

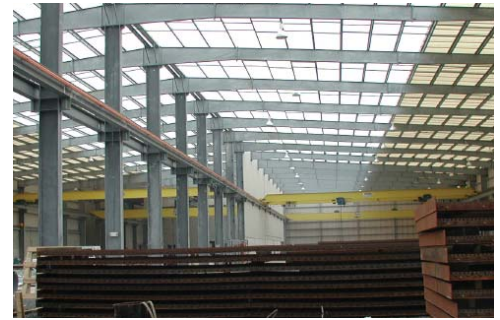
## Tuff Span Roofing & Siding Panels

### Unsurpassed Strength & Corrosion Resistance

For demanding structural and environmental conditions, Tuff Span GRP building panels deliver unsurpassed performance as industrial roofing and siding.

In GRP materials, strength and stiffness is determined by the alignment and amount of its glass fiber reinforcements. For effective reaction and transfer of loads, Tuff Span is constructed with high reinforcing content placed in straight and continuous, bidirectional alignment. As a result, Tuff Span has higher strength and stiffness of any profiled GRP building panel and history of standing up to hurricane winds where aged metal, cementitious, and other materials have failed. Providing personnel safety, Tuff Span series 450 is the standard for walkable, GRP roofing.

To resist attack from aggressive chemical exposure, Tuff Span is formulated with premium resin systems, Iso-Polyester or Vinyl Ester. Extended and superior UV protection is provided by an exterior acrylic coating, UV stabilized resin, embossed resin-rich surface, and interior mat or veil. A wide range of profiles are available in opaque colors or translucent for natural light transmission.



Tuff Span Roofing & Siding; Tuff Span Purlins over Pickling Line



Tuff Span Roofing & Siding - 44,594 SM; Tuff Span Monitor Ridge Vent - 366 LM

Uses	Features	Benefits
<ul style="list-style-type: none"> <li>&gt; Roofing &amp; Siding Panels</li> <li>&gt; Roof &amp; Form Deck</li> <li>&gt; Insulated Panel Assembly</li> <li>&gt; Tank Covers &amp; Lagging</li> <li>&gt; Cooling Tower Casing</li> </ul>	<ul style="list-style-type: none"> <li>&gt; Corrosion Resistance</li> <li>&gt; Strongest FRP Building Panel</li> <li>&gt; 4-Level UV Protection</li> <li>&gt; Fire Retardant</li> <li>&gt; Low Thermal Expansion</li> <li>&gt; Opaque/Translucent Colors</li> </ul>	<ul style="list-style-type: none"> <li>&gt; Life-Cycle Cost Savings</li> <li>&gt; Maintenance-Free Life</li> <li>&gt; Light Transmission Option</li> <li>&gt; Walkable Roof Option</li> <li>&gt; Improved Appearance</li> </ul>

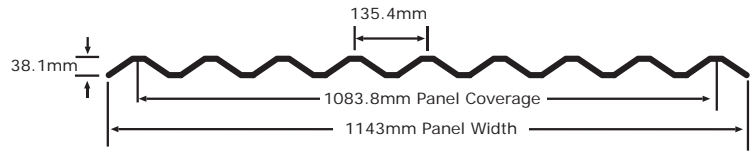
Tuff Span Materials	PFR/VFR						FM		
	150	200	250	300	400	450	10	13	16
Nominal Weight, Oz/square meter	2.4	2.7	3.2	3.7	4.3	4.9	3.2	4.1	5.0
Nominal Glass Content	48% by Wt.						30% by Wt.		
Flame Spread Rating, ASTM E-84	25 or less (Class 1)						15 (Class 1)		
Smoke Development, ASTM E-84	≤ 450 (PFR)			> 450, all VFR			≤ 300		
Fire Test for Roof Coverings, ASTM E-108	Class C: 14° max slope						Class B: 14° max slope		
Rate & Extent of Burning, ASTM D-635	ATB < 5, AFB 10 mm (CC1)								
Ignition Temperature, ASTM D-1929	343 - 426° C								
Coefficient of Thermal Expansion, ASTM D-696	1.44 x 10 <sup>-5</sup> mm/mm° C								

PFR = Iso-Polyester Fire Retardant; VFR = Vinyl Ester Fire Retardant; FM = FM Approved Iso-Polyester

Standard Colors	Light Transmission	Notes
Gray, White, Beige, Shale, Stone White-R	Opaque	Contact Enduro for other colors
Translucent Clear	Up to 80%	% light transmission varies with panel thickness, color & profile
Translucent White	Up to 50%	
Translucent Gray, Beige, Shale, Stone White-R	Up to 40%	

0610

## 5.33 x 1.5 V-Beam



### Roofing Positive Load; L/D = 60; Moment FOS = 2.5

Load, Pascals	957			1436			1915			2394			2872			
Span	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
S E R I E S	FR 450	2.23	3.00	2.74	1.93	2.62	2.41	1.75	2.26	2.18	1.62	2.03	2.03	1.55	1.85	1.90
	FR 400	2.16	2.92	2.69	1.90	2.49	2.34	1.73	2.13	2.13	1.60	1.90	1.98	1.50	1.75	1.85
	FR 300	2.03	2.72	2.51	1.78	2.21	2.18	1.60	1.90	1.98	1.50	1.70	1.85	1.40	1.55	1.73
	FR 250	1.83	2.29	2.29	1.60	1.88	1.98	1.45	1.62	1.80	1.35	1.45	1.62	1.27	1.32	1.47
	FR 200	1.70	2.01	2.11	1.47	1.62	1.83	1.35	1.40	1.57	1.24	1.24	1.40	1.14	1.14	1.29
	FR 150	1.52	1.57	1.78	1.29	1.29	1.45	1.12	1.12	1.24	0.99	0.99	1.12	0.91	0.91	1.02
	FM 16	2.03	2.72	2.49	1.75	2.36	2.18	1.60	2.08	1.98	1.47	1.85	1.83	1.40	1.70	1.73
	FM 13	1.88	2.21	2.31	1.62	1.80	2.03	1.47	1.55	1.75	1.37	1.40	1.55	1.27	1.27	1.42
	FM 10	1.70	1.88	2.11	1.50	1.52	1.73	1.32	1.32	1.50	1.19	1.19	1.32	1.09	1.09	1.22

### Roofing Negative Load; L/D = 60; Moment FOS = 1.88; Pullover FOS = 1.88

Load, Pascals	957			1436			1915			2394			2872			
Span	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
S E R I E S	FR 450	2.24	3.00	2.74	1.93	2.62	2.41	1.75	2.24	2.18	1.63	1.78	2.03	1.55	1.47	1.68
	FR 400	2.16	2.92	2.69	1.90	2.54	2.34	1.73	2.01	2.13	1.60	1.60	1.83	1.50	1.32	1.52
	FR 300	2.03	2.72	2.51	1.78	2.31	2.18	1.60	1.73	1.98	1.50	1.37	1.57	1.40	1.14	1.32
	FR 250	1.83	2.46	2.29	1.60	1.90	1.98	1.45	1.42	1.63	1.35	1.14	1.30	1.27	0.94	1.07
	FR 200	1.70	2.29	2.11	1.47	1.70	1.83	1.35	1.27	1.45	1.24	1.02	1.14	1.17	0.84	0.97
	FR 150	1.52	1.83	1.88	1.32	1.35	1.55	1.19	1.02	1.14	1.12	0.81	0.91	1.04	0.66	0.76
	FM 16	2.03	2.72	2.49	1.75	2.24	2.18	1.60	1.68	1.90	1.47	1.35	1.52	1.40	1.12	1.27
	FM 13	1.88	2.51	2.31	1.63	1.90	2.03	1.47	1.42	1.63	1.37	1.14	1.30	1.30	0.94	1.07
	FM 10	1.70	2.18	2.11	1.50	1.60	1.83	1.35	1.19	1.37	1.24	0.97	1.09	1.19	0.79	0.91

### Siding: Wind Load; L/D = 30; Moment FOS = 1.88; Pullover FOS = 1.88

Load, Pascals	957			1436			1915			2394			2872			
Span	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
S E R I E S	FR 450	2.79	3.71	3.48	2.44	2.97	3.02	2.24	2.24	2.54	2.06	1.78	2.03	1.93	1.47	1.68
	FR 400	2.74	3.51	3.38	2.39	2.67	2.95	2.16	2.01	2.29	2.01	1.60	1.83	1.90	1.32	1.52
	FR 300	2.57	3.12	3.17	2.24	2.31	2.64	2.03	1.73	1.98	1.88	1.37	1.57	1.78	1.14	1.32
	FR 250	2.31	2.64	2.87	2.03	1.90	2.16	1.83	1.42	1.63	1.68	1.14	1.30	1.52	0.94	1.07
	FR 200	2.16	2.31	2.57	1.88	1.70	1.93	1.63	1.27	1.45	1.45	1.02	1.14	1.32	0.84	0.97
	FR 150	1.83	1.83	2.03	1.50	1.35	1.55	1.30	1.02	1.14	1.14	0.81	0.91	1.04	0.66	0.76
	FM 16	2.54	3.35	3.15	2.24	2.24	2.54	2.03	1.68	1.90	1.88	1.35	1.52	1.75	1.12	1.27
	FM 13	2.36	2.57	2.84	2.06	1.90	2.16	1.80	1.42	1.63	1.60	1.14	1.30	1.47	0.94	1.07
	FM 10	2.16	2.18	2.44	1.78	1.60	1.83	1.52	1.19	1.37	1.37	0.97	1.09	1.24	0.79	0.91

1. Maximum spans are shown in lineal meters and based on Uniform Loading in Pascals and panel fasteners with 1.85 cm diameter washer at every low rib over supports.
2. Panel structural properties and maximum spans are based on large-scale tests that consider: Bending Moment at failure; Flexural Stiffness; Pullover Force per fastener.