

ENGINEERING SPECIFICATION
Fibergrate Pre-Engineered Crossover System

SECTION 06 70 00

FIBERGLASS REINFORCED PLASTICS (FRP) FABRICATIONS

PRE-ENGINEERED CROSSOVER SYSTEM

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. This specification is for a fabricated walkover system in compliance with 2018 IBC, and OSHA 1910.25, 1910.28, and 1910.29

1.2 REFERENCES

- A. 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-638-Tensile Properties of 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 D-495-High Voltage, Low-Current, Dry Arc Resistance of Solid Electrical Insulation

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

ASTM E-84-Surface Burning Characteristics of Building Materials

INTERNATIONAL CODE COUNCIL, INC.
The International Building Code, 2018

THE OCCUPATIONAL HEALTH AND SAFETY ADMINISTRATION
Code of Federal Regulations (CFR), Title 29, Section 1910.25, Section 1910.28, and Section 1910.29(b)

1.3 CONTRACTOR SUBMITTALS

- A. The CONTRACTOR shall furnish shop drawings of all fabricated crossovers 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 9001-2015 standard.
- D. Manufacturer shall provide proof of certification from at least two other quality assurance programs for its facilities or products (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, other deformations, and other types of damage. Adhesives, resins and their catalysts are to be stored 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 MATERIALS

- A. Guardrail system to be Dynarail®, Structural Shapes to be Dynaform®, as manufactured by

Fibergrate Composite Structures Inc.
5151 Belt Line Road, Suite 1212
Dallas, Texas 75254-7028 USA
(800) 527-4043 Phone (972) 250-1530 Fax

Website: www.fibergrate.com
E-mail: info@fibergrate.com

2.2 GUARDRAILS AND STRUCTURAL SHAPES

- A. All structural members, posts and rails are to be DYNAFORM® FRP structural shapes manufactured by the pultrusion process. 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 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® ISOFR, fire retardant isophthalic polyester with chemical formulation 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 pultruded structural shapes shall be further protected from ultraviolet (UV) attack with 1) integral UV inhibitors in the resin, 2) a synthetic surfacing veil to help produce a resin rich surface. Guardrails and handrails located outdoors shall be shop coated with a 2 part polyurethane coating, a minimum of 2 mils thick, for improved durability and UV resistance.
- F. All FRP products shall have a tested flame spread rating of 25 or less per ASTM E-84 Tunnel Test.
- G. Top and bottom rails for guards are to be 1.75" x 0.125" (44.4 mm x 3.2 mm) wall square tube, the posts are to be 2.125" x 0.1875" (53.9 mm x 4.8 mm) wall square tube and kick plate is to be ½" deep x 4" wide with two reinforcing ribs. Offset rail used as handrail to be 1.5" x 0.25" (38.1 mm x 6.4 mm) wall round tube.
- H. The completed railing installation shall meet the following load requirements with a minimum factor of safety of 2.0:
 - Concentrated Load: 200 lb (891 N) applied in any direction at any point on the rail.
 - Uniform Load: 50 lb/lf (730.5 N/m) applied in any direction on the rail.
 - Loads are assumed not to act concurrently.
- I. All rails, posts, and kick plates are to be integrally pigmented yellow. All other structural members to be integrally pigmented dark grey.
- J. Pultruded structural shapes used in the railing systems 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

K. All fasteners used in the railing system are to be 316 SS. Rivets to be 18-8 SS.

2.3 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. Grating shall be reinforced with continuous rovings of equal number of layers in each direction. The top layer of reinforcement shall be no more than 1/8" below the top surface of the grating so as to provide maximum stiffness and prevent resin chipping of unreinforced surfaces. 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, interlaminar voids, porosity, resin rich or resin starved areas.

- B. Non-slip surface (select one): Grating shall be manufactured with a concave, meniscus profile on the top of each bar providing maximum slip resistance.
- C. Grating bar intersections are to be filleted to a minimum radius of 1/16" to eliminate local stress concentrations and the possibility of resin cracking at these locations.
- D. Fire rating: 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.
- E. Resin system: The resin system used in the manufacture of the grating shall be Corvex®.
- F. 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.
- G. Color: Dark Grey
- H. G. Depth: 1" with a tolerance of plus or minus 1/16".
- I. H. Mesh Configuration: 1.5" x 1.5" with a tolerance of plus or minus 1/16" mesh centerline to centerline.
- J. 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 100 psf or concentrated load of 300 lb. Deflection is not to exceed 0.375" or $L/D = 120$, whichever is less.

- K. The manufacturer shall certify that the stiffness of all panels manufactured are never more than 2.5% below the published load-deflection values.
- L. 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.

2.4 STAIR TREADS

- A. Manufacture: Stair treads shall be FIBERTRED® as manufactured by Fibergrate Composite Structures Incorporated. Fibertred® stair treads shall be of a one-piece molded construction and shall have a 1-1/2" x 6" rectangular mesh pattern providing unidirectional strength in the tread span direction. Fibertred® shall be reinforced with continuous rovings in each direction. The top layer of reinforcement shall be no more than 1/8" below the top surface of the tread so as to provide maximum stiffness and prevent resin chipping of unreinforced surfaces. 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, interlaminar voids, porosity, resin rich or resin starved areas.
- B. Non-slip surfacing: Fibertred® stair treads shall be manufactured with a concave, meniscus profile on the top of each bar providing maximum slip resistance. For additional safety, and to meet OSHA requirements, stair treads shall be manufactured with a 1-1/2" solid, molded nosing. Nosing shall be gritted with an angular quartz grit, integrally molded into the top surface of the nosing area only.
- C. Fire rating: Fibertred® stair treads shall be fire retardant with a tested flame spread rating of 25 or less when tested in accordance with ASTM E 84. Test data performed only on the resin shall not be accepted.
- D. Resin system: The resin system used in the manufacture of Fibertred® stair treads shall be Corvex®. Manufacturer may be required to submit corrosion data from tests performed on actual stair tread products in standard chemical environments. Corrosion resistance data of the base resin from the manufacturer is not a true indicator of stair tread product corrosion resistance and shall not be accepted.
- E. Thickness: 1-1/2" thick with a tolerance of plus or minus 1/16".
- F. Mesh Configuration: 1-1/2" x 6" rectangular mesh pattern with double cross bars on 6" centers which allows optimum utilization and ease of fabrication.
- G. Color: Dark Grey
- H. Load/Deflection: Fibertred® stair treads shall meet manufacturer's published recommended loading with deflection not to exceed the following:

Concentrated load of 500 pounds, placed at the centerline of a 36" tread span with a maximum deflection not to exceed 0.32".
The concentrated load is applied at the centerline of the tread, over a width of 4" and a depth of 6", starting at the nosing edge to simulate the landing of a foot.
- I. The manufacturer shall certify that the stiffness of all panels manufactured are never more than

2.5% below the published load-deflection values.

- J. Substitutions: Other products of equal strength, stiffness, corrosion resistance and overall quality may, with prior approval, be submitted with the proper supporting data to the engineer for approval.

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 FABRICATION - GUARDRAILS

- A. The post/rail connection for guards is to be fabricated such that the rails are unbroken and continuous through the post without the use of packs or splices. The bottom rail is to be installed through the post at a prepared hole made to fit the outside dimensions of the rail. The top rail is to fit into a machined, u-shaped pocket formed into top of the post such that the rail is located at the center of the post. All exposed post corners are to be radiused to eliminate sharp edges. The rails are to be joined to the post through a combination of bonding and riveting. The offset handrail is to be fabricated such that the rail is continuous with the use of connectors and splices. No sharp, protruding edges are to remain after assembly of the railing system. Spacing of the posts and offset handrail supports shall not exceed 6'-0" (1.83 m).
- B. The bases of the posts are to be attached according to the contract drawings. The bases of the posts are to be reinforced to a height of 8.5" (254 mm). The offset handrails are to be attached to guards with brackets.
- C. To avoid embrittlement at cold temperatures and loss of strength at high temperatures, PVC or CPVC connectors should **not** be used as a load carrying component of the railing system.
- D. All shop fabricated cuts are to be sealed to provide maximum corrosion resistance. Field cuts are to be similarly coated by the contractor in accordance with the manufacturer's instructions.

3.3 FABRICATION – GRATING/FIBERTREDS

- A. Measurements: Grating supplied shall meet the dimensional requirements and tolerances as shown or specified. The Contractor shall provide and/or verify measurements in field for work fabricated to fit field conditions as required by grating manufacturer to complete the work.
- B. Sealing: All shop fabricated grating cuts shall be coated with a sealant to provide maximum corrosion resistance. All field fabricated grating cuts shall be coated similarly by the contractor in accordance with the manufacturer's instructions.
- C. Hardware: Type 316 stainless steel hold-down clips shall be provided and spaced at maximum of four feet apart with a minimum of four per piece of grating, or as recommended by the manufacturer.

4.0 INSTALLATION

- A. Contractor shall install walkover platforms in accordance with manufacturer's assembly drawings. The contractor shall ascertain that plumbness, level and alignment are within acceptable tolerances. Fasten grating panels securely in place with hold-down 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; provide adequate ventilation.