Phenylcyclohexene)*	0.05mg/m ² per hour
ISO 16000 / EN 13419	ISO 16000 / EN 13419 - TVOC at three days	0.5 mg/m ² per hour
ISO 10580 / ISO/TC 219 (Document N238)	ISO 10580 / ISO/TC 219 (Document N238) - TVOC at 24 hours	0.5mg/m ² per hour

*Both limits should be met when testing against ASTM D5116

Engineered Wood Products

At least 95% of all new engineered wood products must meet the formaldehyde emission limits specified in Table 13.2B.

Table 13.2B: Formaldehyde Emission Limit Values for Engineered Wood Products

Test Protocol	Emission Limit/ Unit of Measurement
AS/NZS 2269:2004, testing procedure AS/NZS 2098.11:2005 method 10 for Plywood	≤1mg/ L
AS/NZS 1859.1:2004 - Particle Board, with use of testing procedure AS/NZS 4266.16:2004 method 16	≤1.5 mg/L
AS/NZS 1859.2:2004 - MDF, with use of testing procedure AS/NZS 4266.16:2004 method 16	≤1mg/ L
AS/NZS 4357.4 - Laminated Veneer Lumber (LVL)	≤1mg/ L
Japanese Agricultural Standard MAFF Notification No.701 Appendix Clause 3 (11) - LVL	≤1mg/ L
JIS A 5908:2003- Particle Board and Plywood, with use of testing procedure JIS A 1460	≤1mg/ L
JIS A 5905:2003 - MDF, with use of testing procedure JIS A 1460	≤1mg/ L
JIS A1901 (not applicable to Plywood, applicable to high pressure laminates and compact laminates)	≤0.1 mg/m ² hr*
ASTM D5116 (applicable to high pressure laminates and compact laminates)	≤0.1 mg/m ² hr
ISO 16000 part 9, 10 and 11 (also known as EN 13419), applicable to high pressure laminates and compact laminates	≤0.1 mg/m ² hr (at 3 days)
ASTM D6007	≤0.12mg/m ³ **
ASTM E1333	≤0.12mg/m ³ ***
EN 717-1 (also known as DIN EN 717-1)	≤0.12mg/m ³
EN 717-2 (also known as DIN EN 717-2)	≤3.5mg/m ² hr

*mg/m²hr may also be represented as mg/m²/hr.

**The test report must confirm that the conditions of Table 3 comply for the particular wood product type, the final results must be presented in EN 717-1 equivalent (as presented in the table) using the correlation ratio of 0.98.

***The final results must be presented in EN 717-1 equivalent (as presented in the table), using the correlation ratio of 0.98.

Best Practice PVC

All PVC used in the project should be registered under the Best Practice PVC Product Register managed by the Vinyl Councils Best Environmental Practice (BEP).

Best Practice PVC Register

Click on an application below for a list of accredited Best Practice PVC products:



Available at: <https://www.vinyl.org.au/in-greenstar/best-practice-pvc-product-register>

Appendix B – NCC 2019 Section J JV3 Report



JV3 Compliance Report

DHL Horsley Park

For DHL

Revision	Date	Description	Author	Reviewer
P1	28/01/22	Preliminary (for client review)	KP/ AS	AS

The reader's attention is drawn to the following important information:

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Executive summary

This report summarises the assessment undertaken for compliance utilising the JV3 Verification Method Using a Reference Building, under Performance Requirement JP1 of NCC 2019 Section J Energy Efficiency for DHL Horsley Park at 813 Wallgrove Road, Eastern Creek, NSW 2766. The assessment compares a Deemed to Satisfy (DTS) compliant Reference Building with the Proposed Building as part of a Performance Solution using JV3 modelling protocols. The software used is IES-VE, which meets the modelling requirements of ABCB's Protocol for Building Energy Analysis Software.

This report employs a JV3 compliance pathway to identify suitable building constructions that meet the above requirements. The following are assessed in this report:

- Annual greenhouse gas emissions of the Proposed Building being less than the Reference Building;
- Thermal comfort indicator Predicted Mean Vote (PMV) of $-1 < PMV < +1$ achieved for 95% of the floor area of all occupied zones for 98% of the annual operation hours of the Proposed Building.

The Proposed Building is based on Proposed Building Fabric and Reference ("NCC 2019 DTS") Services. The Reference Building is based on NCC 2019 DTS Building Fabric and NCC 2019 DTS Services.

All values are minimum total system values inclusive of building material, air-gaps, air-films, insulation, etc. The R-values should be read in conjunction with the attached thermal envelope mark-ups, refer to Appendix D.

The proposed building fabric have also taken into consideration reasonable improvement required to achieve a 5 star Green Star Design & As-Built rating. The following is a proposed compliant solution under the JV3 verification methodology for the building.

Building Thermal Envelope	Proposed Min. Compliant Total System R-Value (m ² K/W)	Insulation required
New Roof/Ceiling – Over conditioned space (solar absorptance (SA) of upper surface of a roof must be ≤ 0.40)	3.52[†] (Roof) 2.0[†] (Office ceiling) <i>(For a downward direction of heat flow)</i>	YES Refer Appendix C for examples of thermal construction.
New Walls – separating conditioned spaces from external or unconditioned space (solar absorptance ≤ 0.73)	1.7[†] (External walls) 1.4[†] (Internal walls separating conditioned from unconditioned space)	YES Refer Appendix C for thermal construction.
New Floor – Suspended floor above unconditioned space or exterior	2.2[†]	YES Refer Appendix C for thermal construction.
New Floor – Concrete slab on ground	N/A	NO JV3 assessment confirmed compliance with no floor insulation.

Table 1: Total system JV3 building envelope thermal performance requirements

[†]The required Total R-Value and Total System U-Value, must include allowance for thermal bridging, must be—

- calculated in accordance with AS/NZS 4859.2 for a roof or floor; or
- determined in accordance with Specification J1.5a for wall-glazing construction; or
- determined in accordance with Specification J1.6 or Section 3.5 of CIBSE Guide A for soil or sub-floor spaces.

Glazing	Description	U-Value (W/m ² K)	SHGC
External glazing (all orientation)	External glazed windows and doors with frames (total system)	± 4.6	± 0.46

Table 2: Total system JV3 glazing thermal performance requirements

The following tables summarises the annual greenhouse gas emissions of the Reference and Proposed Building; and the PMV of the Proposed Building. As the Proposed Building produces less annual greenhouse gas emissions compared to the Reference Building, it is compliant.

Building Models	Reference Building (DTS)	Proposed Building (JV3)
Annual greenhouse gas emissions (kgCO ₂ -e)	299,028	298,072
Percentage Improvement compared to DTS		0.32%
Compliance		YES

Table 3: Annual greenhouse gas emissions summary

Total hours of operation (95% of occupied floor area)	% Compliance with -1<PMV<+1
Required % for compliance	98%
Result	98%
Compliance	YES

Table 4: Predicted Mean Vote (PMV) thermal comfort level summary

Introduction

A JV3 assessment has been completed to determine the building fabric and glazing performance to achieve compliance with NCC 2019 Section J1 and J3 for conditioned space. The conditioned space required to comply with the NCC 2019 Section J requirements are the main office, VAS office, dock office 1 and dock office 2. Conditioned space as defined under NCC 2019 Section J One Amendment 1 refers to spaces where temperature in the space is being controlled by air-conditioning, including spaces that is not actively conditioned but provides a return air path or exhaust air path for conditioned air from an adjoining space.

In this assessment, the following items will be addressed:

- J1 Building Fabric (Wall and Glazing) via the JV3 Alternative Performance verification method; and
- J3 Building Sealing

The BCA certifier should confirm this approach is acceptable for the development.

Building description

The proposed development comprises of an ambient warehouse, main office, VAS office, dock office 1 and dock office 2 in Eastern Creek, NSW 2766. This report is applicable to all conditioned spaces defined for the purpose of NCC 2019 Volume One Amendment 1 Section J.

Reference documents

Building Code of Australia

The guidelines from NCC 2019 Volume One Amendment 1 is used in this report.

Drawings

This report is based on the following architectural drawings by:

Architect: Watson Young Architects
Level 11, 15 Blue Street, North Sydney NSW 2060

Relevant documents and drawings used in compiling this report are as follows:

Drawing No.	Revision date	Title
21375_DA02	A	LOCALITY PLAN
21375_DA02	A	SITE PLAN
21375_DA05	A	MAIN OFFICE PLANS
21375_DA07	A	VAS OFFICE PLAN
21375_DA08	A	DOCK OFFICES- PLANS
21375_DA09	A	ROOF PLAN
21375_DA10	A	WAREHOUSE ELEVATIONS & SECTION
21375_DA11	A	MAIN OFFICE ELEVATIONS
21375_DA13	A	VAS OFFICE ELEVATIONS

Table 5: Reference documents

Development Overview

The table below summarises the details of the development.

Development	DHL Horsley Park, 813 Wallgrove Road, Eastern Creek, NSW 2766
Levels	All
Project description	Industrial development comprises of an ambient warehouse, main office, VAS office, dock office 1 and dock office 2
Regulatory reference	NCC 2019 Volume One Amendment 1
Applied climate data	NCC Volume One Climate Zone 6 (Mild temperate) Weather file used: AUS_NSW_Richmond.RAAF_957530_RMY.epw
Modelling software	IES-VE Version 2021.0.2.0

Table 6: Development overview

BCA classification and climate zone

The project is within the NCC/BCA Climate zone 6 area with mild temperate climate. The building has the following classes:

- Class 5 – office building
- Class 7b – ambient warehouse

This is to be confirmed by the BCA certifier.

NCC Section J Compliance

JV3 Verification Method

Using the JV3 verification method, a Reference Building is developed based on compliance with the NCC DTS Provisions. The annual greenhouse gas emissions from the Reference Building is the minimum acceptable benchmark. The Proposed Building's annual greenhouse gas emissions, including services, must not be greater than the benchmark determined from the Reference Building. The Proposed building must achieve $-1 < PMV < +1$ across not less than 95% of the floor area of all occupied zones for not less than 98% of the annual hours of operation of the building. The JV3 verification method can be applied to buildings in Class 3, 5, 6, 7, 8 and 9 through the following models:

- Proposed Building with DTS services.

This ensures that high performing services are not used to overcompensate on poor building fabric.

The alternative solution for this development is based on proposed fabric only (Parts J1) with the same services as the Reference Building. The services are modelled based on NCC DTS provisions compliant with Section J Parts J5, J6, J7 and J8. Therefore, the annual greenhouse gas emissions comparisons are only required to be made between the following models:

- Proposed Building with proposed fabric and DTS services, and
- Reference Building with DTS fabric and DTS services.

Modelling Inputs

Building Fabric

The following table provides an overview of general parameters applied to the reference and proposed building model in relation to their building fabric.

Parameters	Reference Building	Proposed Building
Glazing distribution	As per architectural drawings	As per architectural drawings
Roof lights	As per architectural drawings	As per architectural drawings
Geometry	As per architectural drawings	As per architectural drawings
External shading	As per architectural drawings	As per architectural drawings
External surface solar absorptance	0.45 for Roof 0.60 for External Walls	0.23 for Roof 0.73 for External Walls

Table 7: General Parameters for Reference Building & Proposed Building Models

The building envelope, as defined by Section J, means the parts of a building's fabric that separates a conditioned space or habitable room from the exterior of the building or a non-conditioned space:

- Part J1.3 Roof and ceiling construction: A roof or ceiling that is part of the envelope must achieve total R-values as per NCC Part J1.3.
- Part J1.5 Walls and glazing: Each part of the building that is part of the envelope, must comply with NCC 2019 Façade calculator. This includes compliance with total system U-value and solar admittance of wall-glazing construction.
- Part 1.6 Floors: A floor that is part of the envelope including a floor above or below a carpark or plant room must achieve the total R-Values as per NCC Table J1.6.

Proposed Building (JV3)

Under the JV3 compliance pathway, the following proposed construction is deemed compliant. The proposed building fabric have also taken into consideration on improvement required to achieve a 5 star Green Star Design & As-Built rating.

See tables 8 and 9 below for the building envelope total system thermal performance of the fabric and glazing performance respectively for the proposed building. All values are minimum total system values inclusive of building material, air-gaps, air-films, insulation, etc. The R-values should be read in conjunction with the attached thermal envelope mark-ups, refer to Appendix D.

Building Fabric (JV3)

Building Thermal Envelope	Proposed Min. Compliant Total System R-Value (m ² K/W)	Insulation required
New Roof/Ceiling – Over conditioned space (solar absorptance (SA) of upper surface of a roof must be ≤ 0.23)	3.52[†] (Roof) 2.0[†] (Office ceiling) <i>(For a downward direction of heat flow)</i>	YES Refer Appendix C for examples of thermal construction.
New Walls – separating conditioned spaces from external or unconditioned space (solar absorptance ≤ 0.73)	1.7[†] (External walls) 1.4[†] (Internal walls separating conditioned from unconditioned space)	YES Refer Appendix C for thermal construction.
New Floor – Suspended floor above unconditioned space or exterior	2.2[†]	YES Refer Appendix C for thermal construction.
New Floor – Concrete slab on ground	N/A	NO JV3 assessment confirmed compliance with no floor insulation.

Table 8: JV3 building fabric requirements for Proposed Building

[†] The required Total R-Value and Total System U-Value, must include allowance for thermal bridging, must be —

- (i) calculated in accordance with AS/NZS 4859.2 for a roof or floor; or
- (ii) determined in accordance with Specification J1.5a for wall-glazing construction; or
- (iii) determined in accordance with Specification J1.6 or Section 3.5 of CIBSE Guide A for soil or sub-floor spaces.

Glazing (JV3)

Glazing	Description	U-Value (W/m ² K)	SHGC
External glazing (all orientation)	External glazed windows and doors	4.4	0.44

Table 9: JV3 glazing system requirements for the Proposed Building

Reference Building (DTS)

NCC J1 refers to wall-glazing elements that are forms the conditioned building thermal envelope. The DTS wall-glazing thermal performance requirements has been assessed in accordance with Part J1.5 using the NCC 2019 Volume One Façade Calculator developed by the Australian Building Code Board (ABCB), see Appendix B. The Reference building façade performance values are in accordance with Method 2 pathway of the DTS compliant façade calculations.

The following tables illustrates the total system values for the DTS requirements on J1.5 and is applied to the Reference Building model when determining its annual greenhouse gas emissions.

Building Fabric (DTS)

Building Thermal Envelope	DTS Min. Total System R-Value (m ² K/W)	Insulation required
New Ceiling/Roof – Over conditioned space (solar absorptance (SA) of upper surface of a roof must be ≤ 0.45)	R3.2 ^T	YES
New Walls – separating from external or non-conditioned space	R1.4 ^T	YES
New Floor – Suspended concrete slab/concrete slab on ground	R2.0 ^T	YES

Table 10: DTS building fabric requirements for Reference Building

The R-values for the Proposed Building construction should be read in conjunction with the attached thermal envelope mark-ups in Appendix D. The above is applied to the Reference Building model when determining its annual greenhouse gas emissions.

Glazing (DTS)

Glazing	Description	U-Value (W/m ² K)	SHGC
External glazing (all orientation)	External glazed windows and doors with frames (total system)	4.8	0.49

Table 11: DTS glazing system requirements for the Reference Building

Services

The parameters for building services has been modelled in accordance with NCC Specification JV. The values represent typical usage and therefore may not reflect actual profiles of buildings; however, these values are used in JV3 assessments as a benchmark. The following table summarises the applied thermal parameters to both the Reference and Proposed Building simulation model.

Component	Parameters
HVAC operating conditions	Heating set at: 21°C in conditioned areas Cooling set at: 24° C in conditioned areas
Plant operating profile	As per NCC 2019 JVC Modelling profiles Table 2i for Class 5 building
Occupation density (m ² / person)	10 for all spaces
People	75W sensible heat gain 55W latent heat gain/person
Lighting (W/m ²)	4.5
Appliances and equipment (W/m ²)	11
Infiltration values	0.35 air change per hour (ach) when plant is operating 0.70 air change per hour (ach) when plant operation is off
Shading devices	Shading of external elements has been considered
Mechanical services	To achieve at least deemed to satisfy provision as per NCC 2019
Electrical services	To achieve at least deemed to satisfy provision as per NCC 2019
Hydraulic services	To achieve at least deemed to satisfy provision as per NCC 2019

Table 12: Applied thermal parameters to Reference Building and Proposed Building model for simulation

Additional requirements

In addition to the JV3 modelling requirements, the building must comply with the following additional requirements.

In addition to the modelling requirements for [JV1](#), [JV2](#) and [JV3](#), a building must comply with—

- (a) for general thermal construction, [J1.2](#); and
- (b) for floor edge insulation, [J1.6\(b\)](#) and [J1.6\(c\)](#); and
- (c) for building sealing, [JV4](#) or [J3](#); and
- (d) for deactivation, control and insulation of *air-conditioning* and mechanical ventilation systems—
 - (i) [J5.2\(a\)\(i\)](#); and
 - (ii) [J5.2\(a\)\(ii\)\(A\)](#); and
 - (iii) [J5.2\(a\)\(iv\)](#); and
 - (iv) [J5.2\(a\)\(vi\)](#); and
 - (v) [J5.2\(b\)](#); and
 - (vi) [J5.2\(c\)](#); and
 - (vii) [J5.3\(b\)](#); and
 - (viii) [J5.3\(d\)](#); and
 - (ix) [J5.5](#); and
 - (x) [J5.6](#); and
 - (xi) [J5.8](#); and
- (e) for testing package *air-conditioning* equipment not less than 65 kW_r, AS/NZS 3823.1.2 at test condition T1; and
- (f) for testing a refrigeration chiller, AHRI 551/591; and
- (g) for interior artificial lighting and power control, [J6.3](#); and
- (h) for interior decorative and display lighting, [J6.4](#); and
- (i) for artificial lighting around the exterior of a building, [J6.5](#); and
- (j) for boiling water and chilled water storage units, [J6.6](#); and
- (k) for deactivation of *swimming pool* heating and pumping, [J7.3\(b\)\(ii\)](#) and [J7.3\(c\)](#); and
- (l) for deactivation of spa pool heating and pumping, [J7.4\(b\)\(ii\)](#) and [J7.4\(c\)](#); and
- (m) for facilities for energy monitoring, [Part J8](#); and
- (n) for deactivation of fixed outdoor space heating appliances, clause [J5.9\(c\)](#).

Thermal construction

The construction of insulation must comply with AS/NZS 4859.1, as per NCC Part J1.2 below.

J1.2 Thermal construction — general

- (a) Where *required*, insulation must comply with AS/NZS 4859.1 and be installed so that it—
 - (i) abuts or overlaps adjoining insulation other than at supporting members such as studs, noggings, joists, furring channels and the like where the insulation must be against the member; and
 - (ii) forms a continuous barrier with ceilings, walls, bulkheads, floors or the like that inherently contribute to the thermal barrier; and
 - (iii) does not affect the safe or effective operation of a *service* or fitting.
- (b) Where *required*, *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 a building lining or cladding; 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 50 mm; 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 is compressed between cladding and supporting members, 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 by not less than 50 mm.
- (d) Roof, ceiling, wall and floor materials, and associated surfaces are deemed to have the thermal properties listed in [Specification J1.2](#).
- (e) The *required Total R-Value* and *Total System U-Value*, including allowance for thermal bridging, must be—
 - (i) calculated in accordance with AS/NZS 4859.2 for a roof or floor; or
 - (ii) determined in accordance with [Specification J1.5a](#) for *wall-glazing construction*; or
 - (iii) determined in accordance with [Specification J1.6](#) or Section 3.5 of CIBSE Guide A for soil or sub-floor spaces.

Roof and ceiling construction

The roof and ceiling construction must comply as per NCC Part J1.3(a) to (b) below.

J1.3 Roof and ceiling construction

- (a) A roof or ceiling must achieve a *Total R-Value* greater than or equal to—
 - (i) in *climate zones* 1, 2, 3, 4 and 5, R3.7 for a downward direction of heat flow; and
 - (ii) in *climate zone* 6, R3.2 for a downward direction of heat flow; and
 - (iii) in *climate zone* 7, R3.7 for an upward direction of heat flow; and
 - (iv) in *climate zone* 8, R4.8 for an upward direction of heat flow.
- (b) In *climate zones* 1, 2, 3, 4, 5, 6 and 7, the solar absorptance of the upper surface of a roof must be not more than 0.45.
[SA J1.3\(c\)](#)

Walls and glazing

Wall construction must comply as per NCC Part J1.5(a) to (g) below.

J1.5 Walls and glazing

- (a) The *Total System U-Value* of *wall-glazing construction* must not be greater than—
- (i) for a Class 2 common area, a Class 5, 6, 7, 8 or 9b building or a Class 9a building other than a *ward area*, U2.0; and
 - (ii) for a Class 3 or 9c building or a Class 9a *ward area*—
 - (A) in *climate zones* 1, 3, 4, 6 or 7, U1.1; or
 - (B) in *climate zones* 2 or 5, U2.0; or
 - (C) in *climate zone* 8, U0.9.
- (b) The *Total System U-Value* of *display glazing* must not be greater than U5.8.
- (c) The *Total System U-Value* of *wall-glazing construction* must be calculated in accordance with [Specification J1.5a](#).
- (d) Wall components of a *wall-glazing construction* must achieve a minimum *Total R-Value* of—
- (i) where the wall is less than 80% of the area of the *wall-glazing construction*, R1.0; or
 - (ii) where the wall is 80% or more of the area of the *wall-glazing construction*, the value specified in [Table J1.5a](#).

Table J1.5a Minimum wall Total R-Value - Wall area 80% or more of wall-glazing construction area

<i>Climate zone</i>	Class 2 common area, Class 5, 6, 7, 8 or 9b building or a Class 9a building other than a <i>ward area</i>	Class 3 or 9c building or Class 9a <i>ward area</i>
1	2.4	3.3
2	1.4	1.4
3	1.4	3.3
4	1.4	2.8
5	1.4	1.4
6	1.4	2.8
7	1.4	2.8
8	1.4	3.8

- (e) The *solar admittance* of externally facing *wall-glazing construction* must not be greater than—
- (i) for a Class 2 common area, a Class 5, 6, 7, 8 or 9b building or a Class 9a building other than a *ward area*, the values specified in [Table J1.5b](#); and
 - (ii) for a Class 3 or 9c building or a Class 9a *ward area*, the values specified in [Table J1.5c](#).
- (f) The *solar admittance* of a *wall-glazing construction* must be calculated in accordance with [Specification J1.5a](#).
- (g) The *Total system SHGC* of *display glazing* must not be greater than 0.81 divided by the applicable shading factor specified in [Clause 7](#) of [Specification J1.5a](#).

Table J1.5b Maximum wall-glazing construction solar admittance - Class 2 common area, Class 5, 6, 7, 8 or 9b building or Class 9a building other than a ward area

<i>Climate zone</i>	Eastern aspect <i>solar admittance</i>	Northern aspect <i>solar admittance</i>	Southern aspect <i>solar admittance</i>	Western aspect <i>solar admittance</i>
1	0.12	0.12	0.12	0.12
2	0.13	0.13	0.13	0.13
3	0.16	0.16	0.16	0.16
4	0.13	0.13	0.13	0.13
5	0.13	0.13	0.13	0.13
6	0.13	0.13	0.13	0.13
7	0.13	0.13	0.13	0.13
8	0.2	0.2	0.42	0.36

Table J1.5c Maximum wall-glazing construction solar admittance - Class 3 or 9b building or Class 9a ward area

<i>Climate zone</i>	Eastern aspect <i>solar admittance</i>	Northern aspect <i>solar admittance</i>	Southern aspect <i>solar admittance</i>	Western aspect <i>solar admittance</i>
1	0.07	0.07	0.10	0.07
2	0.10	0.10	0.10	0.10
3	0.07	0.07	0.07	0.07
4	0.07	0.07	0.07	0.07
5	0.10	0.10	0.10	0.10
6	0.07	0.07	0.07	0.07
7	0.07	0.07	0.08	0.07
8	0.08	0.08	0.08	0.08

Floors

Floor construction must comply as per NCC Part J1.6(a) to (c) below.

J1.6 Floors

- (a) A floor must achieve the *Total R-Value* specified in Table J1.6.
- (b) A floor must be insulated around the vertical edge of its perimeter with insulation having an *R-Value* greater than or equal to 1.0 when the floor—
 - (i) is a concrete slab-on-ground in *climate zone* 8; or
 - (ii) has an in-slab or in-screed heating or cooling system, except where used solely in a bathroom, amenity area or the like.
- (c) Insulation *required* by (b) for a concrete slab-on-ground must—
 - (i) be water resistant; and
 - (ii) be continuous from the adjacent finished ground level—
 - (A) to a depth not less than 300 mm; or
 - (B) for the full depth of the vertical edge of the concrete slab-on-ground.

Table J1.6 Floors - Minimum Total R-Value

Location	<i>Climate zone</i> 1 — upwards heat flow	<i>Climate zones</i> 2 and 3 — upwards and downwards heat flow	<i>Climate zones</i> 4, 5, 6 and 7 — downwards heat flow	<i>Climate zone</i> 8 — downwards heat flow
A floor without an in-slab heating or cooling system	2.0	2.0	2.0	3.5
A floor with an in-slab heating or cooling system	3.25	3.25	3.25	4.75

Note to Table J1.6: For the purpose of calculating the *Total R-Value* of a floor, the sub-floor and soil *R-Value* must be calculated in accordance with [Specification J1.6](#) or Section 3.5 of CIBSE Guide A.

Part J3 Building Sealing

The Deemed-to-Satisfy Provisions of this Part apply to elements forming the envelope of a Class 2 to 9 building, other than—

- (a) a building in climate zones 1, 2, 3 and 5 where the only means of air-conditioning is by using an evaporative cooler; or
- (b) a permanent building opening, in a space where a gas appliance is located, that is necessary for the safe operation of a gas appliance; or
- (c) a building or space where the mechanical ventilation required by Part F4 provides sufficient pressurisation to prevent infiltration.

Part J3.2 Chimneys and flues

There are no new chimneys and flues at the conditioned space or habitable section of the building.

Part J3.3 Roof lights

- (a) A roof light must be sealed, or capable of being sealed when serving—
 - (i) a conditioned space; or
 - (ii) a habitable room in climate zones 4, 5, 6, 7 or 8.
- (b) A roof light required by (a) to be sealed, or capable of being sealed, must be constructed with—
 - (i) an imperforate ceiling diffuser or the like installed at the ceiling or internal lining level; or
 - (ii) a weatherproof seal; or
 - (iii) a shutter system readily operated either manually, mechanically or electronically by the occupant.

Part J3.4 Windows and doors

- (a) A door, openable window or the like must be sealed—
 - (i) when forming part of the envelope; or
 - (ii) in climate zone 4, 5, 6, 7 or 8.
- (b) The requirements of (a) do not apply to—
 - (i) a window complying with AS 2047; or
 - (ii) a fire door or smoke door; or
 - (iii) a roller shutter door, roller shutter grille or other security door or device installed only for out-of-hours security.
- (c) A seal to restrict air infiltration—
 - (i) for the bottom edge of a door, must be a draft protection device; and
 - (ii) for the other edges of a door or the edges of an openable window or other such opening, may be a foam or rubber compression strip, fibrous seal or the like.
- (d) An entrance to a building, if leading to a conditioned space must have an airlock, self-closing door, rapid roller door, revolving door or the like, other than—
 - (i) where the conditioned space has a floor area of not more than 50 m²; or
 - (ii) where a café, restaurant, open front shop or the like has—
 - (A) a 3 m deep un-conditioned zone between the main entrance, including an open front, and the conditioned space; and
 - (B) at all other entrances to the café, restaurant, open front shop or the like, self-closing doors.
- (e) A loading dock entrance, if leading to a conditioned space, must be fitted with a rapid roller door or the like.

Part J3.5 Exhaust fans

- (a) An exhaust fan must be fitted with a sealing device such as a self-closing damper or the like when serving—
- (i) a conditioned space; or
 - (ii) a habitable room in climate zone 4, 5, 6, 7 or 8.

Part J3.6 Construction of roofs, walls and floors

- (a) Ceilings, walls, floors and any opening such as a window frame, door frame, roof light frame or the like must be constructed to minimise air leakage in accordance with (b) when forming part of—
- (i) the envelope; or
 - (ii) in climate zone 4, 5, 6, 7 or 8.
- (b) Construction required by (a) must be—
- (i) enclosed by internal lining systems that are close fitting at ceiling, wall and floor junctions; or
 - (ii) sealed at junctions and penetrations with—
 - (A) close fitting architrave, skirting or cornice; or
 - (B) expanding foam, rubber compressible strip, caulking or the like.
- (c) The requirements of (a) do not apply to openings, grilles or the like required for smoke hazard management.

Part J3.7 Evaporative coolers

- An evaporative cooler must be fitted with a self-closing damper or the like –
- (a) when serving a heated space: or
 - (b) in climate zones 4, 5, 6, 7 or 8.

Thermal comfort modelling results

Under NCC 2019 JV3 verification method using a reference building, it is required that the proposed building, must achieve a thermal comfort level of between a Predicted Mean Vote of -1 to +1 across not less than 95% of the floor area of all occupied zones for not less than 98% of the annual hours of operation of the building. The Proposed Building fabric and glazing satisfies this requirement. PMV level for each individual conditioned zone are tabulated below:

PMV Calculation			
Location	PMV - Hours		
	≤ -1.00	>-1.00 to ≤1.00	> 1.00
VAO_MEETING ROOM	0	2302	47
VAO_OPEN OFFICE	0	2330	19
VAO_GATE HOUSE	0	2337	12
VAO_KITCHEN LUNCHROOM	0	2333	16
MOG_MEETING ROOM 3	0	2263	86
MOG_4 PERSON POD 2	0	2301	48
MOG_4 PERSON POD 1	0	2302	47
MOG_MEETING ROOM 2	0	2291	58
MOG_MEETING ROOM 1	0	2296	53
MOG_KITCHEN LUNCH ROOM	0	2343	6
MOL1_TRAINING ROOM	1	2237	111
MOL1_CONFERENCE ROOM	5	2287	57
MOL1_MEETING ROOM 2	0	2278	71
MOL1_MEETING ROOM 1	0	2283	66
MOL1_OPEN OFFICE	0	2323	26
DO1G_DRIVERS WAITING AREA	0	2326	23
DO1G_DISPATCH OFFICE	0	2322	27
DO2L1_OPEN OFFICE	2	2285	62
DO2G_DRIVERS WAITING AREA	0	2305	44
DO2G_BREAKOUT	4	2309	36
DO1L1_OPEN OFFICE	0	2311	38
DO1L1_MEETING ROOM	0	2302	47
DO1L1_OFFICE	21	2202	126
VAO_MEETING ROOM	7	2270	72
Total hours	40	55,138	1,198
Percentage of total of compliant hours based on at least 95% of floor area	0.02%	98.04%	1.94%
Required % compliant hours of operation for at least 95% of floor area	98%		
Compliance	YES		

Table 14: Predicted Mean Vote (PMV) thermal comfort level summary

Energy modelling results

The Proposed Building constructions and glazing performance produces annual greenhouse gas emissions that is less than the Reference Building. Therefore, the Proposed Building is in compliance with the performance requirements specified under NCC Section J for Energy Efficiency, via the JV3 verification method using a Reference Building. The following table compares the annual greenhouse gas emissions results for system heating and cooling, lighting, and equipment for the Reference Building and the Proposed Building. The modelling results show that the Proposed Building is compliant. Refer to Appendix D for a detailed breakdown of the energy usage.

Building Models	Reference Building (DTS)	Proposed Building (JV3)
Annual greenhouse gas emissions (kgCO ₂ -e)	299,028	298,072
Percentage Improvement compared to DTS		0.32%
Compliance		YES

Table 15: Annual greenhouse gas emissions summary

Conclusion

The results from the modelling assessment indicates that the Proposed Building has less annual greenhouse gas emissions than the Reference Building, and satisfies the thermal comfort PMV levels, using building fabric outlined in Tables 1 and 2. Therefore, the Proposed Building meets the requirements under NCC Section J Energy Efficiency via the JV3 Verification using a Reference Building methodology.

Additional information

Project compliance is achieved if all thermal performance requirement recommendations in this report are adopted in both design and construction. Any modifications to design or deviations from the solutions proposed in this report would need to be notified to erbas™ as this may invalidate the results, and the JV3 verification models may need to be revised to reflect these modifications or deviations.

erbas™ is not responsible for the energy performance of the building or for any other purposes that these results are used for other than NCC compliance. Building models do not perfectly simulate buildings and are therefore a simplified and idealised representations of actual buildings. Assumptions are made on a variety of inputs including occupancy, building usage, weather, etc. Actual performance can only be determined once a building is operational and may deviate significantly from the modelled results as a result of construction quality, commissioning, operational management, etc. While reasonable professional care has been taken in developing these models, deviations of actual and estimated consumption may occur due to variations beyond erbas™'s control.

Furthermore, considerations have not been made for other factors such as structural, thermal comfort, condensation, wind, acoustic, fire, safety, etc. The recommendations from this report should be coordinated with these requirements.

Appendix A – Model geometry

The following figures show a snapshot of the geometry of the models, created with IES-VE Version 2021.0.2.0.

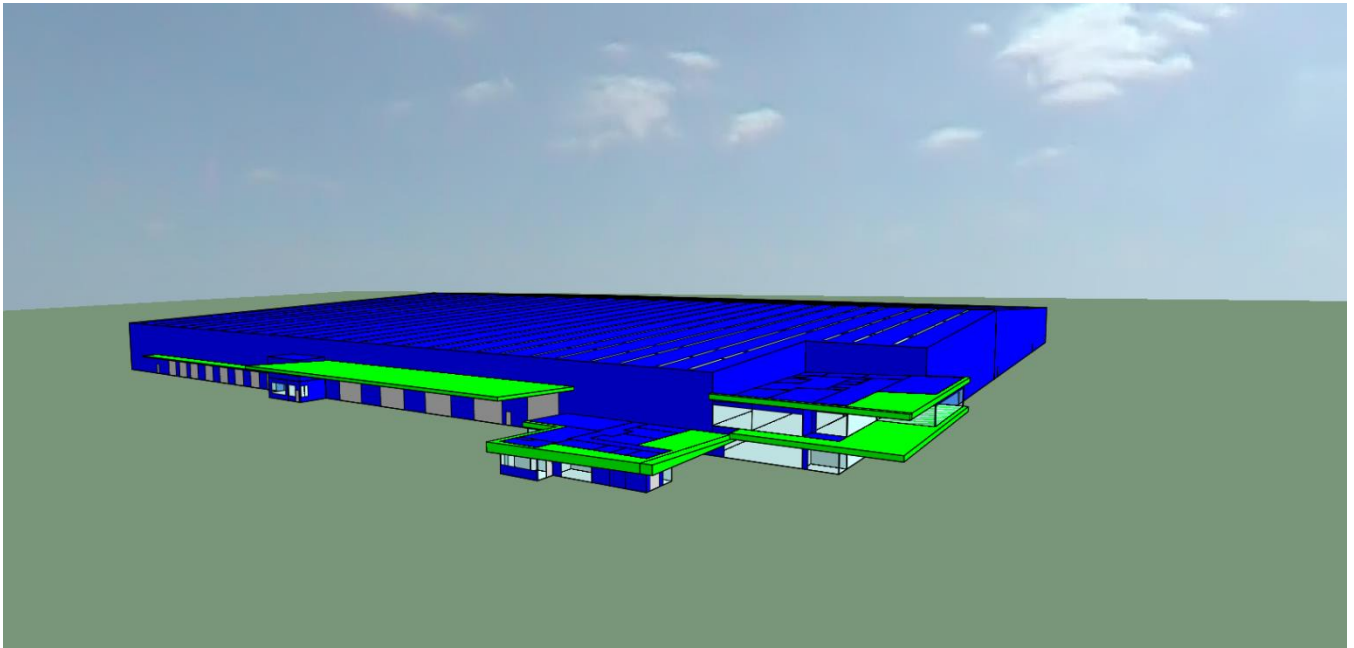


Figure 1: Proposed Development on its Southwest Orientation

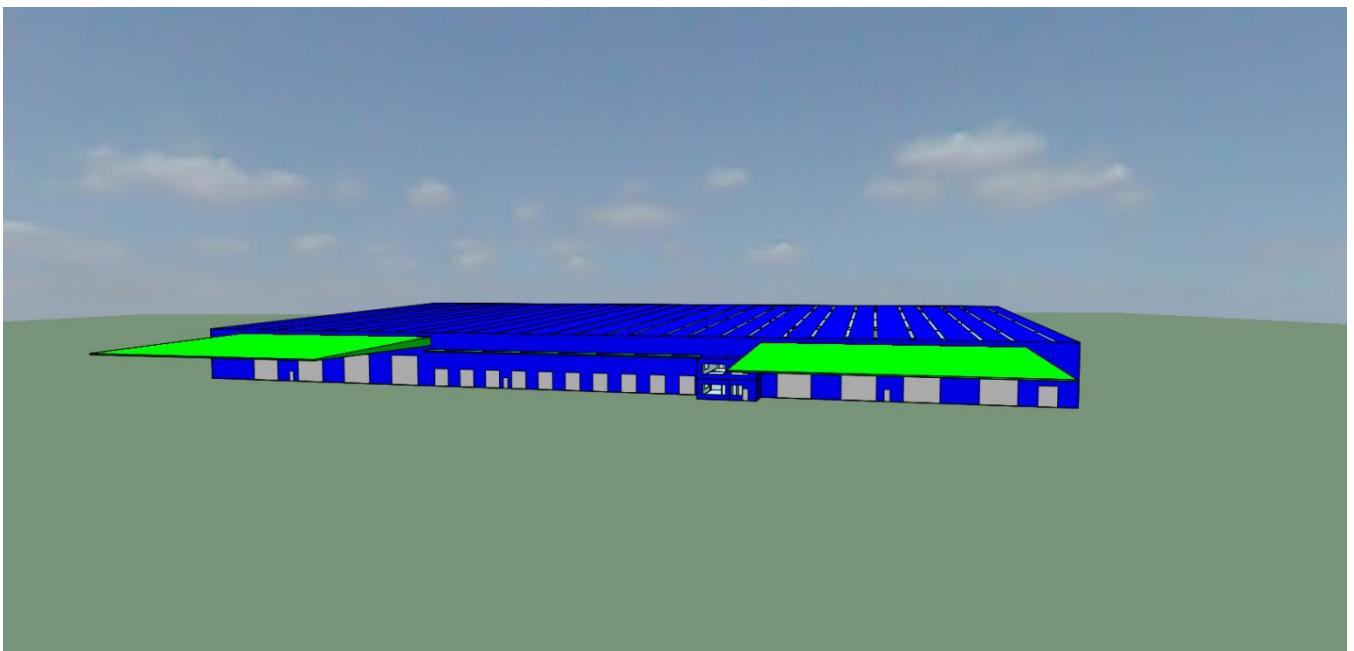


Figure 2: Proposed Development on its Northeast Orientation

Appendix B – Façade calculator (DTS)



Façade

Report



Calculator

Project Summary

Date
28/01/2022

Name
KP

Company
erbas™

Position
ESD Modeller

Building Name / Address
DHL Horsley Park
813 Wallgrove Road, Eastern Creek

Building State
NSW

Climate Zone
Climate Zone 6 - Mild temperate

Building Classification
Class 5 - office building

Stores Above Ground
2

Tool Version
1.2 (June 2020)

The summary below provides an overview of where compliance has been achieved for Specification J1.5a - Calculation of U-Value and solar admittance - Method 1 (Single Aspect) and Method 2 (Multiple Aspects).

Compliant Solution =
 Non-Compliant Solution =

	Method 1				Method 2
	North	East	South	West	All
Wall-glazing U-Value (W/m².K)	1.50	1.35	2.42	2.66	1.99
Solar Admittance	0.07	0.05	0.14	0.12	
AC Energy Value					148

Method 1



Method 2



Project Details

	North	East	South	West
Glazing Area (m²)	92.2	56.592	212.905	184.0109
Glazing to Façade Ratio	19%	15%	42%	48%

Glazing References	North	East	South	West
	W-01 W-02 W-03 W-04	W-01 W-02 W-03	W-01 W-02 W-03 W-04 W-05 W-06 W-07 W-08	W-01 W-02 W-03 W-04 W-05 W-06 W-07 W-08 W-09

Glazing System Types	North	East	South	West
	USER (DEFINED)	USER (DEFINED)	USER (DEFINED)	USER (DEFINED)

Glass Types	North	East	South	West
	DEFAULTS (GENERIC)	DEFAULTS (GENERIC)	DEFAULTS (GENERIC)	DEFAULTS (GENERIC)

Frame Types	North	East	South	West
	Aluminium	Aluminium	Aluminium	Aluminium

Average Glazing U-Value (W/m².K)	North	East	South	West
	4.80	4.80	4.80	4.80

Average Glazing SHGC	North	East	South	West
	0.38	0.33	0.45	0.42

Shading Systems	North	East	South	West
	Horizontal	Horizontal	Horizontal	Horizontal

Wall Area (m²)	North	East	South	West
	387.6413	310.0045	296.4738	203.318

Wall Types	North	East	South	West
	Wall	Wall	Wall	Wall

Methodology	Wall			
	Wall			

Wall Construction	North	East	South	West
	R1.4	R1.4	R1.4	R1.4

Wall Thickness	North	East	South	West
	350 270	350 270	350 270	350

Average Wall R-value (m².K/W)	North	East	South	West
	1.40	1.40	1.40	1.40

Solar Absorbance	North	East	South	West
	0.6	0.6	0.6	0.6

Appendix C – Examples of Thermal construction

Examples of compliant wall makeup

Precast Concrete External Wall

Wall Systems							
Total System R-value Calculator							
	Layer 1	Layer 2 (Air space)	Layer 3	Layer 4	Layer 5	Layer 6	Layer 7
Ventilation	Unventilated						
Material	Concrete - solid	Airspace - non-reflective	R2.7 90mm insulation	Gypsum plasterboard			
Thickness (mm)	150	40	90	13			
Conductivity (W/mK)	1.440		0.033	0.170			
Framing Material			Steel				
Metal Frame, Web Thickness (mm)			1.2				
Metal Frame, Flange Width (mm)			35				
Framing Area %			13.0%				
Thermal Break Material			EPS				
Thermal Break Thickness (mm)			6				
Thermal Break Overlap Area %			100.0%				
Resistance (m ² .K/W)	0.10	0.00	1.53	0.08	0	0	0
Wall Construction			External Surface Resistance (moving air, more than 3m/s and not more than 7/ms wind speed)				0.03
			Internal Surface Resistance (still air, on a wall)				0.12
			System R-Value (m ² .K/W)				1.86
			System U-Value (W/m ² .K)				0.54

Metal Clad External Wall

Wall Systems							
Total System R-value Calculator							
	Layer 1	Layer 2 (Air space)	Layer 3	Layer 4	Layer 5	Layer 6	Layer 7
Ventilation	Unventilated						
Material	Aluminium - sheeting	Airspace - non-reflective	R2.7 90mm insulation	Gypsum plasterboard			
Thickness (mm)	6	40	90	13			
Conductivity (W/mK)	210.000		0.033	0.170			
Framing Material			Steel				
Metal Frame, Web Thickness (mm)			1.2				
Metal Frame, Flange Width (mm)			35				
Framing Area %			13.0%				
Thermal Break Material			EPS				
Thermal Break Thickness (mm)			6				
Thermal Break Overlap Area %			100.0%				
Resistance (m ² .K/W)	0.00	0.00	1.53	0.08	0	0	0
Wall Construction			External Surface Resistance (moving air, more than 3m/s and not more than 7/ms wind speed)				0.03
			Internal Surface Resistance (still air, on a wall)				0.12
			System R-Value (m ² .K/W)				1.75
			System U-Value (W/m ² .K)				0.57

Internal Wall separating conditioned from non-conditioned space (e.g. office and warehouse)

Wall Systems							
Total System R-value Calculator							
	Layer 1	Layer 2 (Air space)	Layer 3	Layer 4	Layer 5	Layer 6	Layer 7
Ventilation	Unventilated						
Material	Aluminium - sheeting	Airspace - non-reflective	R2.7 90mm insulation	Gypsum plasterboard			
Thickness (mm)	6	40	90	13			
Conductivity (W/mK)	210.000		0.033	0.170			
Framing Material			Steel				
Metal Frame, Web Thickness (mm)			1.2				
Metal Frame, Flange Width (mm)			35				
Framing Area %			13.0%				
Thermal Break Material			EPS				
Thermal Break Thickness (mm)			6				
Thermal Break Overlap Area %			100.0%				
Resistance (m ² .K/W)	0.00	0.00	1.53	0.08	0	0	0
Wall Construction			Internal Surface Resistance (Still air)				0.14
			Internal Surface Resistance (still air, on a wall)				0.12
			System R-Value (m ² .K/W)				1.86
			System U-Value (W/m ² .K)				0.54

Example of roof/ ceiling makeup

Note: Thermal break R0.2 needs to be included for the roof/ ceiling construction

Specified Products:

[Sisalation Metal Roof](#)

[Fletcher Insulation Safety Mesh](#)

[75mm Pink® Building Blanket R1.8](#)

Roof Type:

Fletcher Insulation Sisalation Metal Roof , with foil side facing down, installed over purlins and located between metal deck and safety mesh. 75mm Pink® Building Blanket R1.8 installed at ceiling level with 13mm Plasterboard. Calculations are based on 13.00% framing percentage for a Roof with Parallel Framing.

Calculation:

Climate Zone: 6	Building Class: 5	Heat Flow: Summer
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System Diagram	Name	Winter	Summer
	Outdoor Air-Film	0.040	0.040
	Metal Roof	0.000	0.000
	Roof Pitch $\leq 5^\circ$	0.000	0.000
	40mm Air-Space	0.293	0.335
	Sisalation Metal Roof	0.000	0.000
	Fletcher Insulation Safety Mesh	0.000	0.000
	100mm Unventilated Air-Space	0.473	1.904
	75mm Pink® Building Blanket R1.8	1.886	1.752
	13mm Plasterboard	0.077	0.077
	Indoor Air-Film	0.110	0.160
	Total System R-value	2.879	4.267

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- AS/NZS4859.2: 2018
- NZ4214
- ASHRAE Fundamentals Handbook
- NCC2019 Volume One & Volume Two
- ISO: 6946:2007

R-Values for parallel reflective and non-reflective unvented air-spaces were calculated in accordance with methodology based on that developed by Robinson & Powlitch without unsupported extrapolation. For air-spaces 10-90mm hc is obtained by numerical interpolation of the Robinson & Powlitch Dataset (1957). For air-spaces 100-300mm R-Values are calculated in accordance with ISO:6946. For irregular air space or space >300mm R value are given as per AS/NZS4859.2. Please refer to specified product/s technical datasheets for installation instructions and relevant Australian Standards which may apply.

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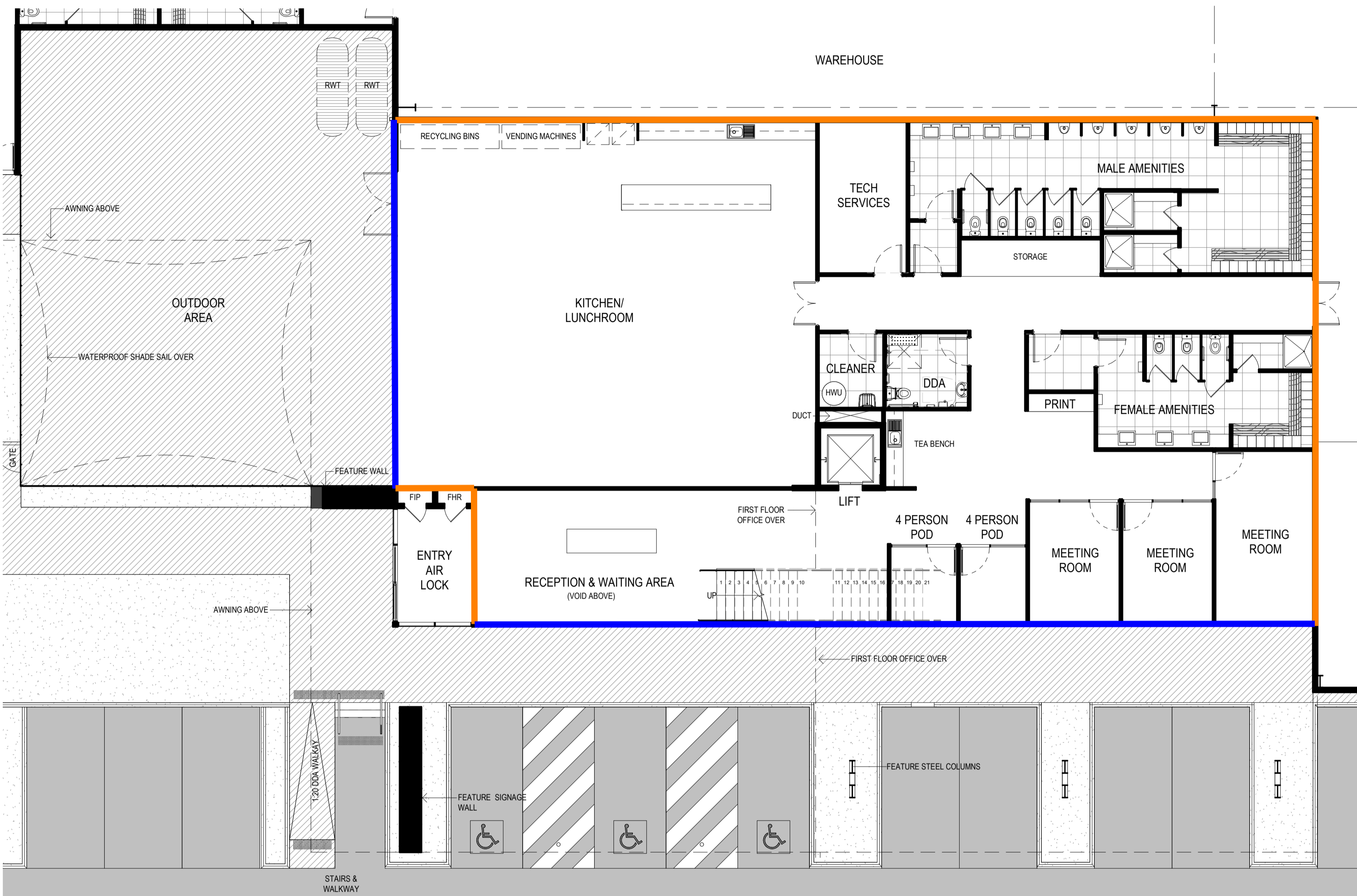
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Appendix D – Thermal Envelope

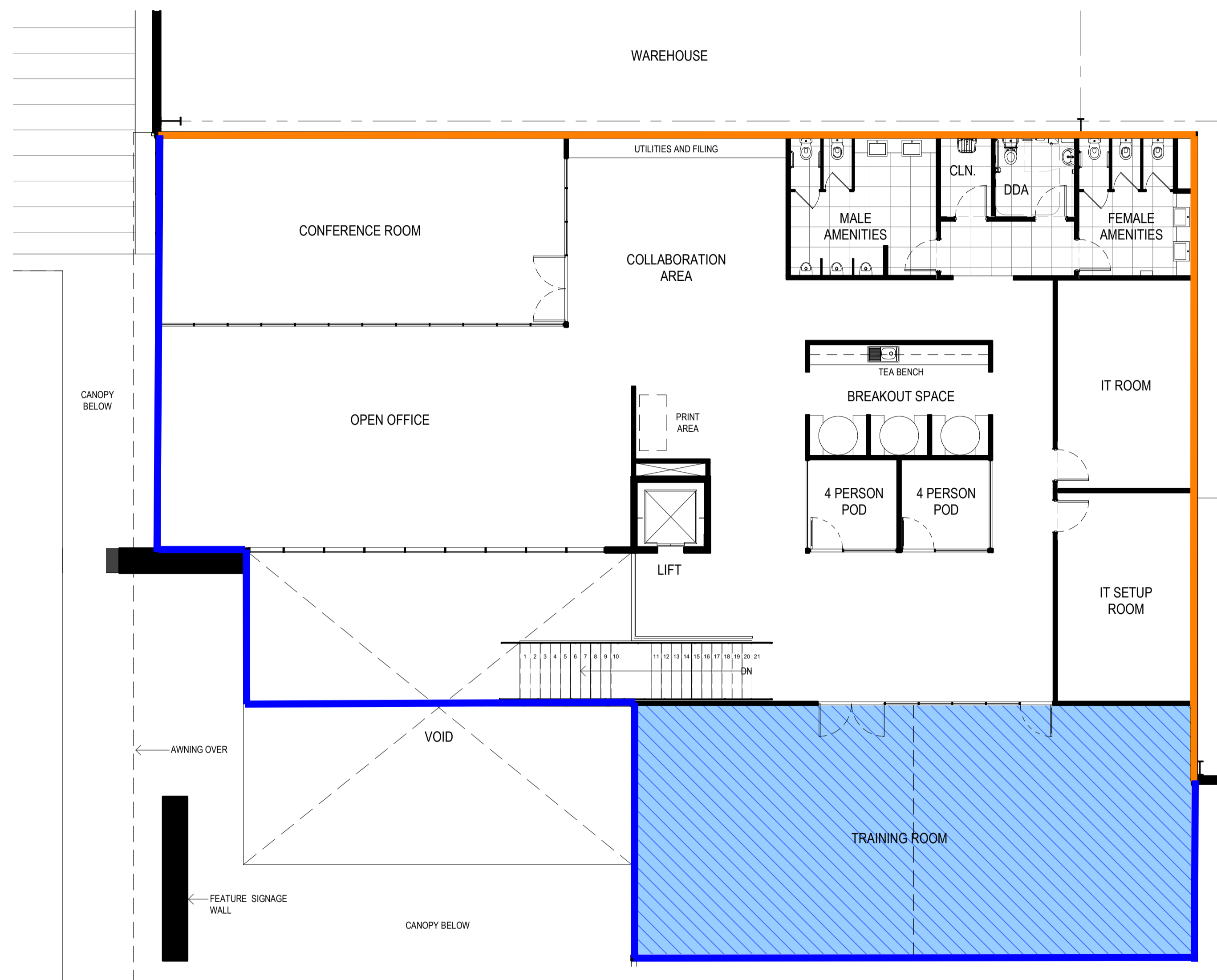
Proposed Min. Compliant Total System R-value

R-values indicated represent overall system R-value including allowance for thermal bridging that are required to be achieved by the overall construction of the respective building fabric elements.

- █ R1.7- External walls separating conditioned spaces from building exterior
- █ R1.4 - Internal walls separating conditioned spaces from unconditioned, unventilated space
- █ R3.52 - Roof/Ceiling over conditioned space below (solar absorptance of upper surface of a roof to be no more than 0.23)
- █ R2.2 - Floor suspended above unconditioned space or exterior
- █ R2.0 - Ceiling separating between office conditioned space and unconditioned warehouse above



MAIN OFFICE- GROUND FLOOR
SCALE: 1 : 100



MAIN OFFICE- FIRST FLOOR
SCALE: 1 : 100

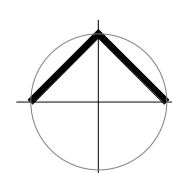
NO.	DATE	REVISION	BY	CHK
P1	05.11.2021	PRELIMINARY ISSUE	AG	RJ
P2	13.12.2021	PRELIMINARY ISSUE	AB	JF
A	27.01.2021	ISSUED FOR APPROVAL	ID	RJ

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PROJECT:
DHL HORSLEY PARK
813 WALLGROVE ROAD, EASTERN CREEK, NSW

TITLE:
MAIN OFFICE PLANS



DATE: DECEMBER, 2021
DRAWN BY: AG
SCALE: 1 : 100 @A1
SCALE: 1 : 200 @A3

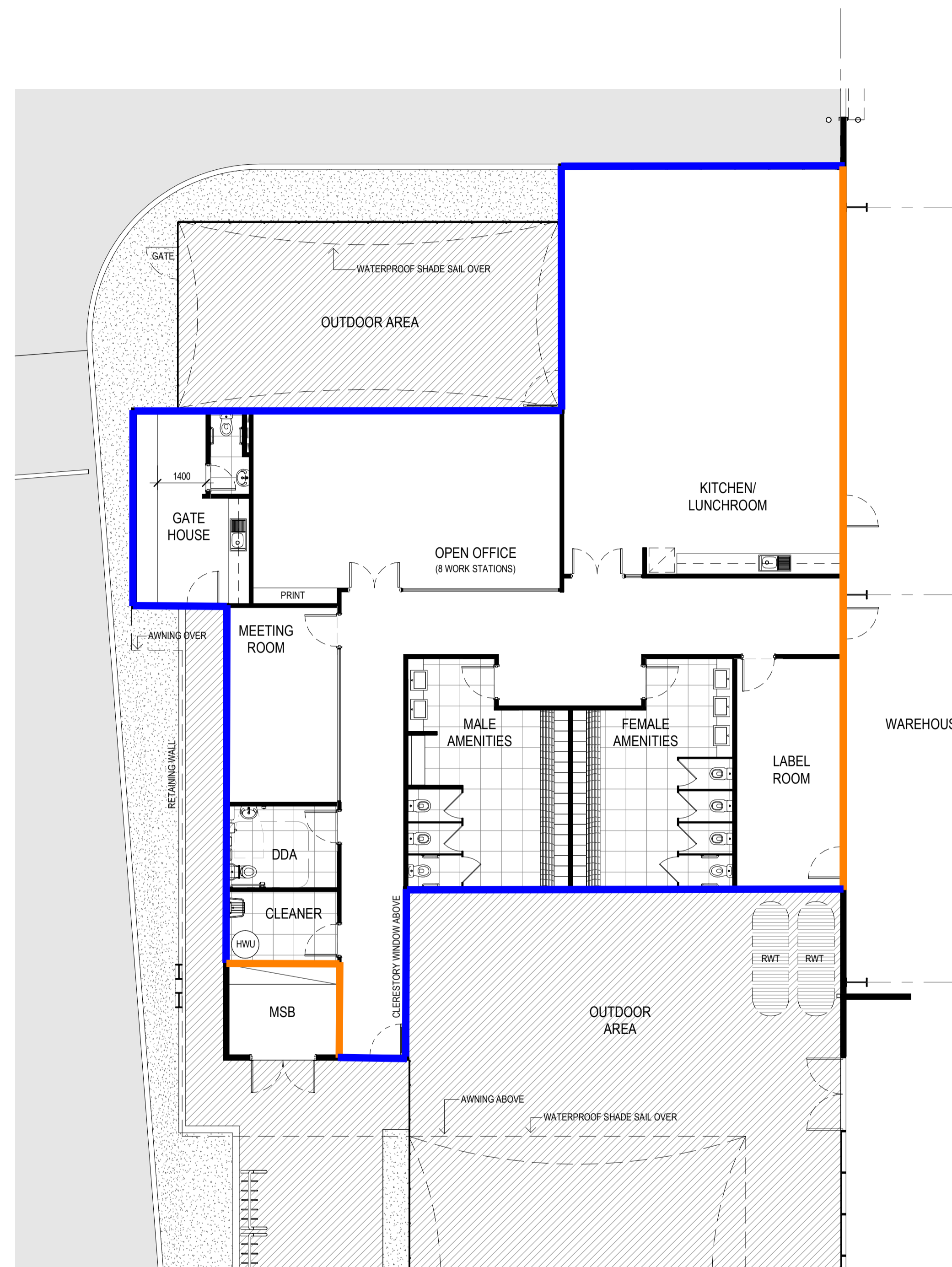
JOB NO:	21375
DRAWING NO:	DA05
REVISION:	A



Proposed Min. Compliant Total System R-value

R-values indicated represent overall system R-value including allowance for thermal bridging that are required to be achieved by the overall construction of the respective building fabric elements.

- R1.7- External walls separating conditioned spaces from building exterior
- R1.4 - Internal walls separating conditioned spaces from unconditioned, unventilated space
- R3.52 - Roof/Ceiling over conditioned space below (solar absorptance of upper surface of a roof to be no more than 0.23)
- R2.2 - Floor suspended above unconditioned space or exterior
- R2.0 - Ceiling separating between office conditioned space and unconditioned warehouse above



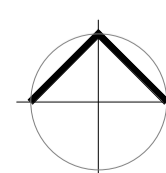
NO.	DATE	REVISION	BY	CHK
P1	13.12.2021	PRELIMINARY ISSUE	AB	JF
A	27.01.2021	ISSUED FOR APPROVAL	ID	RJ

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PROJECT:
DHL HORSLEY PARK
 813 WALLGROVE ROAD, EASTERN CREEK, NSW

TITLE:
VAS OFFICE PLAN



DATE: DECEMBER, 2021
 DRAWN BY: AG
 SCALE: 1 : 100@A1
 SCALE:

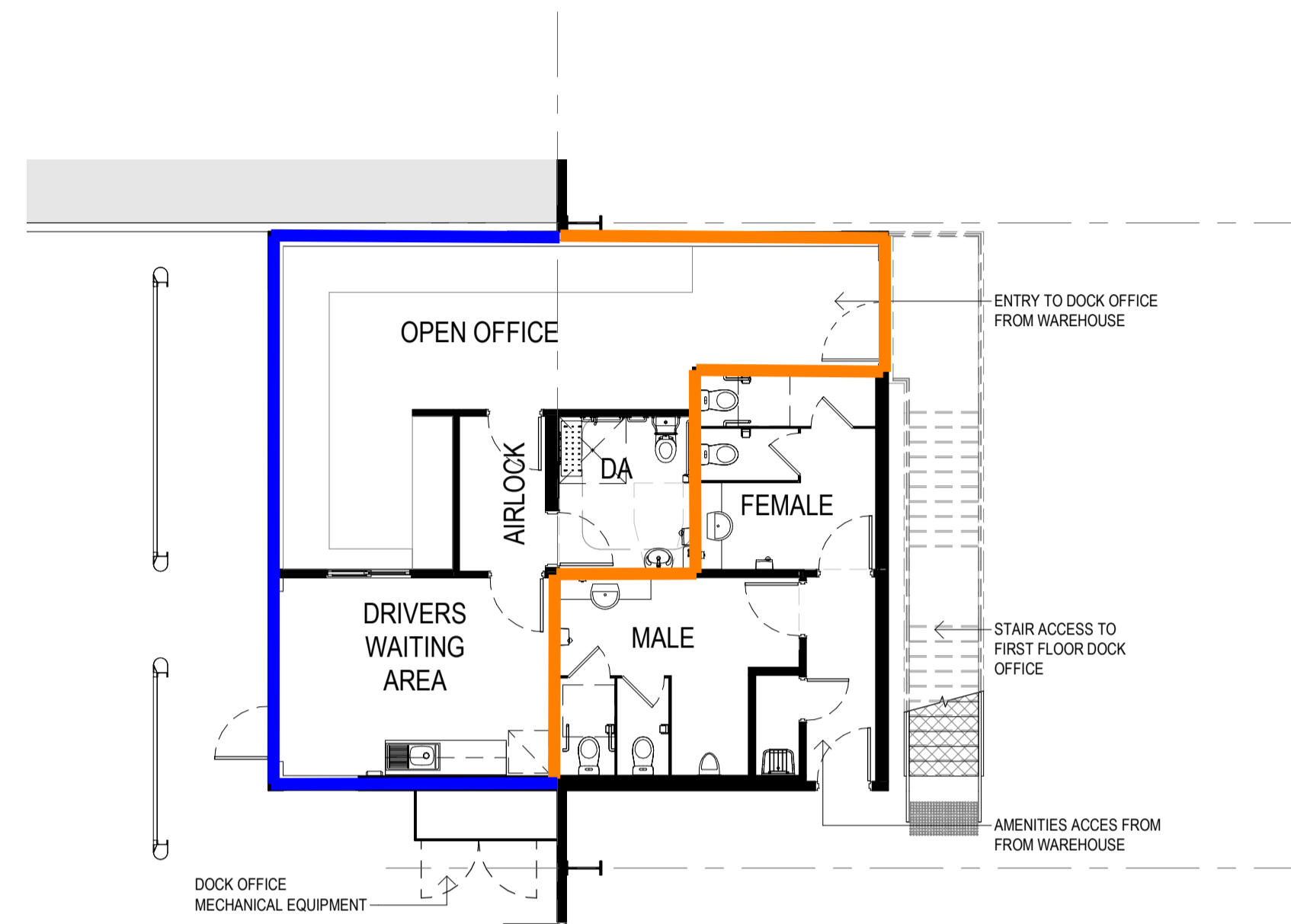
JOB NO:	21375
DRAWING NO:	DA07
REVISION:	A



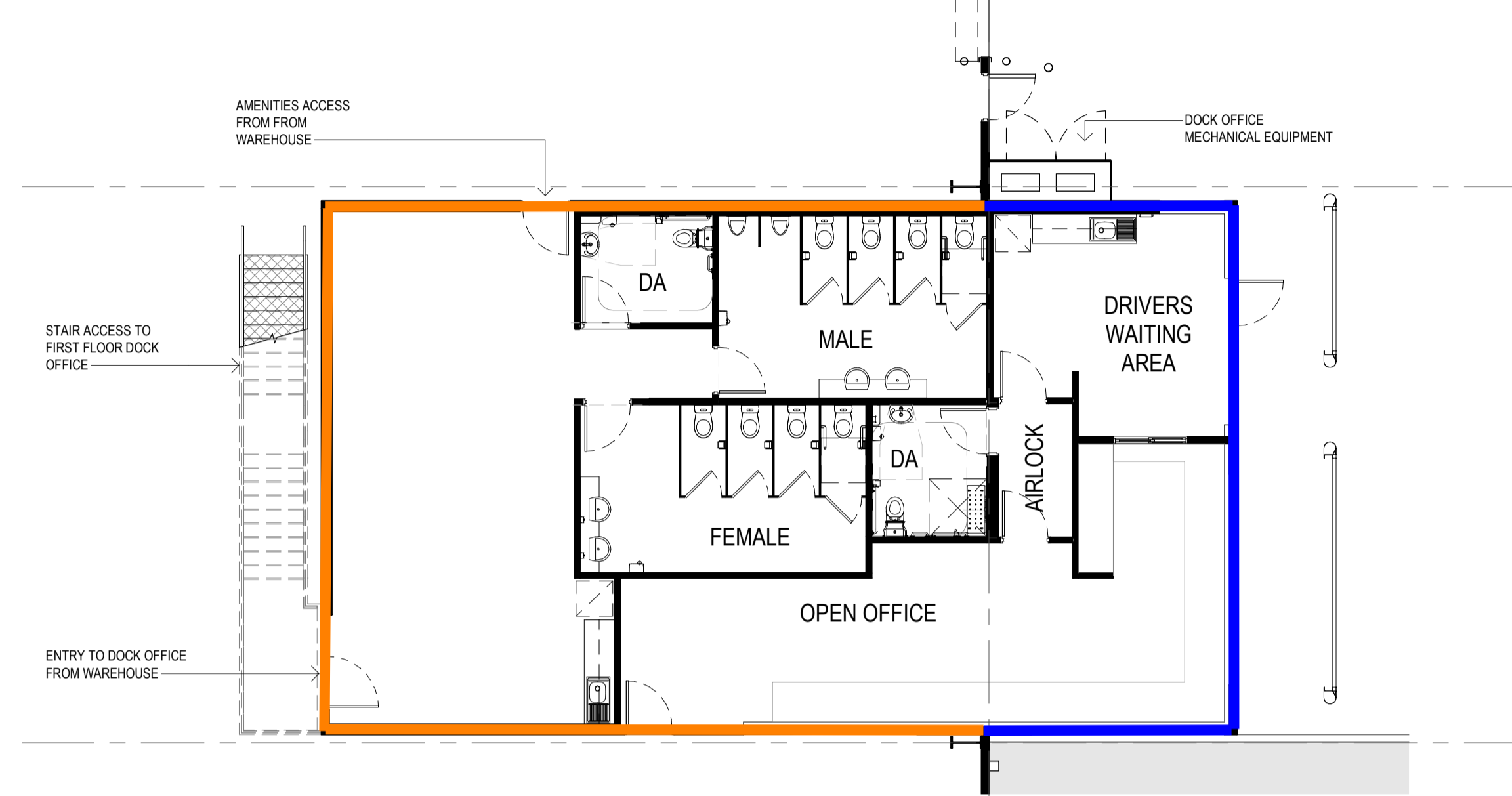
Proposed Min. Compliant Total System R-value

R-values indicated represent overall system R-value including allowance for thermal bridging that are required to be achieved by the overall construction of the respective building fabric elements.

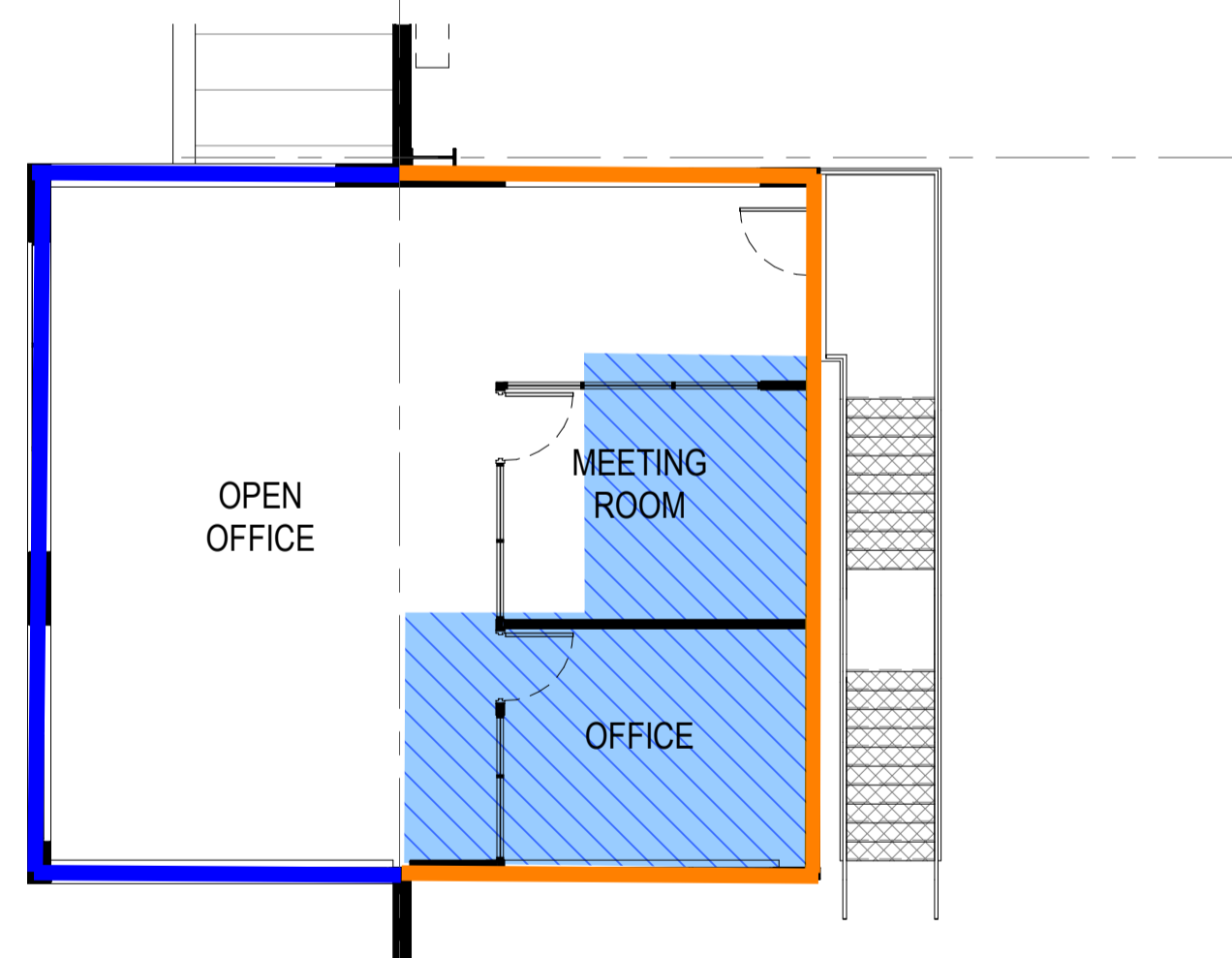
- █ R1.7- External walls separating conditioned spaces from building exterior
- █ R1.4 - Internal walls separating conditioned spaces from unconditioned, unventilated space
- █ R3.52 - Roof/Ceiling over conditioned space below (solar absorptance of upper surface of a roof to be no more than 0.23)
- █ R2.2 - Floor suspended above unconditioned space or exterior
- █ R2.0 - Ceiling separating between office conditioned space and unconditioned warehouse above



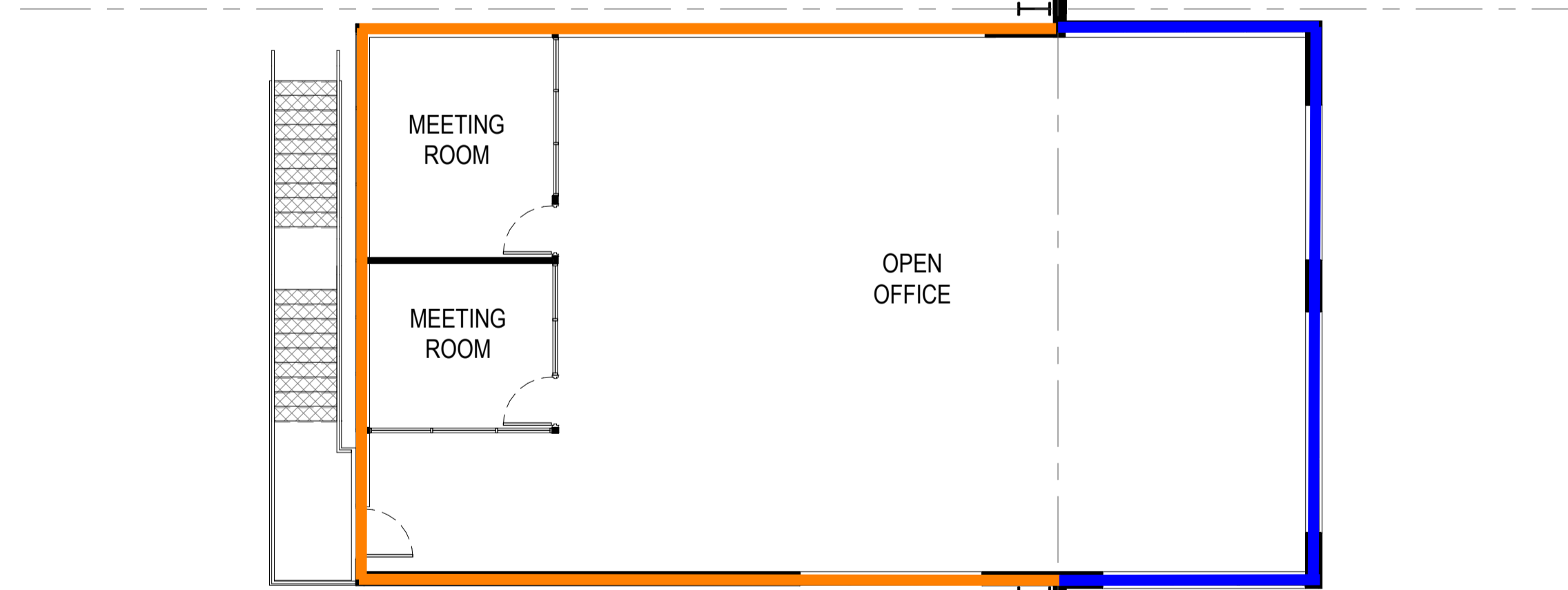
DOCK OFFICE 1-GROUND FLOOR
SCALE: 1 : 100



DOCK OFFICE 2-GROUND FLOOR
SCALE: 1 : 100



DOCK OFFICE 1- FIRST FLOOR
SCALE: 1 : 100



DOCK OFFICE 2- FIRST FLOOR
SCALE: 1 : 100

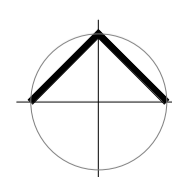
NO.	DATE	REVISION	BY	CHK
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P2	24.11.2021	ISSUED FOR TENDER	IO	RJ
A	27.01.2021	ISSUED FOR APPROVAL	IO	RJ

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DHL HORSLEY PARK
813 WALLGROVE ROAD, EASTERN CREEK, NSW

TITLE:
DOCK OFFICES- PLANS



DATE: DECEMBER, 2021
DRAWN BY: AG
SCALE: 1 : 100@A1
SCALE: 1 : 200 @A3

JOB NO:	21375
DRAWING NO:	DA08
REVISION:	A



Proposed Min. Compliant Total System R-value

R-values indicated represent overall system R-value including allowance for thermal bridging that are required to be achieved by the overall construction of the respective building fabric elements.

- R1.7- External walls separating conditioned spaces from building exterior
- R1.4 - Internal walls separating conditioned spaces from unconditioned, unventilated space
- R3.52 - Roof/Ceiling over conditioned space below (solar absorptance of upper surface of a roof to be no more than 0.23)
- R2.2 - Floor suspended above unconditioned space or exterior
- R2.0 - Ceiling separating between office conditioned space and unconditioned warehouse above



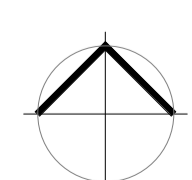
NO.	DATE	REVISION	BY	CHK
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P2	15.12.2021	PRELIMINARY ISSUE	IO	RJ
P3	16.12.2021	PRELIMINARY ISSUE	IO	RJ
A	27.01.2021	ISSUED FOR APPROVAL	IO	RJ

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PROJECT:
DHL HORSLEY PARK
 813 WALLGROVE ROAD, EASTERN CREEK, NSW

TITLE:
ROOF PLAN



DATE: DECEMBER, 2021
 DRAWN BY: IO
 SCALE: 1 : 500@A1

JOB NO:	21375
DRAWING NO:	DA09
REVISION:	A



Appendix E – Simulation results

Reference Building simulation results

	Electricity (MWh)	Interior Lighting (MWh)	Other Process (MWh)	Space Heating (MWh)	Service Water Heating (MWh)	Space Cooling (MWh)	Heat Rejection (MWh)	Interior Central Fans (MWh)
Date	SYD21574_w.	SYD21574_w	SYD21574_w	SYD21574_w.	SYD21574_w	SYD21574_w	SYD21574_w.	SYD21574_w
Jan 01-31	25.7808	2.9842	12.6850	0.0144	0.0789	6.4750	0.4133	3.1301
Feb 01-28	24.6508	2.7446	11.5347	0.0198	0.0747	6.8582	0.4378	2.9810
Mar 01-31	24.8298	3.0795	12.8349	0.0848	0.0856	4.9979	0.3190	3.4282
Apr 01-30	22.3618	2.9679	12.4015	0.3419	0.0820	3.0920	0.1974	3.2791
May 01-31	21.3344	2.9842	12.6850	1.0976	0.0789	1.2771	0.0815	3.1301
Jun 01-30	22.0235	2.9679	12.4015	2.2830	0.0820	0.9494	0.0606	3.2791
Jul 01-31	22.6120	3.0319	12.7599	2.4868	0.0822	0.9138	0.0583	3.2791
Aug 01-31	22.1150	3.0319	12.7599	1.8152	0.0822	1.0779	0.0688	3.2791
Sep 01-30	21.3210	2.9679	12.4015	0.9543	0.0820	1.5380	0.0982	3.2791
Oct 01-31	22.3657	2.9842	12.6850	0.3228	0.0789	2.9749	0.1899	3.1301
Nov 01-30	24.3001	2.9679	12.4015	0.1149	0.0820	5.1274	0.3273	3.2791
Dec 01-31	26.2953	3.0795	12.8348	0.0249	0.0856	6.4317	0.4105	3.4282
Summed total	279.9900	35.7917	150.3851	9.5603	0.9749	41.7133	2.6626	38.9022

Proposed Building simulation results

	Electricity (MWh)	Interior Lighting (MWh)	Other Process (MWh)	Space Heating (MWh)	Service Water Heating (MWh)	Space Cooling (MWh)	Heat Rejection (MWh)	Interior Central Fans (MWh)	Total Energy (MWh)
Date	SYD21574_\	SYD21574_\	SYD21574_\	SYD21574_\	SYD21574_\	SYD21574_\	SYD21574_\	SYD21574_\	SYD21574_\
Jan 01-31	25.6045	2.9842	12.6850	0.0137	0.0789	6.3099	0.4028	3.1301	25.6045
Feb 01-28	24.4922	2.7446	11.5347	0.0180	0.0747	6.7107	0.4283	2.9810	24.4922
Mar 01-31	24.7311	3.0795	12.8349	0.0806	0.0856	4.9090	0.3133	3.4282	24.7311
Apr 01-30	22.2610	2.9679	12.4015	0.3383	0.0820	3.0007	0.1915	3.2791	22.2610
May 01-31	21.2952	2.9842	12.6850	1.0806	0.0789	1.2562	0.0802	3.1301	21.2952
Jun 01-30	21.9921	2.9679	12.4015	2.2555	0.0820	0.9457	0.0604	3.2791	21.9921
Jul 01-31	22.5759	3.0319	12.7599	2.4508	0.0822	0.9136	0.0583	3.2791	22.5759
Aug 01-31	22.0782	3.0319	12.7599	1.7947	0.0822	1.0626	0.0678	3.2791	22.0782
Sep 01-30	21.2678	2.9679	12.4015	0.9514	0.0820	1.4908	0.0952	3.2791	21.2678
Oct 01-31	22.2580	2.9842	12.6850	0.3209	0.0789	2.8755	0.1835	3.1301	22.2580
Nov 01-30	24.1396	2.9679	12.4015	0.1124	0.0820	4.9790	0.3178	3.2791	24.1396
Dec 01-31	26.1166	3.0795	12.8348	0.0232	0.0856	6.2653	0.3999	3.4282	26.1166
Summed	278.8121	35.7917	150.3851	9.4400	0.9749	40.7191	2.5991	38.9022	278.8121

Appendix F – JV3 Verification using a reference model methodology

(a) For a Class 3, 5, 6, 7, 8 or 9 building or common area of a Class 2 building, compliance with JP1 is verified when—

(i) it is determined that the annual greenhouse gas emissions of the proposed building are not more than the

annual greenhouse gas emissions of a reference building when—

(A) the proposed building is modelled with the proposed services; and

(B) the proposed building is modelled with the same services as the reference building; and

(ii) in the proposed building, a thermal comfort level of between a Predicted Mean Vote of -1 to +1 is achieved across not less than 95% of the floor area of all occupied zones for not less than 98% of the annual hours of operation of the building; and

(iii) the building complies with the additional requirements in Specification JVa.

(b) The annual greenhouse gas emissions of the proposed building may be offset by—

(i) renewable energy generated and used on site; and

(ii) another process such as reclaimed energy, used on site.

(c) The calculation method used for (a) and (b) must comply with—

(i) ANSI/ASHRAE Standard 140; and

(ii) Specification JVb.

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