



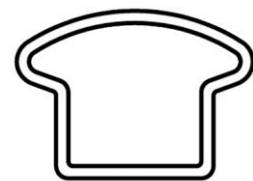
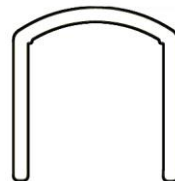
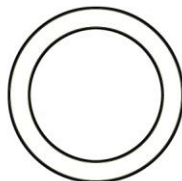
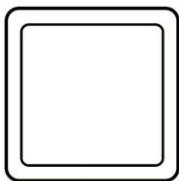
STRONGWELL®

FRP Specifications

Section 06 81 13 Fiberglass Reinforced Polymer (FRP) Guardrail/Handrail and Fabrications

REVISED 11.2017

includes specifications for the following rail shapes:



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SECTION 06 81 13

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 the following FRP Products & Fabrications for FRP Standard Guardrail/Handrail.

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 FRP standard railing system, including connections, shall be designed to meet the configuration and loading requirements of OSHA 1910.29 and IBC with a minimum 2.0 factor of safety.
- B. [List any other governing building codes or project-specific design requirements.]
- C. Additional ADA handrail to be installed where indicated on plans.
- D. Temperature exposure is limited to 100°F (38°C) unless specifically stated otherwise in drawings and/or supplementary conditions.

1.06 SUBMITTALS:

- A. Shop drawings of all fabricated guardrail/handrail 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
 - 2. Dimensions, spacings, and construction guardrails/handrails.
- 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 guardrail/handrail 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 guardrail/handrail shall be manufactured using a pultruded process utilizing _____ (select polyester, vinyl ester or phenolic) resin with flame retardant and ultraviolet (UV) inhibitor additives. Unless a phenolic resin system is utilized, a synthetic surface veil fabric shall encase the glass reinforcement. FRP shapes shall achieve a flame spread rating of 25 or less in accordance with ASTM test method E-84, the flammability characteristics of UL 94 V0 and the self-extinguishing requirements of ASTM D635. (Polyester resin is available without flame retardant and UV inhibitor additives.)
- 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 may be applied. Products manufactured with a phenolic resin system must be coated with a one mil minimum UV coating.
- 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 manufacturer.

2.02 FRP STANDARD RAILINGS:

A. Design

1. The FRP standard railing system, including connections, shall be designed to meet the configuration and loading requirements of OSHA 1910.29 and IBC with a minimum 2.0 factor of safety.
2. Guardrail height is 42" (1067mm) from the top of walkway to the top of the guardrail.
3. Guardrail installation method shall be as indicated on plans.

B. Material

1. The rails and posts shall be (select as appropriate):
 - a. _____ 2" x 2" x .156" (51mm x 51mm x 4mm) square tube
 - b. _____ 1.90" x 0.195" (48mm x 5mm) round tube Rail and Post
 - c. _____ 2" x 2" x .156" (51mm x 51mm x 4mm) with 2.375" (60mm) Square alternative design post
 - d. _____ Channel top rail with 2" x 2" x .156" (51mm x 51mm x 4mm) square tube
 - e. _____ 2" x 2" x .156" (51mm x 51mm x 4mm) square tube, 1" (25mm) square pickets with _____ 4" (102mm) square post or _____ 2" x .156" (51mm x 4mm) square tube post
 - f. _____ 3" round top rail with 2" x .156" (51mm x 4mm) square tube bottom rail and 1" (25mm) round tube pickets and _____ 4" (102mm) square post or _____ 2" x .156" (51mm x 4mm) square tube post.
2. The pultruded parts shall be made with a fire retardant resin that achieves a flame spread rating of 25 or less in accordance with ASTM test method E84, flammability characteristics of UL 94 V0 and meet the self-extinguishing requirement of ASTM D635. The resin matrix shall be _____ (select polyester or vinyl ester) and shall contain a UV inhibitor. The parts _____ (shall or shall not be) coated with an industrial grade polyurethane coating for additional UV protection and wear resistance. The color shall be chosen from manufacturer's standard colors.

Table 2-Standard Railing Fiberglass Pultruded Material Properties

Typical Properties

PROPERTIES	TEST METHOD	UNITS	SQUARE TUBE	ROUND TUBE
			VALUES	VALUES
Ultimate Flexural Stress (Full Section)	n/a	psi	36,000	60,000
		N/mm ²	248	414
Flexural Modulus (non-phenolic) (Full Section)	n/a	psi x 10 ⁶	3.7	4.5
		N/mm ²	25,500	31,000
Flexural Modulus (phenolic) (Full Section)	n/a	psi x 10 ⁶	6.0	6.0
		N/mm ²	41,400	41,400
Density	ASTM D792	lbs/in ³	.065 - .075	.065 - .075
		g/cc	1.80 - 2.08	1.80 - 2.08
24 hr. Water Absorption (non-phenolic)	ASTM D570	% max by wt.	0.6	0.6
24 hr. Water Absorption (phenolic)	ASTM D570	% max by wt.	2.0	2.0
Coefficient Of Thermal Expansion, lengthwise	ASTM D696	10 ⁻⁶ in/in/°F	7	7
		10 ⁻⁵ mm/mm/°C	1.2	1.2

C. Fabrication of Standard Railing System

1. The SAFRAIL fiberglass standard railing system shall be fabricated into finished sections by fabricating and joining together the pultruded square tube using glass-reinforced thermoset components; epoxy bonded and connected as shown in the fabrication details. Railing sections shall be fabricated to the size shown on the approved fabrication drawings and shall be piece marked with a water proof tag.
2. The STRONGRAIL Architectural fiberglass standard railing system shall be fabricated into finished sections by fabricating and joining together the pultruded square tube using molded ABS components; epoxy bonded and connected as shown in the fabrication details. Railing sections shall be fabricated to the size shown on the approved fabrication drawings and shall be piece marked with a water proof tag.

A. For Side Mount

1. Post shall be constructed with a pultruded bottom plug. Length shall be sufficient to extend a minimum of 1" (25mm) beyond the uppermost bolt hole to prevent crushing of post tubing. Bolt holes shall provide clearance of 1/16" (1.6mm) for 1/2" (12.7mm) diameter bolts/studs. On square tubes, holes shall be on longitudinal center line of post, 1" (25mm) from bottom of post (minimum) and not less than 3" (76mm) apart on center. Posts shall be fastened with stainless steel anchor bolts or studs, 1/2" (12.7mm) diameter.
2. Post locations shall be no greater than 18" (450mm), nor less than 9" (230mm) from horizontal or vertical change in handrail direction. For square tubes, post centers shall be no greater than 72" (1830mm) apart on any straight run or rail, or 48" (1220mm) apart on any inclined rail section.

B. Other Attachment Methods

1. Base mount, embedded and removable are also types of mounting procedures for railing pending design and approval by the Design Engineer.

C. Installation of Handrail Sections

1. The fabricated railing sections shall be supplied complete with fittings by the FRP manufacturer. The components used to join fabricated sections together may be shipped loose, to be epoxied and riveted, if required, together, if required in the field by the contractor.
2. The fabricated handrail sections shall be installed as shown on the approved shop drawings. The handrail sections shall be accurately located, erected plumb and level. The sections shall be fastened to the structure 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. Coordinate delivery of such items to project site.
- B. Set sleeves in concrete with tops flush with finish surface elevations; protect sleeves from infiltration of water and debris.

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 81 13