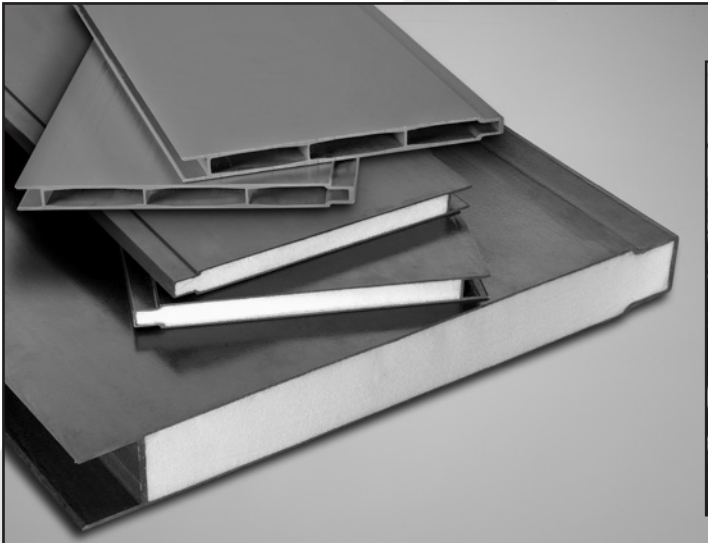


SECTION 14

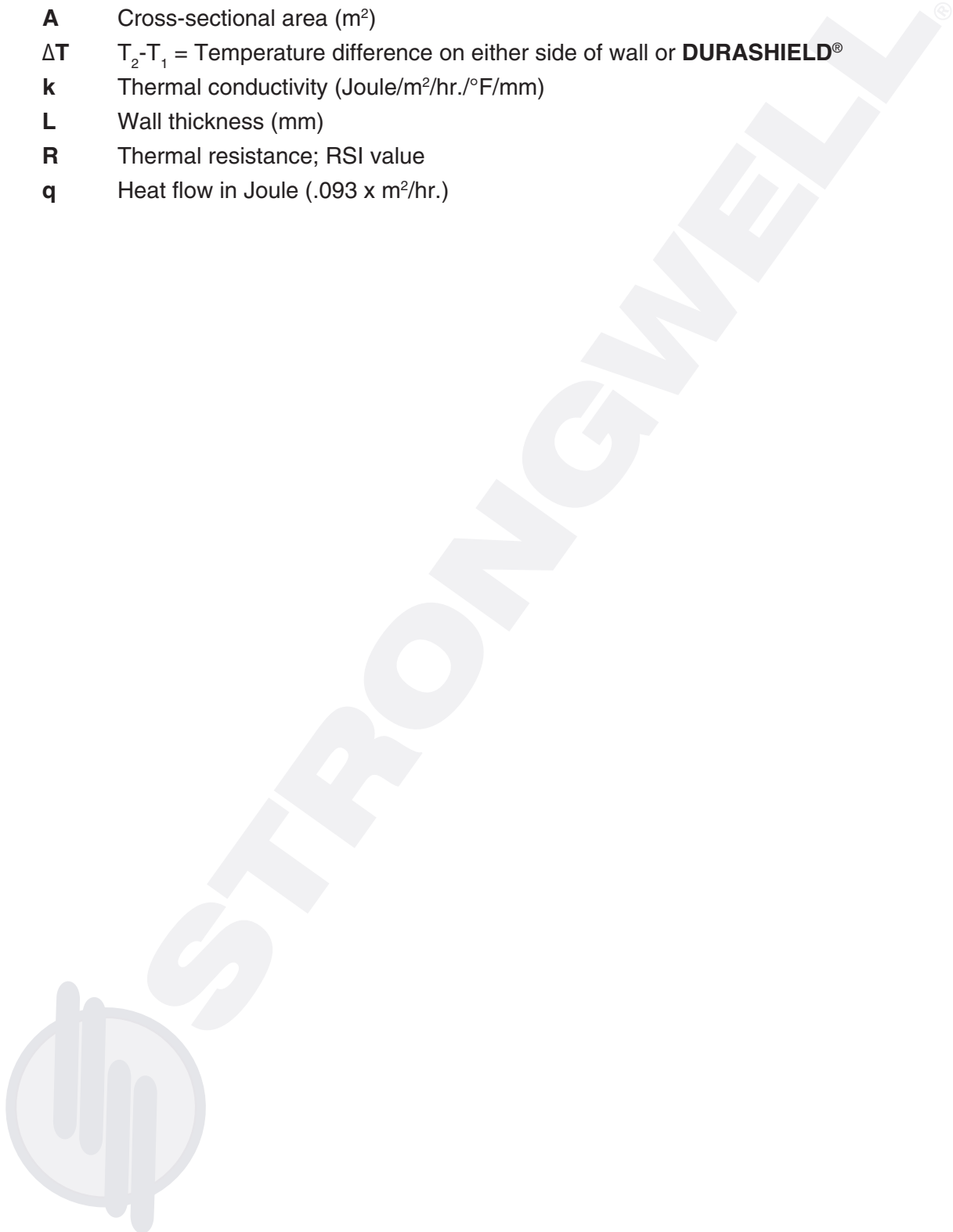
DURASHIELD® FIBERGLASS FOAM CORE BUILDING PANELS & DURASHIELD HC® FIBERGLASS HOLLOW CORE BUILDING PANELS



Look for this blue line in the left margin of the Design Manual documents. This line shows you where the latest update has been made.

SYMBOLS FOR DURASHIELD® FOAM CORE PANELS

- Q** Heat flow (Joule)
- A** Cross-sectional area (m²)
- ΔT** T₂-T₁ = Temperature difference on either side of wall or **DURASHIELD®**
- k** Thermal conductivity (Joule/m²/hr./°F/mm)
- L** Wall thickness (mm)
- R** Thermal resistance; RSI value
- q** Heat flow in Joule (.093 x m²/hr.)



DURASHIELD® FIBERGLASS FOAM CORE BUILDING PANELS

FEATURES

DURASHIELD® is a tongue-and-groove fiberglass pultruded panel comprised of a pultruded skin over a foam core. The exclusively made in the U.S.A. panel provides these features:

- Integral Insulation
- Lightweight
- High Strength
- Corrosion Resistant
- Low in Conductivity
- Flame Retardant
- Transparent to Electromagnetic Emissions

SIZES

DURASHIELD® panels are available in 25.4mm thick x 304.8mm wide and 76.2mm thick x 609.6mm wide sizes. The panels can be produced in any practical length.

MATERIALS OF CONSTRUCTION

The pultruded fiberglass skin of **DURASHIELD®** is available in either a premium polyester or a vinyl ester resin. Both resin systems provide flame retardance (UL 94 V-0). Vinyl ester is utilized in extreme corrosive applications. A synthetic surfacing veil is incorporated into the skin to improve weathering, corrosion resistance, and resistance to degradation from ultraviolet rays. Resistance to weathering can be further enhanced by the application of a polyurethane paint.

The core material, which provides the insulation value of **DURASHIELD®**, is a rigid closed-cell urethane foam. The ends of the panels must be encapsulated or coated with a resin similar to the skin resin to maintain the corrosion and weather resistant qualities of the total panel.

APPLICATIONS

DURASHIELD® panels are designed to be used as walls, roofs, and covers. Typical applications are:

- Radar, Microwave, Radio, and TV Antenna Enclosures
- Enclosures for Electrical Equipment
- Enclosures of Chemical Processing Operations
- Buildings for EMI Testing (Computer Testing)
- Chemical Pit Covers
- Roofs on Wet-End Pulp and Paper Manufacturing
- Modular Buildings
- Walls/Flooring for Food Processing Operations

DURASHIELD® PROPERTIES AND DIMENSIONS

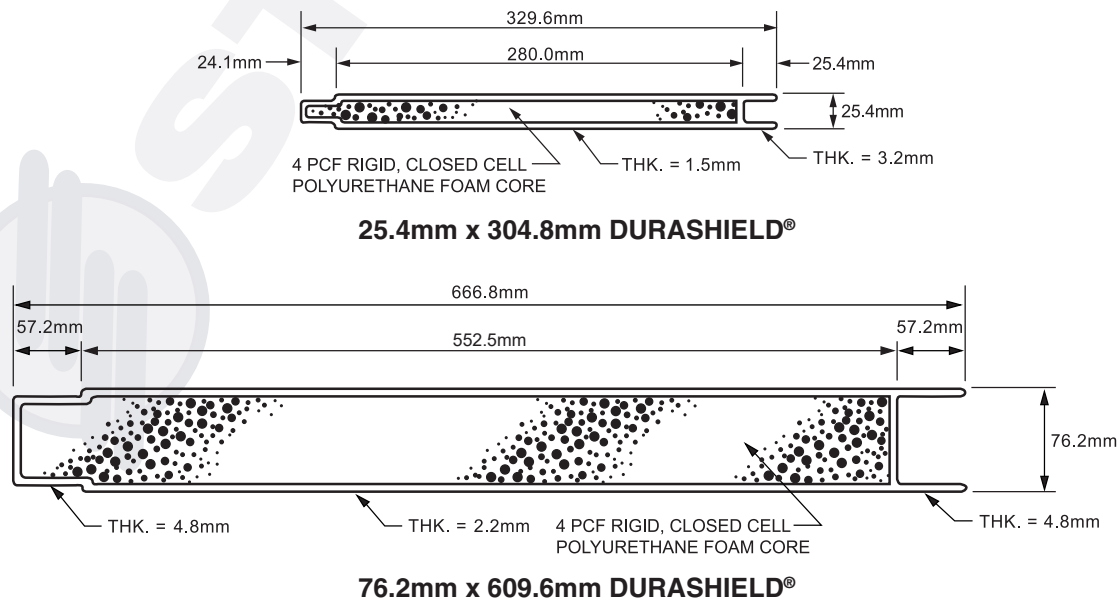
PHYSICAL PROPERTIES (NOMINAL)

PROPERTY	25.4mm PANEL	76.2mm PANEL
Weight (kg/m)	3.27	11.71
Panel Width (mm)	304.8	609.6
'R' value ((m²K)/W)	0.87	3.00
Foam Density (kg/m³)	64.1	64.1
Min. thickness FRP composite skin (mm)	1.524	2.235
Coefficient of Thermal Exp. (10 ⁻⁶ mm/mm/°C)	9.36	9.36
Flame Spread Rating: • Fiberglass Composite Skin • Foam	MAX 25 MAX 25	MAX 25 MAX 25
Water Absorption	<0.3% if properly sealed	<0.3% if properly sealed
UL 94	V-0	V-0

MECHANICAL PROPERTIES (NOMINAL)

PROPERTY	25.4mm PANEL	76.2mm PANEL
LW Flexural Strength (N/mm²)	12.07	6
LW Flexural Modulus (10³N/mm²)	1.38	1.17
LW Short Beam Shear (N/mm²)	0.78	0.62
Pullout Test (pull through) (N) • Std. washer (25.4mm dia. with 9.525mm hole) • Fender washer (50.8mm dia. with 12.7mm hole)	2,890 5,785	3,245 7,209
Crush Test (152.4mm x 152.4mm load plate) (N)	24,920	30,037
Crush Test (full width) (N) • 25.4mm dia. bar • 63.5mm dia. bar	23,140 —	— 83,660

NOMINAL DIMENSIONS



ROOFING AND SIDING LOAD TABLES

25.4mm PANEL ALLOWABLE UNIFORM LOAD (N/m²)**

SPAN (m)	@Δ = span/60			@Δ = span/120			@Δ = span/180		
	Δ (mm)	Siding	Roofing	Δ (mm)	Siding	Roofing	Δ (mm)	Siding	Roofing
1	16.667	*7500	*7300	8.333	*7400	*7000	5.556	5700	5500
1.25	20.833	*6250	*6100	10.417	*6000	*5800	6.944	4050	3900
1.5	25.000	*4350	*4200	12.500	3500	3350	8.333	1900	1750
1.75	29.167	3150	3000	14.583	2100	1950	9.722	1100	950
2	33.333	2450	2300	16.667	1300	1150	11.111	700	550
2.25	37.500	1850	1700	18.750	850	700	12.500	480	380
2.5	41.667	1400	1300	20.833	550	450	13.889	320	220
2.75	45.833	1050	900	22.917	350	250	15.278	180	80
3	50.000	700	550	25.000	300	200	–	–	–
3.25	54.167	500	350	27.083	200	100	–	–	–
3.5	58.333	420	300	–	–	–	–	–	–

76.2mm PANEL ALLOWABLE UNIFORM LOAD (N/m²)**

SPAN (m)	@Δ = span/60			@Δ = span/120			@Δ = span/180		
	Δ (mm)	Siding	Roofing	Δ (mm)	Siding	Roofing	Δ (mm)	Siding	Roofing
2	33.333	*13200	*13000	16.667	10600	10400	11.111	6800	6600
2.25	37.500	*10200	*10000	18.750	7400	7200	12.500	5000	4800
2.5	41.667	*8450	*8200	20.833	5600	5400	13.889	3650	3450
2.75	45.833	*7000	*6800	22.917	4300	4100	15.278	2900	2700
3	50.000	*5900	*5700	25.000	3400	3300	16.667	2250	2100
3.25	54.167	5000	4800	27.083	2750	2550	18.056	1800	1600
3.5	58.333	4300	4100	29.167	2200	2000	19.444	1400	1200
3.75	62.500	3700	3500	31.250	1800	1600	20.833	1200	1000
4	66.667	3200	3000	33.333	1500	1300	22.222	1050	850
4.25	70.833	2600	2400	35.417	1300	1100	23.611	850	650
4.5	75.000	2200	2000	37.500	1050	850	25.000	720	520
4.75	79.167	1900	1700	39.583	900	700	26.389	620	420
5	83.333	1700	1500	41.667	800	600	27.778	500	320
5.25	87.500	1400	1200	43.750	720	520	29.167	450	250
5.5	91.667	1250	1050	45.833	600	400	30.556	410	210
5.75	95.833	1100	800	47.917	500	300	31.944	380	190
6	100.000	950	750	50.000	450	280	33.333	300	150

*Controlled by stress with a factor of safety of 1.50.

**Values are typical.

PERFORMANCE: These tables are offered as a guide only. The effects of sustained impact or dynamic loads, the particular corrosive environment and/or elevated temperatures have not been factored into these tables.

SUPPORTING FIBERGLASS STRUCTURAL SHAPES

DURASHIELD® panels are made for use with Strongwell's EXTREN® line of structural shapes. EXTREN® is available in over 100 standard shapes. Common additional supporting shapes are listed below.

USE	25.4mm PANEL SUPPORTING SHAPES	76.2mm PANEL SUPPORTING SHAPES
	SHAPE DESCRIPTION	SHAPE DESCRIPTION
SECTION/BASE	Standard EXTREN® Angle	Standard EXTREN® Angle
CORNER POST	Standard EXTREN® Angles Inside & Outside	Standard EXTREN® Angles Inside & Outside
ROOF JOINER	90° Custom Angle	90° Custom Angle
DOOR FRAMING	38.1mm x 38.1mm x 6.35mm EXTREN® Channel	88.9mm x 50.8mm x 5.56mm EXTREN® Channel
WINDOW LOUVERS	38.1mm x 38.1mm x 6.35mm EXTREN® Channel	88.9mm x 50.8mm x 5.56mm EXTREN® Channel
FASTENERS	9.53mm dia. FIBREBOLT® Stud & Nut Stainless Steel (optional)	12.7mm dia. FIBREBOLT® Stud & Nut Stainless Steel (optional)

NOTE:

These connections and supporting shapes can also be used with DURASHIELD HC®. See 14-7 for more information about DURASHIELD HC®.



DURASHIELD® HEAT FLOW ESTIMATES

The RSI value technique is a simple way to estimate the heat flow and to compare insulating materials and approaches for **DURASHIELD®**.

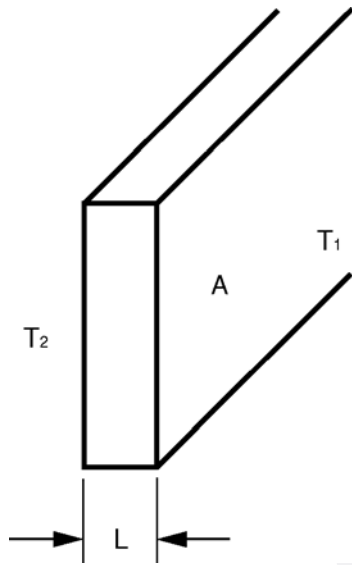
The RSI value for **DURASHIELD®** are:

25.4mm **DURASHIELD®**: RSI = 0.88 (m²·K)/W

76.2mm **DURASHIELD®**: RSI = 2.99 (m²·K)/W

The RSI value will be used by considering heat flowing through a wall on a straight line.

The heat flow equation for one dimensional heat transfer through a wall of thickness “L” is given by:



$$Q = kA \frac{\Delta T}{L} = \frac{\Delta T}{R} A = \frac{T_2 - T_1}{R} A$$

The RSI value approach becomes a simplified way to write the heat flow equation. The above sketch does not indicate whether T₂ or T₁ is inside or outside of the wall. Heat flows from the hotter to the colder location.

For the 25.4mm DURASHIELD®	For the 76.2mm DURASHIELD®
$Q = A \frac{\Delta T}{0.88}$	$Q = A \frac{\Delta T}{2.99}$
$\frac{Q}{A}$ = heat flow per unit area = $q = \frac{W}{m^2}$ That is, “q” is the number of watts that flow through one square meter in one hour. For the Strongwell DURASHIELD® :	
$\frac{Q}{A} = q = \frac{\Delta T}{0.88} \quad (1)$	$\frac{Q}{A} = q = \frac{\Delta T}{2.99} \quad (2)$

DURASHIELD® HEAT FLOW SAMPLE CALCULATIONS

EXAMPLES

- 1) Outside Temperature = 38° C
 Inside Temperature = 82° C
 For the 25.4mm **DURASHIELD®**, from equation (1)

25.4mm **DURASHIELD®**

$$q = \frac{82 - 38}{0.88} = \frac{44}{0.88} = 50.0 \frac{W}{m^2}$$

for a 24 hour time period

$$q_{24} = 50 \times 24 = 1,200 \frac{Wh}{m^2}$$

- 2) Outside Temperature = -18°C
 Inside Temperature = 82°C
 For the 76.2mm **DURASHIELD®**, from equation (2)

76.2mm **DURASHIELD®**

$$q = \frac{82 - -18}{2.99} = \frac{100}{2.99} = 33.4 \frac{W}{m^2}$$

$$q_{24} = 24 \text{ hour heat flow} = 33.4 \times 24 = 801.6 \frac{Wh}{m^2}$$

- 3) Outside Temperature = -18°C
 Inside Temperature = 82°C

25.4mm **DURASHIELD®**

$$q = \frac{82 - -18}{0.88} = \frac{100}{0.88} = 114 \frac{W}{m^2}$$

$$q_{24} = 24 \text{ hour heat flow} = 114 \times 24 = 2,736 \frac{Wh}{m^2}$$

NOTE: The above calculations assume: One dimensional heat flow. This is rarely a strictly valid assumption but is used as a first order approximation. The heat flow will generally be in all directions from a heat source.

GENERAL RULES FOR THE DURASHIELD® CALCULATION:

- 1) Calculate heat flow using

$$q = \frac{\Delta T}{R} \quad (3) \quad R = 0.88 \text{ (m}^2 \cdot \text{K)/W; 25.4mm DURASHIELD®}$$

$$R = 2.99 \text{ (m}^2 \cdot \text{K)/W; 76.2mm DURASHIELD®}$$

This is the BTU's per hour per cross sectional area.

- 2) Determine the desired time interval. Often, either a one hour or 24 hour time period is selected.

$$q_{24} = 24 \frac{\Delta T}{R} = 24 \text{ hour heat flow. (4)}$$

To obtain the heat flow for any time period, multiply the results of equation (3) by the time in hours.

- 3) To obtain the heat flow for any cross sectional area multiply equation (3) by the area. Thus, a 3.75m² subjected to this type of heat flow for a 76.2mm **DURASHIELD®** system would have a total heat flow given by:

$$Q = A \frac{\Delta T}{R} = 3.75 \times \frac{\Delta T}{2.99}$$

As an example, if the temperature difference, ΔT, equaled 40°C for an area of 3.75m²

$$Q = 3.75 \times \frac{40}{2.99} = 50.2 \text{ W}$$

and for 24 hours: $Q_{24} = 24 \times 50.2 = 1,205 \text{ Wh}$

DURASHIELD® HEAT FLOW CHART

Using the same one dimensional heat flow assumption, a quick reference chart is presented for a building constructed of **DURASHIELD®** and maintained at a constant 24°C temperature on the inside:

HEAT FLOW	OUTSIDE TEMPERATURE (°C)	Wh/m ² - One Day	
		25.4mm DURASHIELD®	76.2mm DURASHIELD®
HEAT OUT OF ROOM	-46	1,909	561.9
	-32	1,527	449.5
	-18	1,145	337.1
	-4	763.6	224.7
	10	381.8	112.4
	24	0.0	0.0
HEAT INTO ROOM	38	381.8	112.4
	52	763.6	224.7
	66	1,145	337.1
	80	1,527	449.5
	94	1,909	561.9

DURASHIELD HC® FIBERGLASS HOLLOW CORE BUILDING PANELS

FEATURES

DURASHIELD HC® is a non-insulated alternative to standard **DURASHIELD®**. The hollow core panel is a sensible choice for any type of roofing, flooring, enclosures, or screening that does not require insulation. As a tongue-and-groove building panel, it offers quick assembly and easy installation in various applications. Made exclusively in the U.S.A., **DURASHIELD HC®** panel provides these features:

- Lightweight
- Rot, Rust, and Mildew Resistant
- High Strength
- Low in Maintenance
- Easy to Install
- Low in Conductivity
- Flame Retardant

The pultruded panel's unique hollow core and intermediate ribs provide extra stiffness for uses such as decking, cladding, or tank covers. The panels can be bonded together with standard adhesives and attached to structural shapes with bolts or screw fasteners. Panels will not rot, rust, or mildew, which makes them ideal for high moisture environments including saltwater.

SIZES

DURASHIELD HC® is available as a 25.4mm thick x 304.8mm wide panel. The panels can be produced in any practical length.

MATERIALS OF CONSTRUCTION

A synthetic veil is incorporated into the surface to improve weathering, corrosion, and UV resistance. The standard resin system of **DURASHIELD HC®** is polyester; however, it can be custom ordered with a vinyl ester resin for highly corrosive applications. Both resin systems include flame retardants and meet the requirements of a Class 1 flame spread per ASTM E-84 and the self-extinguishing requirements of ASTM D-635.

APPLICATIONS

DURASHIELD HC® panels are designed to be used as walls, roofs, and covers. Typical applications are:

- Cladding
- Decking
- Cellular Enclosures and Screening
- Tank Covers
- Cooling Tower Partition Walls
- Buildings and Enclosures when Insulation is Not Required

DURASHIELD HC® PROPERTIES AND DIMENSIONS

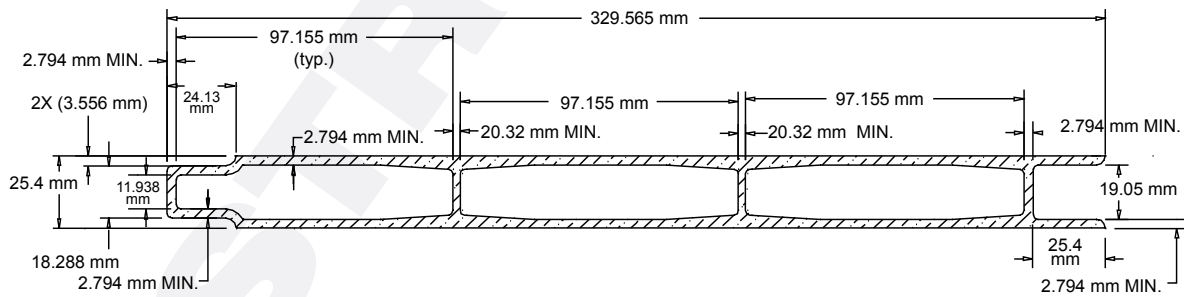
PHYSICAL PROPERTIES (NOMINAL)

PROPERTY	25.4mm PANEL
Depth (mm)	25.4
Panel Width (mm)	304.8
Weight (kg/linear m)	4.87
Area (mm ²)	2,525
Section Modulus (SX) (mm ³ /m of width)	70,357
Moment of Inertia (IX) (mm ⁴ /m of width)	895,826
Coefficient of Thermal Exp. (10 ⁻⁵ mm/mm/°C)	1.2
Flame Spread Rating (ASTM E-84)	MAX 25
Water Absorption	<0.6%
UL 94	V-0

MECHANICAL PROPERTIES (NOMINAL)

PROPERTY	ASTM	25.4mm PANEL
LW Compressive Strength (N/mm ²)	D695	344.8
LW Compressive Modulus (10 ⁶ N/mm ²)	D695	24,141
LW Tensile Strength (N/mm ²)	D638	400
LW Tensile Modulus (10 ⁶ N/mm ²)	D638	24,141
LW Short Beam Shear (N/mm ²)	D2344	31

NOMINAL DIMENSIONS



25.4mm x 304.8mm DURASHIELD®

DURASHIELD HC® ROOFING AND SIDING LOAD TABLES

25.4mm PANEL ALLOWABLE UNIFORM LOAD (N/m²) **

SPAN (m)	@Δ = span/60		@Δ = span/120		@Δ = span/180		@Δ = span/240		@Δ = span/300		@Δ = span/360	
	LOAD (N/m ²)	Δ (mm)	LOAD (N/m ²)	Δ (mm)	LOAD (N/m ²)	Δ (mm)	LOAD (N/m ²)	Δ (mm)	LOAD (N/m ²)	Δ (mm)	LOAD (N/m ²)	Δ (mm)
0.50	88000	8.333	48000	4.167	32000	2.778	25000	2.083	19000	1.667	15000	1.389
0.75	51000	12.500	25000	6.250	17000	4.167	12800	3.125	10000	2.500	8300	2.083
1.00	22000	16.667	11200	8.333	7400	5.556	5600	4.167	4400	3.333	3700	2.778
1.25	14000	20.833	6500	10.417	4800	6.944	3700	5.208	2500	4.167	1900	3.472
1.50	8200	25.000	4000	12.500	2600	8.333	2000	6.250	1600	5.000	1500	4.167
1.75	5200	29.167	2600	14.583	1900	9.722	1200	7.292	1000	5.833	800	4.861
2.00	3500	33.333	1700	16.667	1100	11.111	900	8.333	700	6.667	600	5.556
2.25	2500	37.500	1200	18.750	800	12.500	700	9.375	400	7.500	430	6.250
2.50	1200	41.667	950	20.833	500	13.889	250	10.417	300	8.333	280	6.944

NOTE: Controlled by stress with a factor of safety of 1.50.

****Values are typical.**

PERFORMANCE: These tables are offered as a guide only. The effects of sustained impact or dynamic loads, the particular corrosive environment and/or elevated temperatures have not been factored into these tables.

SUPPORTING FIBERGLASS STRUCTURAL SHAPES

DURASHIELD HC® panels are made for use with Strongwell's **EXTREN®** line of structural shapes. **EXTREN®** is available in over 100 standard shapes. Common additional supporting shapes are listed below.

USE	25.4MM PANEL SUPPORTING SHAPES
	SHAPE DESCRIPTION
SECTION/BASE	Standard EXTREN® Angle
CORNER POST	Standard EXTREN® Angles Inside & Outside
ROOF JOINER	90° Custom Angle
DOOR FRAMING	38.1mm x 38.1mm x 6.35mm EXTREN® Channel
WINDOW LOUVERS	38.1mm x 38.1mm x 6.35mm EXTREN® Channel
FASTENERS	9.53mm dia. FIBREBOLT® Stud & Nut Stainless Steel (optional)

NOTE:

These connections and supporting shapes can also be used with DURASHIELD®.