



**STRONGWELL®**

## **FRP Specifications**

**Section 06 80 00**

### **Fiberglass Reinforced Polymer (FRP) Ladders and Cages and Fabrications**

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## **SECTION 06 80 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 Ladders and Cages.

##### **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. Manufacturer Qualifications: A company with a minimum of 10-years of experience in successfully producing FRP shapes required 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 ladder and cage systems including connections shall meet the requirements set forth in OSHA 1910.27, local building codes and industry standards as applicable.
- B. The minimum design live load shall be a single concentrated load of 200 pounds. Additional concentrated live load units of 200 pounds each as determined from anticipated usage of the ladder shall be located at such points as will cause the maximum stress in the member being considered.

- C. Temperature exposure of \_\_\_\_\_ (105-degrees for example) shall be considered in accordance with Section 3 of the Strongwell Design Manual, unless specifically stated otherwise in drawings and/or supplementary conditions.

#### 1.06 SUBMITTALS:

- A. Shop drawings of ladders and cages 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 per the applicable Strongwell Fabrication Worksheet (all worksheets available at [www.strongwell.com](http://www.strongwell.com)).
- 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 ladders and cages 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 ladders and cages 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. With the exception of ladder hoops and NSF ladders, FRP ladders and cages shall be manufactured using a pultruded process utilizing \_\_\_\_\_ (select polyester or vinyl ester) resin with flame retardant and ultraviolet (UV) inhibitor additives. 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.)

For ladders and cages submerged in potable water, a polyester resin shall be utilized that meets ANSI/NSF standard 61, or approved painting system that meets NSI/NSF standard 61, either certified for potable water applications as required. A 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 of pultruded materials 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 LADDERS AND CAGES:

### A. Performance Requirements

1. Ladder and cage systems shall meet the requirements set forth in OSHA 1910.27.

### B. Materials

1. The side rails and cage straps shall be fiberglass reinforced pultruded polyester with OSHA safety yellow pigment. As an option, an industrial grade polyurethane yellow coating may be applied to the finished ladder and cage. Other colors are available as an option.
2. The side rails shall be 2" (50.8mm) or 2.375" (60.3mm) square tube with a wall thickness of .156" (3.81mm) or greater. The rungs shall be pultruded 1.25" (31.8mm) diameter FRP fluted tube.
3. Cage hoops shall be manufactured by the open mold hand lay-up process with a width of 3" (76.2mm) and thickness of 1/4" (6.4mm) minimum at the top and bottom and 2" (50.8mm) x 1/4" (6.4mm) at the intermediate hoops. The cage shall be interconnected with 2" (50.8mm) x 3/16" (4.76mm) pultruded straps spaced 9" (229mm) on center around the hoop.
4. Fiberglass pultruded rails, cage straps, fluted tube and cage hoops to be manufactured by Strongwell.

### C. Fabrication Requirements

1. All joints and rungs shall be riveted. The hoops shall be attached to the rails in a manner which provides hand clearance throughout the length of the ladder.
2. Ladders shall be shop assembled, and as an option may be pre-drilled and prepared for field attachments of standoff clips.
3. The ladder cages shall be shipped assembled or as an option may be shipped unassembled for field assembly using rivets or bolts.

### D. Workmanship

1. If required, all cut or machined edges, holes and abrasions shall be sealed with a resin compatible with the resin matrix used in the structural shape.

### E. Approved Fabricators

1. Strongwell, or a Strongwell-trained fabricator

F. Installation

1. All FRP ladder sections shall be installed as shown on the approved shop drawings.



## **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 such 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 06600**