



## **FRP Specifications**

**Section 06 70 00**

### **Fiberglass Reinforced Polymer (FRP) Baffle Wall Panel Products and Fabrications**

**REVISED 07.2025**

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## **SECTION 06 70 00**

### **FIBERGLASS REINFORCED POLYMER (FRP) PRODUCTS AND FABRICATIONS**

#### **PART 1 – GENERAL**

##### **1.01 RELATED DOCUMENTS:**

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work of this section.

##### **1.02 SUMMARY:**

- A. This section includes FRP Products & Fabrications for FRP Baffle Wall Panels.

##### **1.03 SCOPE OF WORK:**

- A. Furnish all labor, materials, equipment and incidentals governed by this section necessary to install the fiberglass reinforced polymer (FRP) products as specified herein.

##### **1.04 QUALITY ASSURANCE:**

- A. The material covered by these specifications shall be furnished by an ISO 9001 certified manufacturer of proven ability who is regularly engaged in the manufacture, fabrication and installation of FRP systems.
- B. Substitution of any component or modification of system shall be made only when approved by the Architect or Design Engineer.
- C. Fabricator Qualifications: Firm experienced in successfully producing FRP fabrications similar to that indicated for this project, with sufficient production capacity to produce required units without causing delay in the work.
- D. In addition to requirements of these specifications, comply with manufacturer's instructions and recommendations for work.

##### **1.05 DESIGN CRITERIA:**

- A. The design of FRP products, including connections, shall be in accordance with governing building codes and standards as applicable.
- B. Design load is considered as uniform loading over the entire baffle panel. Design load shall be the greater of water differential or wind load in drained condition, but no combination of the two.
  - 1. Water Differential: (example: 2", 6", 12")
  - 2. Wind Load: (example: 85 mph wind velocity, Exposure C with an Importance Factor of 1.15 in accordance with ASCE 7.)

3. Closed cell panels to be analyzed for sediment-filled condition at 150 pcf.
  4. The baffle system is not intended to withstand a seismic event.
- C. Deflection Limits and Flexural Strength Factors of Safety
1. Baffle panel deflection due to lateral loads less than (example: L/100, L/120) and not to exceed panel thickness.
  2. Baffle panel deflection due to vertical load less than L/360.
  3. Baffle panel Flexural Strength Factor of Safety = 2.0
  4. Structural support deflection less than (example: L/240, L/360).
  5. Structural support Flexural Strength Factor of Safety = 2.5
- D. Panels weakened by penetrations, cuts, etc. shall be stiffened or reinforced as necessary to restore their capacity to withstand the specified loading and deflection limits.
- E. Turbulent flow, increased water differential due to diffusers, shock loads due to pump or valve operations or other impact loads to be addressed by design professional.
- F. Design the baffle panels in accordance with the Strongwell Design Manual for in-service temperatures of \_\_\_\_\_ degrees Fahrenheit (example: 125 degrees) with ultimate stress retention of \_\_\_\_\_ (example: 85% for 125 degrees) and a modulus of elasticity retention of \_\_\_\_\_ (example: 90% for 125 degrees).

#### 1.06 SUBMITTALS:

- A. Shop drawings of all fabricated pultruded baffle wall panels shall be submitted to the Design Engineer for approval in accordance with the requirements of Section \_\_\_\_\_. Fabrication shall not start until receipt of Design Engineer's approval marked "Approved As Submitted" or "Approved As Noted".
- B. Manufacturer's catalog data showing:
1. Materials of construction
- C. Detail shop drawings showing:
1. Dimensions
  2. Sectional assembly
  3. Location and identification mark
  4. Size and type of supporting frames required
- D. Samples of each type of product shall be submitted for approval in accordance with the requirements of Section \_\_\_\_\_.

#### 1.07 SHIPPING AND STORAGE INSTRUCTIONS:

- A. All systems, sub-systems and structures shall be shop fabricated and assembled into the largest practical size suitable for transporting.

- B. All materials and equipment necessary for the fabrication and installation of pultruded baffle wall panels and appurtenances shall be stored before, during, and after shipment in a manner to prevent cracking, twisting, bending, breaking, chipping or damage of any kind to the materials or equipment, including damage due to over exposure to the sun. Any material which, in the opinion of the Design Engineer, has become damaged as to be unfit for use, shall be promptly removed from the site of work, and the Contractor shall receive no compensation for the damaged material or its removal.
- C. Identify and match-mark all materials, items and fabrications for installation and field assembly.

## **PART 2 – PRODUCTS**

### **2.01 GENERAL:**

- A. Materials used in the manufacture of the FRP products shall be raw materials in conformance with the specification and certified as meeting the manufacturer's approved list of raw materials.
- B. All raw materials shall be as specified by the contract.
- C. The visual quality of the pultruded shapes shall conform to ASTM D4385.
- D. FRP baffle panels shall be manufactured by Strongwell using the pultrusion process. Resin shall be (isophthalic polyester) (isophthalic polyester with fire retardant additive) (vinyl ester) (NSF 61 resin certified for potable water applications) with ultraviolet (UV) inhibitor additives. A minimum 7 mil. synthetic surface veil shall be the outermost layer covering the exterior surface.
- E. If required, after fabrication, all cut ends, holes and abrasions of FRP shapes shall be sealed with a compatible resin coating.
- F. FRP products exposed to weather shall contain an ultraviolet inhibitor. Should additional ultraviolet protection be required, a one mil minimum UV coating can be applied.
- G. All exposed surfaces shall be smooth and true to form, consistent with ASTM D4385.
- H. Manufacturers:
  - 1. Strongwell
- I. Pultruded FRP products shall be manufactured and fabricated in the USA. Manufacturer shall provide a written Certificate of Compliance.
- J. The materials covered by these specifications shall be furnished by an ISO 9001 certified manufacturer.

## 2.02 FRP BAFFLE WALL PANEL

### A. Materials

1. FRP baffle panels shall be manufactured by Strongwell using the pultrusion process. Resin shall be (isophthalic polyester) (isophthalic polyester with fire retardant additive) (vinyl ester) (NSF 61 resin certified for potable water applications) with ultraviolet (UV) inhibitor additives. A minimum 7 mil. synthetic surface veil shall be the outermost layer covering the exterior surface.
2. Baffle Wall Panels shall possess the following characteristic coupon properties:

Properties	ASTM Test Method	Units	Value
Tensile Strength, LW	D638	PSI	52,200
		kPa	$3.60 \times 10^5$
Flexural Strength, LW	D790	PSI	63,700
		kPa	$4.39 \times 10^5$
Flexural Modulus, LW	D790	PSI	$1.91 \times 10^6$
		kPa	$1.32 \times 10^7$
Compressive Strength	D695	PSI	52,100
		kPa	$3.59 \times 10^5$
IZOD Impact Strength	D256	ft.lbs./in.	33.3
		J/mm	1.77

3. Baffle Wall Panels shall be manufactured by Strongwell.

## B. Design (Select Profile)

### 1. 24" (610mm) nominal Standard Baffle Wall Panel

#### a. Design Properties

$$I_{xx} = 11.388 \text{ in}^4 \text{ or } 474 \text{ cm}^4$$

$$\text{Moment Capacity} = 65,700 \text{ in-lb/ft or } 24,354 \text{ N-m/m}$$

$$\text{Modulus of Elasticity} = 2.95 \times 10^6 \text{ psi or } 20.31 \times 10^6 \text{ kPa}$$

$$\text{Stiffness EI} = 16.78 \times 10^6 \text{ lb-in}^2/\text{ft or } 15.80 \times 10^{10} \text{ N-mm}^2/\text{m}$$

#### b. Deflection (Static Differential Head of Water)

Load Span Table (24" nominal Standard Baffle Panel)																		
Water Differential	1" (25.4mm)		2" (50.8mm)		3" (76.2mm)		4" (101.6mm)		5" (127.0mm)		6" (152.4mm)		8" (203.2mm)		10" (254mm)		12" (304.8mm)	
Uniform Load	5.2 psf (25.4 kg/m <sup>2</sup> )		10.4 psf (50.8 kg/m <sup>2</sup> )		15.6 psf (76.1 kg/m <sup>2</sup> )		20.8 psf (101.5 kg/m <sup>2</sup> )		26.0 psf (126.9 kg/m <sup>2</sup> )		31.2 psf (152.3 kg/m <sup>2</sup> )		41.6 psf (203.0 kg/m <sup>2</sup> )		52.0 psf (253.8 kg/m <sup>2</sup> )		62.4 psf (304.5 kg/m <sup>2</sup> )	
Span	L/D	FOS	L/D	FOS	L/D	FOS	L/D	FOS	L/D	FOS	L/D	FOS	L/D	FOS	L/D	FOS	L/D	FOS
8' (2.44m)	>360	>6	>360	>6	>360	>6	>360	>6	>360	>6	>360	>6	>360	>6	336	>6	280	>6
9' (2.74m)	>360	>6	>360	>6	>360	>6	>360	>6	>360	>6	>360	>6	300	>6	240	>6	200	>6
10' (3.05m)	>360	>6	>360	>6	>360	>6	>360	>6	355	>6	296	>6	222	>6	177	>6	148	>6
11' (3.35m)	>360	>6	>360	>6	>360	>6	338	>6	270	>6	225	>6	169	>6	135	>6	113	5.8
12' (3.66m)	>360	>6	>360	>6	351	>6	263	>6	211	>6	175	>6	132	>6	105	5.8		
13' (3.96m)	>360	>6	>360	>6	279	>6	209	>6	167	>6	139	>6	105	>6				
14' (4.27m)	>360	>6	338	>6	225	>6	169	>6	135	>6	113	>6						
15' (4.57m)	>360	>6	277	>6	185	>6	139	>6	111	>6	92	>6						
16' (4.88m)	>360	>6	230	>6	153	>6	115	>6	92	>6								
17' (5.18m)	>360	>6	193	>6	129	>6	96	>6										
18' (5.49m)	326	>6	163	>6	109	>6												
19' (5.79m)	279	>6	139	>6	93	>6												
20' (6.10m)	239	>6	120	>6														
21' (6.40m)	207	>6	104	>6														

### 2. 26.8" (680mm) nominal Sloped Baffle Wall Panel

#### a. Design Properties

$$I_{xx} = 18.36 \text{ in}^4 \text{ or } 764 \text{ cm}^4$$

$$\text{Moment Capacity} = 283,200 \text{ in-lb or } 32,0 \text{ N-m}$$

$$\text{Modulus of Elasticity} = 4.0 \times 10^6 \text{ psi or } 27.64 \times 10^6 \text{ kPa}$$

$$\text{Stiffness EI} = 73.61 \times 10^6 \text{ lb-in}^2 \text{ or } 21.12 \times 10^{10} \text{ N-mm}^2$$

#### b. Deflection (Static Differential Head of Water)

### Load Span Table (26.8" nominal Sloped Baffle Panel)

Water Differential	1" (25.4mm)	2" (50.8mm)	3" (76.2mm)	4" (101.6mm)	5" (127.0mm)	6" (152.4mm)	8" (203.2mm)	10" (254mm)	12" (304.8mm)
Uniform Load	5.2 psf (25.4 kg/m <sup>2</sup> )	10.4 psf (50.8 kg/m <sup>2</sup> )	15.6 psf (76.1 kg/m <sup>2</sup> )	20.8 psf (101.5 kg/m <sup>2</sup> )	26.0 psf (126.9 kg/m <sup>2</sup> )	31.2 psf (152.3 kg/m <sup>2</sup> )	41.6 psf (203.0 kg/m <sup>2</sup> )	52.0 psf (253.8 kg/m <sup>2</sup> )	62.4 psf (304.5 kg/m <sup>2</sup> )
Span	L/D FOS	L/D FOS	L/D FOS	L/D FOS	L/D FOS	L/D FOS	L/D FOS	L/D FOS	L/D FOS
8' (2.44m)	>360 >6	>360 >6	>360 >6	>360 >6	>360 >6	>360 >6	>360 >6	>360 >6	>360 >6
9' (2.74m)	>360 >6	>360 >6	>360 >6	>360 >6	>360 >6	>360 >6	>360 >6	>360 >6	>360 >6
10' (3.05m)	>360 >6	>360 >6	>360 >6	>360 >6	>360 >6	>360 >6	>360 >6	338 >6	281 >6
11' (3.35m)	>360 >6	>360 >6	>360 >6	>360 >6	>360 >6	>360 >6	317 >6	254 >6	211 >6
12' (3.66m)	>360 >6	>360 >6	>360 >6	>360 >6	>360 >6	326 >6	244 >6	195 >6	163 >6
13' (3.96m)	>360 >6	>360 >6	>360 >6	>360 >6	307 >6	256 >6	192 >6	153 >6	128 >6
14' (4.27m)	>360 >6	>360 >6	>360 >6	308 >6	246 >6	205 >6	154 >6	123 >6	102 >6
15' (4.57m)	>360 >6	>360 >6	334 >6	250 >6	200 >6	167 >6	125 >6	100 >6	
16' (4.88m)	>360 >6	>360 >6	275 >6	206 >6	165 >6	137 >6	103 >6		
17' (5.18m)	>360 >6	344 >6	229 >6	172 >6	137 >6	114 >6			
18' (5.49m)	>360 >6	289 >6	193 >6	144 >6	115 >6	96 >6			
19' (5.79m)	>360 >6	246 >6	164 >6	123 >6	98 >6				
20' (6.10m)	>360 >6	211 >6	140 >6	105 >6					
21' (6.40m)	>360 >6	182 >6	121 >6	91 >6					
22' (6.71m)	317 >6	158 >6	105 >6						
23' (7.01m)	277 >6	138 >6	92 >6						
24' (7.32m)	244 >6	122 >6							

#### C. Hardware

1. All fasteners, anchors, and structural hardware shall be 316 stainless steel.
2. All connections of Baffle Wall Panels to fiberglass columns or super structure shall be as shown on the approved shop drawings.

#### D. Approved Manufacturers

1. STRONGWELL

## **PART 3 – EXECUTION**

### **3.01 PREPARATION:**

- A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions and directions for installation of anchorages, including concrete inserts, sleeves, anchor bolts and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction.
- B. Coordinate delivery of all listed items to project site.

### **3.02 INSPECTION AND TESTING:**

- A. The Design Engineer shall have the right to inspect and test all materials to be furnished under these specifications prior to their shipment from the point of manufacture.
- B. All labor, power, materials, equipment and appurtenances required for testing shall be furnished by the Contractor at no cost to the Owner.

### **3.03 INSTALLATION, GENERAL:**

- A. Fastening to in-place construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous FRP fabrications to in-place construction; include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts and other connectors as determined by the Design Engineer.
- B. Cutting, fitting and placement: Perform cutting, drilling and fitting required for installation of miscellaneous FRP fabrications. Set FRP fabrication accurately in location, alignment and elevation; with edges and surfaces level, plumb, true and free of rack; measured from established lines and levels.
- C. Provide temporary bracing or anchors in form work for items that are to be built into concrete masonry or similar construction.

### **3.04 ALL FRP INSTALLATION:**

- A. If required, all field cut and drilled edges, holes and abrasions shall be sealed with a catalyzed resin compatible with the original resin as recommended by the manufacturer.
- B. Install items specified as indicated and in accordance with manufacturer's instructions.

**End of Section 06 70 00**