BUILDING SERVICES ENGINEERS

JV3 Performance Based Design Brief

for

New MCS Building
75-81 Chelmsford Dr
Metford NSW 2323

Project No:
MN2542

Client:
Maitland Christian School

Architect:
Paynter Dixon

Prepared By:
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Marline Newcastle Pty Ltd

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Report Details

Revision No.	Description:	Date:	Engineer:	Verified:
1	CC Issue	28 October 2021	M Haratian	D White

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TABLE OF CONTENTS

1. Project Outline

The project involves the construction of School (Expansion) at 75-81 Chelmsford Dr, Metford NSW 2323**. This report only examines the new conditioned spaces of the building. The existing parts of the building(with the same classification) is assumed to comply with the section J requirements.**

This report addresses all areas of Section J of the Building Code of Australia.

2. Referenced Documents

The report is based on the review of the following documents:

Building Code of Australia 2019 Volume 1, Amendment 1

Architectural drawings A102 - 122(Issue date : 24-09-2021)

3. Section J Assessment Summary

JV3 b(i) on site renewable energy source

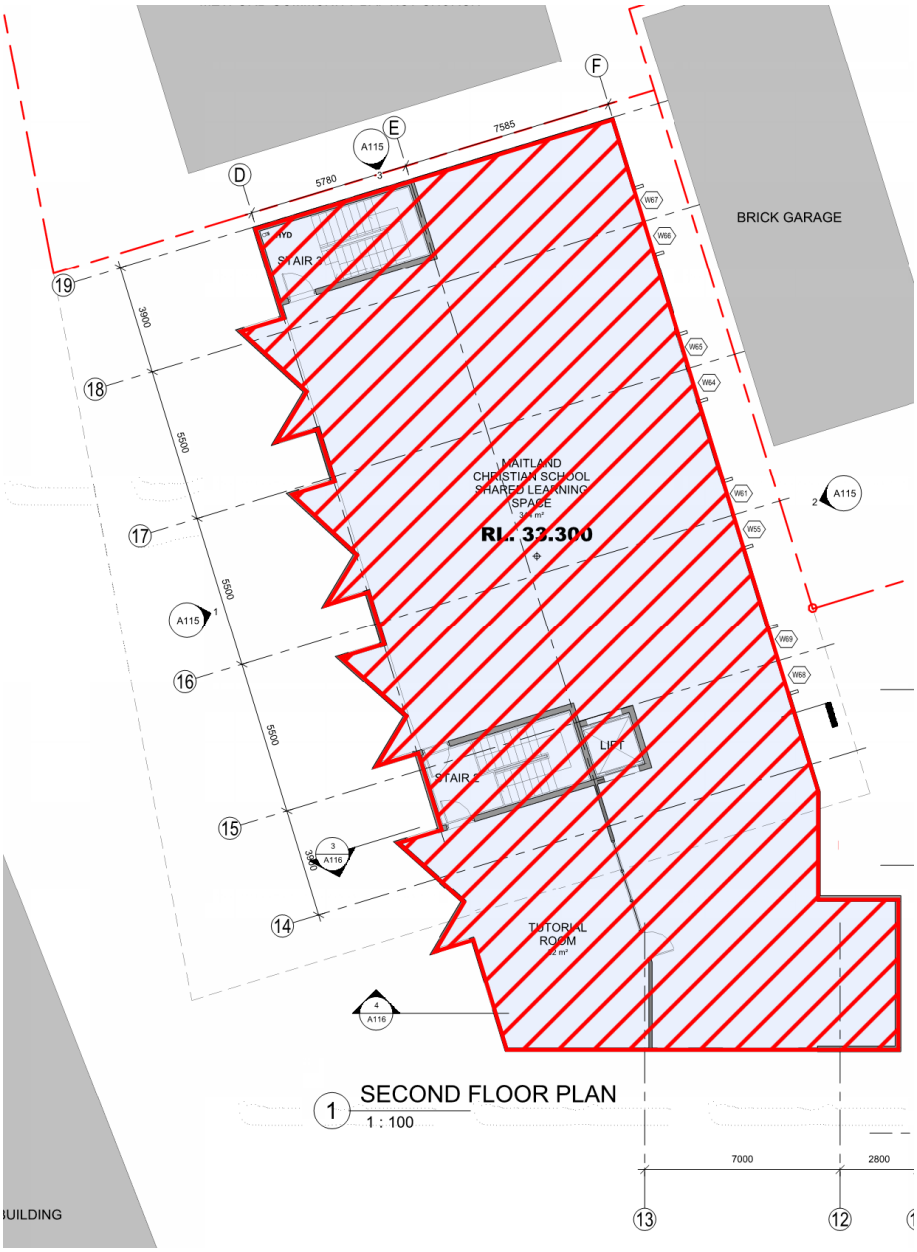
JV3 – Alternative Solution: Architect to document the followings:

- Minimum 5kW PV Solar system to be provided.

J1.3 - Roof and Ceiling Construction

JV3 – Alternative Solution: Architect to document the followings:

- Roof Colour Comply as Surfmist or any other colour with Solar Absorptance < 0.45
- Provide Foil Faced Roof Blanket (R1.30) and reflective air space under the metal deck and Celling Batts (R3.0) on the ceiling (hatched in red)

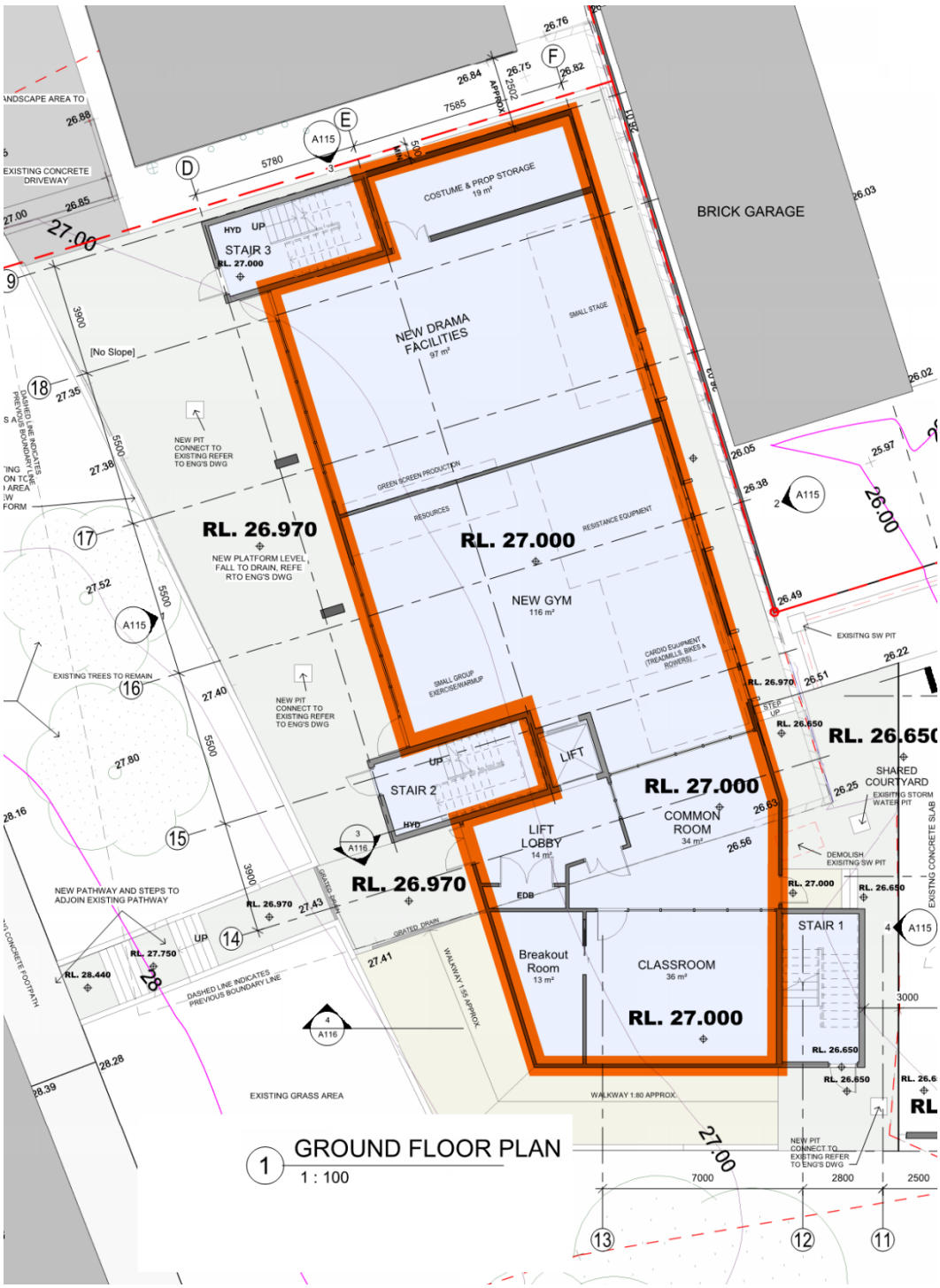


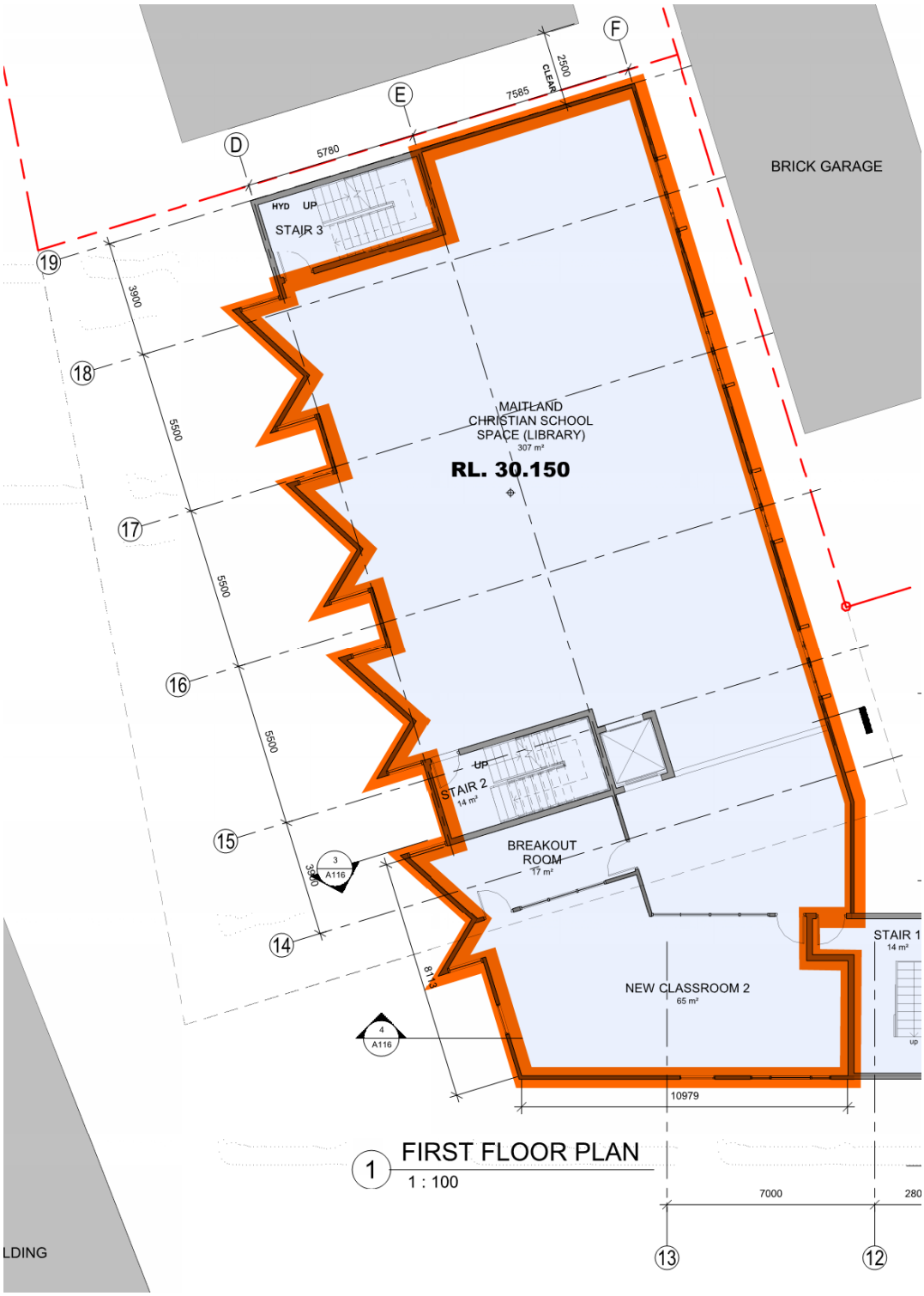
J1.5 – Glazing & Shading

- **JV3 – Alternative Solution:** Architect to document all glazing with U ≤ 6.5 & SHGC ≤ 0.73
- Shading will be compliant as currently documented

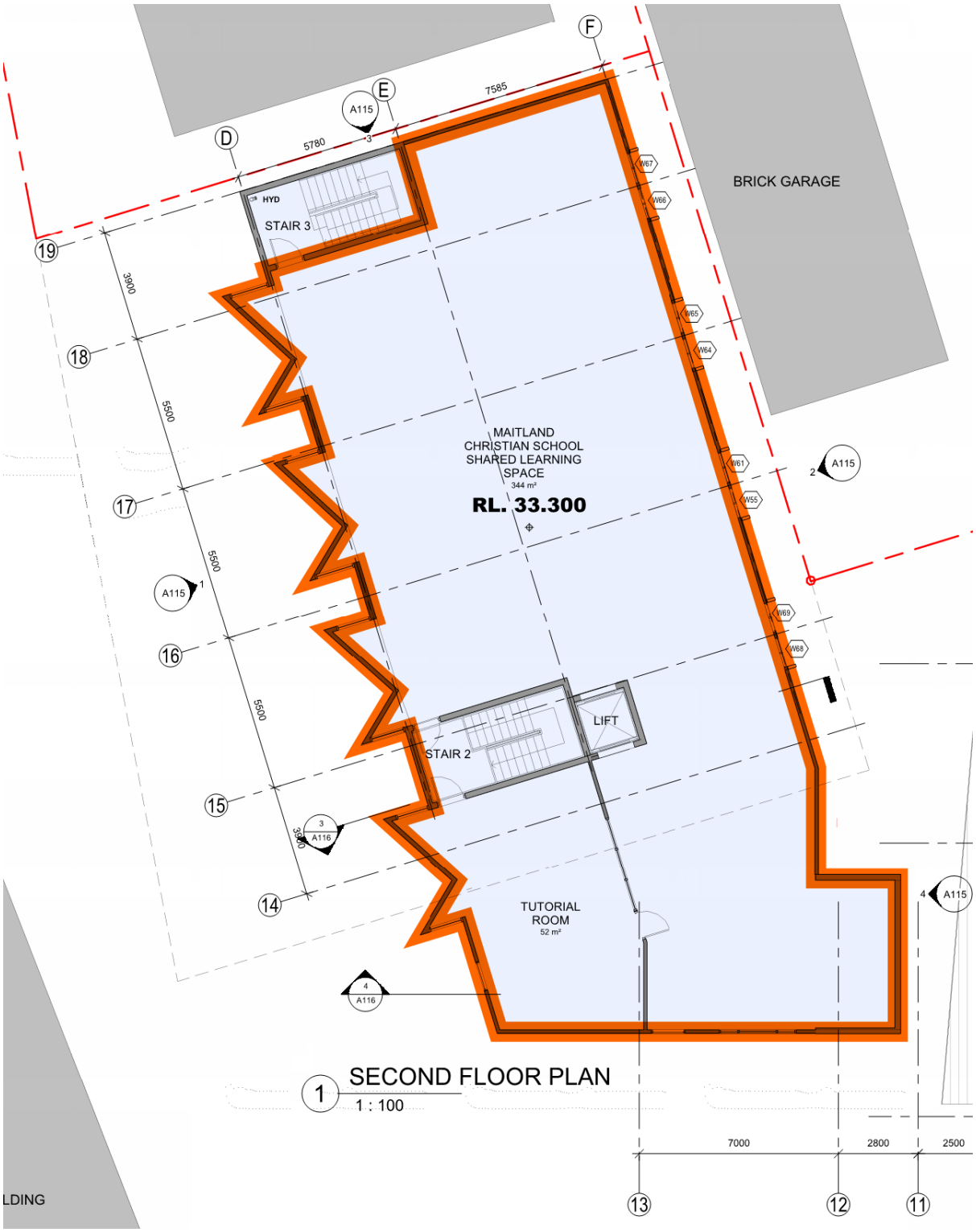
J1.5 – Wall insulation

- Architect to document all walls in Orange below to has R2.0 wall Batts. Insulation to extend to the underside of the roof sheeting/ concrete slab.





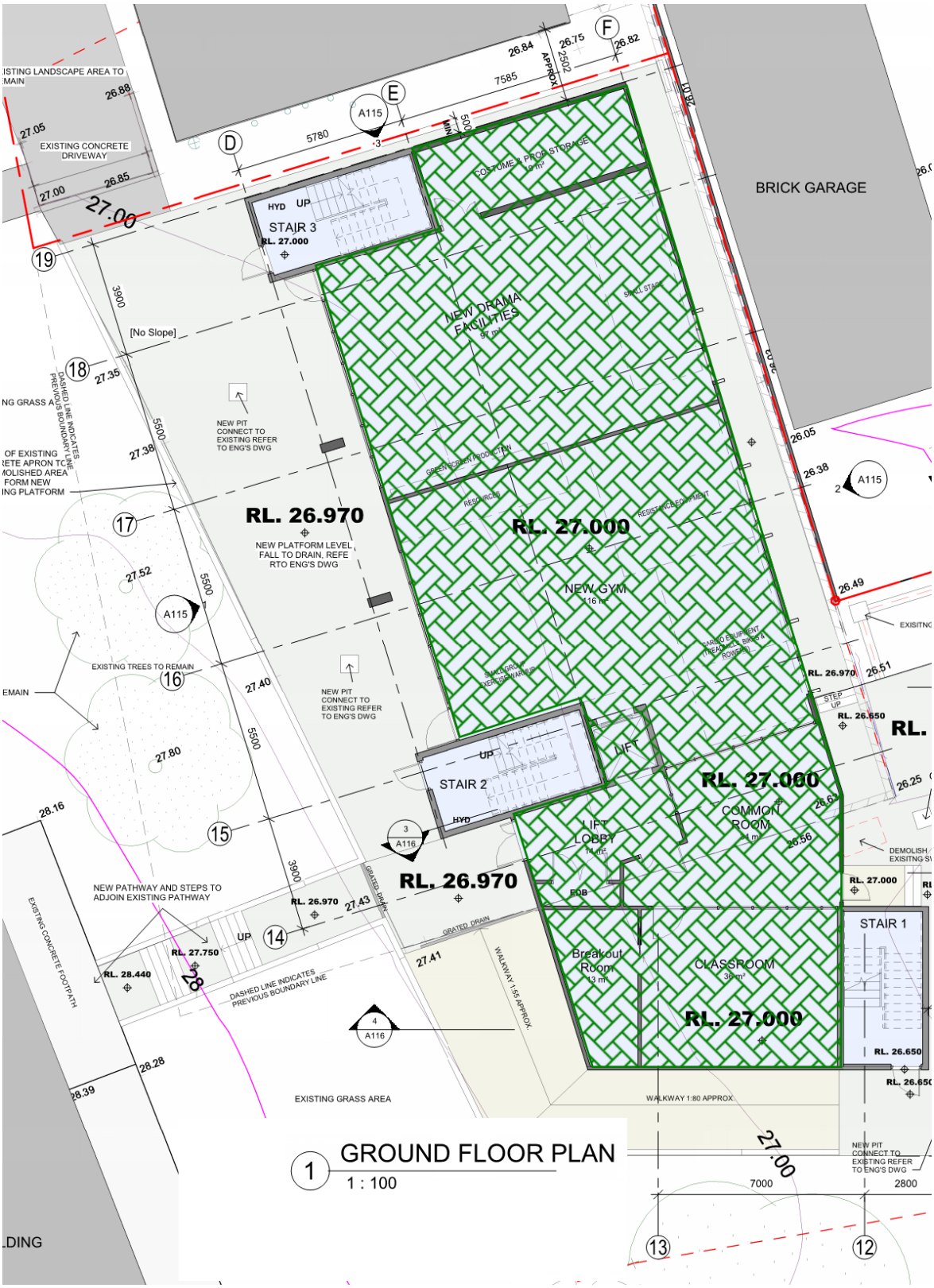
1 FIRST FLOOR PLAN
1 : 100



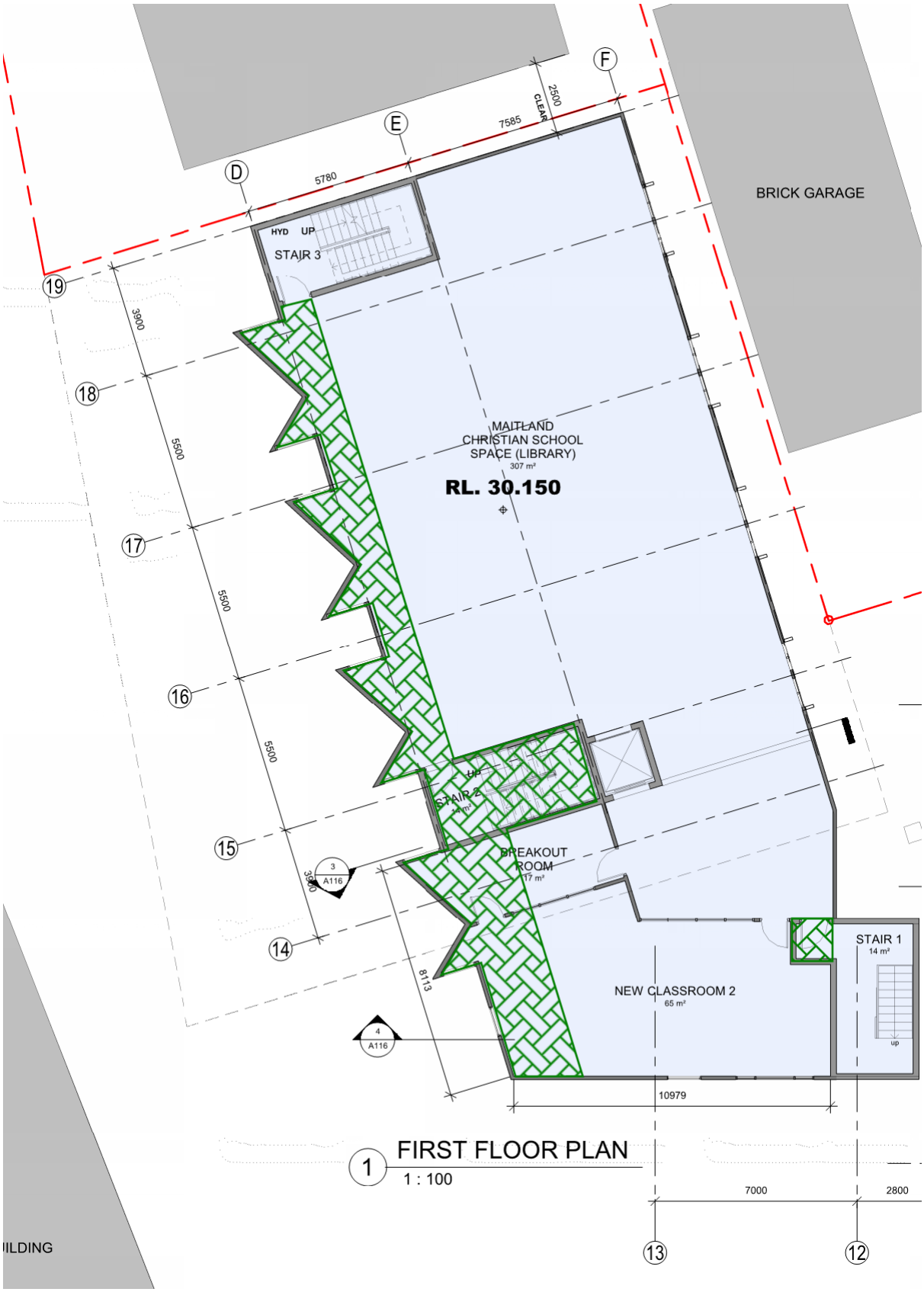
1 SECOND FLOOR PLAN
1 : 100

J1.6 - Floors

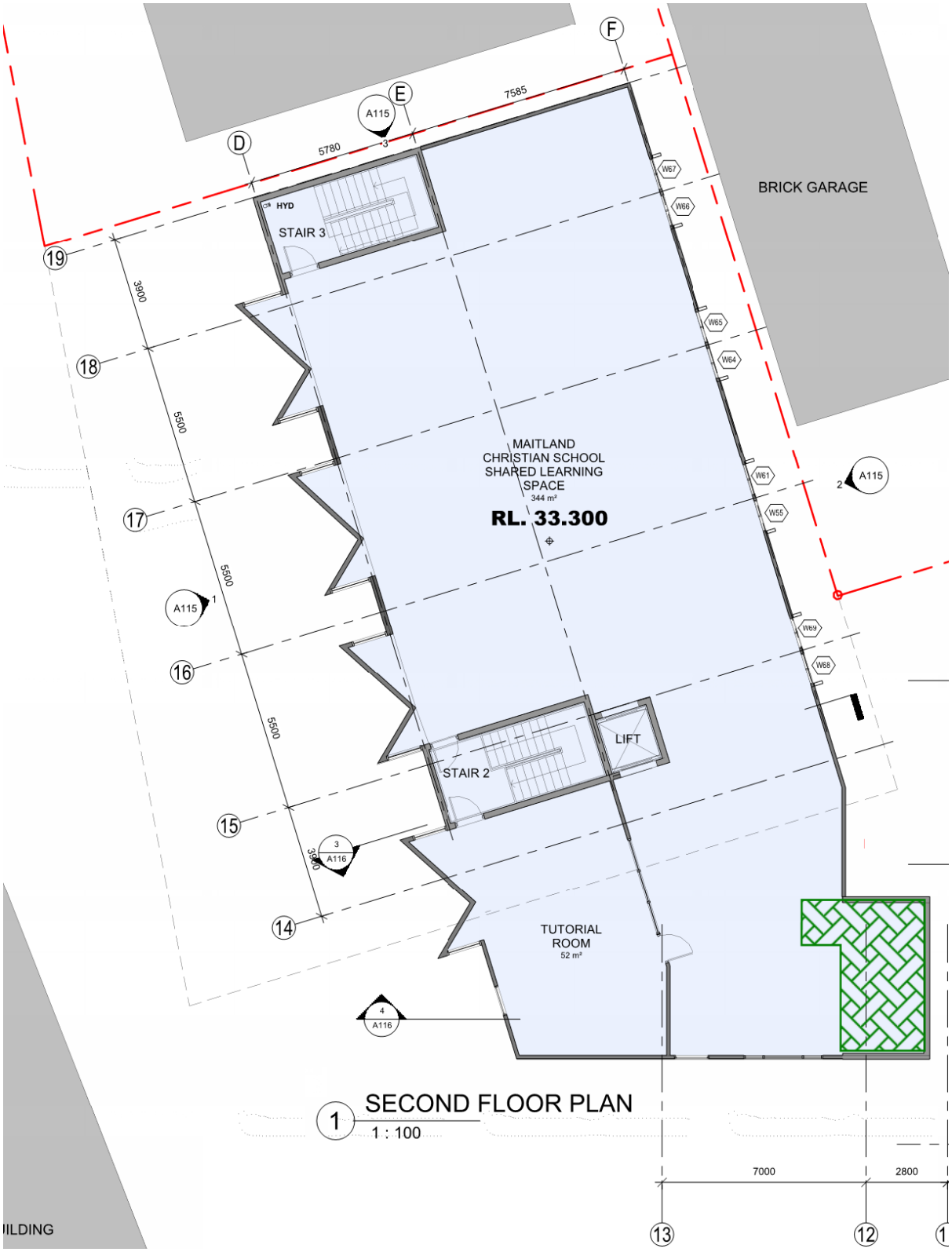
- Provide Floor thermal insulation minimum R0.7 for the Ground floor (hatched in green)



- Provide Floor thermal insulation minimum R1.9 for the First-Floor suspended floor (hatched in green)



- Provide Floor thermal insulation minimum R1.9 for the Second Floor suspended floor (hatched in green)



1 SECOND FLOOR PLAN
1 : 100

J3.4 - External Windows and Doors

- To be specified to comply with AS 2047
- All external door leading to conditioned space greater than 50 m2, are to have self-closers installed.

J3.5 - Exhaust Fan

- Exhaust fans must be fitted with sealing device such as self-closing damper or the like

J3.6 - Construction of Roofs, Walls and Floors

- Documentation to reflect sealing requirements

J8.3 - Facilities For Energy Monitoring

- Documentation is to include metering of Gas & Electricity to allow the time-of use energy consumption to be recorded.

J1.2 - Thermal Construction General

- All works to comply with AS 4859.1

Notes:

1. Refer to Engineers Design Certificates for Sections J3.5, J3.7, J5.2, J5.3, J5.4, J6.2, J6.3, J6.4, J6.5, J6.6, J7.2, J7.3 and J7.4.

2. Tax invoices / receipts, complete with details of material provided, i.e. insulation R-Value, glazing performance details etc.

4. Performance Requirements

JP1 Energy use

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

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

(b) the level of human comfort required for the building use; and

(c) solar radiation being—

(i) utilised for heating; and
(ii) controlled to minimise energy for cooling; and

(d) the energy source of the services; and

(e) the sealing of the building envelope against air leakage; and

(f) for a conditioned space, achieving an hourly regulated energy consumption, averaged over the annual hours of operation, of not more than—

(i) for a Class 6 building, 80 kJ/m2.hr; and
(ii) for a Class 5, 7b, 8 or 9a building other than a ward area, or a Class 9b school, 43 kJ/m2.hr; and
(iii) for all other building classifications, other than a sole-occupancy unit of a Class 2 building or a Class 4 part of a building, 15 kJ/m2.hr.

5. JV3 Verification using a reference building

(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;

Compliance:

"JV3 compliance modelling has been conducted by Marline Newcastle for New MCS Building, Project located at 75-81 Chelmsford Dr Metford NSW 2323. The building has been modelled in accordance with all JV3 verification requirements in order for the building to be assessed on an annual greenhouse gas emission basis rather than be compliant with the Deemed to Satisfy (DTS) requirements.

The reference building was modelled with the DTS façade and glazing (refer Appendix B) and in accordance with the JVb specification. The reference building with reference services was calculated to provide a baseline performance value in GJ of energy consumed within one year. The proposed building was modelled with both the proposed mechanical services and the same services as modelled in the reference building. The annual energy consumption of these models was compared with the baseline reference building and compliance was achieved as the proposed building model consumes less energy than the baseline reference building.

Estimated Annual Generated Output of 5kW PV Solar System as an on-site renewable energy source = 26 GJ (Reference: LG Energy Solar System Output Calculator).

The table 1 indicates the annual GHGE of the Proposed Building (with the Reference and Proposed Services) is not more than the baseline Reference building with its services. This verifies that the proposed building is compliant with JP1.

Table 1- Building Green House Gas Emission

Model	Annual Greenhous Gas Emission(Kg CO2)	Refer to Appendix
JV3 Reference Building with Reference Services	23244	B
JV3 Proposed Building with Reference Services& Solar System	20198	C
JV3 Proposed Building with Proposed Services& Solar System	19404	D

Deference between DTS & Proposed building are as follows

- All New External glazing is compliant as **clear**
- Minimum 5kW solar system as an on-site renewable energy must be used to achieve compliance

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

Compliance:

"Marline Newcastle checked the thermal comfort level for proposed building and it passed the requirement of JV3 (Refer to Appendix E: Proposed Building Temperature Range Check and thermal Comfort Report) "

and

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

Compliance:

"Refer to mechanical design certificate"

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

(i) renewable energy generated and used on site;

Compliance:

"Marline Newcastle proposed using minimum 5kW solar system to offset the annual greenhouse gas emissions of the proposed building"

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

Compliance:

"Design Builder software has been used as calculation software that complies with ANSI/ASHRAE Standard 140"

and

(ii) Specification JVb.

Compliance:

"Marline Newcastle confirm the modelling parameter has been performed base on Specification JVb. Refer to Appendix F Specification JVb Modelling parameters."

6. Limitations

This report comprises an assessment of the building against the BCA 2019 Volume 1, Amendment 1, being the version of the BCA in force at the time of the assessment. Changes

to the building facade after the certificate has been issued may change the compliance of the building in relation to Section J.

7. Building Characteristics

- BCA Classification: Class 9B
- Conditioned Spaces:
  - Ground , First and Second Floor new conditioned spaces

8. Climate Zone

The building is located in Climate Zone 5 in accordance with the BCA.

9. J1: Building Fabric

J1.3 Roof and Ceiling Construction

Deemed to satisfy(DTS) required Minimum Total R value of R3.7(downwards) For roof surfaces with a solar absorptance be not more than 0.45**.**

Typical Construction	
Building Element	**R-Value**
Outdoor air film	0.04
Metal Deck	0.00
Foil Faced Roof Blanket (R1.30)	**1.30**
Reflective air space(downwards)	1.02
Celling Batts (R3.0)	**3.00**
13mm Plasterboard	0.06
Indoor air film	0.12
Total	**5.54**

Compliance:

JV3 – Alternative Solution: .

- Roof surfaces solar absorbance must be not more than 0.45
- Provide Foil Faced Roof Blanket (R1.30) and reflective air space under the metal deck and Celling Batts (R3.0) on the ceiling.

Note: Maximum 10% of roof area have been considered as uninsulated (thermal bridge) area.

List of NCC approved Colorbond Roof Colours

The architect shall select from the following list of pre-approved roof colours. Deviating from these roof colours and/or selecting a darker roof colour may require a Section J JV3 Report for compliance.

J1.4 Roof Lights

- Roof lights are not installed in the building

J1.5 Walls and Glazing

Glazing and Shading

DTS Glazing and shading requirements of J1.5 have been achieved as per the NCC 2019 facade calculator in Appendix A.

This requirement has been changed as part of the JV3 modelling as follows:

Gazing Specification				
Glazing Type	**U-Value**	**SHGC**	**Shading**	**Selection Guide**
All external Glazing	U ≤ 6.5	SHGC ≤ 0.73	As documented	Clear Glass

Notes:

1. The above glazing selection is solely based on compliance with Section J only. All glazing is required to comply with the BCA and all relevant Australian Standards.

Compliance:

- Provide the performance requirements of the glazing as per table above.

Walls (Refer To Orange Walls)

- Requirement as per J1.5

Typical Construction – Orange walls	
Building Element	**R-Value**
Outdoor air film	0.04
Cladding / Concrete	0.03 / 0.07
Wall Thermal Insulation (R2.0)	**2.00**
Non Reflective Air Space	0.17
10 mm plasterboard	0.06
Indoor air film	0.12
Total	**2.42 / 2.46**

Compliance:

- Provide Wall thermal insulation (R2.0) for all orange walls.

Note: Maximum 10% of wall area have been considered as uninsulated (thermal bridge) area.

J1.6 Floors

The ground floor conditioned space is concrete slab on ground without in slab heating or cooling system. As such this floor requires a minimum R Value = R2.0.

Refer to table 2b(Specification J1.6), R value of soil in contact with floor are as follows

R(Condition Space) = R1.30

So Condition Space floor need to cover with thermal insulation as follows:

Typical Floor Construction	
Building Element	**R-Value**
R value of soil in contact with floor	1.30
Floor thermal insulation minimum R0.7	**0.70**
Concrete	0.07
Indoor air film	0.12
Total	**2.19**

Also the First Floor and Second Floor conditioned space has suspended floor slab. As such this floor requires a minimum R Value = R2.0.

So condition space suspended floor need to cover with thermal insulation as follows:

Typical Floor Construction	
Building Element	**R-Value**
Outdoor / Indoor air film	0.04 / 0.12
Floor thermal insulation minimum R1.9	**1.90**
Concrete	0.07
Indoor air film	0.12
Total	**2.13 / 2.21**

Compliance:

- Provide Floor thermal insulation minimum R0.7 for the Ground floor

&

- Provide Floor thermal insulation minimum R1.9 for the First Floor and Second Floor suspended floor

10. J3: Building Sealing

Requirement: Seals to be provided to all external windows and doors opening to the conditioned space. All works to comply with AS 2047.

Exhaust fans must be fitted with sealing device such as self-closing damper or the like.

Construction of all habitable rooms to be:

- (d)An entrance to a building, if leading to a conditioned space must have an 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;

Compliance:

- Provide the above requirements to indicate sealing requirements.
- All entrance doors from the conditioned space to the non-conditioned space are to have a self-closing door.

Compliance:

- Provide the above requirements to indicate sealing requirements.

11. J4: Air Movements

- Not Applicable.

12. J5: Air Conditioning and Ventilation Systems

Refer to Mechanical Design Certification.

13. J6: Artificial Lighting and Power

Refer to Electrical Design Certification.

14. J7: Hot Water Supply

Refer to Hydraulic Design Certification.

15. J8.3: Facilities for Energy Monitoring

- (a) A building or sole-occupancy unit with a floor area of more than 500 m2 must have an energy meter configured to record the time-of-use consumption of gas and electricity.

Compliance:

- Documentation is to include Energy metering(Gas and Electricity) to allow the time-of use energy consumption to be recorded.

16. Appendix A: JV3 Verification Reference Building Glazing Calculator

Façade

Report

Calculator

Project Summary

Date
20/10/2021

Name
Mehran Haratian

Company
Marline Newcastle

Position
Mechanical Engineer

Building Name / Address
NEW MCS BUILDING
75-81 CHELMSFORD DR. METFORD NSW 2323

Building State
NSW

Climate Zone
Climate Zone 5 - Warm temperate

Building Classification
Class 9b - schools

Storeys Above Ground
2

Tool Version
1.1 (April 2020)

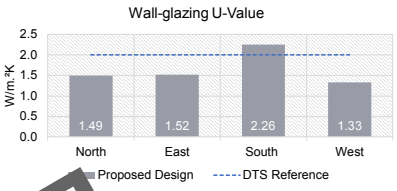
The summary below provides an overview of where compliance has been achieved for Specification J1.5a - Calculation of U-Value and solar admittance - Method 1 (Single Aspect) and Method 2 (Multiple Apects).

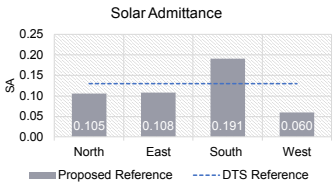
Compliant Solution =
Non-Compliant Solution =

Method 1

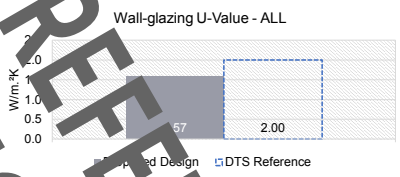
	North	East	South	West	Method 2 All
Wall-glazing U-Value (W/m².K)	1.49	1.52	2.26	1.33	1.57
Solar Admittance	0.11	0.11	0.19	0.06	
AC Energy Value					100

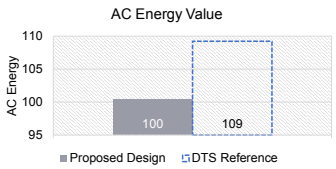
Method 1





Method 2





Project Details

	North	East	South	West
Glazing Area (m²)	25.9	55	46.98	44.2
Glazing to Façade Ratio	21%	22%	38%	17%
Glazing References			1 2	1 2 3 4 5
Glazing System Types	USER (DEFINED)	USER (DEFINED)	USER (DEFINED)	USER (DEFINED)
Glass Types	Comfort Plus Grey	Comfort Plus Grey	Comfort Plus Grey	Comfort Plus Grey
Frame Types	USER (DEFINED)	USER (DEFINED)	USER (DEFINED)	USER (DEFINED)
Average Glazing U-Value (W/m².K)	5.00	5.00	5.00	5.00
Average Glazing SHGC	0.50	0.50	0.50	0.50
Shading Systems	Horizontal Device	Horizontal Device	Horizontal Device	Horizontal Device
Wall Area (m²)	96.93	199.34	75.87	210.14
Wall Types	Wall	Wall	Wall	Wall
Methodology				
Wall Construction	Brick Work + R2.0 & 10% Thermal Bridge Area	Brick Work + R2.0 & 10% Thermal Bridge Area	Brick Work + R2.0 & 10% Thermal Bridge Area	Brick Work + R2.0 & 10% Thermal Bridge Area
Wall Thickness	150	150	150	150
Average Wall R-value (m².K/W)	1.80	1.80	1.80	1.80
Solar Absorptance	0.7	0.7	0.7	0.7

17. Appendix B: Reference Building / Reference Services JV3 Compliance Report

Program Version:**EnergyPlus, Version 9.4.0-998c4b761e, YMD=2021.10.26 10:48**

Table of Contents

Tabular Output Report in Format: **HTML**

Building: **Building**

Environment: **MAITLAND (01-01:31-12) ** Williamtown RAAF NSW AUS RMY WMO#=947760**

Simulation Timestamp: **2021-10-26 10:48:15**

Report: **Annual Building Utility Performance Summary**

Table of Contents

For: **Entire Facility**

Timestamp: **2021-10-26 10:48:15**

Values gathered over 8760.00 hours

= 90.8GJ x 256 KgCO2/GJ= 23244KgCO2 (Refer To Table 3a - JVb)

Site and Source Energy

	Total Energy [GJ]	Energy Per Total Building Area [MJ/m2]	Energy Per Conditioned Building Area [MJ/m2]
Total Site Energy	90.81	77.52	77.52
Net Site Energy	90.81	77.52	77.52
Total Source Energy	287.59	245.50	245.50
Net Source Energy	287.59	245.50	245.50

Site to Source Energy Conversion Factors

	Site=>Source Conversion Factor
Electricity	3.167
Natural Gas	1.084
District Cooling	1.056
District Heating	3.613
Steam	0.250
Gasoline	1.050
Diesel	1.050
Coal	1.050
Fuel Oil No 1	1.050
Fuel Oil No 2	1.050
Propane	1.050
Other Fuel 1	1.000
Other Fuel 2	1.000

Building Area

	Area [m2]
Total Building Area	1171.43
Net Conditioned Building Area	1171.43
Unconditioned Building Area	0.00

End Uses

	Electricity [GJ]	Natural Gas [GJ]	Gasoline [GJ]	Diesel [GJ]	Coal [GJ]	Fuel Oil No 1 [GJ]	Fuel Oil No 2 [GJ]	Propane [GJ]	Other Fuel 1 [GJ]	Other Fuel 2 [GJ]	District Cooling [GJ]	District Heating [GJ]	Water [m3]
Heating	22.98	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cooling	33.68	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Interior Lighting	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Exterior Lighting	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Interior Equipment	32.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Exterior Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fans	1.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pumps	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Heat Rejection	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Humidification	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Heat Recovery	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Water Systems	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Refrigeration	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Generators	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total End Uses	90.81	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Note: Electricity appears to be the principal heating source based on energy usage.

End Uses By Subcategory

							Fuel Oil	Fuel Oil		Other	Other			

18. Appendix C: Proposed Building / Reference Services JV3 Compliance Report

Program Version:**EnergyPlus, Version 9.4.0-998c4b761e, YMD=2021.10.28 09:42**

Table of Contents

Tabular Output Report in Format: **HTML**

Building: **Building**

Environment: **MAITLAND (01-01:31-12) ** Williamtown RAAF NSW AUS RMY WMO#=947760**

Simulation Timestamp: **2021-10-28 09:42:36**

Report: **Annual Building Utility Performance Summary**

Table of Contents

For: **Entire Facility**

Timestamp: **2021-10-28 09:42:36**

Values gathered over 8760.00 hours

= (104.9 – 26)GJ x 256 KgCO2/GJ= 20198 KgCO2
(Refer To Table 3a - JVb)

Site and Source Energy

	Total Energy [GJ]	Energy Per Total Building Area [MJ/m2]	Energy Per Conditioned Building Area [MJ/m2]
Total Site Energy	104.92	89.57	89.57
Net Site Energy	104.92	89.57	89.57
Total Source Energy	332.29	283.66	283.66
Net Source Energy	332.29	283.66	283.66

Site to Source Energy Conversion Factors

	Site=>Source Conversion Factor
Electricity	3.167
Natural Gas	1.084
District Cooling	1.056
District Heating	3.613
Steam	0.250
Gasoline	1.050
Diesel	1.050
Coal	1.050
Fuel Oil No 1	1.050
Fuel Oil No 2	1.050
Propane	1.050
Other Fuel 1	1.000
Other Fuel 2	1.000

Building Area

	Area [m2]
Total Building Area	1171.43
Net Conditioned Building Area	1171.43
Unconditioned Building Area	0.00

End Uses

	Electricity [GJ]	Natural Gas [GJ]	Gasoline [GJ]	Diesel [GJ]	Coal [GJ]	Fuel Oil No 1 [GJ]	Fuel Oil No 2 [GJ]	Propane [GJ]	Other Fuel 1 [GJ]	Other Fuel 2 [GJ]	District Cooling [GJ]	District Heating [GJ]	Water [m3]
Heating	21.69	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cooling	48.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Interior Lighting	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Exterior Lighting	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Interior Equipment	32.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Exterior Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fans	1.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pumps	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Heat Rejection	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Humidification	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Heat Recovery	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Water Systems	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Refrigeration	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Generators	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total End Uses	104.92	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Note: Electricity appears to be the principal heating source based on energy usage.

End Uses By Subcategory

							Fuel Oil	Fuel Oil		Other	Other			

19. Appendix D: Proposed Building / Proposed Services JV3 Compliance Report

Program Version:**EnergyPlus, Version 9.4.0-998c4b761e, YMD=2021.10.28 10:39**

Table of Contents

Tabular Output Report in Format: **HTML**

Building: **Building**

Environment: **MAITLAND (01-01:31-12) ** Williamtown RAAF NSW AUS RMY WMO#=947760**

Simulation Timestamp: **2021-10-28 10:39:26**

Report: **Annual Building Utility Performance Summary**

For: **Entire Facility**

Timestamp: **2021-10-28 10:39:26**

Values gathered over 8760.00 hours

= (101.8 – 26)GJ x 256 KgCO2/GJ= 19404 KgCO2
(Refer To Table 3a - JVb)

Site and Source Energy

	Total Energy [GJ]	Energy Per Total Building Area [MJ/m2]	Energy Per Conditioned Building Area [MJ/m2]
Total Site Energy	101.88	86.97	86.97
Net Site Energy	101.88	86.97	86.97
Total Source Energy	322.64	275.43	275.43
Net Source Energy	322.64	275.43	275.43

Site to Source Energy Conversion Factors

	Site=>Source Conversion Factor
Electricity	3.167
Natural Gas	1.084
District Cooling	1.056
District Heating	3.613
Steam	0.250
Gasoline	1.050
Diesel	1.050
Coal	1.050
Fuel Oil No 1	1.050
Fuel Oil No 2	1.050
Propane	1.050
Other Fuel 1	1.000
Other Fuel 2	1.000

Building Area

	Area [m2]
Total Building Area	1171.43
Net Conditioned Building Area	1171.43
Unconditioned Building Area	0.00

End Uses

	Electricity [GJ]	Natural Gas [GJ]	Gasoline [GJ]	Diesel [GJ]	Coal [GJ]	Fuel Oil No 1 [GJ]	Fuel Oil No 2 [GJ]	Propane [GJ]	Other Fuel 1 [GJ]	Other Fuel 2 [GJ]	District Cooling [GJ]	District Heating [GJ]	Water [m3]
Heating	21.69	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cooling	45.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Interior Lighting	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Exterior Lighting	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Interior Equipment	32.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Exterior Equipment	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fans	1.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pumps	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Heat Rejection	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Humidification	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Heat Recovery	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Water Systems	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Refrigeration	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Generators	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total End Uses	101.88	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Note: Electricity appears to be the principal heating source based on energy usage.

End Uses By Subcategory

							Fuel Oil	Fuel Oil		Other	Other			

21. Appendix E: Proposed Building Temperature Range Check and thermal Comfort Report

Temperature Range Check and Thermal Comfort Report

Site Name: Maitland, **Building Name:** NEW MCS Building, **Location Template:** CESSNOCK AIRPORT, **Weather File:** AUS_NSW_WILLIAMTOWN RAAF_RMY

Report generated: 26/10/2021 10:11:07 AM

Building level activity settings:

Winter clothing level: 1.2, **Summer clothing level:** .8, **Metabolic Rate:** Typing, **Comfort Radiant Temperature Weighting:** 1 - Zone Averaged

Section J Temperature Range Check. Target temperature range: 21 - 24 degrees (occupied zones). 18 - 25 degrees (transitory occupancy (TO) zones).

All zones pass temperature check - **Building : PASS**

Block	Zone	Floor Area (m²)	Fraction Total Floor Area	Building Class	Operation Hours	Operation Hours T below target	Operation Hours T in target range	Operation Hours T above target	Fraction Operation Hours T in target range	Zone temperature meets Section J target (T in target range ≥ 98 % Operation Hours)
Ground Floor	New Drama Facilities	121.2	0.10	Class 9b school	2313	0	2313	0	1.000	PASS
Ground Floor	New Gym	118.2	0.10	Class 9b school	2313	0	2313	0	1.000	PASS
Ground Floor	Common Room	34.7	0.03	Class 9b school	2313	0	2313	0	1.000	PASS
Ground Floor	Lift Lobby	21.7	0.02	Class 9b school	2313	0	2313	0	1.000	PASS
Ground Floor	Breakout Room	14.4	0.01	Class 9b school	2313	0	2313	0	1.000	PASS
Ground Floor	Class Room	37.7	0.03	Class 9b school	2313	0	2313	0	1.000	PASS
First Floor	Breakout Room	17.5	0.01	Class 9b school	2313	0	2313	0	1.000	PASS
First Floor	Library	321.8	0.27	Class 9b school	2313	0	2313	0	1.000	PASS
First Floor	New Classroom 2	72.6	0.06	Class 9b school	2313	0	2313	0	1.000	PASS
Second Floor	Tutorial Room	56.0	0.05	Class 9b school	2313	0	2313	0	1.000	PASS
Second Floor	Shared Learning	355.6	0.30	Class 9b school	2313	0	2313	0	1.000	PASS

Section J PMV Thermal Comfort Check. Target PMV range: -1.0 to +1.0

More than 95% (100.0%) of floor area passes PMV check - **Building : PASS**

Block	Zone	Floor Area (m²)	Fraction Total Floor Area	Building Class	Operation Hours	Operation Hours PMV below -1	Operation Hours PMV between -1 and 1	Operation Hours PMV above 1	Fraction Operation Hours PMV between -1 and 1	Zone PMV meets Section J target (greater than 98 % Operation Hours between -1 and 1)
Ground Floor	New Drama Facilities	121.2	0.10	Class 9b school	2313	5	2308	0	0.998	PASS
Ground Floor	New Gym	118.2	0.10	Class 9b school	2313	5	2308	0	0.998	PASS
Ground Floor	Common Room	34.7	0.03	Class 9b school	2313	1	2312	0	1.000	PASS
Ground Floor	Lift Lobby	21.7	0.02	Class 9b school	2313	2	2311	0	0.999	PASS
Ground Floor	Breakout Room	14.4	0.01	Class 9b school	2313	1	2312	0	1.000	PASS
Ground Floor	Class Room	37.7	0.03	Class 9b school	2313	3	2310	0	0.999	PASS
First Floor	Breakout Room	17.5	0.01	Class 9b school	2313	0	2313	0	1.000	PASS
First Floor	Library	321.8	0.27	Class 9b school	2313	0	2313	0	1.000	PASS
First Floor	New Classroom 2	72.6	0.06	Class 9b school	2313	0	2313	0	1.000	PASS
Second Floor	Tutorial Room	56.0	0.05	Class 9b school	2313	0	2311	2	0.999	PASS
Second Floor	Shared Learning	355.6	0.30	Class 9b school	2313	0	2307	6	0.997	PASS

PMV Thermal Comfort Check. Target PMV range: -0.5 to +0.5

Block	Zone	Floor Area (m²)	Fraction Total Floor Area	Building Class	Operation Hours	Operation Hours PMV below -0.5	Operation Hours PMV between -0.5 and 0.5	Operation Hours PMV above 0.5	Fraction Operation Hours PMV between -0.5 and 0.5
Ground Floor	New Drama Facilities	121.2	0.10	Class 9b school	2313	142	2110	61	0.912
Ground Floor	New Gym	118.2	0.10	Class 9b school	2313	131	2124	58	0.918
Ground Floor	Common Room	34.7	0.03	Class 9b school	2313	138	2149	26	0.929
Ground Floor	Lift Lobby	21.7	0.02	Class 9b school	2313	138	2149	26	0.929
Ground Floor	Breakout Room	14.4	0.01	Class 9b school	2313	153	2150	10	0.930
Ground Floor	Class Room	37.7	0.03	Class 9b school	2313	165	2133	15	0.922
First Floor	Breakout Room	17.5	0.01	Class 9b school	2313	94	2159	60	0.933
First Floor	Library	321.8	0.27	Class 9b school	2313	62	2206	45	0.954
First Floor	New Classroom 2	72.6	0.06	Class 9b school	2313	89	2196	28	0.949
Second Floor	Tutorial Room	56.0	0.05	Class 9b school	2313	29	2051	233	0.887
Second Floor	Shared Learning	355.6	0.30	Class 9b school	2313	25	1890	398	0.817

20. Appendix F: Specification JVb Modelling parameters

Specification JVb Modelling parameters

ACT Appendix

1. Scope

This Specification contains the *required* modelling parameters for JV2 and JV3.

2. Reference building

The *annual greenhouse gas emissions* must be calculated for the *reference building* in accordance with the following:

(a) The *reference building* must—

(i) comply with *Deemed-to-Satisfy Provisions* in Parts J1 to J7; and

(ii) have the minimum amount of mechanical ventilation *required* by Part F4.

(b) The *external walls* must have a solar absorptance of 0.6.

(c) The *air-conditioning* must—

(i) for 98% of the annual *hours of operation*, achieve temperatures between—

(A) 18°CDB to 25°CDB for *conditioned spaces* with transitory occupancy; and

(B) subject to (ii), 21°CDB to 24°CDB in all other *conditioned spaces*; and

(ii) if the proposed building has no mechanically provided cooling or has mixed mode cooling, have the same method of control and control set points for non-mechanical cooling as the proposed building.

(d) The infiltration rate in each zone must be—

(i) 0.7 air changes per hour throughout all zones when there is no mechanically supplied *outdoor air*; and

(ii) 0.35 air changes per hour at all other times.

(e) The artificial lighting must achieve the *required* maximum *Illumination power density* in Part J6 without applying the control device adjustment factors.

(f) *Minimum Energy Performance Standards* must be applied to *services* not covered by Parts J5 to J7.

3. Proposed building and reference building

The *annual greenhouse gas emissions* must be calculated for the proposed building and the *reference building* using the same:

(a) **General—**

(i) *annual greenhouse gas emissions* calculation method; and

(ii) greenhouse gas emissions factors based on either—

(A) the factors in Table 3a; or

(B) the current full fuel cycle emissions factors published by the Australian Government, except, where the greenhouse gas intensity of electricity is less than half the greenhouse gas intensity of natural gas—

(aa) electricity is to be weighted as 1; and

(bb) natural gas is to be weighted as 2; and

Table 3a Greenhouse gas emissions factors ($kgCO_2$-e/GJ)

Energy Source	ACT	NSW	NT	Qld	SA	Tas	Vic	WA
Electricity	-	256	201	256	170	61	323	207
Natural gas	-	51.53	51.53	51.53	51.53	51.53	51.53	51.53

Note to Table 3a: National emissions factors are not applicable to calculations for buildings in the ACT as they

do not take into account investments in renewable electricity generation in the national electricity market made by the ACT. Values for the ACT can be found in the *ACT Appendix*.

(iii) location, being either—

(A) the location where the building is to be constructed if appropriate climatic data is available; or

(B) the nearest location with similar climatic conditions, for which climatic data is available; and

(iv) adjacent structures and features; and

(v) orientation; and

(vi) building form, including—

(A) the roof geometry; and

(B) the floor plan; and

(C) the number of *storeys*; and

(D) the ground to lowest floor arrangements; and

(E) the size and location of *glazing*; and

(F) external doors; and

(vii) testing standards including for insulation, *glazing*, water heater and unitary *air-conditioning* equipment; and

(b) **Fabric and glazing—**

(i) quality of insulation installation; and

(ii) thermal resistance of air films including any adjustment factors, moisture content of materials and the like; and

(iii) dimensions of external, internal and separating walls; and

(iv) internal shading devices, their colour and their criteria for operation; and

(c) **Services—**

(i) range and type of *services* and energy sources, other than *renewable energy* generated on *site*; and

(ii) assumptions and means of calculating the temperature difference across *air-conditioning* zone boundaries; and

(iii) floor coverings and furniture and fittings density; and

(iv) internal artificial lighting illumination levels; and

(v) internal heat gains including people, lighting, appliances, meals and other electric power loads; and

(vi) *air-conditioning* system configuration and zones; and

(vii) profiles for occupancy, *air-conditioning*, lighting and internal heat gains from people, hot meals, appliances, equipment and heated water supply systems based on—

(A) Specification JVc; or

(B) *NABERS Energy for Offices* simulation requirements; or

(C) *Green Star* simulation requirements; or

(D) the actual building if—

(aa) the operating hours per year are not less than 2 500; or

(bb) the daily operating profiles are not listed in Specification JVc; and

(viii) supply heated water temperature and rate of use; and

(ix) infiltration values, unless the following have been specified—

(A) additional sealing provisions to those *required* by Part J3; and

(B) an intended building leakage of less than 10 $m^3/hr.m^2$ at 50Pa; and

(C) pressure testing to verify achievement of the intended building leakage,

in which case the intended building leakage at 50Pa may be converted into a whole building infiltration value for the proposed building infiltration using Tables 4.16 to 4.24 of CIBSE Guide A; and

(x) sequencing for water heaters, refrigeration chillers and heat rejection equipment such as cooling towers; and

(xi) representation of clothing and metabolic rate of the occupants; and

(xii) control of *air-conditioning* except—

(A) the *reference building* must have variable temperature control for chilled and heated water that modulates the chilled water and heated water temperatures as required to maximise the efficiency of the chiller or boiler operation during periods of low load; and

(B) if the controls for the proposed building are not adequately specified or cannot be simulated, the sample control specifications in Appendix B of AIRAH-DA28 must be used; and

(xiii) environmental conditions such as ground reflectivity, sky and ground form factors, temperature of external bounding surfaces, air velocities across external surfaces and the like; and

(xiv) number, sizes, floors and traffic served by lifts and escalators.

4. Services — proposed and reference building

For the modelling of *services* for the purposes of calculating *annual greenhouse gas emissions*—

(a) system demand and response for all items of plant must be calculated on a not less frequent than hourly basis; and

(b) energy usage of all items of plant must be calculated with allowances for—

(i) part load performance; and

(ii) staging to meet system demand; and

(c) energy usage of cooling plant must be calculated with allowances for—

(i) the impact of chilled water temperature on chiller efficiency; and

(ii) the impact of condenser water temperature on water-cooled plant efficiency; and

(iii) the impact of ambient temperature on air-cooled plant efficiency; and

(iv) the energy use of primary pumps serving individual chillers; and

(v) the energy use of auxiliary equipment, including controls and oil heating for chillers; and

(vi) thermal losses in the chilled water system; and

(vii) the impact of chilled water temperature on thermal losses in the chilled water system; and

(d) energy usage of water heating systems for space heating must be calculated with allowances for—

(i) the impact of water temperature on water heater efficiency; and

(ii) the energy use of primary or feedwater pumps serving individual water heaters; and

(iii) thermal losses in water heating systems; and

(iv) the thermal mass of water heating systems, accounting for thermal losses during periods when the system is not operating; and

(e) energy usage of fan and pump systems must be calculated with allowances for—

(i) the method of capacity regulation; and

(ii) the use of either fixed or variable pressure control; and

(f) energy usage of pump systems must be calculated with allowances for the system fixed static pressure head; and

(g) energy usage of auxiliary equipment associated with co-generation and tri-generation systems, including pumps, cooling towers and jacket heaters, must be calculated; and

(h) where the energy usage of the heated water supply for food preparation and sanitary purposes or the energy usage of lifts and escalators is the same in the proposed building and the *reference building*, they may be omitted from the calculation of both the proposed building and the *reference building*; and

(i) energy use of a lift in a building with more than one classification may be apportioned according to the number of *storeys* of the part for which the *annual greenhouse gas emissions* and *thermal comfort level* are being calculated.