Section 07455

FIBERGLASS REINFORCED PANELS

NOTE: THIS SECTION IS FOR EXTERIOR PANELS. FOR CUSTOM FIBERGLASS FABRICATIONS (NOT PANELIZED MATERIAL) USE SECTION 06610.

NOTE: AFTER EDITING THIS SECTION, PLEASE DELETE EDITING NOTES.

PART 1 –GENERAL

NOTE: EDIT THE FOLLOWING ARTICLE TO SUIT THE PROJECT IF DIVISION 1 - GENERAL REQUIREMENTS IS NOT USED, DELETE APPROPRIATE TEXT

1.01 RELATED DOCUMENTS

A. Drawings, Conditions of the Contract and Division 1 Specifications sections, apply to work of this section.

1.02 SUMMARY

A. Section Includes: Fiberglass reinforced panels and hardware.

1.03 DEFINITION

A. "FRP": Where the abbreviation "FRP" is used, it means fiberglass reinforced plastic.

END OF SECTION

1.03 RELATED SECTIONS

NOTE: IN PARAGRAPHS BELOW, INSERT SECTION NUMBERS AND TITLES OF SECTIONS WHICH CONTAIN SPECIFICATIONS RELATED TO INSTALLATION OF FIBERGLASS FABRICATIONS FOR THIS PROJECT DELETE PARAGRAPHS WHICH ARE NOT APPLICABLE TO THIS PROJECT.

NOTE: DELETE PARAGRAPH "A" BELOW, IF FIBERGLASS FABRICATIONS HAVE INTEGRAL STRUCTURAL SUPPORT, OR STRUCTURAL SUPPORT IS NOT REQUIRED.

A. Section 05120 - Structural Steel: Support framing for fiberglass fabrications.
B. Section 06100 - Rough Carpentry: Framing of openings and blocking.
C. Section 07900 - Joint Sealants.
D. Section _____ - _____: Electrical Attachments.

1.05 REFERENCE STANDARDS

A. ASTM D638: Test Method for Tensile Properties of Plastic.
B. ASTM D695: Test Method for Compressive Strength of Rigid Plastics.
C. ASTM D790: Test Methods for Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
D. ASTM E84: Test Method for Surface Burning Characteristics of Building Materials.

NOTE: BASED ON PROJECT SCOPE, DETERMINE WHETHER OR NOT DESIGN IS COMPLEX AND STRUCTURALLY CRITICAL ENOUGH TO WARRANT REQUIRING THAT THE DESIGN BE PREPARED BY A CERTIFIED STRUCTURAL OR CIVIL ENGINEER. DETAILED ENGINEERING CALCULATIONS AND DESIGN SKETCHES MAY BE WAIVED FOR SMALL NON-STRUCTURAL PIECES.

1.06 DESIGN RESPONSIBILITY

A. The FRP fabricator shall be responsible for the structural design of laminates.

NOTE: IF DETAILED ENGINEERING CALCULATIONS ARE WAIVED, DELETE PARAGRAPH B BELOW.

A. Structural design shall be prepared by certified structural or civil engineer licensed in the state where the Project is located and experienced in the use and design of FRP products.
B. The FRP manufacturer shall provide data relating to specific materials for use in design considerations. Data shall be based upon testing of actual fabrications by the FRP manufacturer using material equivalent to those required for this Project.

1.07 DESIGN REQUIREMENTS

A. Structural Requirements: Engineering calculations shall account for the following loads:
    1. Dead Loads: Include the weight of the FRP components and attached items.
    2. Live Loads: As required by applicable code.
    3. Wind Loads: As required by applicable code. Consider wind loads as an inward pressure and as an outward suction.
    4. Snow Loads: As required by applicable codes.
    5. Seismic Design Forces: As required by applicable code.
    6. Load Combinations: Consider applicable load combinations. Do not combine wind loads with seismic loads.

B. Provisions for Movement
    1. Design and detail anchorages, connections, and joints to allow for dimensional changes of the FRP components due to thermal and similar effects.
    2. Where the piece is restrained, allow for effects of restraint in design.

C. Anchorages and Connections
    1. Suggested anchorages and connections are shown on the design drawings. Proposed substitutions may be submitted for review. Substitutions shall satisfy the function of the connection as indicated or implied on the drawings and shall not vary indicated building loading.
    2. Anchorages and connection designs shall consider tolerances and eccentricities of load applications. Provide proper edge and end distances for inserts.

NOTE: IN THE PARAGRAPH BELOW, EDIT TITLE OF VERIFYING ENTITY TO SUIT PROJECT -ARCHITECT, ARCHITECT/ENGINEER, STRUCTURAL OR CIVIL ENGINEER.

D. The ******* will verify that the structure will accept transmitted loads as shown in the calculations.

NOTE: CONSERVATIVELY SELECT ALLOWABLE DESIGN STRESSES AND RESISTANCES BASED ON SUCCESSFUL FIELD HISTORIES OF EXISTING INSTALLATIONS.

1.08 SUBMITTALS

A. Product Data: Submit manufacturer's data on FRP components.

NOTE: IF SPECIFIC COLOR, TEXTURE AND FINISH HAVE BEEN SPECIFIED, KEEP THE PARAGRAPH BELOW

B. Product Samples: Submit minimum 3 inch x 5 inch samples in specified color, texture and finish.

NOTE: IF ARCHITECT HAS PROVIDED SAMPLE TO BE MATCH, USED PARAGRAPH BELOW.

C. Product Samples: Submit minimum 3 inch x 5 inch sample. Match sample provided by Architect.

D. Shop Drawings: Submit drawings indicating:
   1. Panel shapes and dimensions;
   2. Panel surface finish;
   3. Part numbers;
   4. Jointing and connection details;
   5. Adjacent structure details;
   6. Hardware location and details; and
   7. Lifting and erection details.

NOTE: DELETE THE PARAGRAPH BELOW, IF ENGINEERING CALCULATION REQUIREMENTS ARE WAIVED.

E. Engineering Calculations: Submit load, stress and design calculations prepared by a certified structural or civil engineer.

F. Manufacturer's Instructions: Submit manufacturer's instructions and recommendations for:
   1. Product delivery, storage and handling.
   2. Erection, lifting and connecting of FRP components.

G. Part Numbers.

1.09 DELIVERY, STORAGE AND HANDLING

A. Handle, store and transport panels according to manufacturer's recommendations and in a manner that prevents cosmetic and structural damage.

B. Verify that areas where panels will be unloaded are clear of obstructions and well-drained.

C. Do not subject panels to undue stress.

D. Brace and stabilize panels to prevent warping.

NOTE: THE PARAGRAPH BELOW MAY BE USED TO AVOID CONFLICT, IF PROJECT SCHEDULING/PHASING IS SUCH THAT INSTALLED PANELS WILL BE EXPOSED TO DAMAGE FOR AN EXTENDED PERIOD PRIOR TO PROJECT COMPLETION.

NOTE: EDIT PARAGRAPHS BELOW. INSERT "ARCHITECT", ARCHITECT/ENGINEER" "CONSTRUCTION MANAGER", "OWNER'S REPRESENTATIVE" AS APPLICABLE TO PROJECT.

E. Damage Responsibility: Except for damage caused by others, the installer is responsible for chipping, cracking, or other damage to FRP panels after delivery to the job site and until installation is completed and inspected and approved by the ********.

1.10 QUALITY ASSURANCE

NOTE: DELETE PARAGRAPH BELOW IF WORK IS PUBLICLY FUNDED AND/OR THERE IS NO NEED TO STIPULATE EXPERIENCE REQUIREMENT RECOMMENDED MINIMUM IS THREE YEARS.

A. Manufacturer: Provide panels manufactured by a firm specializing in the fabrication of reinforced fiberglass panels with a minimum of three years experience.

NOTE: DELETE ARTICLE BELOW, IF BOLTED CONNECTIONS ARE USED.

1.11 WELDERS' QUALIFICATIONS

A. Arc or gas welding of connecting structure shall be done by welders qualified by the American Welding Society "Standard Qualification Procedure."

NOTE: UNLESS REQUIRED BY PROJECT COMPLEXITY, DELETE THE ARTICLE BELOW. IF MANUFACTURERS MUST ATTEND IT WILL ADD TO COST

1.12 PRE-INSTALLATION CONFERENCE

A. Convene a pre-installation conference prior to commencing panel installation.
B. Require attendance of parties directly affected by work of this Section.
C. Review conditions of installation, installation procedures and coordination required with related work.

NOTE: WHEN A WARRANTY IS REQUIRED THAT EXTENDS BEYOND THE NORMAL "ONE YEAR" WARRANTY THAT IS INCLUDED IN THE MOST COMMONLY USED CONTRACT CONDITIONS, DO NOT INCREASE THE NUMBER OF YEARS WITHOUT VERIFYING THE COST AND AVAILABILITY OF A LONGER WARRANTY WITH MANUFACTURER. THE PARA-GRAPH BELOW MAY BE DELETED, IF ONE YEAR WARRANTY FOR OVERALL PROJECT IS INCLUDED IN CONTRACT CONDITIONS.

1.13 WARRANTY

A. Warrant fiberglass reinforced panels to be free from defects due to materials and workmanship for one year.

PART 2 - PRODUCTS

NOTE: LIST ACCEPTABLE MANUFACTURERS. VERIFY THAT LISTED MANUFACTURERS PRODUCE SPECIFIED PRODUCTS.

2.01 ACCEPTABLE MANUFACTURERS

A. _____

B. _____

C._____

2.02 FABRICATED PRODUCTS

A. Fabrications required are scheduled at the end of this section.

2.03 MATERIAL CHARACTERISTICS

A. Molded Exterior Surface: U-V inhibited, NPG-ISO polyester gel coat, 18 to 22 mils thick.

NOTE: SELECT 1 OR 2. INSERT COLOR IF 2 IS USED.

1. Gel Coat Color: Match sample supplied by Architect.

2. Gel Coat Color: ___

B. Back Up Laminate:

1. Resin: Fire retardant, isophthalic polyester resin.

NOTE: DELETE PARAGRAPH u) BELOW IF FIRE RETARDANT RESIN IS NOT REQUIRED. FIRE RETARDANT RESINS ARE AVAILABLE, BUT MORE EXPENSIVE.

a) Fire Retardant: ASTM E-84, Class 1 (flame spread rating of 25 or less)

2. Fiberglass Reinforcement

a) "E" type fiberglass.
b) Random chopped glass fibers.
c) Glass content approximately 25% to 30% except, 15%, for filled resin systems.

3. Laminate Thickness

a) Nominal thickness 3/16"
b) Additional thickness and reinforcement, or sandwich structures as indicated and as required for structural integrity.

NOTE: PROPERTIES LISTED ARE AVERAGE BASED ON RANGE AVAILABLE WITH FIBERGLASS MATERIAL. THESE ARE NOT MAXIMUMS OR MINIMUMS.

2.04 AVERAGE MECHANICAL PROPERTIES:

PROPERTY	VALUE	TEST METHOD
Tensile strength	12,000 PSI	AS TM D638
Flexural strength	20,000 PSI	ASTM D790
Flexural modulus	0.9 x 10° PSI	ASTM D790
Compressive strength	17,000 PSI	ASTM D695
Bearing strength	9,000 PSI	ASTM D638
Thermal expansion	10 x 10^{-6} (°F)	
Specific gravity	1.5	

NOTE: CERTAIN APPLICATIONS MAY BE BEST SUITED TO SPECIALTY RESINS BLE OF MEETING THE ABOVE MECHANICAL STRENGTH VALUES. SUCH

ALLOWED WITH COMPENSATORY INCREASES IN MINIMUM THICKNESS.

2.05 FINISH

NOTE: IF COLOR HAS BEEN SELECTED, INSERT IN THE PARAGRAPH BELOW -IF NOT, USE THE SECOND OPTION.

A. Color: _____
B. Color as selected by: _____
C. Surface Texture/Exposed side: _____
D. Finish: _____

2.06 TOLERANCES

A. Gel Coat Thickness: + or - 2.5 mils.
B. Length: + or - 1/8 inch in 10 feet.
C. Overall thickness tolerance: +1/8/-0 (+3mm/-0), except for deep under-cut or acute angle areas, which may vary according to the reasonable minimum achievable in the molding process
D. Location of inserts, bolts, pipe sleeves, and other connecting hardware: +/- 1/4"(7mm)
E. Location of flashing reglets: +/- 1/4"(7mm)
F. Variation from Square: 1/8 inch in 10 feet.

2.07 IDENTIFICATION

A. Identify each part with a permanent serial number.
B. Number parts to coordinate with shop drawings.

2.08 CURING AND CLEANING

A. Cure and clean components prior to shipment and remove materials which may be incompatible with adjacent building materials.

2.09 HARDWARE

A. Metal Anchors and Fasteners: Provide anchors and fasteners as recommended by panel manufacturer and conforming to the following standards of the American Society for Testing and Materials:

1. Structural steel: ASTM A36;
2. Cold drawn wire: ASTM A580, Type 304, Cond. A;
3. Stainless steel: ASTM A666, Type 304, grade _____;
4. Carbon steel plate: ASTM A283, grade _____;
5. Malleable iron castings: ASTM A47, grade _____;
6. Carbon steel castings: ASTM A27, grade 60-30; and
7. Anchor bolts ASTM A307 or ASTM A325.

PART 3 – EXECUTION

3.01 INSTALLER'S PRE-INSTALLATION INSPECTION

A. Observe field conditions and verify that building lines, centers, and grades will allow proper installation of FRP panels.

B. Verify that bearing surfaces are true and level.
C. Verity that support framing has been constructed to allow accurate placement and alignment of anchor bolts, plates, dowels, or other connections on the structure.
D. Check field dimensions affecting the installation of FRP components.

NOTE: EDIT PARAGRAPHS BELOW. INSERT "ARCHITECT,"ARCHITEECT/ENGINEER" "CONSTRUCTION MANAGER," "OWNER'S REPRESENTATIVE"AS APPLICABLE TO PROJECT.

E. Report discrepancies between design dimensions and field dimensions, which could adversely affect installation, to the ********.

F. Do not proceed with installation until discrepancies are corrected, or until installation requirements are modified and approved by the ********.

1.02 ERECTION

A. Install fabrications in accordance with manufacturer's instructions and approved shop drawings. Unloading: Use equipment that will prevent delays in installation process. Do not block access to panel installation area or other construction areas with equipment and materials.
B. Lifting and Positioning:
C. Lift FRP with suitable lifting devices at points as recommended by the manufacturer.
D. Set panels level, plumb, square, and true within the allowable tolerances.
E. Temporarily support and brace panels as required to maintain position, stability and alignment during and until permanent connection.
F. Fastening: Fasten FRP panels as shown on approved shop drawings.

NOTE: DELETE PARAGRAPH BELOW, IF BOLTED CONNECTIONS ARE USED.

1. Perform arc or gas welding in accordance with FRP fabricator's instructions and approved shop drawings using materials compatible with the base material.

3.03 ALLOWABLE TOLERANCES FOR ERECTED PANELS

A. Tolerances for Location of FRP Panels: Non-cumulative.
B. Warpage: Maximum permissible warpage of one corner out of the plane of the other three shall be 1/8"/ft (9.5mm)/M distance from the nearest adjacent corner, or 3/8" (9.5mm) total after installation.
C. Bowing: Less than L/200 with a maximum of 1" where L is the panel length in the direction of the bow. Differential bowing between adjacent members of the same design shall be <1/4" (7mm).
D. Width of joint: 1/4" to 3/4" depending upon engineering criteria.
E. Gap tolerances between joints for panel dimensions of:
    1. <10 ft.....+/- 3/16" (5mm)
    2. 10 ft. - 20 ft...+/- 1/4" (7mm)
    3. >20 ft .....+/- 5/16" (9mm)

3.04 CLEANING OF FRP COMPONENTS

A. Clean soiled panels using cleaning methods and materials approved by panel manufacturer.

3.05 PROTECTION OF INSTALLED FRP PANELS

A. Comply with manufacturer's recommendations and instructions for protecting installed panels during constriction activities.

END OF SECTION