

**ENGINEERING SPECIFICATION
PULTRUDED DYNAFORM® FIBERGLASS STRUCTURAL SHAPES
FIBERGRATE® OR CHEMGRATE® MOLDED GRATING WITH
GRATING PEDESTALS**

SECTION 06610

FIBERGLASS REINFORCED PLASTICS (FRP) FABRICATIONS

MOLDED GRATINGS SUPPORTED BY GRATING PEDESTALS

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. The CONTRACTOR shall furnish, fabricate (where necessary), and install all fiberglass reinforced plastic (FRP) items, with all appurtenances, accessories and incidentals necessary to produce a complete, operable and serviceable installation as shown on the Contract Drawings and as specified herein, and in accordance with the requirements of the Contract Documents.

1.2 REFERENCES

The publications listed below (latest revision applicable) form a part of this specification to the extent referenced herein. The publications are referred to within the text by the designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) Test Methods:

ASTM D 635 - Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position

ASTM D-638 - Tensile Properties of Plastics

ASTM D-696 - Coefficient of Linear Thermal Expansion for Plastics

ASTM D-790 - Flexural Properties of Unreinforced and Reinforced Plastics

ASTM D-2344 - Apparent Interlaminar Shear Strength of Parallel Fiber Composites by Short Beam Method

ASTM E-84-Surface Burning Characteristics of Building Materials

THE OCCUPATIONAL HEALTH AND SAFETY ADMINISTRATION (OSHA)

Code of Federal Regulations (CFR), Volume 29

1.3 CONTRACTOR SUBMITTALS

- A. The CONTRACTOR shall furnish shop drawings of all fabricated structural systems and accessories in accordance with the provisions of this Section.

- B. The CONTRACTOR shall furnish manufacturer's shop drawings clearly showing material sizes, types, styles, part or catalog numbers, complete details for the fabrication of and erection of components including, but not limited to, location, lengths, type and sizes of fasteners, clip angles, member sizes, and connection details.
- C. The CONTRACTOR shall submit the manufacturer's published literature including structural design data, structural properties data, corrosion resistance tables, certificates of compliance, test reports as applicable, and design calculations for systems not sized or designed in the contract documents, sealed by a Professional Engineer.
- D. The CONTRACTOR may be requested to submit sample pieces of each item specified herein for acceptance by the ENGINEER as to quality and color. Sample pieces shall be manufactured by the method to be used in the WORK.

1.4 QUALITY ASSURANCE

- A. All items to be provided under this Section shall be furnished only by manufacturers having a minimum of ten (10) years experience in the design and manufacture of similar products and systems. Additionally, if requested, a record of at least five (5) previous, separate, similar successful installations in the last five (5) years shall be provided.
- B. Manufacturer shall offer a 3 year limited warranty on all FRP products against defects in materials and workmanship.
- C. Manufacturer shall be certified to the ISO 9001-2000 standard.
- D. Manufacturer shall provide proof of certification from at least two other quality assurance programs for its facilities or products (UL, DNV, ABS, USCG, AARR).

1.5 PRODUCT DELIVERY AND STORAGE

- A. Delivery of Materials: Manufactured materials shall be delivered in original, unbroken pallets, packages, containers, or bundles bearing the label of the manufacturer. Adhesives, resins and their catalysts and hardeners shall be crated or boxed separately and noted as such to facilitate their movement to a dry indoor storage facility.
- B. Storage of Products: All materials shall be carefully handled to prevent them from abrasion, cracking, chipping, twisting, and other types of damage. Store adhesives, resins and their catalysts and hardeners in dry indoor storage facilities between 70 and 85 degrees Fahrenheit (21 to 29 degrees Celsius) until they are required.

PART 2 - PRODUCTS

2.1 MANUFACTURER

Structural shapes shall be Dynaform®, molded gratings shall be Fibergrate® or Chemgrate®, and grating pedestals shall be Dynaform® and molded components as manufactured by:

Fibergrate Composite Structures Inc.
5151 Belt Line Road, Suite 700
Dallas, Texas 75254-7028 USA
(800) 527-4043 (972) 250-1530 Fax

2.2 GENERAL

- A. All FRP items furnished under this Section shall be composed of fiberglass reinforcement and resin in qualities, quantities, properties, arrangements and dimensions as necessary to meet the design requirements and dimensions as specified in the Contract Documents.
- B. Fiberglass reinforcement shall be continuous roving in sufficient quantities as needed by the application and/or physical properties required.
- C. Resin shall be Vinyl ester for all systems with chemical formulations as necessary to provide the corrosion resistance, strength and other physical properties as required.
- D. All finished surfaces of FRP items and fabrications shall be smooth, resin-rich, free of voids and without dry spots, cracks, crazes or unreinforced areas. All glass fibers shall be well covered with resin to protect against their exposure due to wear or weathering.
- E. All FRP products shall have a tested flame spread rating of 25 or less per ASTM E-84 Tunnel Test. Gratings shall also have tested burn time of less than 30 seconds and an extent of burn rate of less than or equal to 10 millimeters per ASTM D635.
- F. All mechanical grating clips shall be manufactured of Type 316SS (stainless steel).

2.3 STRUCTURAL SHAPES

- A. All structural shapes are to be manufactured by the pultrusion process with a glass content minimum of 45%, maximum of 55% by weight. The structural shapes shall be composed of fiberglass reinforcement and resin in qualities, quantities, properties, arrangements and dimensions as necessary to meet the design requirements and dimensions as specified in the Contract Documents.
- B. Fiberglass reinforcement shall be a combination of continuous roving, continuous strand mat, and surfacing veil in sufficient quantities as needed by the application and/or physical properties required.

- C. Resins shall be DYNAFORM® VEFR, fire retardant vinyl ester with chemical formulation necessary to provide the corrosion resistance, strength and other physical properties as required.
- E. Pultruded structural shapes are to have the minimum longitudinal mechanical properties listed below:

Property	ASTM Method	Value	Units
Tensile Strength	D-638	30,000 (206)	psi (MPa)
Tensile Modulus	D-638	2.5 x 10 ⁶ (17.2)	psi (GPa)
Flexural Strength	D-790	30,000 (206)	psi (MPa)
Flexural Modulus	D-790	1.8 x 10 ⁶ (12.4)	psi (GPa)
Flexural Modulus (Full Section)	N/A	2.8 x 10 ⁶ (19.3)	psi (GPa)
Short Beam Shear (Transverse)	D-2344	4,500 (31)	psi (MPa)
Shear Modulus (Transverse)	N/A	4.5 x 10 ⁵ (3.1)	psi (GPa)
Coefficient of Thermal Expansion	D-696	8.0 x 10 ⁻⁶ (1.4 x 10 ⁻⁶)	in/in/°F (cm/cm/°C)
Flame Spread	E-84	25 or less	N/A

2.4 FIBERGRATE® or CHEMGRATE® SQUARE MESH MOLDED FRP GRATING

- A. Manufacture: Grating shall be of a one piece molded construction with tops and bottoms of bearing bars and cross bars in the same plane. Grating shall have a square mesh pattern providing bidirectional strength. Grating shall be reinforced with continuous rovings of equal number of layers in each direction. Percentage of glass (by weight) shall not exceed 35% so as to achieve maximum corrosion resistance, and as required to maintain the structural requirements of the CONTRACT.

After molding, no dry glass fibers shall be visible on any surface of bearing bars or cross bars. All bars shall be smooth and uniform with no evidence of fiber orientation irregularities, resin rich or resin starved areas.

- B. Non-slip surfacing: Fibergrate® gratings shall be manufactured with a concave, meniscus profile on the top of each bar providing maximum slip resistance. Chemgrate® gratings shall be manufactured with an integral grit molded into the panels during the manufacturing process. A concave profile on the top of each bar shall also be allowed for VE-25 and FS-25 resins.
- C. Fire rating: Unless Chemgrate CP-84 is specified, grating shall be fire retardant with a tested flame spread rating of 25 or less when tested in accordance with ASTM E 84. Data performed only on the resin shall not be acceptable.
- D. Resin system: The resin system used in the manufacture of Fibergrate® gratings shall be {Vi-Corr®, IFR, FGI, Corvex®, ELS, XFR or Super Vi-Corr - choose one}. The

resin system used in the manufacture of Chemgrate® gratings grating shall be {Chemgrate® CP-84 or FS-25 or VE-25 - choose one}. Manufacturer may be required to submit corrosion data from tests performed on actual grating products in standard chemical environments. Corrosion resistance data of the base resin from the manufacturer is not a true indicator of grating product corrosion resistance and shall not be accepted.

- E. Color: {varies by resin - consult your catalog}
- F. Depth: {1-1/2" or 2" choose one} with a tolerance of plus or minus 1/16".
- G. Mesh Configuration: {1-1/2" or 2" choose one} square mesh with a tolerance of plus or minus 1/16" mesh centerline to centerline
- H. Load/Deflection: Grating design loads shall be less than manufacturers published maximum recommended loads. Maximum recommended loads shall be determined by acoustic emission testing. Grating shall be designed for a uniform load of 50 psf or concentrated load of 300 lb. Deflection is not to exceed 0.375".
- I. Substitutions: Other products of equal strength, stiffness, corrosion resistance and overall quality may be submitted with the proper supporting data to the engineer for approval.

2.5. GRATING PEDESTAL SUPPORT SYSTEM

- A. Grating pedestals shall be adjustable. Pedestal shall consist of molded bases and tops, with DYNAFORM® pedestals joining the bases and tops and 316 stainless steel threaded rods for adjustability.
- B. Bases and tops shall be injection molded, glass reinforced, thermoplastic polyester for maximum corrosion resistance. Tops shall be provided in a single head configuration for use in the interior of the grating panels and in a quad head configuration for use at the corners and edges of the grating panels. Pedestal tops are to be manufactured such that there is free drainage of fluids. Color shall be light gray.
- C. Pedestals shall be 2-1/8" x 3/16" square tube as manufactured by the pultrusion process and in accordance with Section 2.3 - STRUCTURAL SHAPES. Adjustability shall be achieved with a 316 stainless steel all-thread component that threads into the molded fittings. Color shall be light gray.
- D. Where required, stainless steel clips for holding single head pedestals to the underside of the grating are to be provided. These clips are to be constructed of 316 stainless steel and be configured to allow height adjustment of the pedestal from the walking surface of the grating.

- E. Design – Pedestal floor system shall be designed for a uniform load of 50 psf or concentrated load of 300 lb. Deflection of supported grating is not to exceed 0.375". Grating pedestals are to be laid out according to the manufacturers published literature or as indicated in the contract drawings.
- F. Perimeter embedded support angle shall be DYNAFORM E-Z ANGLE®. Support where embedment angle is not provided shall be DYNAFORM® angle, 3" x 3" x 1/4" minimum. This ledge angle is to be anchored at a maximum of 24" on center with 3/8" diameter 316SS Hilti Kwik Bolt II anchors or equal, installed following the anchor bolt manufacturers recommendations. Anchor bolts are to be supplied by the contractor.
- G. Substitutions: Other products of equal strength, stiffness, corrosion resistance and overall quality are acceptable only with prior approval by the engineer, after review of the proper supporting data.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Shop inspection is authorized as required by the Owner and shall be at Owner's expense. The fabricator shall give ample notice to Contractor prior to the beginning of any fabrication work so that inspection may be provided. The grating shall be as free, as commercially possible, from visual defects such as foreign inclusions, delamination, blisters, resin burns, air bubbles and pits. The surface shall have a smooth finish (except for grit top surfaces).

3.2 INSTALLATION

- A. Contractor shall install gratings, grating pedestals, and embedment/ledge angles in accordance with manufacturer's assembly drawings. Fasten materials securely in place with fasteners as specified herein. Field cut and drill fiberglass reinforced plastic products with carbide or diamond tipped bits and blades. Seal cut or drilled surfaces in accordance with manufacturer's instructions. Follow manufacturer's instructions when cutting or drilling fiberglass products or using resin products.