STRUCTURAL REPORT		Project No.	24433-1	Issue No.	2
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Load/Span Tables for Aluminium Faced Structural Insulated Panels with EPS Cores (Thermospan and Thermopanel)

For

Metalcraft Insulated Panels Limited

DOCUMENT CONTROL

ISSUE NUMBER	DATE OF ISSUE	EXPIRATION OF PS1	PURPOSE OF ISSUE
1	8 August 2025	N/A	Original Calculations
2	19 August 2025	N/A	Span Range Extended

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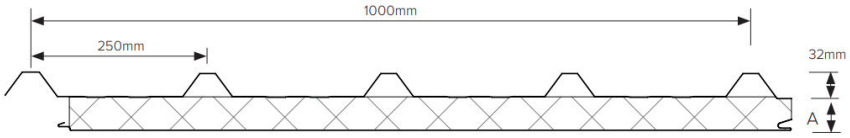
INTRODUCTION

This document provides guidance for engineers and architects looking to uses aluminium faced structural insulated panels (SIPs) incorporating an expanded polystyrene (EPS) core.

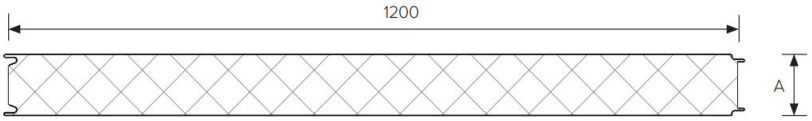
Load-span tables and graphs are presented for the equivalents of the profiled Thermospan and flat Thermopanel products.

Thermospan



- Top skin is 5005-H34 Aluminium 0.9mm thick 5-Rib trapezoidal profile
- Bottom skin is 5005-H34 Aluminium 0.9mm thick flat profile

Thermopanel



- Both skins are 5005-H34 Aluminium 0.9mm thick flat profile

The values for loading on the panels are theoretical. Ideally, these values should be confirmed by testing.

Notes for the load-span tables & graphs

1. The load span charts shown above are suitable only for roof and wall panels under wind loading @ ULS (Ultimate Limit State).
   a. Figures in red indicate capacity is limited by deflection.
   b. Figures in green indicate capacity is limited by fixing.
   c. Figures below 0.6kPa have been removed to allow for minimum factored roof loading due to gravity
2. For roof panels, min. roof slope of 3 degree applies.
3. The loading is shown for a simply supported single span.
4. For a continuous panel supported on multiple spans, deflection is reduced but the fixing load will be significantly higher and may be the governing design criteria.
5. Deflection limit of Span / 150 for SLS has been applied.
6. Self-weight of the panel has been ignored. For long-span thin panels, sagging under self-weight or additional dead load may be the governing design criteria.
7. Aluminium faced SIPS with EPS cores are unlikely to be suitable for situations requiring fire rated elements.
8. Creep under loading over time has been ignored. When panels are subject to long-term gravity loading or snow loading, excess sagging due to creep may may be the governing design criteria.
9. Fixing with 14g tek screws (or equivalent) at 250mm crs are required. The maximum pull-out load on a fixing is 2.37kN at ULS. Minimum purlin thickness = 2mm. Always check that adequate fixing capacity is provided.
10. Design parameters as follows (to be confirmed by testing):

$k = 0.3$ $f_{cv} = 125\ kPa$ $\phi_m = 0.9$ $\phi_v = 0.8$ $f_{y1} = 130\ MPa$ $f_{u1} = 160\ MPa$ $t_{s1} = 0.9\ mm$

Maximum Loading (kPa) Limited By Fixing Capacity @ ULS (Simply Supported)

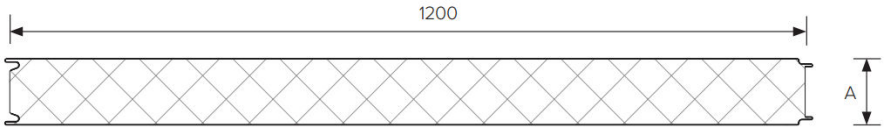
	Span (m)							
	2	2.5	3	3.5	4	5	6	7
Fixing	9.48	7.58	6.32	5.42	4.74	3.79	3.16	2.71

Panel Self Weight (kg/m^2)

	Panel mass Thickness (mm)							
	50	75	100	125	150	175	200	250
Thermopanel	5.6	6.0	6.4	6.8	7.2	7.6	8.0	8.3
Thermospan	6.2	6.6	7.0	7.4	7.8	8.2	8.6	9.4

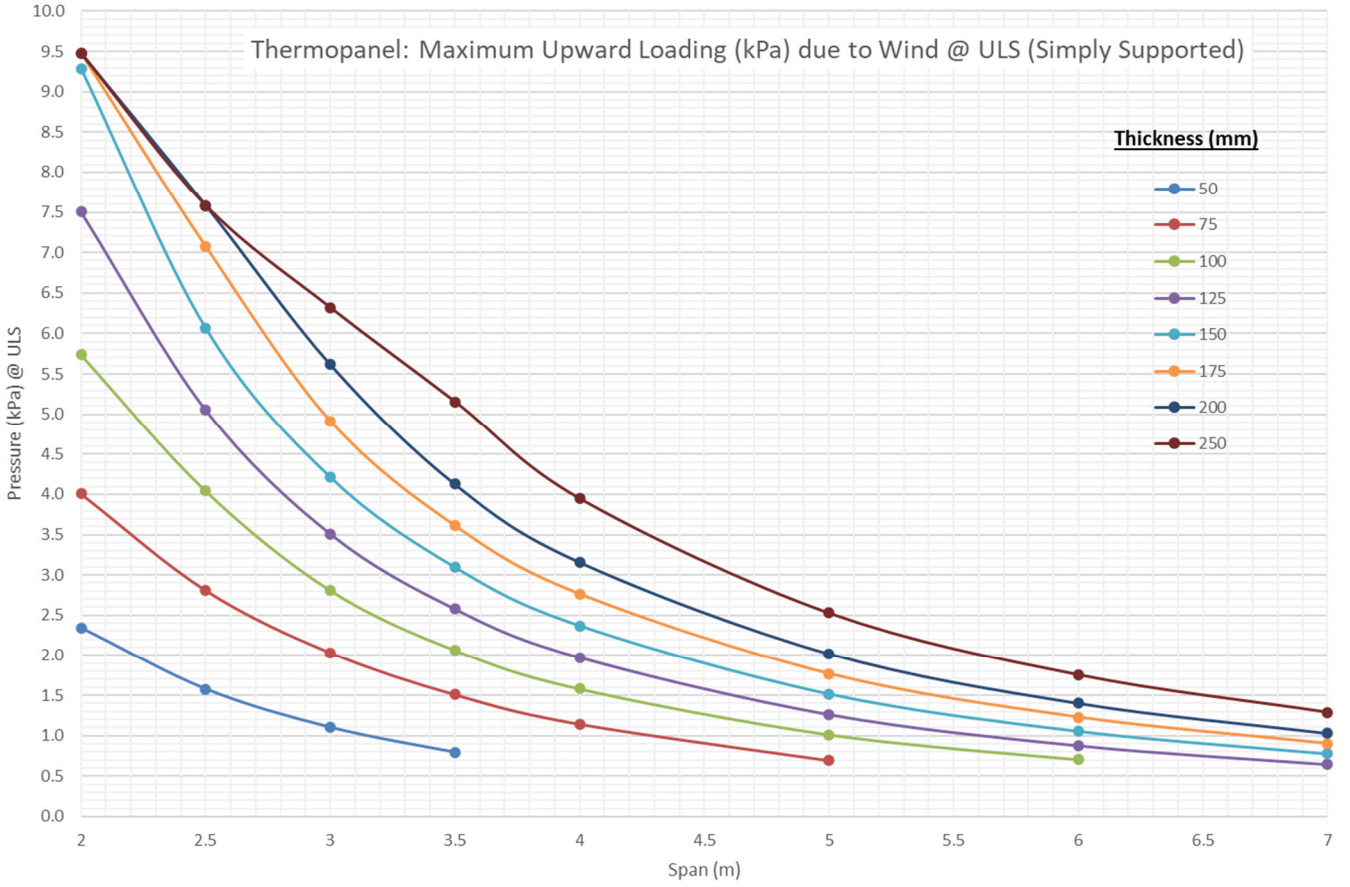
LOAD-SPAN TABLES & GRAPHS

1. THERMOPANEL (0.9MM ALUMINIUM SKINS TOP & BOTTOM / EPS CORE) SIMPLY SUPPORTED SINGLE SPAN PANELS

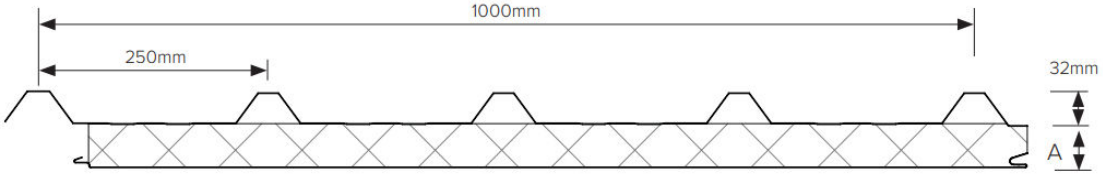


Maximum Upward Loading (kPa) due to Wind @ ULS (Simply Supported)

Thickness (mm)	Span (m)							
	2	2.5	3	3.5	4	5	6	7
50	2.34	1.58	1.10	0.79				
75	4.01	2.81	2.03	1.51	1.14			
100	5.74	4.04	2.81	2.06	1.58	1.01	0.70	
125	7.50	5.05	3.51	2.58	1.97	1.26	0.88	0.64
150	9.29	6.07	4.21	3.09	2.37	1.52	1.05	0.77
175	*9.48*	7.08	4.91	3.61	2.76	1.77	1.23	0.90
200	*9.48*	*7.58*	5.62	4.13	3.16	2.02	1.40	1.03
250	*9.48*	*7.58*	*6.32*	5.16	3.95	2.53	1.76	1.29

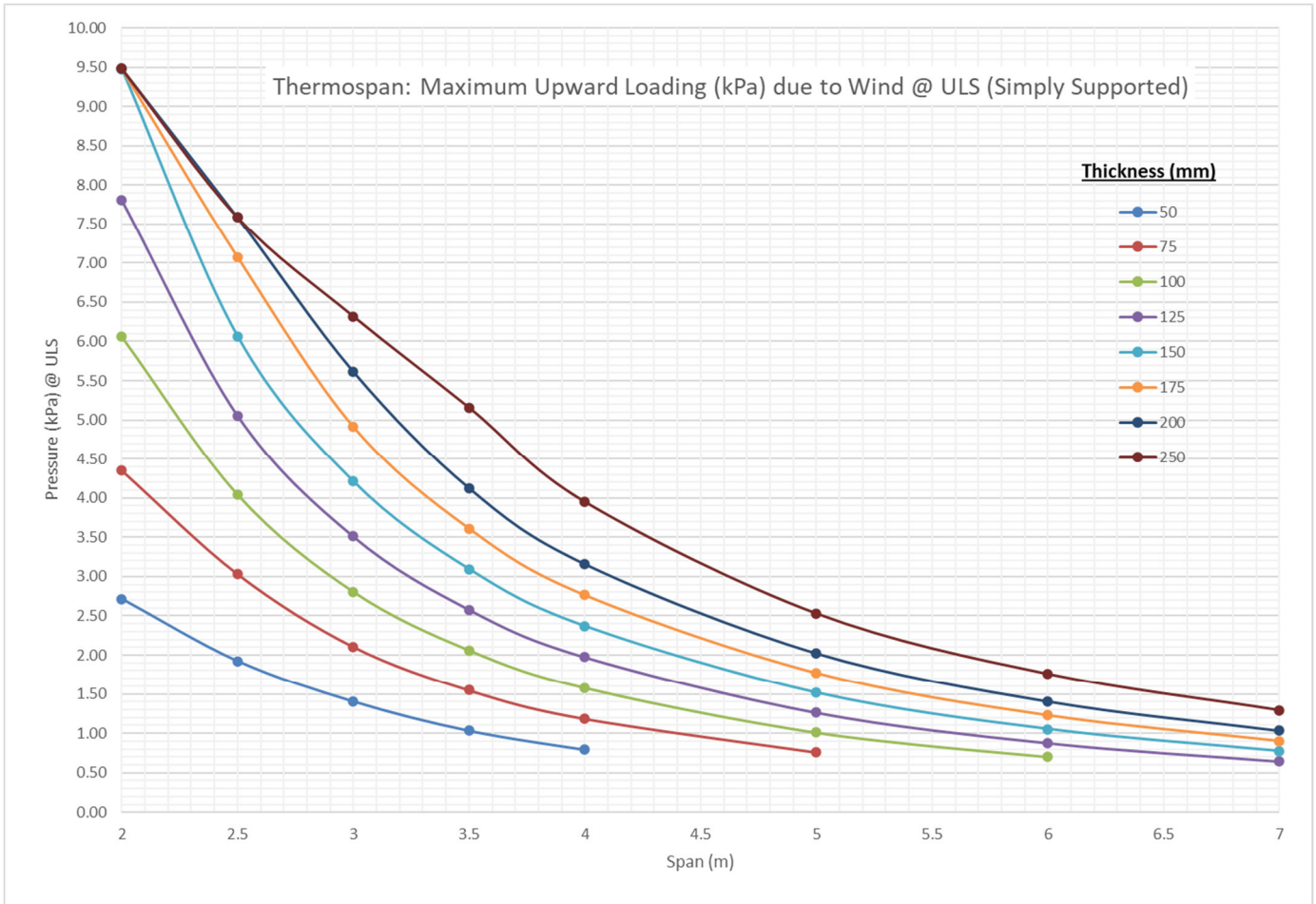


2. THERMOSPAN (0.9MM ALUMINIUM SKINS TOP & BOTTOM / EPS CORE) SIMPLY SUPPORTED SINGLE SPAN PANELS



Maximum Upward Loading (kPa) due to Wind @ ULS (Simply Supported)

Thickness (mm)	Span (m)							
	2	2.5	3	3.5	4	5	6	7
50	2.72	1.92	1.40	1.03	0.79			
75	4.35	3.03	2.11	1.55	1.18	0.76		
100	6.06	4.04	2.81	2.06	1.58	1.01	0.70	
125	7.80	5.05	3.51	2.58	1.97	1.26	0.88	0.64
150	*9.48*	6.07	4.21	3.09	2.37	1.52	1.05	0.77
175	*9.48*	7.08	4.91	3.61	2.76	1.77	1.23	0.90
200	*9.48*	*7.58*	5.62	4.13	3.16	2.02	1.40	1.03
250	*9.48*	*7.58*	*6.32*	5.16	3.95	2.53	1.76	1.29



APPENDIX A: MATERIAL DATA SHEET FOR ALUMINIUM SHEET

5005-H34 Aluminum

5005-H34 aluminum is 5005 aluminum in the H34 temper. To achieve this temper, the metal is strain hardened, and then stabilized, to a strength that is roughly halfway between annealed (O) and full-hard (H38).

The graph bars on the material properties cards below compare 5005-H34 aluminum to: 5000-series alloys (top), all aluminum alloys (middle), and the entire database (bottom). A full bar means this is the highest value in the relevant set. A half-full bar means it's 50% of the highest, and so on.

Mechanical Properties

Brinell Hardness

43

Elastic (Young's, Tensile) Modulus

68 GPa 9.9 x 10^6 psi

Elongation at Break

7.3 %

Fatigue Strength

74 MPa 11 x 10^3 psi

Poisson's Ratio

0.33

Shear Modulus

26 GPa 3.7 x 10^6 psi

Shear Strength

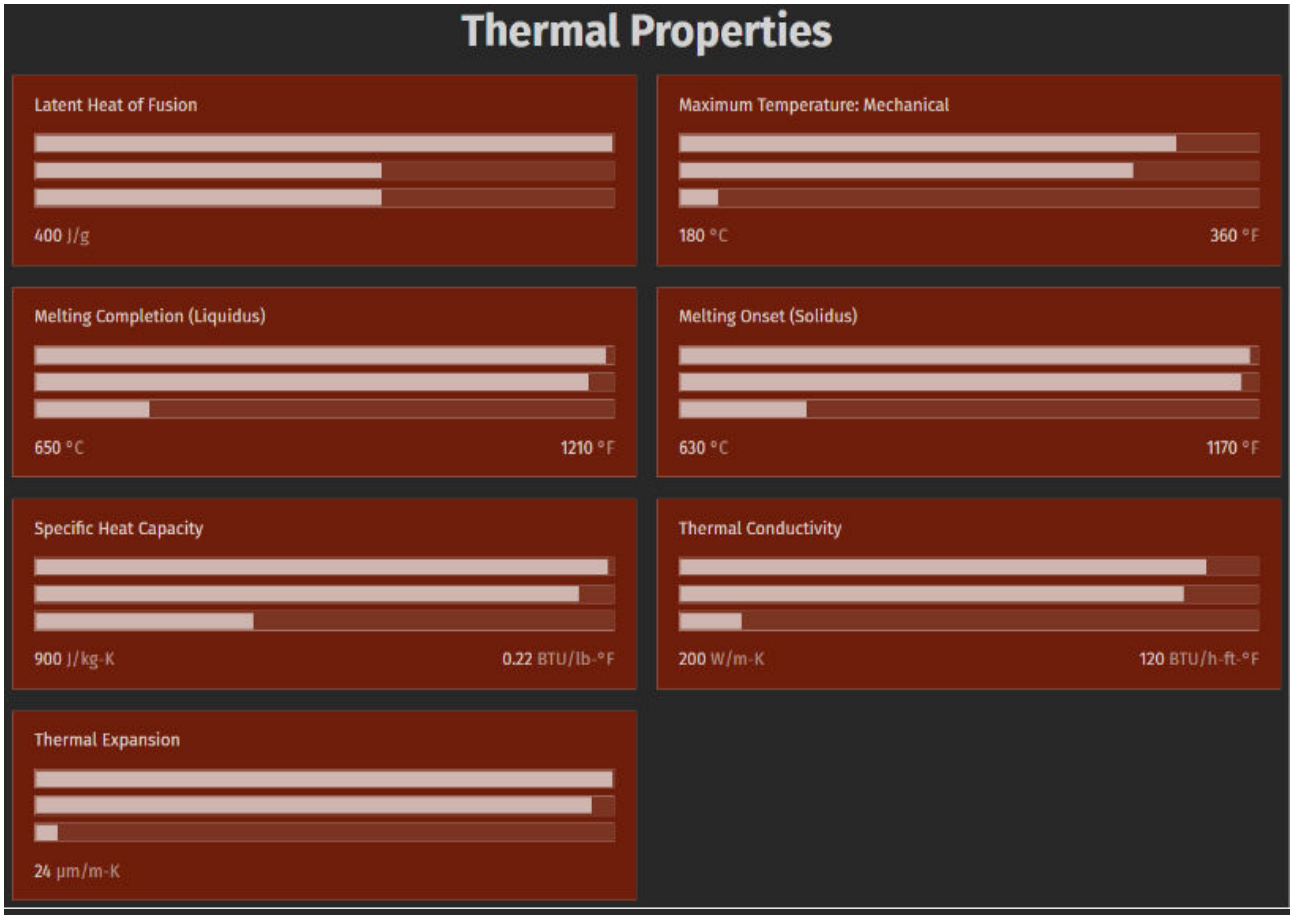
96 MPa 14 x 10^3 psi

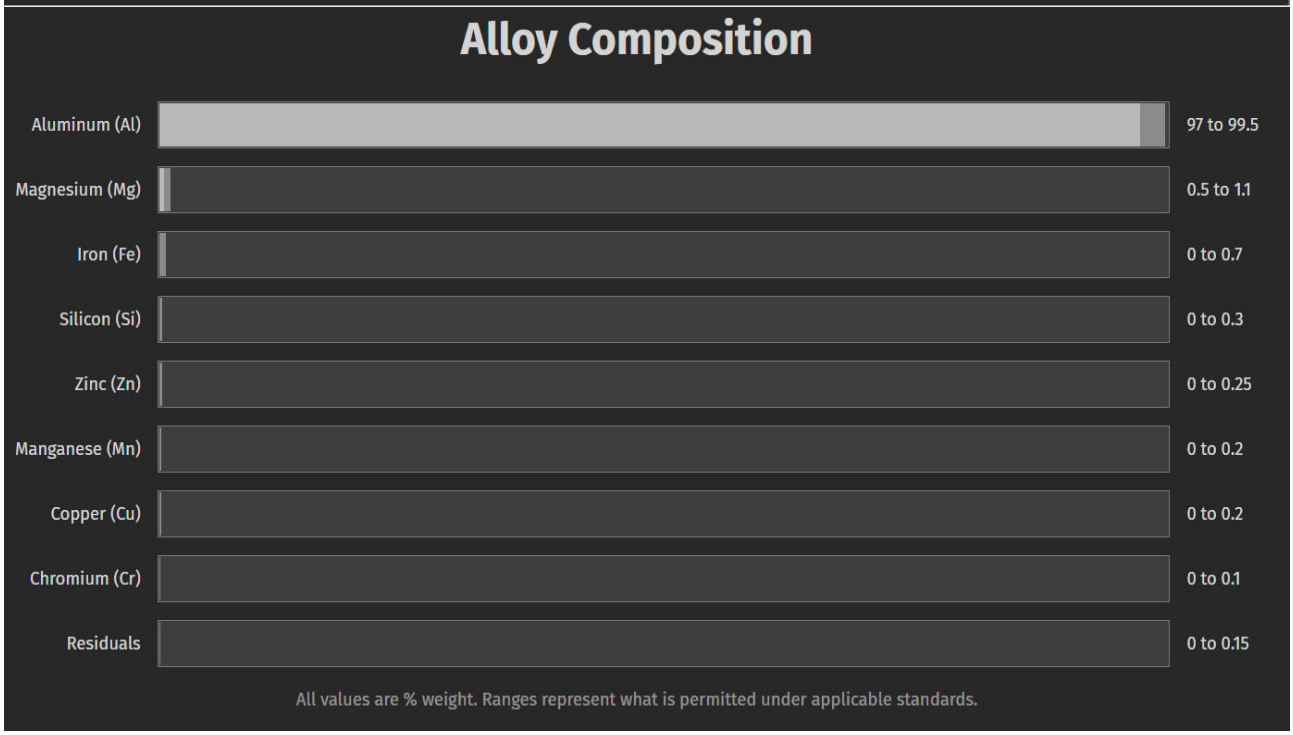
Tensile Strength: Ultimate (UTS)

160 MPa 23 x 10^3 psi

Tensile Strength: Yield (Proof)

130 MPa 19 x 10^3 psi


Thermal Properties
Latent Heat of Fusion
400 J/g
Maximum Temperature: Mechanical
180 °C
360 °F
Melting Completion (Liquidus)
650 °C
1210 °F
Melting Onset (Solidus)
630 °C
1170 °F
Specific Heat Capacity
900 J/kg-K
0.22 BTU/lb-°F
Thermal Conductivity
200 W/m-K
120 BTU/h-ft-°F
Thermal Expansion
24 µm/m-K


Alloy Composition
Aluminum (Al)
97 to 99.5
Magnesium (Mg)
0.5 to 1.1
Iron (Fe)
0 to 0.7
Silicon (Si)
0 to 0.3
Zinc (Zn)
0 to 0.25
Manganese (Mn)
0 to 0.2
Copper (Cu)
0 to 0.2
Chromium (Cr)
0 to 0.1
Residuals
0 to 0.15
All values are % weight. Ranges represent what is permitted under applicable standards.

APPENDIX B: MATERIAL DATA SHEETS FOR EPS

FUTURE FOAMS

Expanded Polystyrene (EPS) Product Manual

Ref: FF-PM-007
Page 3 of 18
Revised 07/10/2024

B: PRODUCT DATA

EPS CHARACTERISTICS

Dimensions: Standard size is 2400mm x 1200mm, 3600mm x 1200mm
Other dimensions available on request

Thicknesses: Standard thicknesses are: 10mm, 15mm, 20mm, 25mm, 30mm, 40mm, 50mm, 75mm, 100mm, 150mm, 200mm, 250mm, and 300mm. Other thicknesses available on request

Type of Edge: Straight Edge
Colour: White
Surface: Smooth face

PROPERTIES

The physical properties of well-made oven-cured EPS are primarily determined by the moulded density (See Fig. 1 to 4).
However, these properties will be affected by raw material and manufacturing variations, so Australian Standard 1366-3-1992 specifies the classes in terms of performance properties rather than density.
The standard lists the 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:								
- median flame duration (max.)	SD	2	2	2	2	2	2	AS 2122.1
- 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/ft².h.°F								

FUTURE FOAMS

Expanded Polystyrene (EPS) Product Manual

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 EPS can be seen in (Fig.1 to 4): Compressive strength, Cross Breaking strength (flexural strength), Tensile strength, and shear strength.

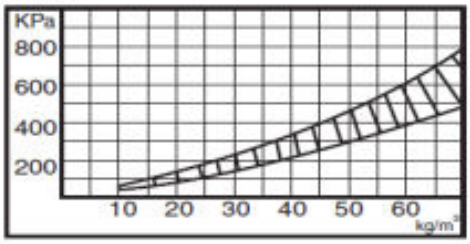


Fig. 1: Stress at 10% deformation v density

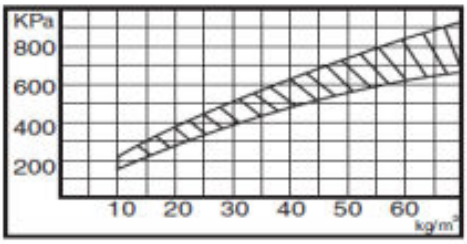


Fig. 3: Tensile strength v density

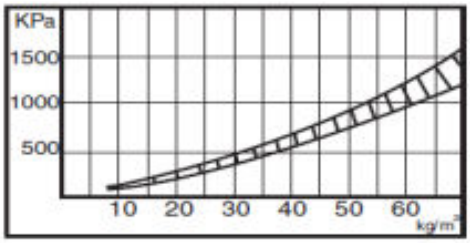


Fig. 2: Cross-breaking strength v density

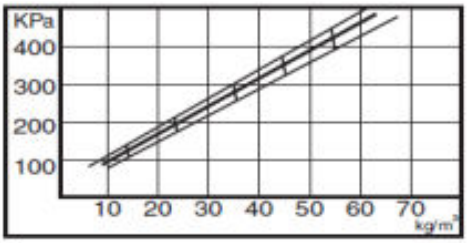


Fig. 4: Shear strength v density at 23ºC

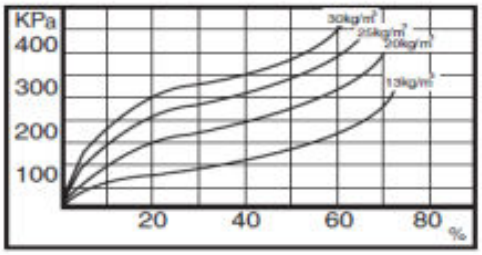


Fig. 5: Stress v compressive strain

Categories: Polymer; Thermoplastic; Polystyrene (PS); Expanded Polystyrene (EPS)

Material Notes: This property data is a summary of similar materials in the MatWeb database for the category "Expanded Polystyrene (EPS)". Each property range of values reported is minimum and maximum values of appropriate MatWeb entries. The comments report the average value, and number of data points used to calculate the average. The values are not necessarily typical of any specific grade, especially less common values and those that can be most affected by additives or processing methods.

Vendors: No vendors are listed for this material. Please click here if you are a supplier and would like information on how to add your listing to this material.

Physical Properties	Metric	English	Comments
Density	0.00310 - 3.50 g/cc	0.000112 - 0.126 lb/in³	Average value: 0.212 g/cc Grade Count:385
Filler Content	0.300 - 10.5 %	0.300 - 10.5 %	Average value: 5.17 % Grade Count:37
Water Absorption	0.0300 - 9.00 %	0.0300 - 9.00 %	Average value: 0.397 % Grade Count:50
Particle Size	100 - 3150 µm	100 - 3150 µm	Average value: 983 µm Grade Count:95
Water Vapor Transmission	50.0 - 200 g/m²/day	3.22 - 12.9 g/100 in²/day	Average value: 126 g/m²/day Grade Count:6
Viscosity	1.65 - 1.70 cP	1.65 - 1.70 cP	Average value: 1.67 cP Grade Count:9
Permeability	0.500 - 3.50	0.500 - 3.50	Average value: 1.79 Grade Count:19
Maximum Moisture Content	0.200 - 0.500	0.200 - 0.500	Average value: 0.403 Grade Count:40
Melt Flow	1.80 - 4.00 g/10 min	1.80 - 4.00 g/10 min	Average value: 2.53 g/10 min Grade Count:3
Outgassing - Total Mass Loss	1.00 - 2.50 %	1.00 - 2.50 %	Average value: 1.39 % Grade Count:7
Vapor Pressure	0.685 bar	514 torr	Average value: 0.685 bar Grade Count:9

Mechanical Properties	Metric	English	Comments
Tensile Strength, Ultimate	0.0800 - 1.10 MPa	11.6 - 160 psi	Average value: 0.464 MPa Grade Count:47
Tensile Strength, Yield	47.1 - 51.0 MPa	6830 - 7400 psi	Average value: 48.4 MPa Grade Count:3
Elongation at Break	5.00 - 13.4 %	5.00 - 13.4 %	Average value: 8.45 % Grade Count:21
Creep Strength	0.0600 - 0.300 MPa	8.70 - 43.5 psi	Average value: 0.156 MPa Grade Count:6
Modulus of Elasticity	0.00650 - 2.65 GPa	0.943 - 384 ksi	Average value: 0.484 GPa Grade Count:8
Flexural Yield Strength	0.0750 - 3.00 MPa	10.9 - 435 psi	Average value: 0.433 MPa Grade Count:142
Flexural Modulus	0.00628 - 0.0342 GPa	0.911 - 4.96 ksi	Average value: 0.0153 GPa Grade Count:20
Flexural Strain at Break	6.90 - 14.1 %	6.90 - 14.1 %	Average value: 10.8 % Grade Count:16
Compressive Yield Strength	0.0392 - 10.9 MPa	5.69 - 1580 psi	Average value: 0.461 MPa Grade Count:156
Compressive Modulus	0.00500 - 0.0400 GPa	0.725 - 5.80 ksi	Average value: 0.0177 GPa Grade Count:6
Shear Strength	0.200 - 0.300 MPa	29.0 - 43.5 psi	Average value: 0.290 MPa Grade Count:5
Adhesive Bond Strength	0.100 - 0.400 MPa	14.5 - 58.0 psi	Average value: 0.165 MPa Grade Count:5
Izod Impact, Notched	0.216 - 0.245 J/cm	0.404 - 0.459 ft-lb/in	Average value: 0.235 J/cm Grade Count:3
Puncture Energy	41.4 - 316 J	30.5 - 233 ft-lb	Average value: 103 J Grade Count:16
Tear Strength	1.05 - 6.10 kN/m	5.99 - 34.8 pli	Average value: 2.74 kN/m Grade Count:17
K Factor (Wear Factor)	54.0 - 59.0	54.0 - 59.0	Average value: 56.8 Grade Count:13
Compression Set	32.2 - 45.7 %	32.2 - 45.7 %	Average value: 41.1 % Grade Count:20

Electrical Properties	Metric	English	Comments
Surface Resistance	1.00e+10 - 1.00e+12 ohm	1.00e+10 - 1.00e+12 ohm	Average value: 2.44e+11 ohm Grade Count:5

Thermal Properties	Metric	English	Comments
CTE, linear	63.0 - 80.0 µm/m-°C	35.0 - 44.4 µin/in-°F	Average value: 66.3 µm/m-°C Grade Count:33
CTE, linear, Transverse to Flow	60.0 µm/m-°C	33.3 µin/in-°F	Average value: 60.0 µm/m-°C Grade Count:6
Thermal Conductivity	0.0270 - 0.0450 W/m-K	0.187 - 0.312 BTU-in/hr-ft²-°F	Average value: 0.0353 W/m-K Grade Count:106
☒	0.0240 - 0.0370 W/m-K @Temperature -80.0 - 50.0 °C	0.167 - 0.257 BTU-in/hr-ft²-°F @Temperature -112 - 122 °F	Average value: 0.0312 W/m-K Grade Count:5
☒	0.0240 - 0.0370 W/m-K @Temperature -80.0 - 50.0 °C	0.167 - 0.257 BTU-in/hr-ft²-°F @Temperature -112 - 122 °F	Average value: 0.0312 W/m-K Grade Count:1
	0.0240 - 0.0370 W/m-K @Thickness 50.0 - 50.0 mm	0.167 - 0.257 BTU-in/hr-ft²-°F @Thickness 1.97 - 1.97 in	Average value: 0.0312 W/m-K Grade Count:1
Insulation R Value	3.66 - 20.0	3.66 - 20.0	Average value: 8.05 Grade Count:7
☒	>= 5.40 @Temperature -3.89 - 4.44 °C	>= 5.40 @Temperature 25.0 - 40.0 °F	Average value: 9.35 Grade Count:3
	>= 5.40 @Thickness 25.4 - 76.2 mm	>= 5.40 @Thickness 1.00 - 3.00 in	Average value: 9.35 Grade Count:3

AS1366.3

Table of physical properties of EPS

PHYSICAL PROPERTY	UNIT	SL	S	M	H	VH	TEST METHOD
Density	kg/m³	12.5	16	20	24	28	
Compressive stress at 10% deformation (min)	kPa	70	85	105	135	165	AS 2498.3
Cross-breaking strength (min)	kPa	135	165	200	260	320	AS 2498.4
Rate of water vapour transmission (max) measured parallel to rise at 23°C	mg/m2s	630	580	520	460	400	AS 2498.5
Dimensional stability of length, width, thickness (max) at 70°C, dry condition 7 days	%	1	1	1	1	1	AS 2498.6
Thermal resistance (min) at a mean temperature of 25°C	m2.K/W	1.13	1.17	1.20	1.25	1.28	AS 2464.5 or AS 2464.6
Flame propagation characteristics:							AS 2122.1
median flame duration (max)	s	2	2	2	2	2	
eighth value (max)	s	3	3	3	3	3	
median volume retained	%	18	22	30	40	50	
eighth value (min)	%	15	19	27	37	47	