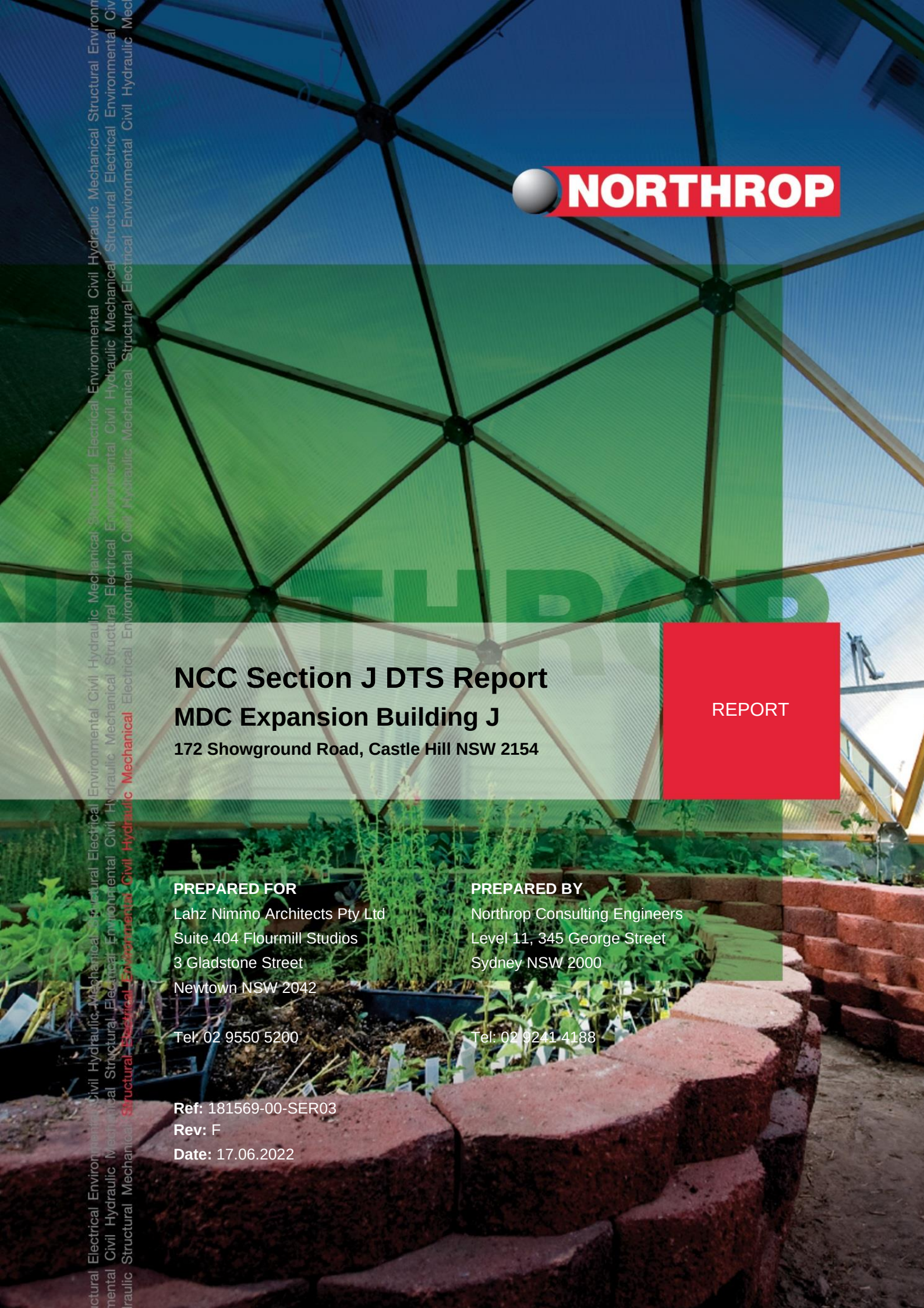

NCC Section J DTS Report

MDC Expansion Building J

172 Showground Road, Castle Hill NSW 2154

REPORT

PREPARED FOR
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Ref: 181569-00-SER03
Rev: F
Date: 17.06.2022

NCC SECTION J DTS REPORT

Activity Schedule

Date	Revision	Issue	Prepared By	Approved By
21.03.2019	A	Preliminary	J. Caparrotta	E. Chan
08.09.2020	B	NCC2019	B. Park	I. Van Eerden
06.09.2021	C	Arch Design Revision	R. McShane	I. Van Eerden
29.11.2021	D	Boundary Markup Revision	R. McShane	I. Van Eerden
10.03.2022	E	Issued for Construction	R. McShane	I. Van Eerden
17.06.2022	F	BCA Revision	R. McShane	I. Van Eerden

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1. SUMMARY

Northrop Consulting Engineers have been engaged to conduct a NCC Section J Deemed-to-Satisfy (DTS) assessment according to National Construction Code (NCC) 2019, Section J Part J1. This summary report provides minimum compliance requirements for Building Fabric and Glazing (J1).

The table below outlines compliance requirements for J1;

Table 1: Insulation and Glazing System requirements for the main building elements

Building Fabrics	Required total R-value	Design Insulation / Glazing
Roof and Ceiling	3.2	60mm Bradford Anticon Roofing Blanket w/ internal thermal breaks
External Walls (Metal Cladding)	1.4	90mm R2.5HD Fletcher Pink Batts Insulation with internal thermal breaks with the stud work frame
External Walls (Precast)	1.4	50mm DCTech Proctor Vulcanwool with internal thermal breaks within the stud work frame
Insulated Partition Walls to Non-Conditioned Spaces	1.4	90mm R2.5HD Fletcher Pink Batts Insulation with internal thermal breaks with the stud work frame
Suspended Floors	2.0	70mm R1.7 Fletcher Pink Batts Silencer Insulation
Floors and Ceilings to non-conditioned space e.g. Plantrooms	1.0	25mm R0.7 Bradford Multitel Blanket insulation
Uniform Glazing System	U-Value: 4.7 SHGC: 0.69	Single Glazed Comfort Plus Clear in a Capral 400 Series Frame

Should the requirements listed above be deemed unfeasible, it is recommended that the project team should proceed with a **JV3 performance-based solution**. This approach is more flexible as it offers a holistic assessment of the building performance, rather than individual components however the NCC2019 JV3 requirements for thermal comfort analysis may result in a higher performance being required.

2. REPORT LIMITATIONS

Due care and skill has been exercised in the preparation of this report.

This report is intended as a guide to illustrate the potential NCC section J compliance methods to be considered in the development. It should be read in conjunction with the other design documentation and specific applications may vary during the development of the project.

No responsibility or liability to any third party is accepted for any loss or damage arising out of the use of this report by any third party. Any third party wishing to act upon any material contained in this report should first contact Northrop for detailed advice, which will take into account that party's particular requirements.

3. DTS ASSESSMENT

3.1 Referenced Drawings

Drawing	Drawing No.	Rev	Date
Lower Ground Floor Plan 01	J-WD-A1400	A	11.03.2022
Lower Ground Floor Plan 01	J-WD-A1401	A	11.03.2022
Ground Floor Plan 01	J-WD-A1402	B	02.05.2022
Ground Floor Plan 02	J-WD-A1403	A	11.03.2022
Level 01 Floor Plan 01	J-WD-A1404	C	13.05.2022
Level 01 Floor Plan 02	J-WD-A1405	A	11.03.2022
Level 02 / Lower Roof Plan Floor Plan 01	J-WD-A1406	A	11.03.2022
Lower Roof Plan Floor Plan 02	J-WD-A1407	A	11.03.2022
Roof Plan	J-WD-A1408	A	11.03.2022

3.2 Building Classification

The MDC Expansion Building J development is classified as the following;

Level	Class	Description
Level 1	9b, 8, 7b	Collections, Laboratories, Storage
Ground	9b	Flexible Area
Lower Ground	5, 9b 7b	Offices, VLO, Storage

The development is located in 172 Showground Road, Castle Hill NSW 2154 which belongs to climate zone 6 as shown in Figure 1 below.

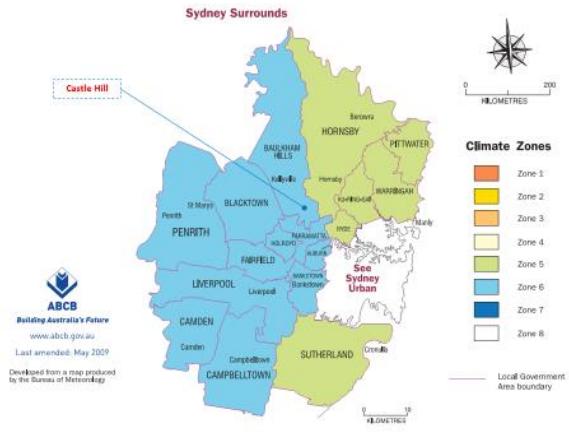


Figure 1: Climate zone map, Castle Hill

3.3 Building Fabric

Building fabric thermal insulation requirements apply to the building fabric enclosing habitable and conditioned spaces forming part of the thermal boundary of the site (building envelope). A marked up floor plan of the drawing in Appendix B to this advice demonstrating the examined thermal envelope.

The tables below outline typical compliance requirements;

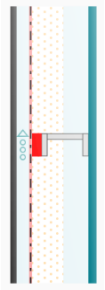
a) R3.2 Metal Deck Roof and Ceiling construction example

Item Description	**R-Value**	
Outdoor Air Film (7m/s)	0.04	
Metal Deck Roof	0.00	
R1.08 Insulation (with a layer of foil)* 4mm Thermal Liner** 500mm Air Gap	3.17	
13mm Plasterboard/Ceiling Tiles	0.06	
Indoor Air Film (still air)	0.11	Required
Total R-Value:	3.44	*3.2*

* 40mm DCTech Proctor VulcanWool Insulation (150 kg/m^3
** Ametalin ThermalLiner 4™

A roof that has metal sheet roofing fixed to metal purlins, metal rafters or metal battens; and does not have a ceiling lining or has a ceiling lining fixed directly to those metal purlins, metal rafters or metal battens, must have a thermal break, consisting of material with an R-Value of not less than R0.2, installed between the metal sheet roofing and its supporting metal purlins, metal rafters or metal battens.

b) R1.4 External Walls (Metal Cladding) construction example

Item Description	**R-Value**	
Outdoor Air Film	0.04	
1mm Metal Cladding	0.09	
20mm ventilated airgap Vapour barrier Steel Stud Frame with Thermal Break (DCTech Thermal Break strip) R1.47 Rock Wool Insulation* 20mm ventilated airgap	1.27*	
13mm Plasterboard	0.08	
Indoor Air Film	0.11	Required
Total R-Value:	1.49	*1.40*

*DCTech 50mm VulcanWool (120 kg/m3) Stone Wool
Please note that these include consideration of this as a bridged insulation zone including a 75mm thick metal stud frame with VulcanWool thermal break and airgaps either side.

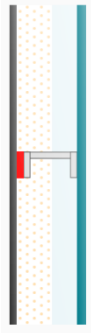
c) R1.4 External Walls (Precast Wall) construction example

Item Description	**R-Value**	
Outdoor Air Film	0.04	
90mm Precast Concrete	0.12	
Steel Stud Frame with Thermal Break (50mm DCTech VulcanWool Thermal Break strip) R1.35 50mm Stone Wool Insulation*	1.16	
13mm Plasterboard	0.08	
Indoor Air Film	0.12	Required
Total R-Value:	1.51	*1.40*

*DCTech 50mm VulcanWool (120 kg/m3) Stone Wool
Please note that these include consideration of this as a bridged insulation zone including a 92mm thick metal stud frame with VulcanWool thermal break and airgaps either side.

d) Insulated partition construction example

Item Description	**R-Value**	
Indoor Air Film	0.11	
13mm Plasterboard	0.08	
R1.5 Insulation* 75mm steel stud frame w/ DCT Vulcan wool thermal break strip	1.23	
13mm Plasterboard	0.08	
Indoor Air Film	0.11	Required
Total R-Value:	*1.43*	*1.40*



*70mm R1.5 Fletcher Pink Batts Wall Insulation
Please note that these include consideration of this as a bridged insulation zone including a 75mm thick metal stud frame with VulcanWool thermal break and 70mm R1.5 Fletcher Pink Batts Wall Insulation

e) Suspended floor construction example

Item Description	R-Value	
Outdoor Air Film	0.04	
Concrete Slab 200mm	0.14	
R1.7 Insulation*	1.70	
Carpet (10mm)	0.18	
Indoor Air Film	0.11	Required
Total R-Value:	*2.17*	*2.0*

*70mm R1.7 Fletcher Pink Batts Silencer Insulation

f) Floor and ceiling to non-conditioned area construction example

Item Description	R-Value	
Indoor Air Film	0.11	
Concrete Slab 200mm	0.14	
R0.7 Insulation*	0.7	
13mm Plasterboard	0.08	
Indoor Air Film	0.11	Required
Total R-Value:	*1.14*	*1.0*

*25mm R0.7 Bradford Multitel Insulation Blanket

3.4 Glazing

Glazing requirement in terms of U-value and Solar Heat Gain Coefficient (SHGC) as well as indicative glazing type are listed below. The DTS glazing calculator assess the glazing on different orientations independently, thus the below provides different glazing requirement on different orientation and example of equivalent glazing product;

Table 3: Glazing requirements for a uniform solution

U-Value	SHGC	Equivalent Glazing
4.7	0.69	Comfort Plus Clear in a Capral Frame

APPENDIX A - GLAZING CALCULATOR(S)

NCC 2019 Wall-Glazing Calculator v3.0

Wall and glazing energy efficiency in Class 2-9 buildings - Method 2 of Specification J1.5a, NCC 2019

Building name and description	Classification	Climate Zone
Powerhouse Musuem Discovery Centre	Other	6

Calculated Area-Weighted U-Value	1.18	Calculated Representative Air-Conditioning Energy Value	252.8
Allowable Area-Weighted U-Value	2.00	Allowable Representative Air-Conditioning Energy Value	282.7
Building total U-Value allowance met	59%	Building total SHGC allowance met	90%
Check Values: Visible	Wall Element Requirements: Met	Display Glazing Element Requirements	-

Use of this calculator does not guarantee compliance with the NCC. The disclaimer and a version update check are available at the bottom of the page.

Building Check-Values

	Area (m^2) Walls	Glazing	Sub-total	Display	Glazing Percentage (non display)
North	413.9	7.2	**421.1**	0.0	2%
East	840.5	212.4	**1052.9**	0.0	20%
South	316.4	152.8	**469.1**	0.0	33%
West	1009.8	104.6	**1114.4**	0.0	9%
Internal	943.6	0.0	**943.6**	0.0	0%
Total	**3524.1**	**477.0**	**4001.1**	**0.0**	**12%**

Element Limits

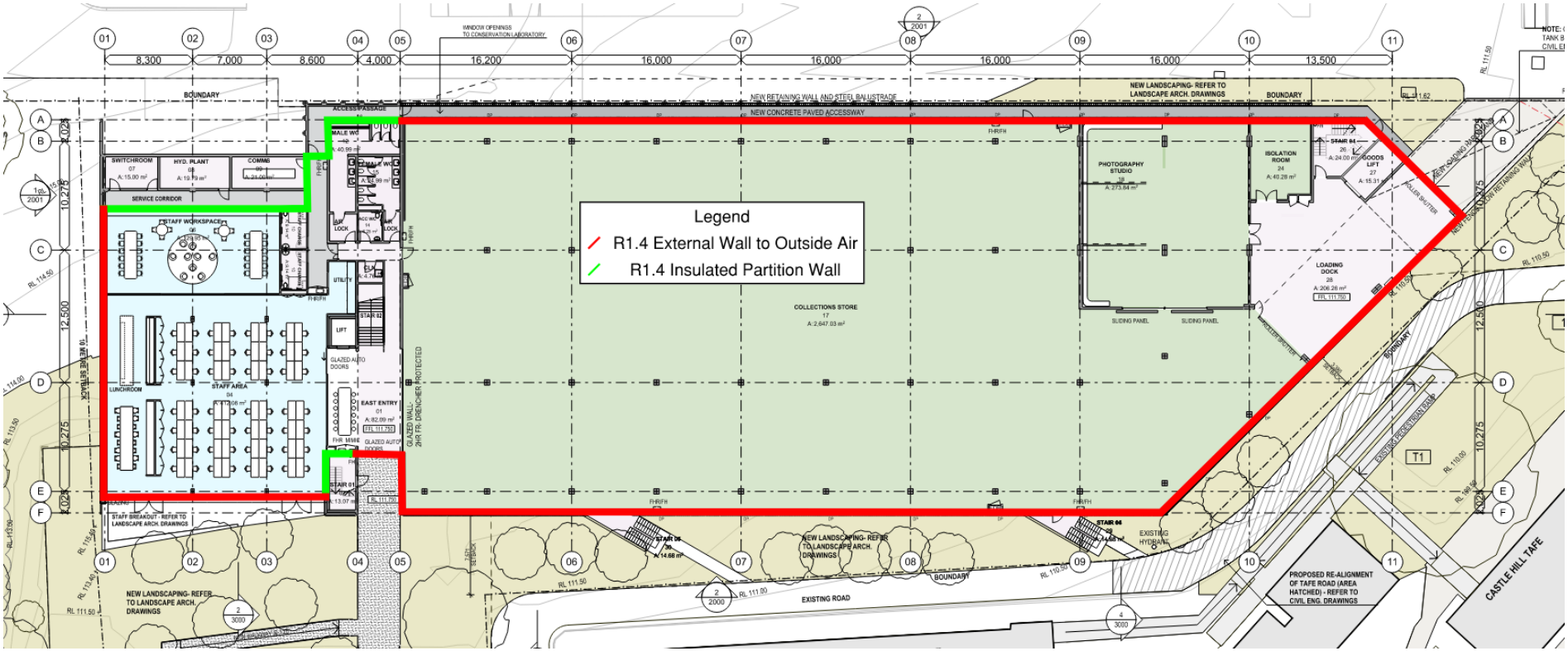
Wall U-Value*	0.71
Display Glazing U-Value	5.8
Display Glazing Solar Admittance	0.81

*The wall u-value limit will update based on building class and glazing %

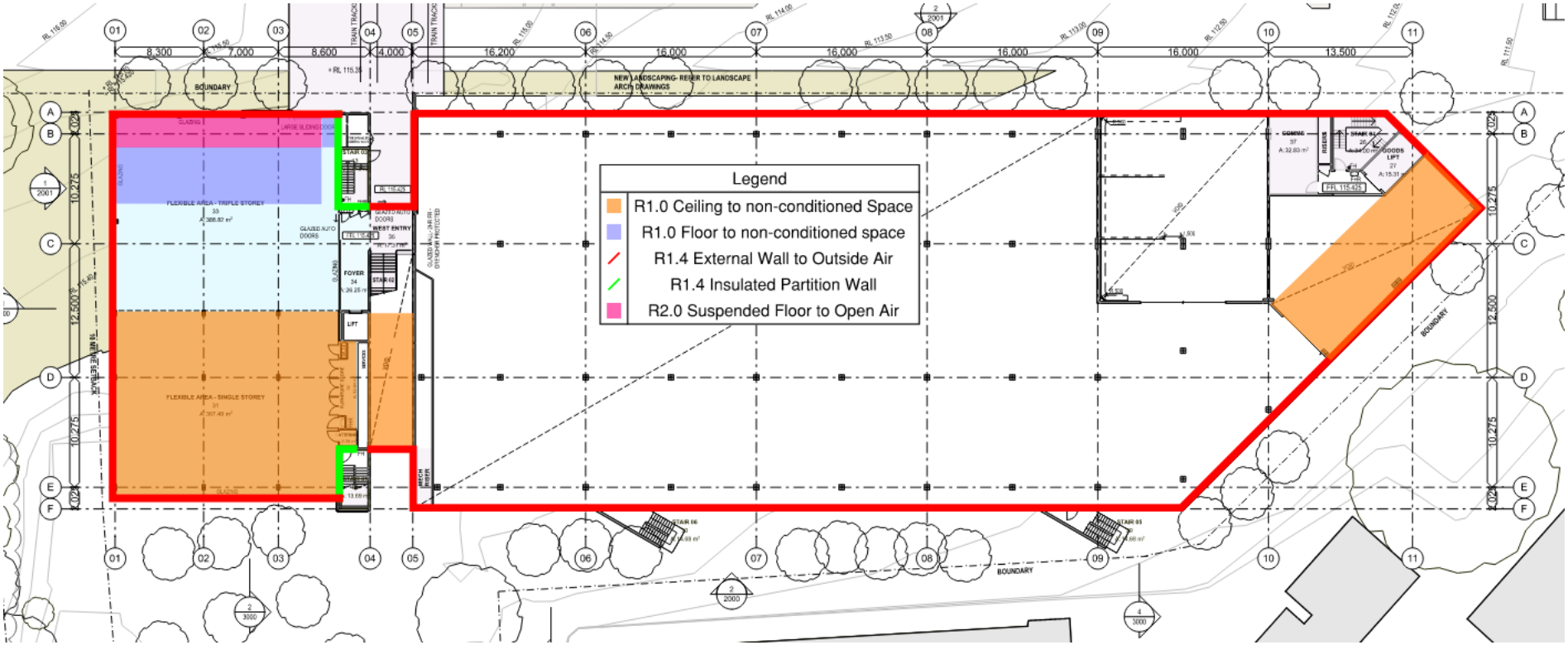
Element Description					U-Value		SHGC and Shading					Element Check-Values				
ID	Description (optional)	Element Type	Facing Sector	Area (m^2)	U-Value	U-Value Element share of allowance used	SHGC	Glazing Height (m)	Shading Height (m)	Shading Projection (m)	SHGC Element share of allowance used	Rounded G/H	Rounded P/H	Shading Factor	Solar Admittance	AC Energy Value
1	North	Wall	North	413.92	0.70	6% of building total					Not counted	0	0	1	0	0
2	East	Wall	East	840.49	0.70	12% of building total					Not counted	0	0	1	0	0
3	South	Wall	South	316.37	0.70	5% of building total					Not counted	0	0	1	0	0
4	West	Wall	West	1009.77	0.70	15% of building total					Not counted	0	0	1	0	0
5	Internal	Wall	Internal	943.56	0.70	14% of building total					Not counted	0	0	1	0	0
6	North_L1	Glazing	North	7.15	4.70	1% of building total	0.69	2.75			0% of building total	0	0	1	0.69	0
7						Not counted					Not counted	0	0	1	0	0
8	East_LG	Glazing	East	16.00	4.70	2% of building total	0.69	3.2	6.875	8	6% of building total	0.6	1.1	0.79	0.5451	14.128992
9	East_LG	Glazing	East	72.00	4.70	7% of building total	0.69	3.2	6.875	4.1	30% of building total	0.6	0.5	0.95	0.6555	76.45752
10	East_LG	Glazing	East	16.00	4.70	2% of building total	0.69	3.2	3.2	8	2% of building total	0	2.5	0.35	0.2415	6.25968
11	East_LG	Glazing	East	82.69	4.70	8% of building total	0.69	3.675	3.675	4.1	13% of building total	0	1.1	0.35	0.2415	32.349831
12	East_LG	Glazing	East	16.00	4.70	2% of building total	0.69	3.2	3.2	2.6	3% of building total	0	0.8	0.41	0.2829	7.332768
13	East_LG	Glazing	East	9.75	4.70	1% of building total	0.69				4% of building total	0	0	1	0.69	10.89855
14						Not counted					Not counted	0	0	1	0	0
15	South_LG	Glazing	South	38.40	4.70	4% of building total	0.69				10% of building total	0	0	1	0.69	26.496
16	South_G	Glazing	South	46.56	4.70	5% of building total	0.69				13% of building total	0	0	1	0.69	32.1264
17	South_G	Glazing	South	67.80	4.70	7% of building total	0.69				19% of building total	0	0	1	0.69	46.784588
18						Not counted					Not counted	0	0	1	0	0
19	West_G	Glazing	West	72.64	4.70	7% of building total	0.69				0% of building total	0	0	1	0.69	0
20	West_G	Glazing	West	16.00	4.70	2% of building total	0.69	3.2	3.2	3.95	0% of building total	0	1.2	0.35	0.2415	0
21	West_L1	Glazing	West	16.00	4.70	2% of building total	0.69				0% of building total	0	0	1	0.69	0

APPENDIX B - BUILDING THERMAL BOUNDARY MARKUP

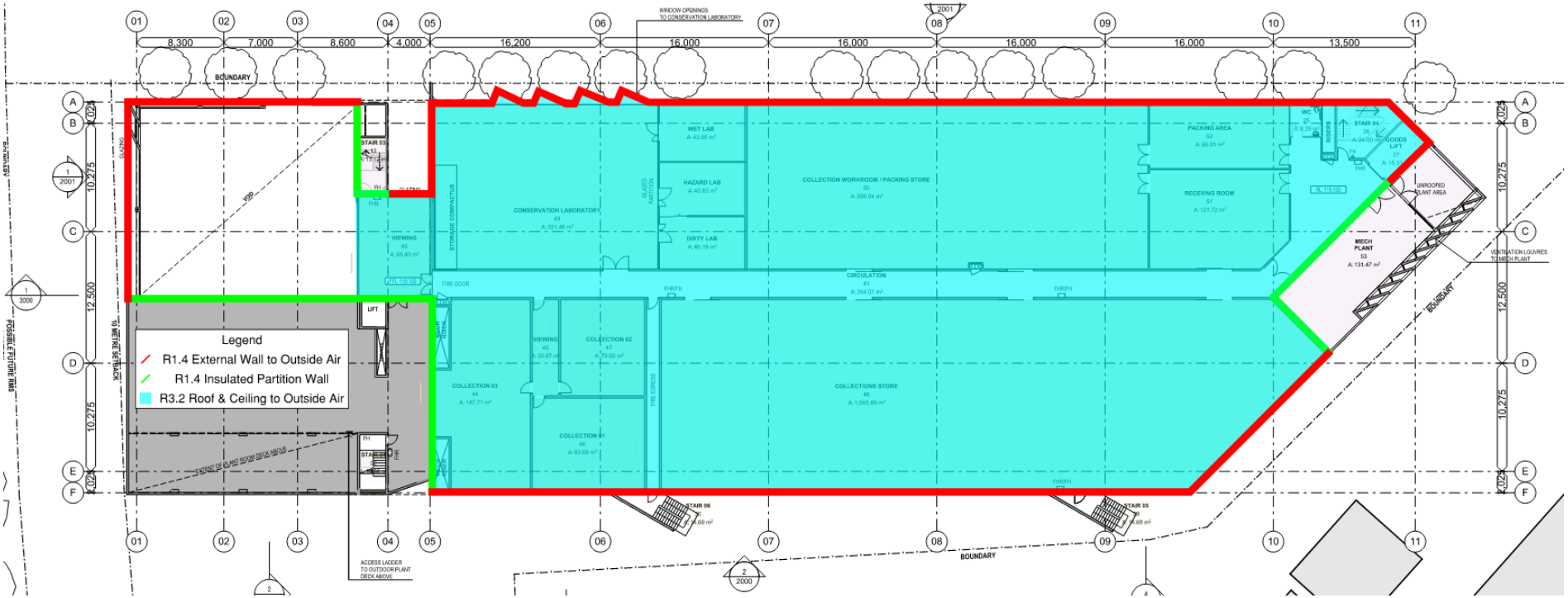
Lower Ground



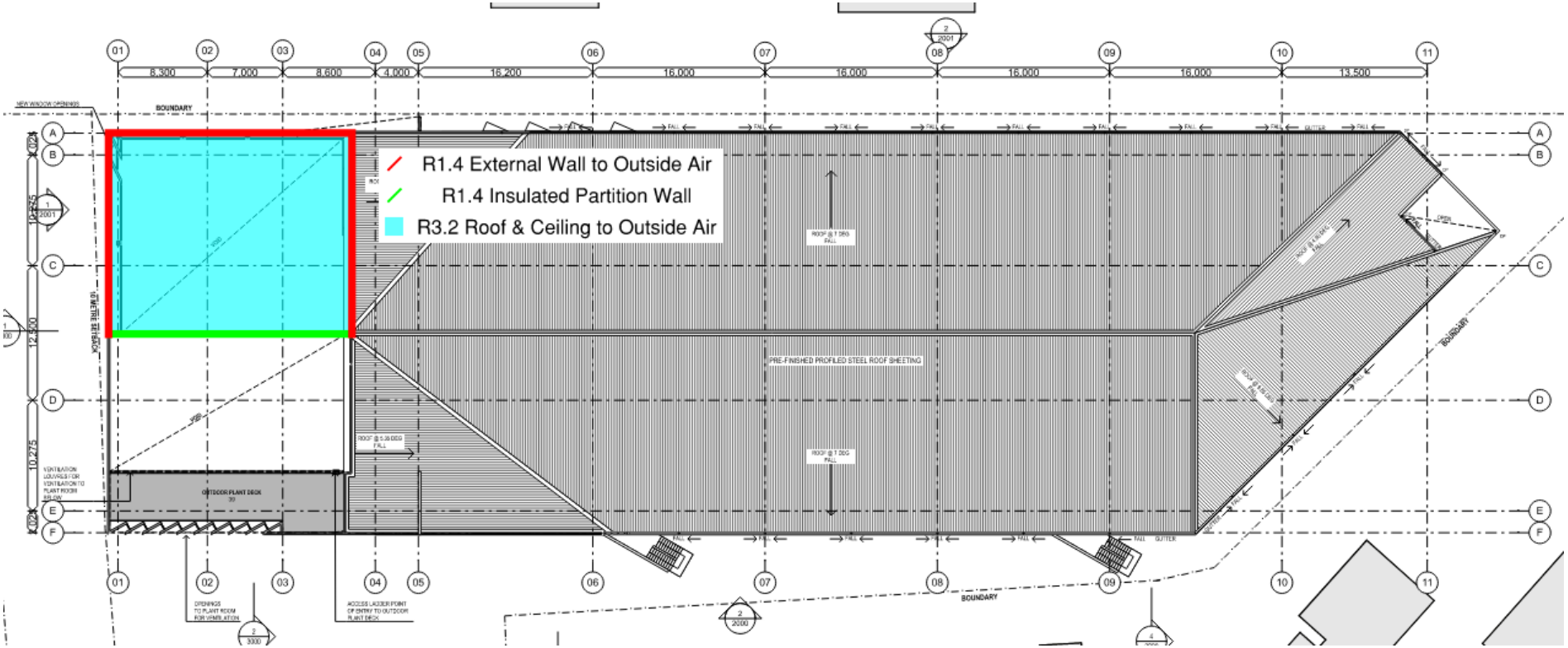
Ground


Legend
R1.0 Ceiling to non-conditioned Space
R1.0 Floor to non-conditioned space
R1.4 External Wall to Outside Air
R1.4 Insulated Partition Wall
R2.0 Suspended Floor to Open Air
BOUNDARY
FLEXIBLE AREA - TRIPLE STOREY
FLEXIBLE AREA - SINGLE STOREY
FOYER
LIFT
WEST ENTRY
NEW LANDSCAPING- REFER TO LANDSCAPE ARCH DRAWINGS

Level 1


Legend
R1.4 External Wall to Outside Air
R1.4 Insulated Partition Wall
R3.2 Roof & Ceiling to Outside Air
BOUNDARY
10 METRE SETBACK
POSSIBLE FUTURE RMS
WET LAB
HAZARD LAB
DIRTY LAB
CONSERVATION LABORATORY
COLLECTION WORKROOM / PACKING STORE
PACKING AREA
RECEIVING ROOM
CIRCULATION
COLLECTIONS STORE
COLLECTION 01
COLLECTION 02
COLLECTION 03
VIEWING
MECH PLANT
UNROOFED PLANT AREA
STAIR 03
STAIR 04
STAIR 05
STAIR 06
LIFT
GOODS LIFT
WINDOW OPENINGS TO CONSERVATION LABORATORY
ACCESS LADDER TO OUTDOOR PLANT DECK ABOVE
VENTILATION LOUVRES TO MECH PLANT

Level 2


R1.4 External Wall to Outside Air
R1.4 Insulated Partition Wall
R3.2 Roof & Ceiling to Outside Air
BOUNDARY
PRE-FINISHED PROFILED STEEL ROOF SHEETING
OUTDOOR PLANT DECK
8,300
7,000
8,600
4,000
16,200
16,000
16,000
16,000
16,000
13,500