

SECTION 06 82 00
GLASS-FIBER-REINFORCED PLASTIC

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. ASTM International (ASTM):
 - a. C177, Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded Hot-Plate Apparatus.
 - b. D570, Standard Test Method for Water Absorption of Plastics.
 - c. D635, Standard Test Method for Rate of Burning and/or Extent and Time of Burning Plastics in a Horizontal Position.
 - d. D638, Standard Test Method for Tensile Properties of Plastics.
 - e. D695, Standard Test Method for Compressive Properties of Rigid Plastics.
 - f. D696, Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30 Degrees C and 30 Degrees C.
 - g. D790, Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
 - h. D792, Standard Test Methods for Density and Specific Gravity (Relative Density) by Plastics Displacement.
 - i. D2344, Standard Test Method for Apparent Interlaminar Shear Strength of Parallel Fiber Composites by Short-Beam Method.
 - j. D2583, Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor.
 - k. E84, Standard Test Method for Surface Burning Characteristics of Building Materials.
2. Building Officials and Code Administrators International (BOCA): National Building Code (NBC).
3. International Conference of Building Officials (ICBO): Uniform Building Code (UBC).
4. Occupational Safety and Health Act (OSHA): 29 CFR 19.10, Code of Federal Regulations.
5. Southern Building Code Congress International (SBCCI): Standard Building Code (SBC).
6. UL: 94, UL Standard for Safety Test for Flammability of Plastic Materials for Parts in Devices and Appliances.

1.02 DESIGN REQUIREMENTS

- A. This section contains components and connectors that require Contractor design.

1.03 SUBMITTALS

A. Action Submittals:

1. Shop Drawings:
 - a. Product Data: Catalog information and catalog cuts showing materials, design tasks, and showing load, span, and deflection; include manufacturer's specifications.
 - b. Grating: Show dimensions, weight, size, and location of connections to adjacent grating, supports, and other Work.
 - c. Grating Supports: Show dimensions, weight, size, location, and anchorage to supporting structure.
 - d. Stairs, Platforms, Stringers, Handrails, Ladders, and Support Structures:
 - 1) Show dimensions, weight, size, and location of connections to adjacent supports and other Work.
 - 2) Structural calculations for platforms, ladders and cages, handrails, and other fabrications shown.
2. Samples: Each type of grating, handrail, and handrail connection.

B. Informational Submittals:

1. Handling and storage requirements.
2. Manufacturer's installation instructions.
3. Factory test reports for physical properties of product.
 - a. Test data for handrails and supports may supplement load calculations providing data covers the complete system, including anchorage.
 - b. Test data for all components showing load and deflection due to load, in enough detail to prove handrail is strong enough and satisfies national, state, local standards, regulations, code requirements, and OSHA 29 CFR 19.10, using design loads specified.
 - c. Include test data for the following:
 - 1) Railing and post connections.
 - 2) Railing wall connections.
 - 3) Post and base connections.
 - 4) Railing expansion joint connections.
4. Manufacturer's Certification of Compliance for specified products.
5. Fabricator's qualification experience.
6. Manufacturer's qualification experience.

7. Independent laboratory test report, dated within 2 years of submittal date, of fire retardant testing conducted on exact type of grating proposed (not a resin test report).

1.04 QUALIFICATIONS

- A. Designer: Calculations required for Contractor design shall be stamped by a registered engineer, licensed in state where Project will be constructed.
- B. Fabricator: Minimum of 5 years' experience.
- C. Manufacturer: Minimum of 5 years' experience in manufacturing of products meeting these specifications.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Preparation for Shipment:
 1. Insofar as is practical, factory assemble items provided hereunder.
 2. Ladders shall be shipped fully shop-fabricated and assembled.
 3. Package and clearly tag parts and assemblies that are of necessity shipped unassembled in a manner that will protect materials from damage, and facilitate identification and final assembly in field.
- B. Storage and Handling: In accordance with manufacturer's recommendations and in such a manner as to prevent damage of any kind, including overexposure to sunlight.

PART 2 PRODUCTS

2.01 GENERAL

- A. Like Items of Materials: Where possible, provide end products of one manufacturer in order to achieve standardization for appearance, maintenance, and replacement.
- B. Unless otherwise specified, all products shall be manufactured by a pultruded process using vinyl ester resin.
- C. Products shall be manufactured with ultra-violet (UV) inhibitor additives.
- D. Exterior surfaces shall have a synthetic surface veil covering.
- E. Furnish molded products as an option where permitted by specifications.

- F. Fire Retardance:
 - 1. Flame spread shall be less than 25 as measured by ASTM E84.
 - 2. Include combinations of aluminum trihydrate, halogen, and antimony trioxide, where required to meet fire retardance, in the resin system.
 - 3. Meet self-extinguishing requirements of ASTM D635.
- G. Color pigment shall be dispersed in resin system.
- H. Fabricate FRP products exposed to outdoor conditions with an additional 1-mil thick UV coating to shield product from UV light.
- I. All cut ends, holes, and abrasions of FRP shapes shall be sealed with resin to prevent intrusion of moisture.

2.02 GRATING AND STAIR TREADS

- A. Manufacturers:
 - 1. Fibergrate Composite Structures, Inc., Addison, TX.
 - 2. Or equal.
- B. Physical Characteristics:
 - 1. Molded Type:
 - a. Nonskid grit affixed to top of bar surface or a concave, meniscus top to all bars, providing skid resistance.
 - b. Load bars in both directions with equal stiffness.
 - c. Square mesh with 1-1/2-inch maximum spacing.
- C. Functional Characteristics: None.
- D. Performance Characteristics:
 - 1. 100 psf minimum, unless otherwise shown.
 - 2. Maximum Deflection: 1/4 inch, unless otherwise shown.
 - 3. Stair Tread: 100 psf uniform load or concentrated load of 300 pounds on area of 4 square inches located in center of tread, whichever produces greater stress.
- E. Hold-Down Clamps:
 - 1. Manufacturers: None.
 - 2. Physical Characteristics: Type 316 stainless steel.
 - 3. Functional Characteristics: None.
 - 4. Performance Characteristics: None.

F. Bolts and Connectors:

1. Manufacturers: None.
2. Physical Characteristics: Corrosion-resistant FRP or Type 316 stainless steel.
3. Functional Characteristics: None.
4. Performance Characteristics: Size and strength to meet IBC requirements.

G. Fabrications:

1. Field measure areas to receive grating. Verify dimensions of new fabricated supports, and fabricate to dimension required for specified clearances.
2. Section Length: Sufficient to prevent it falling through clear opening when oriented in span direction when one end is touching either concrete or vertical leg of grating support.

2.03 STRUCTURAL PLATFORMS

A. Deflection and Safety Factors:

1. Deflection Criteria: Not to exceed $L/360$.
2. Safety Factors:
 - a. Minimum ratios of ultimate stress to allowable static service stress:
 - 1) Flexural Members: 2.5.
 - 2) Compression Members: 3.0.
 - 3) Shear: 3.0.
 - 4) Connections: 4.0.
3. Minimum design safety factors for dynamic or impact loads shall be twice the values for static service loads.

B. Loads:

1. 100 psf uniform live load over platform.
2. Static and dynamic loads for equipment shown.

C. Glass fiber reinforced polyester or vinyl ester resin matrix, approximately 50 percent resin-to-glass ratio.

D. Continuous glass strand rovings shall be used internally for longitudinal strength.

E. Continuous strand glass mats shall be used internally for transverse strength.

F. Material Properties:

Minimum Ultimate Coupon Properties (UN)		
Material Properties	Test Method	Units
Pultruded Fiberglass Structural Shapes		
Ultimate tensile stress in longitudinal direction, psi (MPa)	ASTM D638	30,000 (207)
Ultimate compressive stress in longitudinal direction, psi (MPa)	ASTM D695	30,000 (207)
Ultimate flexural stress in longitudinal direction, psi (MPa)	ASTM D790	30,000 (207)
Ultimate short beam shear in longitudinal direction, psi (MPa)	ASTM D2344	4,500 (31)
Ultimate tensile stress in transverse direction, psi (MPa)	ASTM D638	7,000 (48)
Ultimate compressive stress in transverse direction, psi (MPa)	ASTM D695	15,000 (103)
Ultimate flexural stress in transverse direction, psi (MPa)	ASTM D790	10,000 (69)
Density (lb/in. ³) (kg/mm ³)	ASTM D792	0.060-0.070 (0.00166-0.0194)
Water absorption (25-hr immersion)	ASTM D570	0.60 max, % by weight
Barcol hardness	ASTM D2583	45
Coefficient of thermal expansion 10 ⁻⁶ in./in./° C	ASTM D696	
Expansion, LW10 ⁻⁶ in./in./° F		4.4
Thermal conductivity, Btu-in./ft ² /hr/° F	ASTM C177	
Flame-Retardant Properties		
Flammability test	ASTM D635	Self-extinguishing
Surface burning characteristics	ASTM E84	25 maximum

Minimum Ultimate Coupon Properties (UN)		
Material Properties	Test Method	Units
Flammability class	UL 94	VO
Temperature index	UL 94	130 C

PART 3 EXECUTION

3.01 GENERAL

- A. Install in accordance with manufacturer's written instructions.
- B. Install plumb or level, rigid and neat, as applicable.
- C. Furnish fasteners and anchorages for complete installation.
- D. Seal field cut holes, edges, and abrasions with catalyzed resin compatible with original resin.

3.02 GRATING

- A. Anchor grating securely to supports to prevent displacement.
- B. Install each grating section such that it is easily removable.
- C. Clearance (Grating to Vertical Surfaces): 1/4 inch (plus or minus 1/8-inch tolerance).

3.03 STRUCTURAL SHAPES

- A. Connect parts with approved connectors meeting manufacturer's design requirements and with corrosion resistance equal to structural shapes.
- B. Provide supports and bracings required to comply with applicable codes and design requirements.

END OF SECTION

