



ENERGY EFFICIENCY REPORT

NCC 2019 AMENDMENT 1

SECTION J

NSW RFS SNOWY MONARO

**FIRE CONTROL CENTRE,
AIRCRAFT HANGAR
AND STORES BUILDING**

GEEBUNG STREET POLO FLAT, SNOWY MONARO

**FOR
NSW PUBLIC WORKS ADVISORY**

14th JULY 2023

REVISION A

22396

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01 Introduction

This report is intended to provide the details of energy efficiency provisions as required by Section J NCC 2019 – Amendment 1.

Note: From May 2023 to September 2023 Section J of NCC 2019 Volume One Amendment 1 may apply instead of Section J NCC 2022 Volume 1. From October 2023 Section J of NCC 2022 Volume One applies.

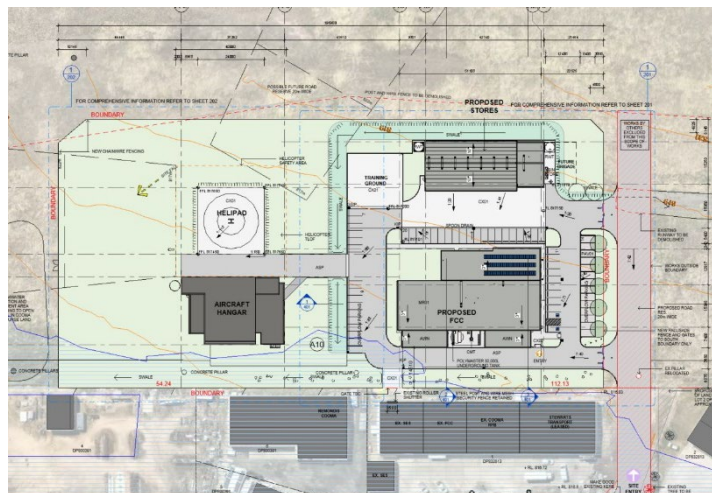
Under NCC Section J, Performance Requirement JP1 is satisfied when Parts J1 to J7 are complied with, therefore complying with the Deemed-to Satisfy provisions on Part J0.1.

We have set out this report based on each Part of Section J and have included calculations where required.

02 Site

The proposed buildings are located at 11 Geebung Street, Polo Flat, 2630, at Lot 1, DP 832813.

It sits within a general industrial zone, within the Narrabri Council area.



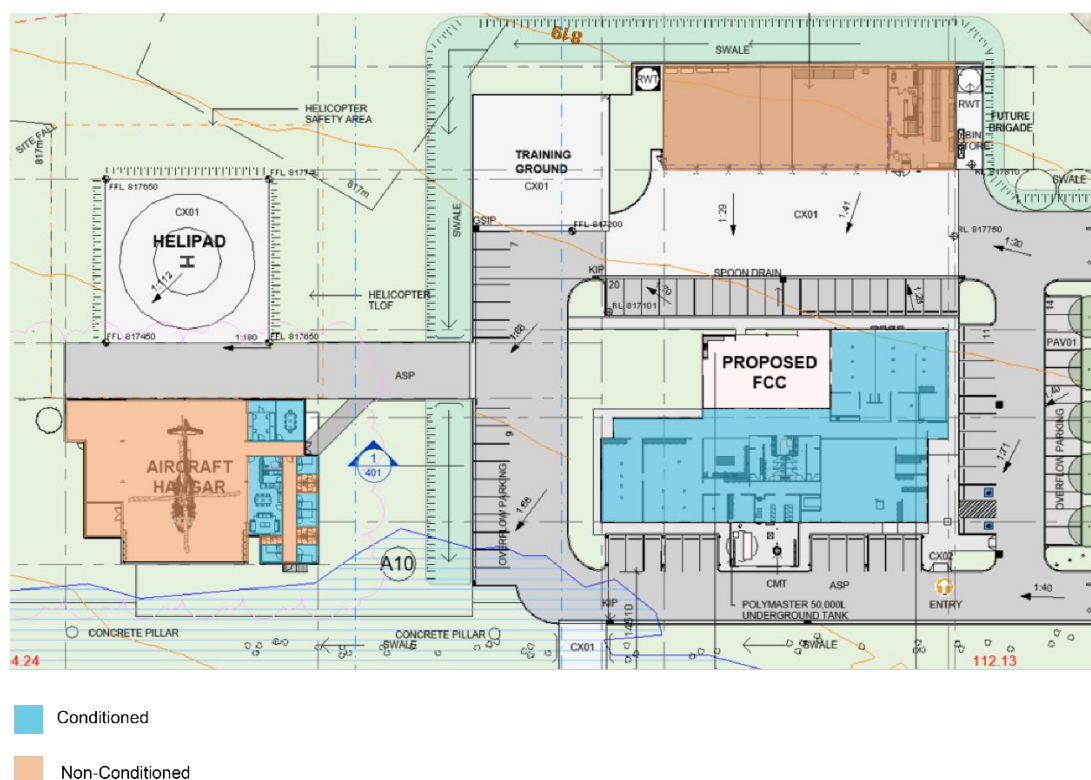
03 Proposed Building

The enclosed conditioned parts to be assessed in the new buildings will be the following classes:

- Fire Control Centre – Class 5– 1002m²
- Aircraft Hangar – Classes 4 and 5 – 155m²

Non-conditioned spaces Class 7a vehicle and stores bays in the Stores Buildings include service cupboards accessed from vehicle bay areas.

Conditioned and Non-conditioned spaces are highlighted in the diagram below.



04 Building Fabric – Part J1

- J1.1 This part applies to the conditioned spaces Classes 3 and 5 (Fire Control Centre and Aircraft Hangar) buildings.
- J1.2 Insulation to be installed in this building will comply with AS/NZS 4859.1 and Clause J1.2
- J1.3 – Climate Zone = 7

05 Roof – Part J1.3

The roof of the building is Shale Grey Colorbond, with a surface solar absorbance value of 0.43, which is not more than 0.45. This is less than the maximum permitted under J1.3. For roof and ceiling construction Section J1.3 requires R3.7 min for a downward direction of heat flow.

The specified Roof Construction for the conditioned spaces (Flat Ceiling Areas) is as follows:

	R-Values
Outdoor air film	0.040
Colorbond Roof Sheeting	0.000
140mm Roof Insulation, CSR Anticon	3.300
250mm Roof Purlins with Airspace	0.460
Suspended plasterboard ceiling	0.060
Indoor Air Film	0.110

Total System R-value **3.970** (Min. required R3.7)

Refer to Annexure A for full report. Compliant with AS4859.2.

- d) J1.4 – Roof lights are not installed in the building.

06 Walls – Part J1.5

- e) J1.5 – Section J1.5b requires external walls and glazing that are part of the envelope to have a Total System U-value of walling-glazing construction not greater than U1.1 (climate zone 7). This also applied to internal walls separating conditioned space to non-conditioned space.

Wall components of a wall-glazing construction, where the wall is 80% or more of the area of the wall-glazing construction, must achieve a min. total R-value of R1.4.

The specified External Wall Construction (Colorbond Metal Wall Cladding) for the FCC and the RFB buildings are described below:

Building: Fire Control Centre

Wall Type: WS951

	R-Values
Outdoor air film	0.030
Colorbond Metal Wall Cladding	0.000
Unventilated 50mm Air Space battens	0.160
Wall Sarking Bradford Enviroseal Wall Wrap	0.000
Thermal Bridging	- 0.800
Thermal Break tape 6mm thick	0.200
92mm Steel Stud	0.000
90mm steel stud Bulk Insulation Bradford Gold	2.700
High Performance Wall Batts	
13mm Plasterboard Lining	0.080
Indoor Air Film (still air)	0.110
Total System R-value	2.480
	(Min. required R1.4)

Figures based on ICANZ System.

Building: Fire Control Centre

Wall Type: WS952

	R-Values
Outdoor air film	0.030
Colorbond Metal Wall Cladding	0.000
Unventilated 50mm Air Space battens	0.160
Wall Sarking Bradford Enviroseal Wall Wrap	0.000

Thermal Bridging	- 0.800
Thermal Break tape 6mm thick	0.200
92mm Steel Stud	0.000
90mm steel stud Bulk Insulation Bradford Gold	2.700
High Performance Wall Batts	
12mm Plywood Lining	0.090
Indoor Air Film (still air)	0.110
Total System R-value	2.490
	(Min. required R1.4)

Figures based on ICANZ System.

Building: Aircraft Hangar
Wall Type: WS953

	R-Values
Outdoor air film	0.030
Lysaght Dominion Cladding	0.000
Unventilated 50mm Air Space battens	0.160
Wall Sarking Bradford Enviroseal Wall Wrap	0.000
Thermal Bridging	- 0.800
Thermal Break tape 6mm thick	0.200
92mm Steel Stud	0.000
90mm steel stud Bulk Insulation Bradford Gold	2.700
High Performance Wall Batts	
13mm Plasterboard Lining	0.080
Indoor Air Film (still air)	0.110
Total System R-value	2.480
	(Min. required R1.4)

Figures based on ICANZ System.

Building: Fire Control Centre
Wall Type: WS961

	R-Values
Outdoor air film	0.030
Colorbond Metal Wall Cladding	0.000
Unventilated 35mm Air Space battens	0.160
Wall Sarking Bradford Enviroseal Wall Wrap	0.000
Thermal Bridging	- 0.800
Thermal Break tape 6mm thick	0.200
92mm Steel Stud	0.000
90mm steel stud Bulk Insulation Bradford Gold	2.700
High Performance Wall Batts	
13mm Plasterboard Lining	0.080
Indoor Air Film (still air)	0.110

Total System R-value**2.480**

(Min. required R1.4)

Figures based on ICANZ System.

Building: Fire Control Centre

Wall Type: WS962

	R-Values
Outdoor air film	0.030
Colorbond Metal Wall Cladding	0.000
Unventilated 35mm Air Space battens	0.160
Wall Sarking Bradford Enviroseal Wall Wrap	0.000
Thermal Bridging	- 0.800
Thermal Break tape 6mm thick	0.200
92mm Steel Stud	0.000
90mm steel stud Bulk Insulation Bradford Gold	2.700
High Performance Wall Batts	
12mm Plywood Lining	0.090
Indoor Air Film (still air)	0.110
Total System R-value	2.490
	(Min. required R1.4)

Figures based on ICANZ System.

Refer to Annexure A for the Total System U-value for each elevation of each respective building.

07 Windows – Part J1.5

- f) The windows are a combination of Aluminium framed double-glazed double hung, awning and sliding sash, with fixed panels, clear glass and double glazing.

- g) Shading is provided by eaves overhangs throughout.

The aircraft hangar has east and south facing windows with no eaves overhangs.

08 External Glazing – Part J2

- a) J2.4 is applicable for Class 4, 5 and 9b buildings. Refer to Annexure A for the NCC Glazing Calculations.

The aggregate air conditioning value is to be within the allowance shown below in accordance with Table 2.4a.

The maximum aggregate conductance and aggregate solar heat gain attributable to each glazing element is set out below based on WERS data.

The specified externally glazed windows and doors are as follows:

Fire Control Centre and Aircraft Hangar

DFA01 Hinged Door:	Capral 225 Series (commercial). Glazed Hinged Aluminium Framed Single Door.
Glass Type:	Viridian Energy Tech Clear. Double Glazed IGU High Performance Solar Control
U-Value:	2.90
SHGC Value:	0.31
DFA02 Hinged Door:	Capral 225 Series (commercial). Glazed Hinged Aluminium Framed Double Hinged Door.
Glass Type:	Viridian Energy Tech Clear. Double Glazed IGU High Performance Solar Control
U-Value:	2.90
SHGC Value:	0.31
DSL01 Sliding Door:	Capral 480 Series (commercial). Glazed Sliding Aluminium Framed Door.
Glass Type:	Viridian Energy Tech Clear. Double Glazed IGU High Performance Solar Control
U-Value:	2.90
SHGC Value:	0.31
WAT01 Fixed Window:	Capral 425 Narrowline Series (commercial). Fixed Centre Glazed Aluminium Framed Window.
Glass Type:	Viridian Energy Tech Clear. Double Glazed IGU High Performance Solar Control
U-Value:	2.80
SHGC Value:	0.36
WAT01 Fixed Window:	Capral 425 Narrowline Series (commercial). Fixed Centre Glazed Aluminium Framed Window.
Glass Type:	Viridian Vlam Hush. Single Glazed High Acoustic Glass
U-Value:	4.00
SHGC Value:	0.43
WAT02 Double Hung Window:	Capral 481 Double Hung Series (commercial). Double Hung Aluminium Window
Glass Type:	Viridian Energy Tech Clear. Double Glazed IGU High Performance Solar Control

U-Value: 3.70

SHGC Value: 0.49

WAT03 Hinged Door Window: Capral 225 Hinged Door Series (commercial). Aluminium Hinged Door.

Glass Type: Viridian Energy Tech Clear. Double Glazed IGU High Performance Solar Control

U-Value: 3.50

SHGC Value: 0.40

WAT07 Awning Window: Capral 382482 Series (commercial). Aluminium Awning Window.

Glass Type: Viridian Vlam Hush. Double Glazed IGU High Performance Solar Control

U-Value: 4.50

SHGC Value: 0.34

Stores Building

WAT04 Sliding Window: Capral 480 Series Sliding Window (commercial)

Glass Type: Viridian Vlam Hush. Single Glazed High Acoustic Glass

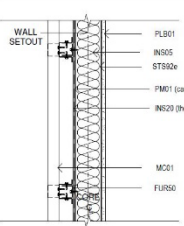
U-Value: 5.30

SHGC Value: 0.38

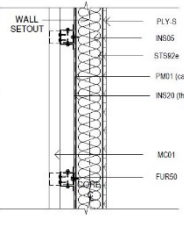
09 Combined Wall and Window Assessment

The designated wall and window system meets the requirements, as shown below. The full report has been attached in Appendix A.

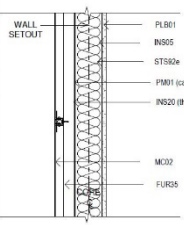
Fire Control Centre

EXTERNAL WALL TYPES	WS951	
		
	THICKNESS (mm)	199
	THERMAL RATING	
	FIRE RATING	++
	ACOUSTIC RATING	RW45
	INSULATION RATING	R2.7 / 90mm
	COMMENTS	

Façade							
Wall Systems							
	Layer 1	Layer 2 (Air space)	Layer 3	Layer 4	Layer 5	Layer 6	Layer 7
Ventilation	Unventilated						
Material	Steel	Airspace - 35mm, outer surface 0.20 emittance	Airspace - 70mm, inner surface 0.05 emittance	Glass wool	Gypsum plasterboard		
Thickness (mm)	1	39	50	50	13		
Conductivity (W/mK)	47.500	n/a	n/a	0.040	0.170		
Framing Material	Steel						
Metal Frame, Web Thickness (mm)	0.95	0.95	0.1				
Metal Frame, Flange Width (mm)	38	50	90				
Framing Area %	12.0%	12.0%	12.0%				
Thermal Break Material				EPS	None		
Thermal Break Thickness (mm)	0	0	6	1			
Thermal Break Overlap Area %	0.0%	0.0%	5.0%	1.0%			
Resistance (m².K/W)	0.00	0.00	0.00	2.25	0.08	0	0
Wall Construction	WS951						
	External Surface Resistance (moving air, more than 3m/s and not more than 7m/s wind)						
	Internal Surface Resistance (still air, on a wall)						
	System R-Value (m².K/W)						
	System U-Value (W/m².K)						

EXTERNAL WALL TYPES	WS952	
		
	THICKNESS (mm)	198
	THERMAL RATING	
	FIRE RATING	++
	ACOUSTIC RATING	RW45
	INSULATION RATING	R2.7 / 90mm
	COMMENTS	PLY-8 STRUCTURAL PLYWOOD SHEET SUBSTRATE FOR ALL WALLS SUPPORTING WHITEBOARD & AV EQUIPMENT. FOR COMPREHENSIVE INFORMATION ON LOCATION OF WHITEBOARDS & AV EQUIPMENT REFER TO ARCHITECTURAL ROOM LAYOUT DRAWINGS & FURNITURE PLANS.

Façade							
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	Steel	Airspace - 35mm, outer surface 0.20 emittance	Airspace - 70mm, inner surface 0.05 emittance	Glass wool	Plywood		
Thickness (mm)	1	38	50	90	12		
Conductivity (W/mK)	47.500	n/a	n/a	0.040	0.140		
Framing Material	Steel						
Metal Frame, Web Thickness (mm)	0.95	0.95	0.1				
Metal Frame, Flange Width (mm)	38	50	90				
Framing Area %	12.0%	12.0%	12.0%				
Thermal Break Material				EPS	None		
Thermal Break Thickness (mm)	0	0	6	1			
Thermal Break Overlap Area %	0.0%	0.0%	5.0%	1.0%			
Resistance (m².K/W)	0.00	0.00	0.00	2.25	0.09	0	0
Wall Construction	WS952						
	External Surface Resistance (moving air, more than 3m/s and not more than 7m/s wind)						
	Internal Surface Resistance (still air, on a wall)						
	System R-Value (m².K/W)						
	System U-Value (W/m².K)						

EXTERNAL WALL TYPES	WS961	
		
	THICKNESS (mm)	176
	THERMAL RATING	
	FIRE RATING	++
	ACOUSTIC RATING	RW45
	INSULATION RATING	R2.7 / 90mm
	COMMENTS	

Façade							
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	Steel	Airspace - 35mm, outer surface 0.20 emittance	Airspace - 70mm, inner surface 0.05 emittance	Glass wool	Gypsum plasterboard		
Thickness (mm)	1	27	35	90	13		
Conductivity (W/mK)	47.500	n/a	n/a	0.040	0.170		
Framing Material	Steel						
Metal Frame, Web Thickness (mm)	0.95	0.95	0.1				
Metal Frame, Flange Width (mm)	27	35	90				
Framing Area %	12.0%	12.0%	12.0%				
Thermal Break Material				EPS	None		
Thermal Break Thickness (mm)	0	0	6	1			
Thermal Break Overlap Area %	0.0%	0.0%	5.0%	1.0%			
Resistance (m².K/W)	0.00	0.00	0.00	2.25	0.08	0	0
Wall Construction	WS961						
	External Surface Resistance (moving air, more than 3m/s and not more than 7m/s wind)						
	Internal Surface Resistance (still air, on a wall)						
	System R-Value (m².K/W)						
	System U-Value (W/m².K)						

WS962

THICKNESS	175
THERMAL RATING	
FIRE RATING	FF
ACOUSTIC RATING	RW45
INSULATION RATING	R2.7 / 50mm

COMMENTS
PLY-9 STRUCTURAL PLYWOOD SHEET
SUBSTRATE FOR ALL WALLS
SUPPORTING WHITEBOARD & AV
EQUIPMENT. FOR COMPREHENSIVE
INFORMATION ON LOCATION OF
WHITEBOARDS & AV EQUIPMENT REFER
TO ARCHITECTURAL ROOM LAYOUT
DRAWINGS & FURNITURE PLANS.

Façade
Wall Systems

Calculator

Wall Systems

Total System R-value Calculator

	Layer 1	Layer 2 (Airspace)	Layer 3	Layer 4	Layer 5	Layer 6	Layer 7
Ventilation	Unventilated						
Material	Steel	Airspace - 35mm, outer surface 0.20 emittance	Airspace - 70mm, inner surface 0.95 emittance	Glass wool	Plywood		
Thickness (mm)	1	27	35	50	12		
Conductivity (W/mK)	47.500	n/a	n/a	0.040	0.140		
Framing Material	Steel	Steel					
Metal Frame, Web Thickness (mm)	0.95	0.95	0.1				
Metal Frame, Flange Width (mm)	27	35	90				
Framing Area %	12.0%	12.0%	12.0%				
Thermal Break Material				EPS	None		
Thermal Break Thickness (mm)	0	0	6	1			
Thermal Break Overlap Area %	0.0%	0.0%	5.0%	1.0%			
Resistance (m².K/W)	0.00	0.00	0.00	2.25	0.09	0	9
Wall Construction	WS962						
	External Surface Resistance (moving air, more than 3m/s and not more than 7m/s wind)						0.03
	Internal Surface Resistance (still air, on a wall)						0.12
	System R-Value (m².K/W)						2.49
	System U-Value (W/m².K)						0.40

Façade
Report

Calculator

Project Summary

Date
14/07/2023

Name
Jennifer Rosbach

Company
NBRS

Position
Senior Architect

Building Name / Address
Snowy Monaro FCC
9 Polo Flat Road, Polo Flat

Building State
NSW

Climate Zone
Climate Zone 7 - Cool temperate

Building Classification
Mixed 2 - 2 common, 5, 6, 7, 8, 9b, 9a non-ward

Stores Above Ground
1

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 =

	North	East	Method 1 South	West	Method 2 All
Wall-glazing U-Value (W/m².K)	1.50	1.06	0.69	0.78	1.01
Solar Admittance	0.10	0.06	0.03	0.03	
AC Energy Value					50

Method 1

Wall-glazing U-Value

Solar Admittance

Method 2

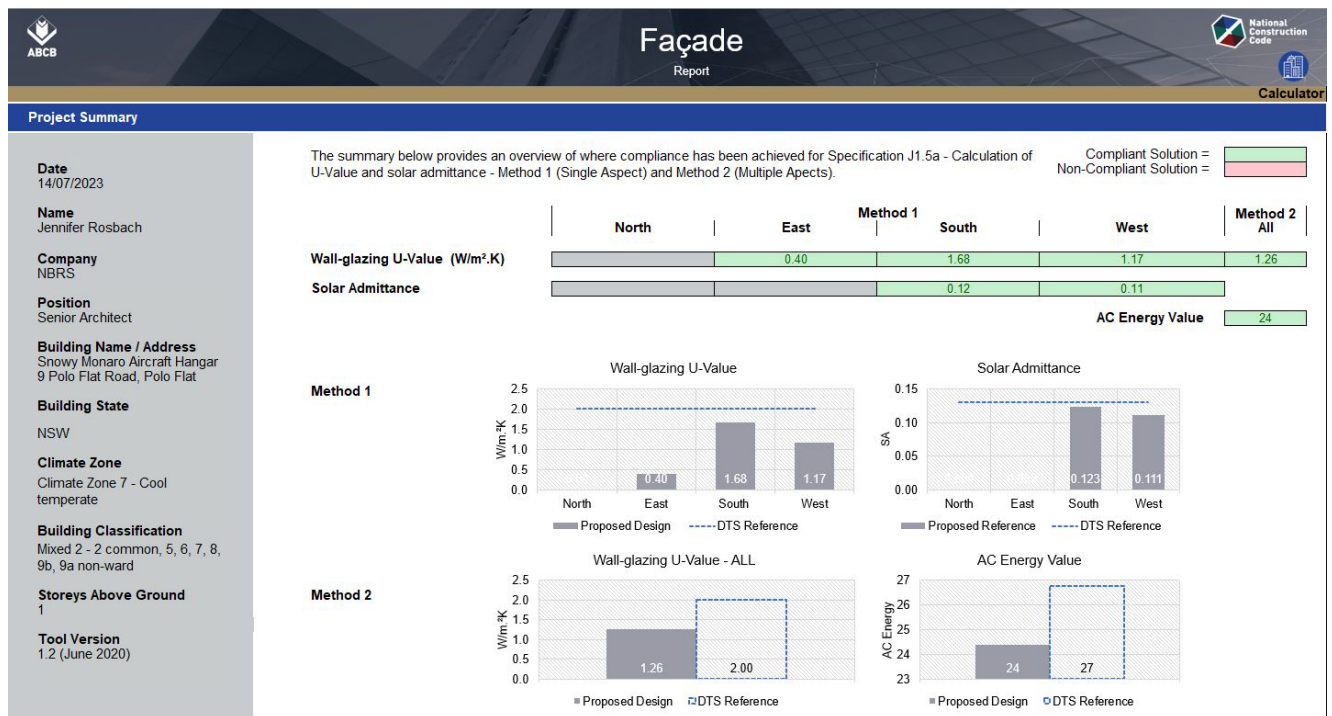
Wall-glazing U-Value - ALL

AC Energy Value

Aircraft Hangar

WS952	
	THICKNESS 198 THERMAL RATING FIRE RATING J1 ACOUSTIC RATING RW45 INSULATION RATING R2.7 / 50mm COMMENTS PLY-9 STRUCTURAL PLYWOOD SHEET SUBSTRATE FOR ALL WALLS SUPPORTING WHITEBOARD & AV EQUIPMENT. FOR COMPREHENSIVE INFORMATION ON LOCATION OF WHITEBOARDS & AV EQUIPMENT REFER TO ARCHITECTURAL ROOM LAYOUT DRAWINGS & FURNITURE PLANS.

Façade							
Wall Systems							
Total System R-value Calculator							
Ventilation	Layer 1	Layer 2 (Air space)	Layer 3	Layer 4	Layer 5	Layer 6	Layer 7
Material	Steel	Airspace - 35mm, outer surface 0.20 emittance	Airspace - 75mm, inner surface 0.95 emittance	Glass wool	Plywood		
Thickness (mm)	1	35	50	50	12		
Conductivity (W/mK)	47.500	n/a	n/a	0.040	0.140		
Framing Material	Steel	Steel					
Metal Frame, Web Thickness (mm)	0.95	0.96	0.1				
Metal Frame, Flange Width (mm)	38	50	50				
Framing Area %	12.9%	12.0%	12.6%				
Thermal Break Material			EPS	None			
Thermal Break Thickness (mm)	0	0	6	1			
Thermal Break Overlap Area %	0.0%	0.0%	5.0%	1.0%			
Resistance (m².K/W)	0.00	0.00	0.96	2.25	0.09	0	0
Wall Construction	WS952	External Surface Resistance (moving air, more than 3m/s and not more than 7m/s wind)					0.03
		Internal Surface Resistance (still air, on a wall)					0.12
		System R-Value (m².K/W)					2.49
		System U-Value (W/m².K)					0.40



10 Floors – Part J1.6

- a) J1.6 – The new floor is a concrete slab on ground with no in-slab heating and requires a minimum R-Value of R2.0.

The specified Floor Construction (concrete slab on ground) is described below for the Fire Control Centre:

	R-Values
Interior air film	0.160
Sheet vinyl floor lining	0.008
100mm reinforced concrete slab	0.100
Underfloor insulation – RMax Isolite X-38 premium grade polystyrene board 35mm	1.000
Ground/ Soil Thermal Resistance – refer to Spec J1.6 Table 2b	2.300
Total System R-value	3.568
	(Min. required R2.0)

Figures based on ICANZ System.

The specified Floor Constructions (concrete slab on ground) are described below for the Aircraft Hangar:

	R-Values
Interior air film	0.160
Sheet vinyl floor lining	0.008
100mm reinforced concrete slab	0.100
Underfloor insulation – RMax Isolite X-38 premium grade polystyrene board 35mm	1.000
Ground/ Soil Thermal Resistance – refer to Spec J1.6 Table 2b	2.300
Total System R-value	3.568
	(Min. required R2.0)

	R-Values
Interior air film	0.160
10mm Loop Pile Carpet	0.008
100mm reinforced concrete slab	0.100
Underfloor insulation – RMax Isolite X-38 premium grade polystyrene board 35mm	1.000
Ground/ Soil Thermal Resistance – refer to Spec J1.6 Table 2b	2.300
Total System R-value	3.568
	(Min. required R2.0)

Figures based on ICANZ System.

The specified Floor Construction (concrete slab on ground) is described below for the Stores Building:

	R-Values
Interior air film	0.160
Sheet vinyl floor lining	0.008
100mm reinforced concrete slab	0.100
Ground/ Soil Thermal Resistance – refer to Spec	1.300
J1.6 Table 2b	
Total System R-value	2.568
	(Min. required R2.0)

Figures based on ICANZ System.

- b) J2.5 – Some shading is provided by eaves overhangs.

11 Building Sealing – Part J3

All external doors opening directly to a conditioned space shall be fitted with a door closer and seals complying with clause J3.4(c).

All doors that separate a conditioned space from a non-conditioned space shall be fitted with seals complying with clause J3.4(c). and door closers complying with clause J3.4(d).

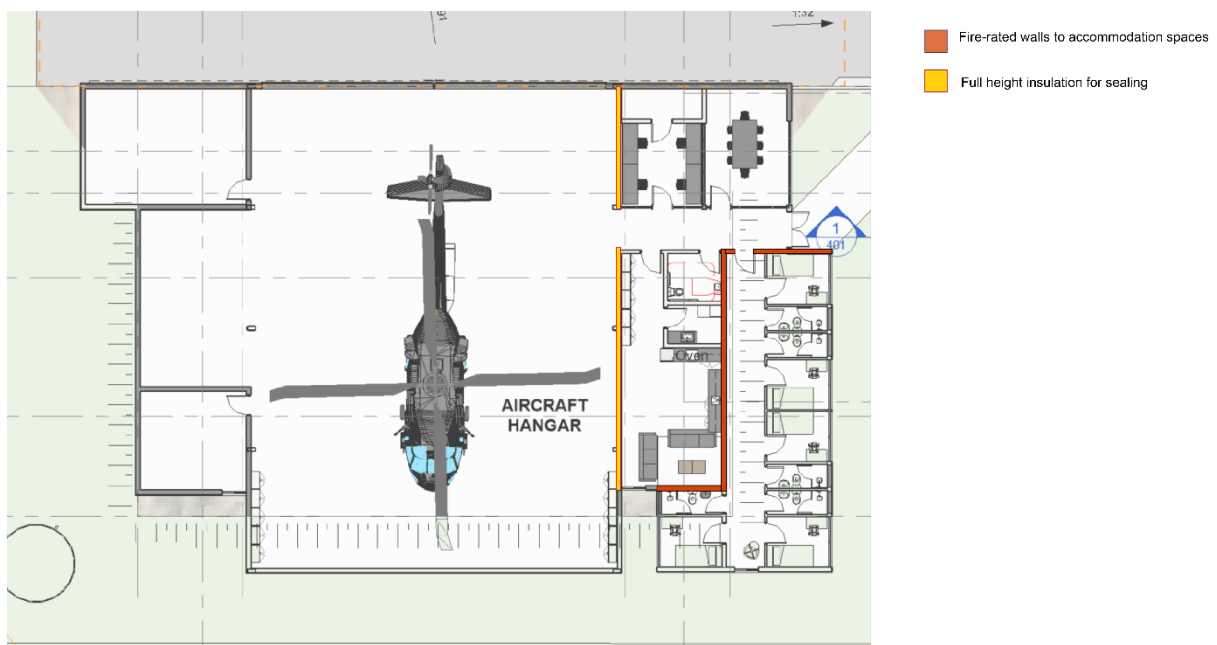
All windows will be constructed and installed to comply with AS 2047.

Roof ventilation fans in the Stores Building and the Fire Control Centre will be fitted with a manual damper to comply with Clause J3.5. Refer to Annexure B for Certifications of Mechanical Services.

Construction of roof, walls and floors shall comply with Clause J3.6(b).

In the Aircraft Hangar, the walls dividing the accommodation spaces and the kitchen/ living area will be fire rated (see highlighted plans below).

In the case of service cupboards opening off the non-conditioned space, the rear and side walls will be insulated (see highlighted plans below) and extend to an insulated ceiling over the cupboard with walls above the cupboard insulated for full height to the roof.



12 Air Conditioning and Ventilation Systems – Part J5

Refer to Annexure B for Certification of Mechanical Services

13 Artificial Lighting and Power – Part J6

Refer to Annexure B for Certification of Electrical Services

14 Heated Water Supply – Part J7

Refer to Annexure B for Certification of Hydraulic Services.

15 Facilities for Energy Monitoring – Part J8

a) Part J8.3 – Facilities for Energy Monitoring

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

Refer to Electrical Services Drawings E00.00 to E30.00 inclusive and Annexure B for Certification of Electrical Services.

Annexure A – Glazing Calculations

For use with NCC Clause J2.4



Façade

Report



Calculator

Project Summary

Date
14/07/2023

Name
Jennifer Rosbach

Company
NBRS

Position
Senior Architect

Building Name / Address
Snowy Monaro FCC
9 Polo Flat Road, Polo Flat

Building State
NSW

Climate Zone
Climate Zone 7 - Cool temperate

Building Classification
Mixed 2 - 2 common, 5, 6, 7, 8, 9b, 9a non-ward

Storeys Above Ground
1

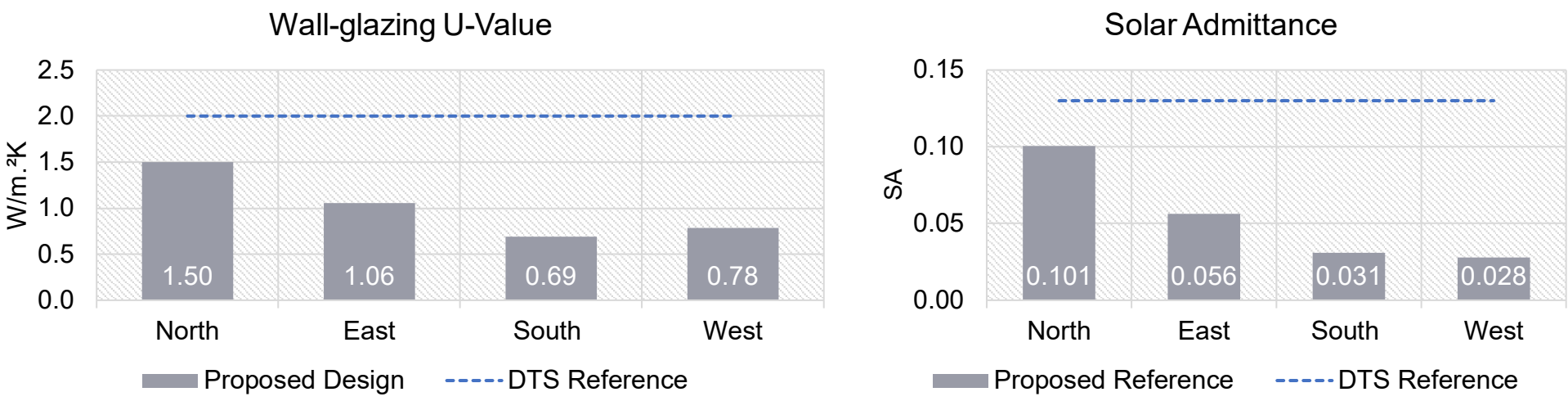
Tool Version
1.2 (June 2020)

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).

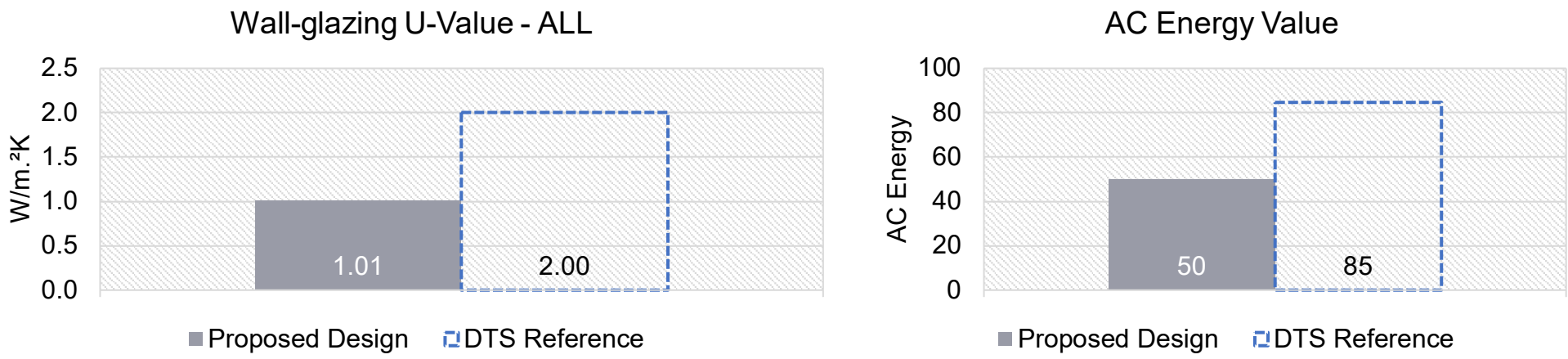
Compliant Solution =
Non-Compliant Solution =

	North	East	Method 1 South	West	Method 2 All
Wall-glazing U-Value (W/m².K)	1.50	1.06	0.69	0.78	1.01
Solar Admittance	0.10	0.06	0.03	0.03	
AC Energy Value					50

Method 1



Method 2



Project Details

	North	East	South	West
Glazing Area (m²)	48.672	47.3853	11.612	14.13
Glazing to Façade Ratio	39%	25%	11%	10%
Glazing References	WAT01 - F WAT03 - H	WAT01 - F WAT03 - H WAT02 - DH	WAT01 - F WAT03 - H	WAT02 - DH WAT03 - H WAT01 - F WAT04 - SD
Glazing System Types	Fixed USER (DEFINED)	Fixed USER (DEFINED)	Fixed USER (DEFINED)	USER (DEFINED) Fixed Sliding Door
Glass Types	Double Glazed Unit - double low-E coating	Double Glazed Unit - double low-E coating	Double Glazed Unit - double low-E coating	Double Glazed Unit - double low-E coating Double Glazed Unit - single low-E coating
Frame Types	Aluminium thermally broken	Aluminium thermally broken	Aluminium thermally broken	Aluminium thermally broken
Average Glazing U-Value (W/m².K)	3.22	3.04	3.15	4.32
Average Glazing SHGC	0.38	0.38	0.38	0.40
Shading Systems	Horizontal	Horizontal	Horizontal	Horizontal
Wall Area (m²)	76.244	144.134	98.834	131.753
Wall Types	Wall	Wall	Wall	Wall
Methodology	Wall			
Wall Construction	WS951__ WS952__ WS961__	WS951__ WS962__	WS951__ WS962__	WS951__ WS962__
Wall Thickness	199 198 176	199 175	199 175	199
Average Wall R-value (m².K/W)	2.48	2.48	2.48	2.48
Solar Absorptance	0.7	0.7	0.7	0.7



Project Summary

Date
14/07/2023

Name
Jennifer Rosbach

Company
NBRS

Position
Senior Architect

Building Name / Address
Snowy Monaro Aircraft Hangar
9 Polo Flat Road, Polo Flat

Building State
NSW

Climate Zone
Climate Zone 7 - Cool
temperate

Building Classification
Mixed 2 - 2 common, 5, 6, 7, 8,
9b, 9a non-ward

Storeys Above Ground
1

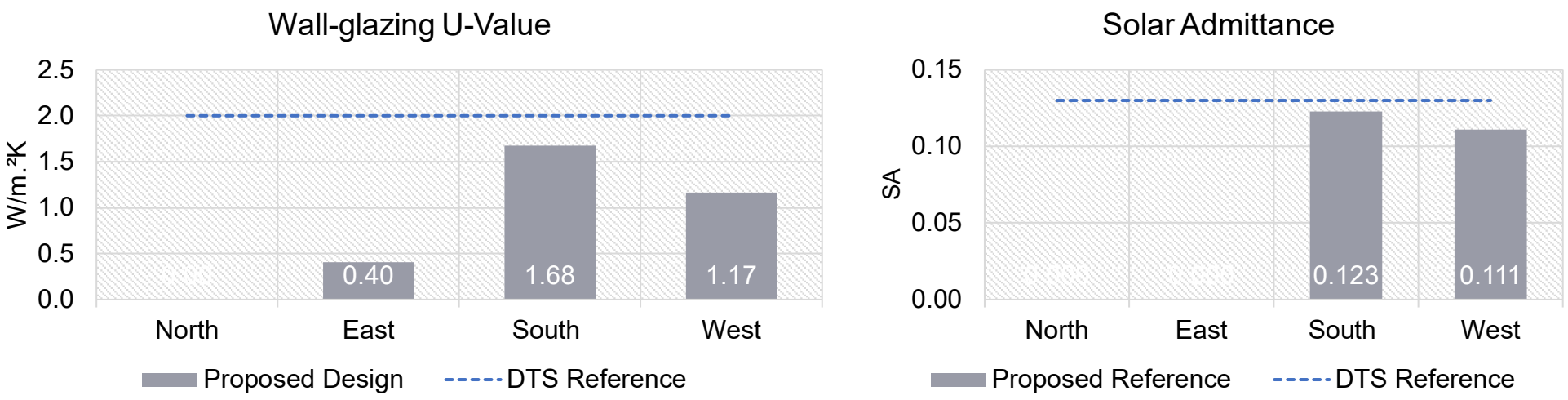
Tool Version
1.2 (June 2020)

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 Apects).

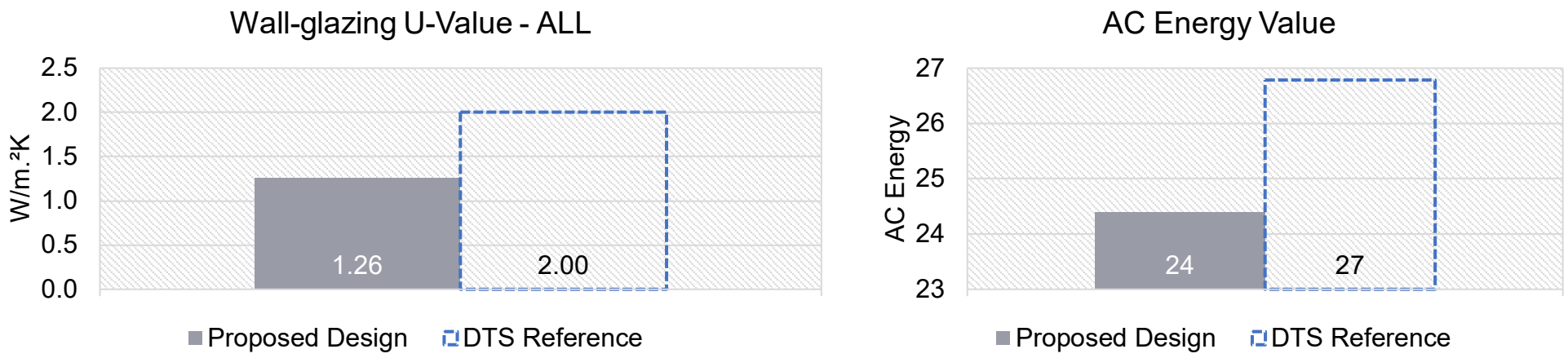
Compliant Solution =
Non-Compliant Solution =

	North	East	Method 1 South	West	Method 2 All
Wall-glazing U-Value (W/m².K)		0.40	1.68	1.17	1.26
Solar Admittance			0.12	0.11	
AC Energy Value					24

Method 1



Method 2



Project Details

	North	East	South	West
Glazing Area (m²)		0	59.213	12.268
Glazing to Façade Ratio		0%	46%	30%
Glazing References			WAT07 - A WAT01 - F WAT03 - H WAT02 - DH	WAT03 - H WAT01 - F
Glazing System Types			Awning Fixed USER (DEFINED)	USER (DEFINED) Fixed
Glass Types			Double Glazed Unit - double low-E coating	Double Glazed Unit - double low-E coating
Frame Types			Aluminium thermally broken	Aluminium thermally broken
Average Glazing U-Value (W/m².K)			3.16	2.93
Average Glazing SHGC	0.00	0.00	0.37	0.37
Shading Systems	Horizontal	Horizontal	Horizontal	Horizontal
Wall Area (m²)		57.898	68.947	28.302
Wall Types		Wall	Wall	Wall
Methodology	Wall			
Wall Construction		WS953__	WS953__	WS953__
Wall Thickness		199	199	199
Average Wall R-value (m².K/W)		2.48	2.48	2.48
Solar Absorptance	0.7	0.7	0.7	0.7



Thermal Calculation Report

RFS Snowy Monaro FCC and ACH

Thermal Calculator

Generated By: Rebekah Chew

Last Update: 05/07/2023 12:07

PDF Reference No: CSR_TC_20230705-120517103

Thermal Calculation Summary

This CSR Thermal Report is a prediction of thermal performance based upon the user selected construction system and selected variables for Australian Class 3/5/6/7/8/9 building applications. The thermal calculation methodology used in this report is in accordance with the conditions and assumptions stated in AS/NZS 4859.2:2018, Clause 4.3 Total Thermal Resistance - associated with a construction of materials, computed or measured over an area sufficient to be fully representative of the element of construction, and specified as a Total R-value, including surface film resistances and thermal bridging [Unit: (m².K)/W], referred to as System Total R-value.

Construction elements are shown in order of layers from exterior to interior, including air resistance on surfaces and bridging pathways. Please refer to the full list of assumptions and limitations used in this calculation for more detail. Users are recommended to seek further advice to confirm the suitability of the thermal performance report in accordance with the National Construction Code (NCC) requirements.

IMPORTANT: This thermal calculation report must always be reproduced in full, including all Assumptions & Limitations – extracts of this report are not valid.

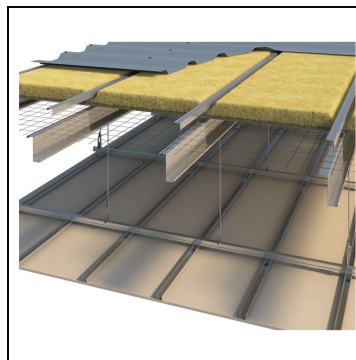
Selected Calculation Template: TC1000R

Template Description: TC1000R Flat Metal Roof with Spacers and Suspended Ceiling - Steel Frame

Note: Items in illustration are indicative only

User Selections

NCC Version	NCC 2022
Climate Zone	7



Thermal Calculation Summary

Total System R-Value	Summer	Winter
User Defined Target System R-value (Optional)		
DTS Elemental Target R-Value		3.7
Calculated System R-value (R_T)	4.34	4.15

Product Specification Summary

Component	Product
Metal Sheet	Steel Sheeting
Roof Purlin	C or Z Purlin 254mm(D) x 79mm(W) x 1.9mm BMT
Roof Insulation	CSR Bradford Anticon 140 MD R3.3 140mm
Roof Spacer	CSR Bradford Ashgrid 120mm Non-Cyclonic
Ceiling Insulation	None
Ceiling Lining	CSR Gyprock® Standard Plasterboard 13mm

Calculation Assumptions

1. Calculation methodology: Calculated in accordance with AS/NZS 4859.2:2018 which includes thermal bridging, in accordance with NZS 4214:2006 and the National Construction Code versions NCC2019 Amendment 1 and NCC2022.
2. Target R-values: Referenced minimum Target R-values refer to the Deemed to Satisfy (DTS) values from the elemental provisions in the user selected National Construction Code edition.
3. Surface Emissivity: Unless otherwise stated or selected, exterior surface emissivity is derated to allow for slight dust accumulation for upward facing horizontal and upward facing inclined surfaces - excluding those surfaces of initial emittance 0.7 or higher.
4. Thermal resistance: Where specified, CSR insulation products are tested in accordance with AS/NZS 4859.1:2018 in a NATA certified laboratory. Where available, NATA tested supporting data for thermal resistance is used for other products or when test data is unavailable, AIRAH, ASHRAE or NCC reference data for generic materials is used.
5. Material properties: Unless stated otherwise, all materials are assumed to be a constant thickness.
6. Compression of insulation: Insulation is assumed to recover to its nominal thickness unless the cavity dimension is less than the nominal thickness of the selected insulation – where insulation is compressed, the R-value is calculated in accordance with AS/NZS 4859.2:2018.
7. Roof spacers: Thermal bridging due to the incorporation of roof spacers has been included in this calculation.
8. Ceiling cavities: The thermal resistance of a ceiling cavity assumes that the total area of the ceiling cavity has no air interchange with the internal environment.
9. Ceiling Insulation: Where ceiling insulation is specified, it is assumed that the ceiling insulation provides 100% coverage of the ceiling.
10. Air leakage: Where a vapour or air control layer is required, it is assumed that shall be continuously sealed at all discontinuities, end laps, joints and penetrations.
11. Spacer Compatibility: SpacerX is only suitable for following concealed fix roof sheet applications: Apex Apdeck 700, Fielders KingKlip®, Lysaght Klip Lok 700 Hi-strength®, Metroll Metlok® 700 and Stramit Speed Deck Ultra®.
12. Installation: It is assumed that membrane materials shall be installed in accordance with AS 4200.2:2017.
13. Tropical Climate Zone 1: Installation of a vapour barrier on the external (warm) side of the construction in NCC Climate Zone 1 is recommended to reduce the transport of moisture.
14. Product Emissivity based upon results tested in accordance with AS/NZS 4200.1:2017, have been converted to hemispherical emissivity in accordance with AS/NZS 4859.2:2018.
15. Solar absorptance limitations are not considered in this calculation.
16. In accordance with AS/NZS 4859.2:2018, the System Total R-value includes mean temperature condition adjustments of material R-value and reflective air spaces to Australian Only conditions.

Specification Limitations

1. This report is only valid for use under Australian conditions and construction in accordance with the Australian National Construction Code.
2. This is a theoretical thermal calculation in accordance with AS/NZS 4859.2:2018 and may not be representative of actual in-situ performance.
3. Changes to the system configuration described in this report may result in changes to thermal performance.
4. The suitability of products recommended in this specification should be independently verified by the specifier or purchaser prior to use.
5. Product recommendations and product availability may change without notice, please refer to the CSR website for the latest information.

6. Calculation methodologies may be amended or updated from time to time without prior notice, the user, specifier or purchaser should always check the latest version prior to use.
7. This thermal performance calculation is only valid when used in conjunction with the specified CSR insulation products.
8. Images are for representation purposes only and may not accurately represent actual products, construction and/or installation methods.
9. Where the "Thermal Break" option is selected in the thermal calculation, the following assumptions apply.
 - Thermal Break provides a minimum in-situ material R-value of R 0.2.
 - Thermal Break material width is equal to the width of the framing member.
 - Thermal Break material covers all framing members including stud, noggings, top track & bottom track.
10. It should be noted that some construction systems recommended within this Thermal Calculator may require application or brand specific installation hardware – it is recommended that the installer always check the manufacturers recommended installation guidance prior to commencing.
11. This calculation only assesses and provides a system thermal performance. Other factors which are not considered and should be independently assessed, include but are not limited to:
 - Condensation risk
 - Weather proofing
 - Fire & bushfire performance
 - Structural adequacy
 - Requirements for Cyclonic regions.

System Summary

Component	Product
Roof Pitch	3
Are you in a Cyclonic Region?	No
Outer Air Film	Air Film External
Metal Sheet	Steel Sheeting
Roof Purlin	C or Z Purlin 254mm(D) x 79mm(W) x 1.9mm BMT
Average purlin Spacing	900
Roof Insulation	CSR Bradford Anticon 140 MD R3.3 140mm
Roof Spacer	CSR Bradford Ashgrid 120mm Non-Cyclonic
Do You Have Vents On The Roof ?	No
Roof Cavity Size	600
Ceiling Insulation	None
Ceiling Lining	CSR Gyprock® Standard Plasterboard 13mm
Internal Air Film	Air Film Internal (Still Air)

Thermal Compliance Reports with Bridging Pathways

Pathway 1 of (6)				[91.22 %] of Calculated Area	
Elements	In-Situ Thickness (mm)	R-Value (m ² .K/W)		Emittance	
		Summer	Winter	In	Out
Outdoor air-film	0	0.04	0.04	0	0.9
Steel Sheeting	0.48	0	0	0.9	0.9
R3.3 140mm Anticon 140 MD	140	3.14	3.47	0.04	0.9
Unventilated air-space	600	1.09	0.56	0.04	0.9
13mm Gyprock Standard	13	0.06	0.06	0.9	0.9
Indoor air-film	0	0.16	0.11	0.9	0
Total		4.49	4.25		

Pathway 2 of (6)				[0 %] of Calculated Area	
Elements	In-Situ Thickness (mm)	R-Value (m ² .K/W)		Emittance	
		Summer	Winter	In	Out
Outdoor air-film	0	0.04	0.04	0	0.9
Steel Sheeting	0.48	0	0	0.9	0.9
R3.3 140mm Anticon 140 MD	80	2.47	2.73	0.04	0.9
120mm Non-Cyclonic Ashgrid	1.2	0	0	0.9	0.9
254mm x 79 x 1.9 C or Z Purlin	254	0.22	0.22	0.9	0.9
Unventilated air-space	600	0.28	0.18	0.9	0.9
13mm Gyprock Standard	13	0.06	0.06	0.9	0.9
Indoor air-film	0	0.16	0.11	0.9	0
Total		3.24	3.34		

Pathway 3 of (6)				[8.76 %] of Calculated Area	
Elements	In-Situ Thickness (mm)	R-Value (m ² .K/W)		Emittance	
		Summer	Winter	In	Out
Outdoor air-film	0	0.04	0.04	0	0.9
Steel Sheeting	0.48	0	0	0.9	0.9
R3.3 140mm Anticon 140 MD	80	2.47	2.73	0.04	0.9
120mm Non-Cyclonic Ashgrid	1.2	0	0	0.9	0.9
254mm x 79 x 1.9 C or Z Purlin	254	0.22	0.22	0.9	0.9
Unventilated air-space	600	0.28	0.18	0.9	0.9
13mm Gyprock Standard	13	0.06	0.06	0.9	0.9
Indoor air-film	0	0.16	0.11	0.9	0
Total		3.24	3.34		

Pathway 4 of (6)				[0.02 %] of Calculated Area	
Elements	In-Situ Thickness (mm)	R-Value (m ² .K/W)		Emittance	
		Summer	Winter	In	Out
Outdoor air-film	0	0.04	0.04	0	0.9
Steel Sheeting	0.48	0	0	0.9	0.9
R3.3 140mm Anticon 140 MD	7.27	1.65	1.83	0.04	0.9
120mm Non-Cyclonic Ashgrid	1.2	0	0	0.9	0.9
120mm Non-Cyclonic Ashgrid	1.2	0	0	0.9	0.9
254mm x 79 x 1.9 C or Z Purlin	254	0.22	0.22	0.9	0.9
Unventilated air-space	600	0.28	0.18	0.9	0.9
13mm Gyprock Standard	13	0.06	0.06	0.9	0.9
Indoor air-film	0	0.16	0.11	0.9	0
Total		2.42	2.44		

Pathway 5 of (6)				[0 %] of Calculated Area	
Elements	In-Situ Thickness (mm)	R-Value (m ² .K/W)		Emittance	
		Summer	Winter	In	Out
Outdoor air-film	0	0.04	0.04	0	0.9
Steel Sheeting	0.48	0	0	0.9	0.9
R3.3 140mm Anticon 140 MD	7.27	1.65	1.83	0.04	0.9
120mm Non-Cyclonic Ashgrid	1.2	0	0	0.9	0.9
120mm Non-Cyclonic Ashgrid	1.2	0	0	0.9	0.9
254mm x 79 x 1.9 C or Z Purlin	254	0.22	0.22	0.9	0.9
Unventilated air-space	600	0.28	0.18	0.9	0.9
13mm Gyprock Standard	13	0.06	0.06	0.9	0.9
Indoor air-film	0	0.16	0.11	0.9	0
Total		2.42	2.44		

Pathway 6 of (6)				[0 %] of Calculated Area	
Elements	In-Situ Thickness (mm)	R-Value (m ² .K/W)		Emittance	
		Summer	Winter	In	Out
Outdoor air-film	0	0.04	0.04	0	0.9
Steel Sheeting	0.48	0	0	0.9	0.9
R3.3 140mm Anticon 140 MD	7.27	1.65	1.83	0.04	0.9
120mm Non-Cyclonic Ashgrid	1.2	0	0	0.9	0.9
120mm Non-Cyclonic Ashgrid	1.2	0	0	0.9	0.9
254mm x 79 x 1.9 C or Z Purlin	254	0.22	0.22	0.9	0.9
Unventilated air-space	600	0.28	0.18	0.9	0.9
13mm Gyprock Standard	13	0.06	0.06	0.9	0.9
Indoor air-film	0	0.16	0.11	0.9	0
Total		2.42	2.44		

The CSR Thermal Calculator is the property of CSR Building Products. Recommendations and advice regarding the use of products and systems described in this calculation are to be taken as a guide only and are given without liability on the part of the company and its employees. CSR reserve the right to change product specifications and calculation methodologies without prior notification. The specifier and purchaser should independently determine the suitability of the product and specification for the intended application prior to specification and installation.

Annexure B – Certifications

Mechanical Services

Electrical Services

Hydraulic Services

Annexure C – Product Data Sheets

Bradford Gold Ceiling Batts

Bradford Gold High Performance Wall Batts

Isolite X-38 Underslab Insulation

CSR Bradford Anticon

Bradford Enviroseal Wall Wrap

Thermal Break

Bradford Gold® & Gold® Hi-Performance

Refer to product table below for applicable product codes covered by this document

Issue **G**

Product Type & Application

Bradford Gold® and Gold Hi-Performance (HP) are non-combustible Glasswool thermal insulation products. They are for use in external walls and ceilings to reduce heat transfer through the building envelope.

Compliance with the NCC

For use in Australia, when correctly specified and installed, this product provides the following compliance:

NCC 2019

- **Thermal** - Complies with NCC 2019 Volume 1 Amend. 1 Section J1.2(a), NCC 2019 Volume 2 Amend. 1 Section 3.12.1.1(a), and all state-prescribed variations. This product meets the requirements of the NCC through compliance with AS/NZS 4859.1.
- **Non-Combustibility** - Meets the non-combustible requirements of NCC 2019 Volume 1 Amend. 1 C1.9(a) when tested or assessed in accordance with AS 1530.1.
- **Fire Hazard Properties** - Meets the requirements of the NCC 2019 Volume 1 Amend. 1, Specification C1.10 Clause 7 for insulation materials. When assessed to AS/NZS 1530.3 this product does not exceed the 'Spread of Flame' or 'Smoke Developed' indices of Specification C1.10 Clause 7.

NCC 2022

- **Thermal** - Complies with NCC 2022 Volume 1 J4D3(1) and ABCB Housing Provisions Standard 2022 13.2.2(1). This product meets the requirements of the NCC through compliance with AS/NZS 4859.1.
- **Non-Combustibility** - Meets the non-combustible requirements of NCC 2022 Volume 1 C2D10(1) when tested or assessed in accordance with AS 1530.1.
- **Fire Hazard Properties** - Meets the requirements of the NCC 2022 Volume 1, S7C7 for insulation materials. When assessed to AS/NZS 1530.3 this product does not exceed the 'Spread of Flame' or 'Smoke Developed' indices of Table S7C7.

Conditions of Storage, Use & Maintenance

- Store in the original packaging in a cool, dry area, away from foodstuffs. Ensure packages are adequately labelled, protected from physical damage, and sealed when not in use. Avoid packaging being stored under UV light (direct sunlight) for long periods.

Refer to the product SUI/MSDS at Bradfordinsulation.com.au for more information.

Specific Design or Installation Instructions

- Isolate power before installation.
- **Caution:** Electrical cables and equipment partially or completely surrounded with bulk thermal insulation may overheat and fail. In new build construction with electrical wiring in accordance with AS/NZS 3000: 2018 or later, wiring may be partially or completely surrounded for up to 400mm. If more than 400mm is surrounded, or for wiring pre AS/NZS 3000:2018, seek advice from a licenced electrician. Refer to legislation and referenced standards for full details or seek advice from an electrician if in doubt.
- **IMPORTANT:** R2.2 (HP), R2.5 (HP), R2.7 (HP) and R4.0 (HP) Wall Batts are high-density products that will not compress during installation and must be installed in a cavity of the correct size, with no obstructions. If installed in a cavity smaller than the product's nominal thickness, there is a risk of deformation or detachment of rigid wall lining materials.
- Suitable for applications that specify non-combustible bulk insulation products - not suitable for exposed internal wall and ceiling lining applications that require a Group Number.
- Insulation should be installed so that it forms a continuous layer and abuts or overlaps adjoining insulation other than at supporting members such as columns, studs, noggings, joists, furring channels and the like where the insulation must butt against the member.
- Compensate for gaps as specified by the NCC 2019 Volume 2 Amend. 1, 3.12.1.2(e) and Table 3.12.1.1h, ABCB Housing Provisions Standard 2022 13.2.3(5) and Table 13.2.3w. It should be installed at nominal thickness, except where it crosses structures, services and fittings.
- Ceiling perimeter batts may be required to achieve compliance depending upon roof and exterior wall design.
- Suitable for applications where the product is protected from direct UV light, water and wind pressure during and after installation.

For general installation guidance refer to the product installation guide at Bradfordinsulation.com.au

Supplementary information - Additional installation guidance for this product can be found in AS3999.

Bradford Gold® & Gold® Hi-Performance

Limitations of Use

- **IMPORTANT:** Do Not Modify This Product: Compliance with the evidence of suitability data referenced in this document is only achieved by the product or configuration listed in this PTS.
- **IMPORTANT:** R2.2 (HP), R2.5 (HP), R2.7 (HP) and R4.0 (HP) Wall Batts are high-density products that will not compress during installation and must be installed in a cavity of the correct size, with no obstructions. If installed in a cavity smaller than the product's nominal thickness, there is a risk of deformation or detachment of rigid wall lining materials.
- This product is not suitable for use as an exposed internal wall or ceiling lining in applications which require a Group Number in accordance with AS ISO 9705 and AS 5637.1 (NCC 2019 Volume 1 Amend. 1, Specification C1.10 Clause 4, NCC 2022 Volume 1 S7C4).
- Unfaced Glasswool is not a water or vapour barrier and is not suitable for water or vapour control.
- Maximum service temperature is 300°C for Glasswool.
- Check the plasterboard, ceiling tile or ceiling grid manufacturer's weight limitations prior to increasing the recommended R-Values or densities to ensure the structure can support the additional weight of the insulation batts.

Evidence of Suitability

- Testing to AS/NZS 4859.1 across the following reports-
 - CSR Lab Report R-20004A
 - CSR Lab Report R-20005
 - CSR Lab Report R-20006
 - CSR Lab Report R-20007
 - CSR Lab Report R-20014
 - CSR Lab Report R-20015
 - CSR Lab Report R-20016
 - CSR Lab Report R-20017
 - CSR Lab Report R-20018
 - CSR Lab Report R-20019
 - CSR Lab Report R-20020
 - BRANZ Report DI11505-001
 - BRANZ Report DI11505-002
 - BRANZ Report DI12309-001
 - BRANZ Report DI13245-001
- Testing and Professional Assessment to AS 1530.1 across the following reports –
 - CSIRO Assessment FCO-2812.
 - CSIRO Report FNC-9694
 - CSR NATA Lab Report NR-17008
 - CSR NATA Lab Report NR-18006
 - CSR NATA Lab Report NR-18007
 - CSR NATA Lab Report NR-20003
 - CSR NATA Lab Report NR-20004
 - CSR NATA Lab Report NR-22102
 - CSR NATA Lab Report NR-22103
- Professional Assessment, AS/NZS 1530.3 –
 - Warringtonfire Assessment FAS200045

Bradford Gold® & Gold® Hi-Performance

Applicable Product Codes – Ceiling Products

R-VALUE (m ² K/W)	THICKNESS (mm)	STANDARD SIZE (mm)	PIECES PER PACK	m ² PER PACK	COVERAGE PER PACK (m ²)	PACKS PER MULTI	PRODUCT CODE
R2.5	140	1160 x 430	16	8.0	9.0	7	111720
R2.5	140	1160 x 580	16	10.8	12.2	7	111719
R3.0	165	1160 x 430	16	8.0	9.0	6	15226
R3.0	165	1160 x 580	16	10.8	12.2	6	15256
R3.5	185	1160 x 430	16	8.0	9.0	5	15241
R3.5	185	1160 x 580	10	6.7	7.6	8	41895
R4.1	215	1160 x 430	10	5.0	5.6	7	111716
R4.1	215	1160 x 580	10	6.7	7.6	7	111715
#R5.0 (HP)	240	1160 x 430	8	4.0	4.5	5	105417#
R5.0 (HP)	240	1160 x 430	8	4.0	4.5	6	467911
#R5.0 (HP)	240	1160 x 580	8	5.4	6.1	5	105419#
R5.0 (HP)	240	1160 x 580	8	5.4	6.1	6	467912
#R6.0 (HP)	260	1160 x 430	6	3.0	3.4	5	77871#
R6.0 (HP)	260	1160 x 430	6	3.0	3.4	6	467949
#R6.0 (HP)	260	1160 x 580	6	4.0	4.5	5	77849#
R6.0 (HP)	260	1160 x 580	6	4.0	4.5	6	467960
#R7.0 (HP)	290	1160 x 430	4	2.0	2.3	5	122546#
R7.0 (HP)	290	1160 x 430	4	2.0	2.3	6	467961
#R7.0 (HP)	290	1160 x 580	4	2.7	3.0	5	122545#
R7.0 (HP)	290	1160 x 580	4	2.7	3.0	6	467962

Product discontinued December 2022.

Bradford Gold® & Gold® Hi-Performance

Applicable Product Codes – Wall Products

R-VALUE (m ² K/W)	THICKNESS (mm)	STANDARD SIZE (mm)	PIECES PER PACK	m ² PER PACK	COVERAGE PER PACK (m ²)	PACKS PER MULTI	PRODUCT CODE
#R1.5	75	1160 x 430	22	11.0	12.5	7	111727#
#R1.5	75	1160 x 580	22	14.8	16.7	7	111726#
#R1.5 *	75	1200 x 450	22	11.8	11.8	7	127776#
#R1.5 *	75	1200 x 600	22	15.8	15.8	7	127781#
R2.0 (HP)	75	1160 x 420	12	5.8	7.0	6	152166
R2.0 (HP)	75	1160 x 570	12	7.9	9.1	6	152192
R2.0 (HP) *	75	1200 x 450	12	6.5	6.5	6	131367
R2.0 (HP) *	75	1200 x 600	12	8.6	8.6	6	131368
R2.0	90	1160 x 430	22	11.0	12.5	5	15250
R2.0	90	1160 x 580	18	12.1	13.6	6	15229
R2.0 *	90	1200 x 450	18	9.7	9.7	6	127777
R2.0 *	90	1200 x 600	18	12.9	12.9	6	127782
R2.2 (HP)	75	1160 x 420	6	2.9	3.5	6	152168
R2.2 (HP)	75	1160 x 570	6	4.0	4.5	6	152194
R2.2	90	1160 x 430	16	8.0	9.0	5	170351
R2.2	90	1160 x 580	16	10.8	12.2	5	170227
R2.5 (HP)	90	1160 x 420	9	4.4	5.0	6	181430^
R2.5 (HP)	90	1160 x 570	9	6.0	6.7	6	181471^
R2.5 (HP) *	90	1200 x 450	9	4.9	4.9	6	181412^
R2.5 (HP) *	90	1200 x 600	9	6.5	6.5	6	181433^
R2.7 (HP)	90	1160 x 420	5	2.4	2.8	5	152191^
R2.7 (HP)	90	1160 x 570	5	3.3	3.8	5	152197^
R2.7 (HP) *	90	1200 x 450	5	2.7	2.7	5	127780^
R2.7 (HP) *	90	1200 x 600	5	3.6	3.6	5	126512^
R4.0 (HP)	140	1160 x 420	5	2.4	2.8	6	181432^
R4.0 (HP)	140	1160 x 570	5	3.3	3.8	6	181416^

* Suitable for steel frame construction.

Product discontinued 31st July 2022.

^ AS/NZS 1530.3 Test Report available.

Bradford Gold® & Gold® Hi-Performance

Additional Product Data

Maximum Service Temperature		300°C (suitable where a long term surface operating temperature $\geq 90^{\circ}\text{C}$ is required for insulation around heat generating equipment.)
Fire Hazard Properties	When assessed in accordance with AS/NZS 1530 Part 3-1999	<ul style="list-style-type: none"> • Ignitability: 0 • Spread of flame: 0 • Heat Evolved: 0 • Smoke Developed: 1
Non-Combustibility	When assessed to AS 1530 Part 1	Non - Combustible
Sample Specification – Wall Products	The insulation material shall be Bradford Gold® or Bradford Gold® Hi-Performance having a material R-Value; Rm...(specify R-Value) @ XXmm... (specify thickness).	
Sample Specification – Ceiling Products	The insulation material shall be Bradford Gold® or Bradford Gold® Hi-Performance Ceiling Batts R ____ m ² K/W (specify type) as manufactured by Bradford Insulation.	

Other Accreditation



FBS-1 Glasswool - The fibre component of these products is listed by Safe Work Australia as Man-made Vitreous Fibre (Glasswool) of low bio persistence as specified under Note Q in the Australian Hazardous Substances Information System and in the Australian Approved Criteria documentation. In accordance with EU ATP 31 (2009) these fibres are not classified as an irritant, or as carcinogenic.
Refer to the product SUI/MSDS at Bradfordinsulation.com.au for more information.



National Asthma Council Sensitive Choice

Isolite®



RMAX Isolite® expanded polystyrene



TECHNICAL DATA



RMAX
Rigid Cellular Plastics

A division of Huntsman Chemical Company
Australia Pty. Limited ABN 48 004 146 338

Isolite® is the brand name for RMAX block moulded flame retardant modified grade of EPS (expanded polystyrene).

It is a closed cell, resilient, lightweight rigid cellular plastics material produced in a range of densities between 10 kg/m³ and 35 kg/m³.

The main applications for products manufactured from Isolite® are thermal insulation systems (wall, roof and sub-floor), ceiling panels and other decorative surfaces, Voidforms® and blockouts, pipe insulation, protective packaging, floatation and buoyancy applications, and stage sets.

Manufacturing process

Pre expansion

Expanded polystyrene is supplied as plastic beads in which an expanding agent, usually pentane, has been dissolved. In the presence of steam the thermoplastic polystyrene softens and the increasing vapour pressure of the expanding agent causes the beads to expand up to 50 times their original volume. During this stage the degree of expansion is controlled to achieve the desired density. Expanded polystyrene does not contain any ozone depleting substance and none is used in it's manufacture.

Conditioning

From the pre-expander the beads are gently transported to large hoppers for ageing. The time of ageing is set to cool and stabilise the beads and allow for infusion of air to replace the expanding agent in the cells.

Moulding

After conditioning, the beads are charged into a closed mould where they are further expanded and fused together by steam heating.

Finishing

The freshly moulded blocks of Isolite® are passed through temperature controlled ovens to remove moisture and the final traces of the expanding agent, and to provide blocks of constant dimensional stability.

Manufactured to a standard

Isolite® EPS is manufactured to AS 1366 Part 3-1992, Rigid Cellular Plastic Sheets for Thermal Insulation, Rigid Cellular Polystyrene, in six classes. The standard designates a colour to identify each of the six classes:

Class L: Blue	Class M: Black
Class SL: Yellow	Class H: Green
Class S: Brown	Class VH: Red

The standard specifies the minimum physical property limits for each of the six classes (See Table 1) and methods for determination of compliance.

Quality control

To meet with the compliance requirements of the standard, the RMAX quality control system monitors and controls each stage of the manufacturing process and assures that Isolite® conforms to AS 1366.3 within 95% confidence limits by on site testing of density and key physical properties

Comprehensive physical testing for product development and quality assurance is carried out in the company's own laboratory, which is NATA accredited.

Properties of Isolite®

The physical properties are primarily determined by the moulded density for well made oven cured EPS.

(See Fig.1 to 4).

However, these properties will be affected by raw material and manufacturing variations, and for this reason Australian Standard 1366-3-1992 specifies the classes in terms of performance properties rather than density.

The standard lists Nominal Density for each class (See Table 2), but these densities should be regarded as a guide only as the physical properties shown in Table 1 may be achieved by EPS of other densities.



Table 1: Physical properties of EPS, according to AS 1366, Part 3-1992

		Class						
Physical property	Unit	L	SL	S	M	H	VH	Test method
Compressive stress at 10% deformation (min.)	kPa	50	70	85	105	135	165	AS 2498.3
Cross-breaking strength (min.)	kPa	95	135	165	200	260	320	AS 2498.4
Rate of water vapour transmission (max.) measured parallel to rise at 23°C	µg/m².s	710	630	580	520	460	400	AS 2498.5
Dimensional stability of length, width, thickness (max.) at 70°C, dry condition 7 days	percent	1	1	1	1	1	1	AS 2498.6
Thermal resistance (min.) at a mean temperature of 23°C (50mm sample)	m².K/W	1	1.13	1.17	1.20	1.25	1.28	AS/NZS 4859.1
Flame propagation characteristics:								AS 2122.1
- median flame duration (max.)	SD	2	2	2	2	2	2	
- eight value (max.)	SD	3	3	3	3	3	3	
- median volume retained	percent	15	18	22	30	40	50	
- eight value (min.)	percent	12	15	19	27	37	47	
1 W/m.K=6.93 Btu in/ft²h.°F								

Table 2: Nominal Density, kg/m³

Class					
L	SL	S	M	H	VH
11	13.5	16	19	24	28

Mechanical properties

The density dependency of the main physical properties of Isolite® can be seen in (Fig.1 to 4): Compressive strength, Cross Breaking strength (flexural strength) Tensile strength and Shear strength.

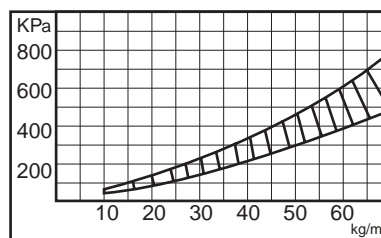


Fig. 1: Stress at 10% deformation v density

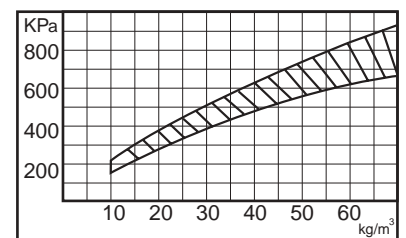


Fig. 3: Tensile strength v density

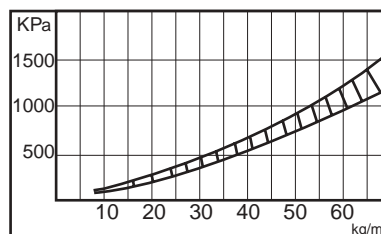


Fig. 2: Cross-breaking strength v density

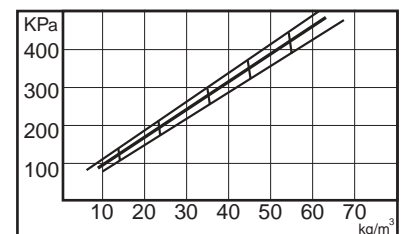


Fig. 4: Shear strength v density at 23°C

Compressive creep

It is common to report only the compressive stress at 10% deformation but the latter is often taken from complete stress-strain curves as shown in (Fig.5). Although it appears to deform elastically over a range of comprehensive loads, Isolite® that has been stressed will, with the release of all stress, retain some permanent deformation.

(Fig.1 to 5) can be useful for short term loads where some deformation is acceptable. For long term loads (Fig.6), showing compressive creep under constant loads versus time, should be used.

It should be noted that compressive Strength in AS 1366.3 is a performance characteristic at 10% deformation and should not be taken as a universal design loading recommendation.

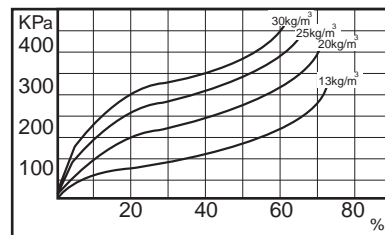


Fig. 5: Stress v compressive strain

Floatation properties

The density of Isolite® is low compared with water, with a nominal density range from 10 to 25 kg/m³ compared with water at 1000 kg/m³. The water buoyancy per cubic metre of Isolite® is determined by subtracting its kg/m³ density from 1000. The result is the weight in kilograms which a cubic metre of Isolite® can support when fully submerged in water.

Thermal properties

The low thermal conductivity (K value) of Isolite® characterises its exceptional insulating properties. (See Fig.7).

As (Fig.8) shows, EPS has a remarkably high R value compared with most other insulating material used in similar applications.

Isolite® EPS gains its thermal resistance from the stabilised air trapped within its cellular structure; it contains no fluorocarbon blowing agent that might cause depletion of ozone in the upper atmosphere.

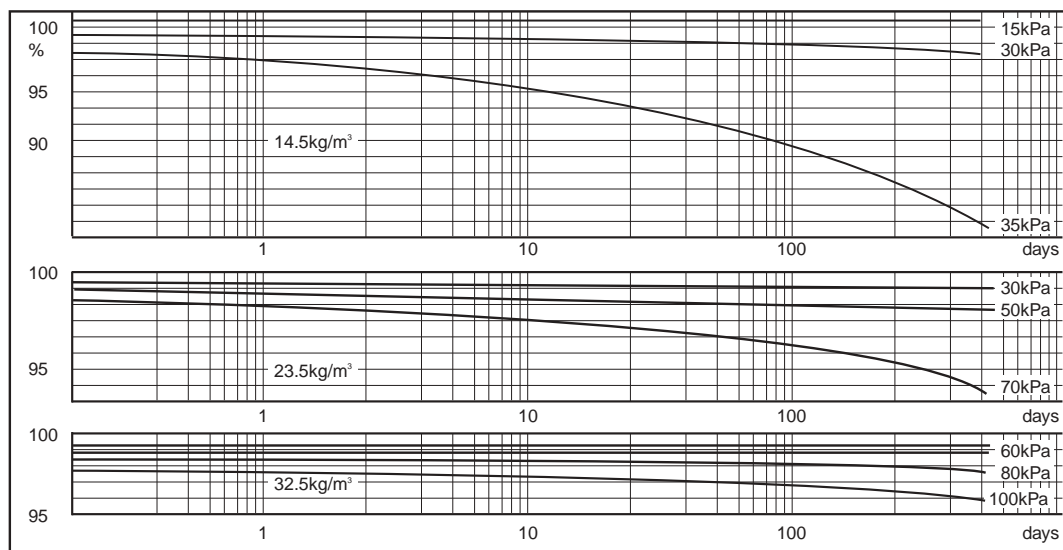


Fig. 6: Compressive creep: stress strain curves for extended periods of time



Design thermal properties

As Australian Standard 1366 Part 3 is a minimum conformance standard, the thermal resistances quoted will be achieved, as a minimum, in 97.5% of cases in a statistical sample, when tested at a mean sample temperature of 23°C.

Thermal resistance varies with mean insulation temperature, where mean insulation temperature is the average of the temperature on either side of the insulation.

For design purposes the average thermal resistance is a better guide than the minimum thermal resistance.

A full listing of design thermal conductivity values for each class of EPS at differing mean temperatures is shown on Table 8.

Low temperature operation

Isolite® does not become brittle at sub-zero temperatures. The testing of specimens at -75°C for 48 hours demonstrates no loss of impact resistance compared with specimens tested at +23°C.

It is able to withstand temperature cycling and thereby assure long term performance without the loss of structural integrity of physical properties; core specimens taken from 20 year old freezer rooms show no deterioration.

Unlike some other insulating materials, the K value of Isolite® decreases at lower average mean temperatures (See Fig.9).

High temperature operation

The effect of elevated temperatures on the mechanical properties is an accelerating decline in the values shown in (Fig.1 to 5) until at approximately 85°C the so-called zero strength is reached. (See Fig.10).

Isolite® should not be continuously exposed to temperatures in excess of 80°C as expansion and blistering may occur.

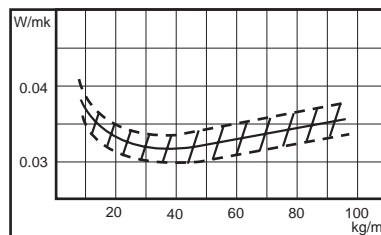


Fig. 7: Thermal conductivity at 10°C v density

Concrete	0.04	■
Brick	0.043	■
Glass	0.048	■
EPS Concrete	0.12	■
Wood	0.35	■
Compressed Wood	0.83	■
Fibreglass	1.0	■
EPS – Class SL	1.13	■
EPS – Class VH	1.28	■

Fig. 8: Typical R Values, various insulating materials 50mm thick

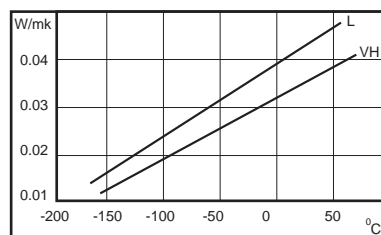


Fig. 9: Indicative thermal conductivity v temperature

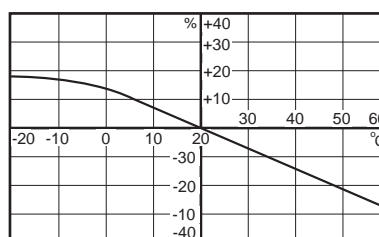


Fig. 10: Change in stress at 10% deformation, relative to K value at 20°C, v temperature

Table 3: Moisture gain of EPS by liquid water absorption

Time Period	Test Condition	% by volume
1 day	ASTM C-272	2.5
7 days	Submersion	3.0
7 days	10 metre submersion	3.0
90 days	Submersion	6.0
550 days	Submersion	7.8
1000 days	Burial in wetted soil	1.7

Table 4: Typical thermal performance by EPS thickness after vapour induced moisture gain.

Moisture Gain (% by volume at 25mm)	R value retention%			
	25mm	50mm	75mm	100mm
2	96	98	99	99
4	92	96	97	98
6	89	94	96	97
8	86	92	95	96
10	84	90	93	95
12	82	89	92	94
14	80	88	91	93

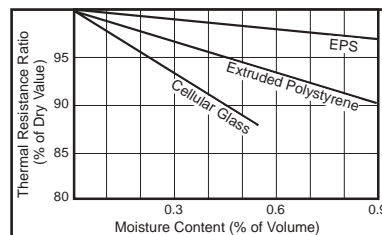


Fig. 11: Thermal resistance v's moisture content curves for EPS, extruded polystyrene and cellular glass

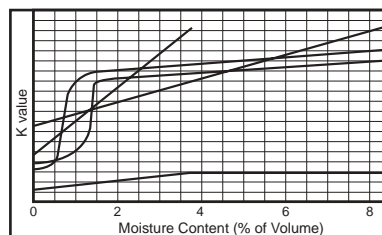


Fig. 12: The effect of moisture on K values, various insulating materials

Effect of moisture on K value

The dimensional stability and mechanical properties of Isolite® are not affected by water but because absorbed water will increase the K value, as with all insulating materials, care should be taken in designing insulated structures to take account of water and water vapour that may be present.

While Table 3 shows that certain amounts of water are absorbed by EPS under various conditions, Table 4 demonstrates that the loss of R values in EPS as a result of this moisture absorption is minimal. Overseas research [Ref(i)] has so revealed that the decay in thermal resistance caused by moisture is considerably less for EPS than for either extruded polystyrene foam or cellular glass. (See Fig.11).

As with other building materials care should always be taken to keep Isolite® dry before and during installation.

Water vapour transmission properties

Although Isolite® has a low water vapour transmission rate it is not considered a vapour barrier. This breatheability characteristic reduces any tendency towards the formation of vapour dams.

As (Fig.12) shows, of all the material used for insulation purposes, EPS is one of the most resistant to the adverse affects of moisture.

In applications where the high humidity and high temperature differentials are likely a vapour barrier should be installed. Normally the vapour barrier should be installed on the warm side of the structure with the insulation as near as possible to the cold side.

Acoustic properties

Because Isolite® has a closed cell structure, it offers only a limited absorption of airborne sound.

Structure borne sounds, transmitted through such structures as walls and pipes, may be effectively isolated by the use of floating floor systems. For this type of sound insulation, Isolite® with the required dynamic stiffness can be obtained by compressing the sheets by 50 to 60 percent and then allowing them to recover to 80 to 90 per cent of their original thickness.



Chemical properties

Isolite® is resistant to virtually all aqueous media including dilute acid and alkalis. In addition, it is resistant to water-miscible alcohols such as methanol, ethanol and i-propanol, and also to silicon oils.

Isolite® has limited resistance to paraffin oil, vegetable oils, diesel fuel and vaseline. These substances may attack the surface of Isolite® after long term contact. Isolite® is not resistant to hydrocarbons, chlorinated hydrocarbons, ketones and esters.

Paint containing thinners and solutions of synthetic adhesives naturally fall in to the same category, and this should be taken into account in any painting or bonding operation.

Anhydrous acids such as glacial acetic acid or fuming sulphuric acid destroy Isolite®.

Prolonged exposure to UV light causes yellowing and embrittlement of Isolite®, which should therefore be protected from direct outdoor exposure.

Resistance to specific reagents is given in the RMAX technical data sheet **Isolite® Chemical Resistance**.

Table 5: Electrical properties (Normal density 16kg/m³)

Frequency cps.	Dielectric Constant	Dissipation Factor	Loss Factor	Volume Resistivity	Surface Resistivity	Dielectric Strength
60	1.19	.0005	.0006			
1000	1.07	.0005	.0006	3.8x10 ¹³	9.18x10 ⁶	49
1000000	1.02	.0005	.0006			

Table 6: Comparative testing of Early Fire Hazard properties for selected materials

Material	Ignitability Index (0 -20)	Spread of Flame Index (0-10)	Heat Evolved Index (0-10)	Smoke Produced Index (0-10)
Isolite® with sisalation 450 facing	0	0	0	0-1
Isolite® sandwich panel faced both sides with 0.65mm Steel	0	0	0	0
Isolite® expanded polystyrene	12	0	3	5
Isothane® rigid polyurethane	18	10	4	7
An Australian Hardboard (4.75mm)				
- Bare	14	6	7	3
- Impregnated with fire retardant	0	0	0	7
An Australian Softboard (12.70mm)				
- Bare	16	9	7	3
- Impregnated with fire retardant	4	0	0	7
T&G Boarding (25 x 100mm)				
- Bluegum	11	0	3	2
- Oregon	13	6	5	3
Plywood, Coachwood Veneer (4.75mm)				
- Bare	15	7	7	4
- Impregnated with fire retardant	12	0	3	5

Resistance to fungi and bacteria

Fungus attack has not been observed on Isolite®, and it does not support bacterial growth. Surface spoilage (in the form of spilt soft drink, sugar, etc) can however supply the nutrient for fungal or bacterial growth.

Resistance to ants, termites, rodents and marine borers

Since it has no food value, Isolite® does not attract ants, termites, or rodents, however, it is not a barrier to them. Ants, termites and rodents will chew through Isolite® to reach food or establish a comfortable home.

Marine borers can attack EPS, as they do wood and Isolite® should be protected by an anti-fouling paint over a suitable primer.

Electrical properties

The electrical characteristics of Isolite® (See Table 5) and air are similar. This applies to arc resistance, as well as other electrical properties. The EPS melts about the path of an arc as soon as the arc penetrates it.

Dielectric loss of Isolite® is quite low.

Flammability properties

Expanded polystyrene products are combustible and should not be exposed to open flame or other ignition sources.

As with all other organic material, insulation products must be considered combustible and to constitute a fire hazard if improperly used or installed. The material contains a flame retardant additive to inhibit accidental ignition from small fire sources. Table 6 shows test results for Isolite® and other common building materials to provide a guide as to how these products compare.

Intending users of Isolite® should obtain a copy of 'Recommendations for the storage and handling of EPS', available from any RMAX office.

Coefficient of linear thermal expansion

The coefficient of linear thermal expansion for Isolite® is 6.3×10^{-5} m/m deg K.

Toxicity

The heat of combustion of solid polystyrene polymer is 40,472 kJ/kg; combustion products are carbon dioxide, water, soot (carbon), and to a lesser extent carbon monoxide.

A CSIRO report [Ref (ii)] comments that the toxicity of gases associated with the burning of EPS is no greater than that associated with timber. Extensive research programs have been conducted overseas [Ref (iii)] to determine if thermal decomposition products of EPS present toxicity hazard. The test results have revealed that the toxicity of the decomposition products appears to be no greater than for wood and decidedly less than other conventional building products.

References

- (i) Wayne Tobiasson and John Ricard, US Army Cold Regions Research and Engineering Laboratory, 'Moisture gain and its thermal consequences for common roof insulations'.
- (ii) P.R. Nicholl and K.G. Martin, 'Toxicity considerations of combustion products from cellular plastics'.
- (iii) H.Th Hofmann and H. Oettel, 'Comparative toxicity of thermal decomposition products'.

Table 7: Maximum Toxicity Index

Material	Toxicity Index due to:				
	HCN	CO	CO2	HC1	Total
Acrylic fibre	1.19	0.02	<0.01	-	1.21
Nylon	0.43	0.08	0.01	-	0.52
Wool	0.33	0.04	0.01	-	0.38
PVC	-	0.27	<0.01	0.29	0.36
Urea-formaldehyde foam	0.26	0.01	<0.01	-	0.27
Rigid polyurethane foam	0.05	0.05	<0.01	-	0.10
Polystyrene	-	0.09	0.01	-	0.10
White pine	-	0.09	0.003	-	0.09



Thermal conductivity design values – W/m K

- (a) Determine mean temperature of insulation in °C
 $T_{\text{mean}} = \frac{T_o + T_i}{2}$
 T_o = Temperature on outside surface of insulation
 T_i = Temperature on inside surface of insulation
- (b) Select the class of EPS from AS 1366.3
- (c) Look up relevant K value in the table for the mean temperature in °C Thermal conductivity quoted in W/mK

Table 8: Thermal Conductivity W/mK

Class – Temperature	L	SL	S	M	H	VH
0	.0398	.0370	.0360	.0349	.0337	.0321
1	.0391	.0372	.0361	.0350	.0338	.0322
2	.0393	.0374	.0363	.0351	.0339	.0323
3	.0394	.0375	.0364	.0353	.0341	.0325
4	.0396	.0377	.0366	.0354	.0342	.0326
5	.0397	.0378	.0367	.0356	.0343	.0327
6	.0399	.0380	.0369	.0357	.0344	.0328
7	.0401	.0382	.0370	.0358	.0346	.0330
8	.0402	.0383	.0372	.0360	.0347	.0331
9	.0404	.0385	.0373	.0361	.0348	.0332
10	.0406	.0386	.0375	.0362	.0349	.0333
11	.0407	.0388	.0376	.0364	.0351	.0335
12	.0409	.0389	.0378	.0365	.0352	.0336
13	.0410	.0391	.0379	.0367	.0353	.0337
14	.0412	.0393	.0381	.0368	.0354	.0338
15	.0414	.0394	.0382	.0369	.0356	.0340
16	.0415	.0396	.0384	.0371	.0357	.0341
17	.0417	.0397	.0385	.0372	.0358	.0342
18	.0419	.0399	.0387	.0373	.0359	.0343
19	.0420	.0401	.0388	.0375	.0361	.0345
20	.0422	.0402	.0390	.0376	.0362	.0346
21	.0423	.0404	.0391	.0378	.0363	.0347
22	.0425	.0405	.0393	.0379	.0364	.0348
23	.0427	.0407	.0394	.0380	.0366	.0350
24	.0428	.0408	.0396	.0382	.0367	.0351
25	.0430	.0410	.0397	.0383	.0368	.0352
26	.0432	.0412	.0399	.0384	.0369	.0353
27	.0433	.0413	.0400	.0386	.0371	.0355
28	.0435	.0415	.0402	.0387	.0372	.0356
29	.0437	.0416	.0403	.0388	.0373	.0357
30	.0438	.0418	.0405	.0390	.0374	.0358
31	.0440	.0419	.0406	.0391	.0376	.0360
32	.0441	.0421	.0408	.0393	.0377	.0361
33	.0443	.0423	.0409	.0394	.0378	.0362
34	.0445	.0424	.0411	.0395	.0379	.0363
35	.0446	.0426	.0412	.0397	.0381	.0365
36	.0448	.0427	.0414	.0398	.0382	.0366
37	.0450	.0429	.0415	.0399	.0383	.0367
38	.0451	.0431	.0416	.0401	.0384	.0368
39	.0453	.0432	.0418	.0402	.0386	.0370
40	.0454	.0434	.0420	.0404	.0387	.0371
41	.0456	.0435	.0421	.0405	.0388	.0372
42	.0458	.0437	.0423	.0406	.0389	.0373
43	.0459	.0438	.0424	.0408	.0391	.0375
44	.0461	.0440	.0426	.0409	.0392	.0376
45	.0463	.0442	.0427	.0410	.0393	.0377
46	.0464	.0443	.0429	.0412	.0394	.0378
47	.0466	.0445	.0430	.0413	.0396	.0380
48	.0467	.0446	.0432	.0415	.0397	.0381
49	.0469	.0448	.0433	.0416	.0398	.0382
50	.0471	.0450	.0435	.0417	.0399	.0383
51	.0472	.0451	.0436	.0419	.0401	.0385
52	.0474	.0453	.0438	.0420	.0402	.0386
53	.0476	.0454	.0439	.0421	.0403	.0387
54	.0477	.0456	.0441	.0423	.0404	.0388
55	.0479	.0457	.0442	.0424	.0406	.0390
56	.0481	.0459	.0444	.0425	.0407	.0391
57	.0482	.0461	.0445	.0427	.0408	.0392
58	.0484	.0462	.0447	.0428	.0409	.0393
59	.0485	.0464	.0448	.0430	.0411	.0395
60	.0487	.0465	.0450	.0431	.0412	.0396

Anticon® & Anticon® HP Roofing Blanket

Refer to product table below for applicable product codes covered by this document

Issue **H**

Product Type & Application

Anticon® and Anticon® High Performance (HP) are Glasswool blankets with a light (LD), medium (MD) or heavy (HD) duty reinforced, paper-based, reflective foil laminate adhered to one side. They are primarily intended for use as metal roof insulation in residential and commercial applications.

Compliance with the NCC

For use in Australia, when correctly specified and installed, this product provides the following compliance:

NCC 2019

- **Thermal** - Complies with NCC 2019 Volume 1 Amend. 1 Section J1.2(a), NCC 2019 Volume 2 Amend. 1 Section 3.12.1.1(a), and all state-prescribed variations. The product meets the requirements of the NCC through compliance with AS/NZS 4859.1.
- **Fire Hazard Properties** - Achieves a Group Number of 1 and $SMOGR_{RC} \leq 100 \text{ m}^2/\text{s}^2 \times 1000$ for all thicknesses, in accordance with AS ISO 9705 and AS 5637.1. It may be used as an exposed wall or ceiling lining where specified by the NCC 2019 Volume 1 Amend. 1, Specification C1.10 Clause 4.
- **Fire Hazard Properties** - Meets the requirements of the NCC 2019 Volume 1 Amend. 1, Specification C1.10 Clause 7 for insulation materials. When assessed to AS/NZS 1530.3 this product does not exceed the 'Spread of Flame' or 'Smoke Developed' indices of Specification C1.10 Clause 7.
- **Weatherproofing and Condensation Control** - Facing material only meets the requirements of the NCC 2019 Volume 1 Amend. 1 F1.6 and all State-prescribed variations, through compliance with AS/NZS 4200.1.
- **BAL** - All products meet the requirements for sheet roof construction of buildings in bushfire-prone regions BAL 12.5-40, as per AS 3959, sections 5 to 8.
- **BAL** - Anticon FZ 80 with Light Duty facing meets the requirements for sheet roof construction of buildings in bushfire-prone region BAL-FZ, as per AS 3959, Appendix H3 Clause (c).

NCC 2022

- **Thermal** - Complies with NCC 2022 Volume 1 J4D3(1) and ABCB Housing Provisions Standard 2022 13.2.2(1). This product meets the requirements of the NCC through compliance with AS/NZS 4859.1.
- **Fire Hazard Properties** - Achieves a Group Number of 1 and $SMOGR_{RC} \leq 100 \text{ m}^2/\text{s}^2 \times 1000$ for all thicknesses, in accordance with AS ISO 9705 and AS 5637.1. It may be used as an exposed wall or ceiling lining where specified by the NCC 2022 Volume 1 S7C4.

Compliance with the NCC cont.

NCC 2022 cont.

- **Fire Hazard Properties** - Meets the requirements of the NCC 2022 Volume 1, S7C7 for insulation materials. When assessed to AS/NZS 1530.3 this product does not exceed the 'Spread of Flame' or 'Smoke Developed' indices of Table S7C7.
- **Weatherproofing and Condensation Control** - Facing material only meets the requirements of the NCC 2022 Volume 1 F3D3 and all State-prescribed variations, through compliance with AS/NZS 4200.1.
- **BAL** - All products meet the requirements for sheet roof construction of buildings in bushfire-prone regions BAL 12.5-40, as per AS 3959, sections 5 to 8.
- **BAL** - Anticon FZ 80 with Light Duty facing meets the requirements for sheet roof construction of buildings in bushfire-prone region BAL-FZ, as per AS 3959, Appendix H3 Clause (c).

Conditions of Storage & Maintenance

- Store in the original packaging in a cool, dry area, away from foodstuffs. Ensure packages are adequately labelled, protected from physical damage, and sealed when not in use. Avoid packaging being stored under UV light (direct sunlight) for long periods.
- Do not pressure clean or use mineral based cleaners on the facing product.

Refer to the product SUIS/MSDS at Bradfordinsulation.com.au for more information.

Anticon® & Anticon® HP Roofing Blanket

Evidence of Suitability

- Testing to AS/NZS 4859.1 across the following reports apply to the unfaced blanket -
 - CSR Lab Report R-20024.
 - CSR Lab Report R-20025.
 - CSR Lab Report R-20026.
 - CSR Lab Report R-20027.
 - CSR Lab Report R-20028.
 - CSR Lab Report R-20029.
 - CSR Lab Report R-20030.
 - CSR Lab Report R-20031.
 - CSR Lab Report R-20032.
 - CSR Lab Report R-22008.
 - CSR NATA Lab Report NR-23104.
- Professional Assessment, AS ISO 9705 and AS 5637.1 -
 - CSIRO Assessment FCO-3029.
 - BRANZ Assessment FC11516.
- Professional Assessment, AS/NZS 1530.3 -
 - Warringtonfire Assessment FAS200045.
- Testing to AS/NZS 4200.1 across the following reports apply to the **Light Duty** facing product -
 - AWTa Report 7-598683-MN – *Resistance to Dry Delamination.*
 - AWTa Report 7-598683-MN – *Resistance to Wet Delamination.*
 - AWTa Report 7-598683-MN – *Moisture Shrinkage.*
 - Orora Report 24133 – *Folding Endurance.*
 - AWTa Report 7-598683-MN – *Tensile Strength.*
 - AWTa Report 7-598683-MN – *Edge Tearing.*
 - AWTa Report 7-598762-MN – *Emittance Classification.*
 - R&D Services Report RD18258-R2 – *Vapour Control Classification.*
 - AWTa Report 7-543644-NV – *Water Control Classification.*
 - CSR Lab NATA Report NR-17218 – *Flammability Classification.*
 - CSR Lab Report R-20078 – *Thickness*
- Testing to AS/NZS 4200.1 across the following reports apply to the **Medium Duty** facing product -
 - CSIRO Report 14-0240a – *Resistance to Dry Delamination.*
 - CSIRO Report 14-0240a – *Resistance to Wet Delamination.*
 - CSIRO Report 14-0240a – *Moisture Shrinkage.*
 - Orora Report 24133 – *Folding Endurance.*
 - CSIRO Report 14-0240a – *Tensile Strength.*
 - AWTa NATA Report 18-000297 – *Edge Tearing.*
 - R&D Services Report RD16659 – *Emittance Classification.*
 - CSIRO Report 6500.3B – *Vapour Control Classification.*
 - AWTa Report 7-543035-NV – *Water Control Classification.*
 - CSR Lab NATA Report NR-17210 – *Flammability Classification.*
 - CSR Lab Report R-20078 – *Thickness*

Evidence of Suitability cont.

- Testing to AS/NZS 4200.1 across the following reports apply to the **Heavy Duty** facing product -
 - AWTa Report 16-005482 – *Resistance to Dry Delamination.*
 - AWTa Report 16-005482 – *Resistance to Wet Delamination.*
 - AWTa Report 16-005482 – *Moisture Shrinkage.*
 - Orora Report 24133 – *Folding Endurance.*
 - AWTa NATA Report 16-005482 – *Tensile Strength.*
 - AWTa NATA Report 16-005482 – *Edge Tearing.*
 - R&D Services Report RD16659 – *Emittance Classification.*
 - R&D Services Report RD19028-R3 – *Vapour Control Classification.*
 - AWTa Report 7-542982-NV – *Water Control Classification.*
 - CSR Lab NATA Report NR-17213 – *Flammability Classification*
 - CSR Lab Report R-20078 – *Thickness*

Limitations of Use

- **IMPORTANT:** Compliance with the evidence of suitability data referenced in this document is only achieved when this product is produced at a CSR approved facility, in accordance with CSR specifications and approved materials.
- **IMPORTANT:** Do Not Modify This Product: Compliance with the evidence of suitability data referenced in this document is only achieved by the product or configuration listed in this PTS.
- This material is not classified as non-combustible in accordance with AS1530.1 and is not suitable for use where non-combustible material is required.
- This product does not meet the non-combustibility or fusion temperature requirements of AS 1668.1, 2.3.2.
- Group number and SMOGRA_{RC} ratings only apply when the installation requirements listed under 'Specific Design or Installation Instructions' are met.
- Not suitable for use under tiled roofs.
- This product is not designed to withstand exposure to the elements and must be installed dry and remain dry until the roof is completed - accordingly, it is recommended that the exterior cladding and all closure flashings should be installed within the same workday to comply with the product warranty.
- It is recommended to commence installation of this product only if it can be completed prior to rain.
- If this product is left exposed, it must be protected from getting wet.
- Maximum service temperature is 300°C for unfaced Glasswool, 70°C for faced Glasswool.
- The foil facing product should not come into contact with wet concrete, or alkaline materials.
- This product is not suitable for installation in underslab concrete roof applications within a conditioned space where there is a risk of moisture transfer through the unfaced edges. Bradford PIR boards are recommended for these applications.

Anticon® & Anticon® HP Roofing Blanket

Specific Design or Installation Instructions

- Isolate power before installation.
- **WARNING:** This product contains aluminium foil which conducts electricity. To avoid electrocution, care should be taken to ensure that this product or conductive fasteners used to secure this product, do not come into contact or close proximity with electrical wiring during installation or use.
- **Caution:** Electrical cables and equipment partially or completely surrounded with bulk thermal insulation may overheat and fail. In new build construction with electrical wiring in accordance with AS/NZS 3000: 2018 or later, wiring may be partially or completely surrounded for up to 400mm. If more than 400mm is surrounded, or for wiring pre AS/NZS 3000:2018, seek advice from a licenced electrician. Refer to legislation and referenced standards for full details or seek advice from an electrician if in doubt.
- To create an air, water, or vapour barrier, the facing material needs to be sealed at overlaps, end laps, discontinuities and penetrations in accordance with AS 4200.2.
- In a roof installation the reflective aluminium side should face inward toward the internal roof cavity.
- Insulation should be installed so that it forms a continuous layer and abuts or overlaps adjoining insulation other than at supporting members such as columns, studs, noggings, joists, furring channels and the like where the insulation must butt against the member.
- To maintain the water barrier properties of the facing material it should not be punctured, creased, crushed, sharply folded or dragged over the building structure during installation.
- Stated thermal performance is based on the insulation blanket or board only - reflective R-values are construction-dependent upon the adjacent airgap and must be determined in accordance with AS/NZS 4859.2.
- **Condensation Risk Consideration:** The facing material is classified as a vapour barrier and is recommended to be positioned on the warm side of the construction to reduce the risk of condensation entrapment within the structure. As there are many factors which can influence condensation risk it is highly recommended that designers undertake a hygrothermal analysis to further reduce condensation risk.
- Suitable for interior applications where the product is protected from UV light, water and wind pressure during and after installation.
- Suitable for underslab concrete roof/soffit applications in unconditioned spaces.

For general installation guidance refer to the product installation guide at Bradfordinsulation.com.au

Supplementary information - Additional installation guidance for this product can be found in AS 3999.

Anticon® & Anticon® HP Roofing Blanket

Applicable Product Codes

BASE BLANKET R-VALUE (m ² K/W)	THICKNESS (mm)	NOMINAL LENGTH (m)	NOMINAL WIDTH (mm)	NOMINAL COVERAGE (m ² per Roll)	PRODUCT	PRODUCT CODE
LIGHT DUTY FACING						
R1.3	60	15	1200	18	Anticon 60	15417
R1.3	60	15	1400	21	Anticon 60	74479
R1.3	60	20	1200	24	Anticon 60	15574
R1.4	70	15	1200	18	Anticon 70	99004
R1.4	70	20	1200	24	Anticon 70	99005
R1.8	80	15	1200	18	Anticon 80	16072
R1.8	80	15	1200	18	Anticon FZ 80	475803
R2.0	90	15	1200	18	Anticon 90	128181
R2.3	100	10	1200	12	Anticon 100	15625
R2.5	110	10	1200	12	Anticon 11	84860
R2.5 HP	100	10	1200	12	Anticon 100	85383
R3.0	130	10	1200	12	Anticon 13	83271
R3.3	140	7.5	1200	9	Anticon 140	102251
R3.6	145	7.5	1200	9	Anticon 145	102252
R3.6 HP	130	5	1200	6	Anticon 130	194622
R4.2	175	6	1200	7.2	Anticon 175	179193
MEDIUM DUTY FACING						
R1.3	60	15	1200	18	Anticon 60	15630^
R1.8	80	15	1200	18	Anticon 80	15696^
R2.3	100	10	1200	12	Anticon 100	15629
R2.5	110	10	1200	12	Anticon 110	84859
R2.5 HP	100	10	1200	12	Anticon 100	88604^
R3.0	130	10	1200	12	Anticon 130	81861^
R3.3	140	7.5	1200	9	Anticon 140	102312
R3.6	145	7.5	1200	9	Anticon 145	102311^
R4.2	175	6	1200	7.2	Anticon 175	132761^
HEAVY DUTY FACING						
R1.3	60	15	1200	18	Anticon 60	16013
R1.8	80	10	1200	12	Anticon 80	16106
R2.3	100	10	1200	12	Anticon 100	15359
R2.5	110	10	1200	12	Anticon 110	84858
R2.5 HP	100	10	1200	12	Anticon 100	95821
R3.0	130	10	1200	12	Anticon 130	84891

^ AS/NZS 1530.3 Test Report available.

R-values are determined in accordance with AS/NZS 4859.1. The contribution of the reflective air-gap is construction dependant and excluded from the declared R-value. The duty classification of the facing material does not influence the R-value.

Anticon® & Anticon® HP Roofing Blanket

Additional Product Data

Maximum Service Temperature		300°C for unfaced Glasswool 70°C for faced Glasswool
Fire Hazard Properties	When assessed in accordance with AS/NZS 1530 Part 3	• Ignitability: 0 • Spread of flame: 0 • Heat Evolved: 0 • Smoke Developed: 1

Acoustic Performance

Sound absorption results were tested under AS/ISO 354-2006 and NRC and SAA rated using ASTM C423-90A-

Product	Thickness (mm)	Practical Sound Absorption Coefficient (α_p)	Frequency (Hz)						NRC	SAA	α_w
			125	250	500	1000	2000	4000			
Anticon 60 with LD Facing	60	Practical Sound Absorption Coefficient (α_p)	0.25	0.75	1	0.55	0.25	0.15	0.65	0.64	0.30 (LM)
Anticon 80 with LD Facing	80		0.45	1	0.95	0.5	0.35	0.15	0.7	0.72	0.35 (LM)
Anticon 130 with LD Facing	130		0.6	1.0	1.0	0.7	0.4	0.25	0.85	0.84	0.4 (LM)

The practical sound absorption coefficient (α_p) and weighted sound absorption coefficient (α_w) are determined as per AS/ISO 11654-1997.

Other Accreditation



FBS-1 Glasswool - The fibre component of these products is listed by Safe Work Australia as Man-made Vitreous Fibre (Glasswool) of low bio persistence as specified under Note Q in the Australian Hazardous Substances Information System and in the Australian Approved Criteria documentation. In accordance with EU ATP 31 (2009) these fibres are not classified as an irritant, or as carcinogenic.
Refer to the product SUI/MSDS at Bradfordinsulation.com.au for more information.



National Asthma Council Sensitive Choice

Enviroseal® CW

Refer to product table below for applicable product codes covered by this document

Issue **D**

Product Type & Application

Enviroseal® CW is a Class 4 vapour permeable, air and water barrier membrane. It is rated as Light Wall Duty and is constructed from a non-reflective, non-conductive spun bond material.

Compliance with the NCC

For use in Australia, when correctly specified and installed, this pliable building membrane:

NCC 2019

- **Condensation Control** - Meets the requirements of the NCC 2019 Volume 1 Amend. 1 F6.2(a), NCC 2019 Volume 2 Amend. 1 3.8.7.2(a) for pliable building membranes through compliance with AS 4200.1.
- **Non- Combustible Sarking-Type Material Exemption** - This product may be used in accordance with the non-combustible sarking-type material exemption stated in NCC 2019 Volume 1 Amend. 1 C1.9(e)(vi) and Volume 2 Amend. 1 3.7.1.1(f) – it does not exceed 1mm in thickness and has a Flammability Index ≤5.
- **Non- Combustible Sarking-Type Material Exemption** - The integrated adhesive component of the product has not been tested to AS1530.2.
- **BAL and Fire Hazard Properties** - Meets the requirements of sarking for construction of buildings in bushfire-prone regions BAL 12.5-FZ, as per AS 3959, section 3.10; and the fire hazard property requirements for sarking-type materials in all locations except exposed installations in fire control rooms or fire-isolated exits, in NCC 2019 Volume 1 Amend. 1 Specification C1.10.

NCC 2022

- **Condensation Control** - Meets the requirements of NCC 2022 Volume 1 F8D3, ABCB Housing Provisions Standard 2022 10.8.1 for pliable building membranes through compliance with AS 4200.1.
- **Non- Combustible Sarking-Type Material Exemption** - This product may be used in accordance with the non-combustible sarking-type material exemption stated in NCC 2022 Volume 1 C2D10(6)(f) and NCC 2022 Volume 2 H3D2(1)(f) – it does not exceed 1mm in thickness and has a Flammability Index ≤5.
- **Non- Combustible Sarking-Type Material Exemption** - The integrated adhesive component of the product has not been tested to AS1530.2.
- **BAL and Fire Hazard Properties** - Meets the requirements of sarking for construction of buildings in bushfire-prone regions BAL 12.5-FZ, as per AS 3959, section 3.10; and the fire hazard property requirements for sarking-type materials in all locations except exposed installations in fire control rooms or fire-isolated exits, in NCC 2022 Volume 1 S7C7.

Limitations of Use

- **IMPORTANT:** Do Not Modify This Product: Compliance with the evidence of suitability data referenced in this document is only achieved by the product or configuration listed in this PTS.
- This product is not intended for use as a roof sarking.
- Not suitable for use in tropical NCC Climate Zone 1.
- This product does not provide a reflective R-value.
- This product does not have a Group Number in accordance with AS ISO 9705 and AS 5637.1 (NCC 2019 Volume 1 Amend. 1 Specification C1.10 Clause 4, NCC 2022 Volume 1 S7C4) and is not suitable as an exposed internal wall and ceiling lining.
- This product is not designed to withstand prolonged exposure to the elements - accordingly, the exterior cladding should be installed within 6 weeks. Products exposed during this period should be inspected for damage and repaired or replaced prior to installation of the exterior cladding to comply with the Product Warranty. Products exposed for longer than the recommended periods will not be covered by the Product Warranty.
- Additional mechanical fasteners should be considered for products exposed to harsh weather conditions prior to cladding.
- Products exposed to harsh weather conditions prior to cladding should be inspected for damage and replaced or repaired to ensure compliance with the product warranty.
- Prior to cladding, it is good practice to protect this product from UV exposure and harsh weather conditions which may cause damage.
- This product has not been tested for pressure equalised façade applications.
- This product should not come into contact with wet concrete, or alkaline materials.
- This product is not suitable for submersion in water or continuous contact with soil.

Evidence of Suitability

Testing to AS/NZS 4200.1 across the following reports-

- AWTa Report 19-005150 – *Resistance to Dry Delamination.*
- AWTa Report 19-005152 – *Resistance to Wet Delamination.*
- AWTa Report 19-005154 – *Moisture Shrinkage.*
- SCION Report 33876587 – *Folding Endurance.*
- AWTa NATA Report 19-005143 – *Burst Strength.*
- AWTa NATA Report 19-005145 – *Edge Tearing.*
- AWTa Report 20-005792 - *Electrical Conductivity.*
- AWTa NATA Report 19-00953 – *Vapour Control Classification.*
- AWTa Report 19-005147 – *Water Control Classification.*
- AWTa NATA Report 22-001560 – *Flammability Classification.*
- SGS Report SGS-IPS 00736-18-C – *Air Control Classification.*
- CSR Lab Report R-20078 – *Thickness.*

Enviroseal[®] CW

Specific Design or Installation Instructions

- Isolate power before installation.
- **Application Suitability:** Suitable for installation on the exterior side of the building frame of all wall construction types in NCC Climate Zones 2 to 8. Always check cladding manufacturer's guidance to confirm compatibility and refer to the Condensation Risk Consideration section on this document for further guidance.
- This product is suitable for brick veneer or lightweight cladding construction where the permeability Class is compatible with the wall cladding manufacturer's recommendation.
- Where this product is used with OSB, plywood or other supporting materials it is recommended that suitable ventilation is provided above or below the assembly to manage condensation risk.
- Recommended for use on framed walls that provide membrane support at no greater than 600mm centres. Please refer to Enviroseal HTS or HTS-IT Product Technical Statement for applications having support exceeding 600mm centres.
- When installed for vapour and/or air control, this product should be sealed at overlaps (minimum 50mm), end laps, discontinuities and penetrations by suitable means such as heat and moisture resistant adhesive tape.
- When installed for water control, this product must have overlaps of minimum 150mm, or 50mm and be taped on the exterior face.
- Where direct fix cladding and/or the profile of the cladding reduces drainage and drying, the incorporation of a cavity for drainage and drying is recommended.
- Always follow the installation instructions in AS 4200.2, and those available on the Bradford website. For inclusion in BAL (Bushfire Attack Level) classified buildings, additionally adhere to the installation requirements of AS 3959.
- To maintain the water barrier properties of the material it should not be punctured, creased, crushed, sharply folded or dragged over the building structure during installation.
- **Condensation Risk Consideration:** As there are many factors which can influence condensation risk it is highly recommended that designers undertake a hygrothermal analysis of the building design to further reduce condensation risk.

For general installation guidance refer to the product installation guide at Bradfordinsulation.com.au

Conditions of Storage & Maintenance

- Store in the original packaging in a cool, dry area, away from UV light (direct sunlight).
- Do not pressure clean or use mineral-based cleaners on this product.

Refer to the product SUIS/MSDS at Bradfordinsulation.com.au for more information.

Enviroseal® CW

Applicable Product Codes

PRODUCT NAME	WIDTH (mm)	LENGTH (m)	m ² PER ROLL	WEIGHT (kg)	PRODUCT CODE
Enviroseal CW	1500	50	75	10.7	114175
Enviroseal CW-IT	1500	50	75	10.8	134863

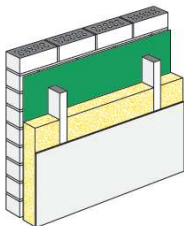
Additional Product Data - AS 4200.1

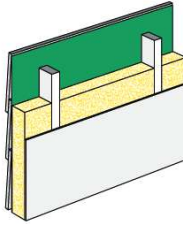
Duty Classification (AS/NZS 4200.1)	Light Wall	
Burst Strength (AS/NZS 4200.1 and AS 2001.2.19)	≥ 200 N	
Edge Tear Resistance (AS/NZS 4200.1 and TAPPI T470)	≥ 45 N	Machine Direction
	≥ 45 N	Lateral Direction
Water Control Classification (AS/NZS 4201.4)	Water Barrier	
Vapour Control Classification (ASTM E96)	Class 4 Vapour Permeable	
Air Control Classification (ISO 5636-5)	Air Barrier	
Emittance Classification (AS/NZS 4200.1 and AS/NZS 4201.5)	Non-Reflective, 0.9	Inward Facing
	Non-Reflective, 0.9	Outward Facing
Flammability Index (AS 1530.2)	≤ 5 (Low)	
Electrical Conductivity	Non-Conductive	
Resistance to Dry Delamination (AS/NZS 4201.1)	Pass	
Resistance to Wet Delamination (AS/NZS 4201.2)	Pass	
Moisture Shrinkage (AS/NZS 4201.3)	≤ 0.5 %	
Thickness	< 1.0 mm	

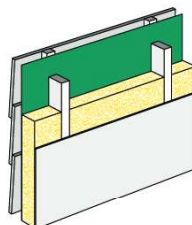
Enviroseal® CW

Application Tables

Valid for NCC 2016 Volumes 1 & 2, and NCC 2019 Volume 2

	Brick Veneer Wall	
	Insulation	
	R2.5	
	Summer	Winter
	R_t 3.0	R_t 3.2

	Lightweight Clad (Direct Fix)	
	Insulation	
	R2.5	
	Summer	Winter
	R_t 2.6	R_t 2.9

	Lightweight Clad (Battened)	
	Insulation	
	R2.5	
	Summer	Winter
	R_t 2.8	R_t 3.1

R-Value Assumptions

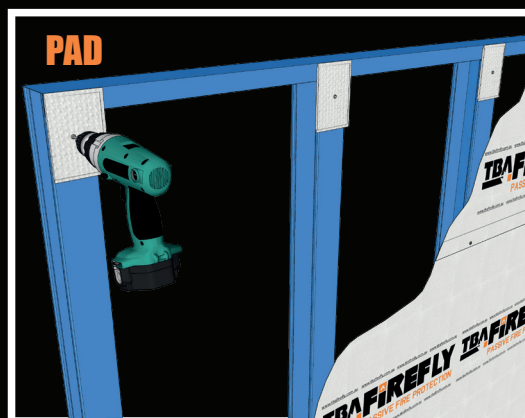
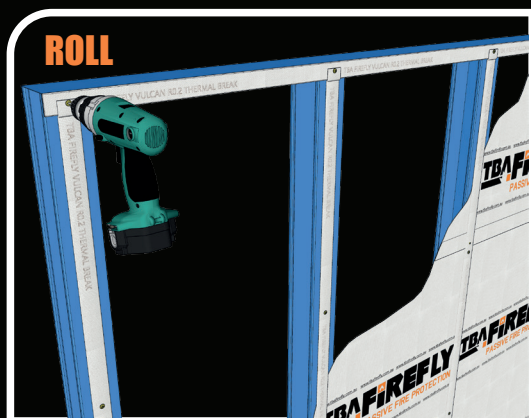
Product performance is calculated in accordance with AS/NZS 4859.2 and the stated thermal performance is the depicted application's Total R-Value. The contribution of this product to the Total R-Value depends upon installation and environmental conditions, and will be reduced in those cavities which are ventilated. No thermal bridging is considered in these calculations.

Calculations are based upon:

- A temperature difference of 6°C for heat flow out and 12°C for heat flow in.
- Reflective surface emittance of ≤ 0.05, non-reflective surface emittance of ≥ 0.90.

PHONE: (07) 5411 4209 (Option 2)
OR (02) 8004 3333 (Option 2)

WEBSITE: tbafirefly.com.au
EMAIL: sales@tbafirefly.com.au



THERMAL BREAK REQUIREMENTS OF THE NCC FOR METAL FRAMED CONSTRUCTION

The National Construction Code (BCA Vol 1 & 2) introduced a requirement in 2006 which states that all metal framed buildings of certain construction and building classification, require a Thermal Break with an R 0.2m² K/W to be installed between the metal frame and external cladding.

Metal framed walls have a higher thermal conductivity than timber framed walls which will cause heat leakage through the wall frame and into the building.

A Thermal Break reduces the impact of thermal bridging by reducing the flow of heat through the conductive pathway from the steel framing to the external cladding.

Where a Thermal Break is used to meet the compliance provisions of the BCA (NCC) for Metal Framed External Walls of All Type A and Type B Construction it must meet

All of the following criteria:

- Be a Non-combustible product
- Be installed between the Metal Frame and the External Cladding
- Be a material with an R-Value of not less than R 0.2

TBA FIREFLY VULCAN NON-COMBUSTIBLE R0.2 THERMAL BREAK

Description	Thermal Break Roll	Thermal Break Pad
Product Code	Vulcan Thermal Break R0.2	Vulcan R0.2 TB Pads
Thickness	6mm	6mm
Width	90mm	90mm
Length	10M	150mm
R-Value	R0.26	R0.26
Non-Combustible	Yes	Yes

The TBA FireflyTM Vulcan R0.2 Thermal Break is 100% **Non-combustible** in accordance with **AS1530.1**.
No fillers, no binders and no adhesives.

Report No: CSIRO FCO-3289

For full construction details please see our Installation Manual

**TBA FIREFLYTM VULCAN R0.2 THERMAL BREAK
FOR METAL FRAMES OF ALL TYPE A AND TYPE B CONSTRUCTION**