

## Tuff Span Roofing & Siding Panels

### Unsurpassed Strength & Corrosion Resistance

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

In FRP 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 FRP 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, FRP 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 - 480,000 SF; Tuff Span Monitor Ridge Vent - 1,200 LF

#### Uses

- Roofing & Siding Panels
- Roof & Form Deck
- Insulated Panel Assembly
- Tank Covers & Lagging
- Cooling Tower Casing

#### Features

- Corrosion Resistance
- Strongest FRP Building Panel
- 4-Level UV Protection
- Fire Retardant
- Low Thermal Expansion
- Opaque/Translucent Colors

#### Benefits

- Life-Cycle Cost Savings
- Maintenance-Free Life
- Light Transmission Option
- Walkable Roof Option
- Improved Appearance

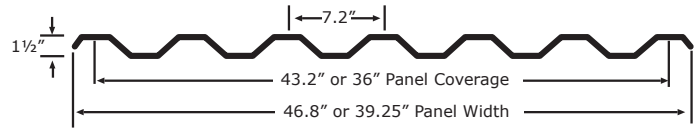
Tuff Span Materials	PFR/VFR						FM		
	150	200	250	300	400	450	10	13	16
Nominal Weight, Oz/SF	8	9.5	10.5	12	14	16	10.5	13.5	16.5
Nominal Glass Content	48% by Wt.						30% by Wt.		
Flame Spread Rating, ASTM E-84	25 or less (Class 1)						15 (Class 1)		
Smoke Development, ASTM E-84	≤ 450 (PFR)				> 450, all VFR		≤ 300		
Fire Test for Roof Coverings, ASTM E-108	Class C: 3/12 max slope						Class B: 3/12 max slope		
Rate & Extent of Burning, ASTM D-635	ATB < 5, AFB 10 mm (CC1)								
Ignition Temperature, ASTM D-1929	650 - 800° F								
Coefficient of Thermal Expansion, ASTM D-696	8 x 10 <sup>-6</sup> in/in° F								

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%	
Translucent Cream	Up to 27%	FM Approved translucent panels

0112

## 7.2 x 1.5 Rib



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

Load, PSF	20			30			40			50			60			
	Span	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
S E R I E S	FR 450	7' 11"	10' 7"	9' 9"	6' 11"	9' 3"	8' 6"	6' 3"	8' 5"	7' 9"	5' 10"	7' 9"	7' 2"	5' 6"	7' 1"	6' 9"
	FR 400	7' 7"	10' 2"	9' 4"	6' 7"	8' 11"	8' 2"	6' 0"	8' 0"	7' 5"	5' 7"	7' 2"	6' 11"	5' 3"	6' 6"	6' 6"
	FR 300	7' 0"	9' 4"	8' 8"	6' 1"	7' 7"	7' 7"	5' 7"	6' 7"	6' 10"	5' 2"	5' 10"	6' 5"	4' 10"	5' 4"	6' 0"
	FR 250	6' 5"	7' 10"	7' 11"	5' 7"	6' 5"	6' 11"	5' 1"	5' 6"	6' 2"	4' 8"	4' 11"	5' 6"	4' 5"	4' 6"	5' 1"
	FR 200	5' 10"	7' 3"	7' 3"	5' 1"	5' 11"	6' 4"	4' 8"	5' 1"	5' 8"	4' 4"	4' 7"	5' 1"	4' 1"	4' 2"	4' 8"
	FR 150	5' 5"	5' 11"	6' 7"	4' 8"	4' 10"	5' 5"	4' 2"	4' 2"	4' 8"	3' 9"	3' 9"	4' 2"	3' 5"	3' 5"	3' 10"
	FM 16	7' 2"	9' 8"	8' 11"	6' 3"	8' 5"	7' 9"	5' 8"	7' 8"	7' 0"	5' 3"	7' 1"	6' 6"	5' 0"	6' 6"	6' 2"
	FM 13	6' 8"	8' 6"	8' 3"	5' 10"	6' 11"	7' 2"	5' 3"	6' 0"	6' 6"	4' 11"	5' 4"	6' 0"	4' 7"	4' 11"	5' 6"
	FM 10	6' 1"	7' 3"	7' 6"	5' 4"	5' 11"	6' 7"	4' 10"	5' 1"	5' 8"	4' 6"	4' 7"	5' 1"	4' 2"	4' 2"	4' 8"

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

Load, PSF	20			30			40			50			60			
	Span	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
S E R I E S	FR 450	7' 11"	10' 7"	9' 9"	6' 11"	9' 3"	8' 6"	6' 3"	8' 5"	7' 9"	5' 10"	7' 10"	7' 2"	5' 6"	7' 4"	6' 9"
	FR 400	7' 7"	10' 2"	9' 4"	6' 7"	8' 10"	8' 2"	6' 0"	8' 1"	7' 5"	5' 7"	7' 6"	6' 11"	5' 3"	6' 7"	6' 6"
	FR 300	7' 0"	9' 5"	8' 8"	6' 1"	8' 3"	7' 7"	5' 7"	7' 5"	6' 10"	5' 2"	6' 8"	6' 5"	4' 10"	5' 7"	6' 0"
	FR 250	6' 5"	8' 7"	7' 11"	5' 7"	7' 4"	6' 11"	5' 1"	6' 5"	6' 3"	4' 8"	5' 8"	5' 10"	4' 5"	4' 8"	5' 4"
	FR 200	5' 10"	7' 10"	7' 3"	5' 1"	6' 9"	6' 4"	4' 8"	5' 10"	5' 9"	4' 4"	4' 8"	5' 3"	4' 1"	3' 10"	4' 5"
	FR 150	5' 5"	6' 10"	6' 8"	4' 8"	5' 7"	5' 10"	4' 3"	4' 10"	5' 3"	3' 11"	4' 1"	4' 8"	3' 9"	3' 5"	3' 10"
	FM 16	7' 2"	9' 8"	8' 11"	6' 3"	8' 5"	7' 9"	5' 8"	7' 8"	7' 0"	5' 3"	7' 1"	6' 6"	5' 0"	5' 10"	6' 2"
	FM 13	6' 8"	8' 11"	8' 3"	5' 10"	7' 9"	7' 2"	5' 3"	6' 11"	6' 6"	4' 11"	5' 11"	6' 1"	4' 7"	4' 11"	5' 7"
	FM 10	6' 1"	8' 2"	7' 6"	5' 4"	6' 9"	6' 7"	4' 10"	5' 11"	6' 0"	4' 6"	5' 1"	5' 6"	4' 2"	4' 3"	4' 10"

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

Load, PSF	20			30			40			50			60			
	Span	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
S E R I E S	FR 450	10' 0"	13' 4"	12' 4"	8' 8"	11' 6"	10' 9"	7' 11"	10' 0"	9' 9"	7' 4"	8' 11"	9' 1"	6' 11"	7' 9"	8' 6"
	FR 400	9' 7"	12' 10"	11' 10"	8' 4"	10' 8"	10' 4"	7' 7"	9' 3"	9' 4"	7' 0"	7' 11"	8' 8"	6' 7"	6' 7"	7' 6"
	FR 300	8' 10"	10' 9"	10' 11"	7' 9"	8' 9"	9' 7"	7' 0"	7' 7"	8' 6"	6' 6"	6' 8"	7' 7"	6' 1"	5' 7"	6' 4"
	FR 250	8' 1"	9' 0"	10' 0"	7' 1"	7' 4"	8' 3"	6' 5"	6' 5"	7' 2"	5' 8"	5' 8"	6' 5"	5' 2"	4' 8"	5' 4"
	FR 200	7' 5"	8' 4"	9' 2"	6' 5"	6' 9"	7' 7"	5' 10"	5' 10"	6' 7"	5' 3"	4' 8"	5' 3"	4' 9"	3' 10"	4' 5"
	FR 150	6' 9"	6' 10"	7' 8"	5' 7"	5' 7"	6' 3"	4' 10"	4' 10"	5' 5"	4' 4"	4' 8"	5' 3"	3' 11"	3' 5"	3' 10"
	FM 16	9' 1"	12' 2"	11' 2"	7' 11"	10' 7"	9' 9"	7' 2"	8' 10"	8' 11"	6' 8"	7' 1"	8' 0"	6' 3"	5' 10"	6' 8"
	FM 13	8' 5"	9' 9"	10' 4"	7' 4"	8' 0"	8' 11"	6' 8"	6' 11"	7' 9"	6' 2"	5' 11"	6' 9"	5' 8"	4' 11"	5' 7"
	FM 10	7' 8"	8' 4"	9' 4"	6' 8"	6' 9"	7' 7"	5' 11"	5' 11"	6' 7"	5' 3"	5' 1"	5' 9"	4' 9"	4' 3"	4' 10"

- 1) Maximum span for uniform load, PSF, is shown in lineal feet and based on panel fasteners with .729" diameter washer located 7.2" on center.
- 2) Structural properties and maximum spans are based on large-scale tests that consider: bending moment at failure, flexural stiffness and pullover force per fastener.

Step Tuff: Walkable FRP Roof Panels	Span	Deflection at 250 lbs Concentrated Load
Tuff Span Series 450	7' 6" Multiple Span	1" or L/90

With strength and stiffness superior to other FRP roofing panels, Tuff Span Series 450 gives installers and plant workers safe support and confidence when walking on the material. Users must provide safe conditions and are responsible for workers on Step Tuff roofs. This includes, but is not limited to, risks associated with slippery roofs and suitability of aged materials. OSHA safety measures such as safety shoes, harnesses, tie-off lines, etc. must be observed and monitored by contractor or end user.

FM Wind Uplift Classification	Series	Class	Span	Washer Diameter	Tuff Span FM materials meet approval requirements per FM Standard 4880 for use as building panels without automatic sprinkler requirements.
Wind uplift classifications based on tests conducted by FM Global	FM 10	I-90	5' 6"	1.125"	
	FM 13, 16	I-90	6' 8"	1.125"	