

SECTION 07 44 50  
FIBERGLASS REINFORCED POLYMER (FRP) PANELS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Design, Engineering, manufacturing and erection of fiberglass reinforced panels. Delegated Design of Exterior Fiber Reinforced Polymer Composites Panel Profiles.
- B. Attachment, embedded and anchoring hardware.
- C. Strong back and panel stiffeners.
- D. Aluminum integral panel support.

1.2 RELATED SECTIONS

- A. Section 07 05 43      Cladding Support Systems
- B. Section 01 74 19      Construction Waste Management
- C. Section 014339      Mock-Ups
- D. Section 014400      Quality Assurance

1.3 REFERENCES

- A. Abbreviations:
  - 1. FRP: Fiber reinforced polymer (FRP) composites.
- B. Reference Standards:
  - 1. ASTM International (ASTM)
    - a. ASTM A27 - Standard Test Method for Steel Castings, Carbon, for General Application.
    - b. ASTM A36 - Standard Specification for Carbon Structural Steel.
    - c. ASTM A47 - Standard Specification for Ferritic Malleable Iron Castings.
    - d. ASTM A283 - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.
    - e. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
    - f. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat

Treated, 120/105 ksi Minimum Tensile Strength.

- g. ASTM A580 - Standard Specification for Stainless Steel Wire.
- h. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
- i. ASTM D638: Test Method for Tensile Properties of Plastic.
- j. ASTM D695: Test Method for Compressive Strength of Rigid Plastics.
- k. ASTM D790: Test Methods for Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
- l. ASTM E84: Test Method for Surface Burning Characteristics of Building Materials.

1. International Building Code (IBC), 2012
2. ASCE/SEI 7-10: Minimum Design Loads for Buildings and Other Structures

#### 1.4 PERFORMANCE REQUIREMENTS

##### A. General Prescriptive Requirements:

1. Refer to requirements in Section 07 05 43 – Cladding Support Systems.
2. All brackets outside the vapor barrier shall be stainless steel or aluminum.
3. All external areas of the cladding shall be accessible for maintenance and repair.
  - a) Loads to be adjusted as necessary for the type and orientation of maintenance equipment anticipated. The Contract Work shall sustain safely, and without damage, access and specified maintenance loads.
4. Incorporate separators to prevent bimetallic corrosion when deemed necessary by manufacturer.

##### B. General Performance:

1. Comply with performance requirements specified, as determined by preconstruction testing representing those indicated for this Project.
2. Contract Work shall as specified:
  - a) Withstand and accommodate the stresses and movements induced by the specified cambers, estimated deflections, relative deflections and the long term movements associated with the settlement of the foundations, or any other movements of the structure, changes in temperature and chemical changes.
  - b) Include suitable allowances for the specified construction tolerances.
  - c) Withstand the specified deleterious and degrading effects of radiation from the sun, weathering, atmospheric pollution, vandalism, vermin, fungi and other growths for the required service life described herein without maintenance in excess of routine cleaning and minor repairs.
  - d) Have a resistance to combustion and fire spread appropriate to each part.
  - e) Cleaning and maintenance of the Work shall be carried out easily, without interfering with the function of the building.
3. Failure shall include the following:
  - a) Structural failure of components resulting from forces within specified limits.
  - b) Thermal stresses transferring to/from the Contract Work to the building structure.
  - c) Excessive deflections.

- d) Noise or vibration created by thermal and structural movements.
- e) Loosening or weakening of fasteners, attachments, and other components.
- f) De-lamination.
- g) Failure of touch-up finish to match factory finish.
- h) Staining of adjacent components or wetting of interior building components.
- i) Discoloration, fading, chalking, excessive non-uniformity, pitting, cracking, peeling, corrosion, or crazing of finish.
  - 1) The terms below used in conjunction with finish Guarantee are defined as follows:
  - 2) "Resin color retention": Change of color should be maximum 5 delta E over and above the initial 1.5 delta E allowable under section 074450, 2.1, A, 3, over the equivalent of 5 years.
  - 3) "Excessive non-uniformity": means non-uniform fading during the period of the guarantee to the extent that adjacent parts have a color difference greater than the original acceptable color range.
  - 4) "Will not pit or otherwise corrode": means there shall be no pitting or other type of corrosion of finish discernible from a distance of ten (10) feet, resulting from the natural elements in the atmosphere at the Project site.
- j) Failure to fulfill other specified performance requirements.

## 1.5 ADMINISTRATIVE REQUIREMENTS

### A. Pre-installation Meeting:

- 1. Convene a pre-installation meeting prior to commencing installation.
- 2. Require attendance of parties directly affected by work of this Section.
- 3. Review conditions of installation, installation procedures, and coordination required with related work.

## 1.6 SUBMITTALS

### A. Product Data: Submit standard FRP composites product data.

### B. Shop Drawings - Drawings shall indicate the following:

- 1. Fabrication shapes and dimensions.
- 2. Surface finish.
- 3. Color.
- 4. Thicknesses.
- 5. Anchoring details.
- 6. Methods of support.
- 7. Connections between fabrications and adjacent building components.
- 8. Fabrication details.
- 9. Required clearances.
- 10. Lifting and erection details.
- 11. Allowances for FRP composites fabrication and adjacent material tolerances.

- D. Certificates:
1. Manufacturer's qualification statement.
  2. Installer's qualification statement.
  3. Current valid third party product Listing and Labeling in accordance with the requirements in the International Building Code. Labels affixed to products manufactured and delivered to the jobsite.
  4. List of manufacturers personnel with current valid certification in the American Composites Manufacturers Association - Certified Composites Technician program.
- E. Quality Control Program: Manufacturers internal Quality Control Manual and Quality Assurance Procedures.
- F. Delegated-Design Submittal: For FRP composites assemblies indicated to comply with performance requirements and design criteria include analysis data and calculations signed and sealed by the licensed professional engineer responsible for their preparation.
- G. Manufacturer's Instructions - Submit manufacturer's printed installation instructions, maintenance instructions and recommendations for product delivery, storage and handling.
- H. Closeout Submittals:
1. Submit manufacturer's warranty for project.

## 1.7 QUALITY ASSURANCE

- A. Qualifications:
1. Manufacturer:
    - a. Provide products manufactured by a firm specializing in the fabrication of FRP composites products with a minimum of five years' experience.
    - b. Shall be member of American Composites Manufacturers Association (ACMA) and have a Certified Composites Technician (CCT) on staff.
    - c. Shall have a Listing and Labeling program indicating compliance with flame spread index requirements per Section 2612 ("Fiber Reinforced Polymer", 2012 IBC).
    - d. Shall have an internal quality control program.
  2. Installer: Approved by the manufacturer for the installation of components provided under this Section.
  3. Welders: Qualified by the American Welding Society "Standard Qualification Procedure" for arc or gas welding of connecting structure.
- B. Mock-ups (Representative Sample): Build mock-ups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for

materials and execution.

## 1.8 ENVIRONMENTAL QUALITY ASSURANCE

- A. Provide materials and products with recycled content as specified.
- B. Applicable LEED Credits:
  - 1. Materials & Resources Credit 4, Recycled Content

## 1.9 DELIVERY, STORAGE AND HANDLING

- A. Transport, handle, and store FRP composites products according to manufacturer's recommendations and in a manner that prevents cosmetic and structural damage.
- B. Inspect each component to ensure that it complies with specified requirements.
- C. Verify that areas where panels will be unloaded are clear of obstructions and well-drained.
- D. Brace and stabilize FRP composites products to prevent warping.
- E. Protect FRP composites products from damage by retaining shipping protection in place until installation.

## 1.10 WARRANTY

- A. Warrant FRP composites products to be free from defects due to materials and workmanship for five years.

## PART 2 – PRODUCTS

### 2.1 MATERIAL

- A. Molded Exterior Surface:
  - 1. Coating: UV inhibited in mold coating and paint.
  - 2. Texture and Color: Sandblast to specified texture as shown in approved sample.
  - 3. Match Resin with Manufacturer's approved sample to within laboratory tolerance of 1.5 delta E, according to CIED2000 (International Commission on Illumination).
  - 4. Procure aggregate from same source as for mock-up to avoid variation from approved mock-up.
  - 5. Procure aggregate in one batch and mix batch to reduce color variation.
- B. Laminate:

1. Matrix:
  - a. Resin: Manufacturer's standard product
  - b. Fillers and Additives: As required
2. Fiber Reinforcement:
  - a. Fiber Type: E-glass fiber
  - b. Fiber Architecture: TBD
    - 1) Oriented strand glass fibers; multi-axial
  - c. Glass content (Fiber Volume Fraction):
    - 1) Standard: Minimum 20 percent.
    - 2) Filled Systems: Minimum 15 percent.

## 2.2 DESIGN CRITERIA

- A. Conform to performance requirements identified for exterior wall in Section 07 05 43 – Cladding Support System.
- B. Installed products shall be capable of withstanding positive and negative wind pressure without structural failure, cracking, crazing, permanent distortion or displacement.
- C. Provisions for Movement:
  1. Design and detail anchorages, connections, and joints to allow for dimensional changes of the FRP composites product.
- D. FRP Component Fire Test Response Characteristics:
  1. FRP composites used as exterior components shall meet the requirements of 2012, IBC Section 2603.5 and 2612 for combustibility.
  2. NFPA 268 - Ignition; does not exhibit sustained flaming.
  3. NFPA 285 - Fire Propagation
  4. ASTM E84 - Class A 25 or less.

## 2.3 FABRICATION

- A. General: Fabricate and finish FRP composites panel profiles and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. Fabricate panel profiles in accordance with approved shop drawings.
  1. Laminate Thickness. TBD
  2. Embed anchors into panel profiles per approved shop drawings.
  3. After removing component from mold, prepare exposed surface for specified finish

- texture.
4. Seams or mold lines shall be filled where necessary, ground smooth, and finished to match surrounding surfaces.
  5. Provide major ribs and intermediate stiffening ribs as indicated on approved shop drawings.
  6. Identification:
    - a. Identify each part with a permanent serial number.
    - b. Number parts to coordinate with shop drawings.
  7. Cure and clean components prior to shipment and remove material which may be incompatible with adjacent building materials.
- C. Finish Texture; exposed surfaces: Per finish on NFPA 285 test panel or equal, as approved by Architect.
1. Finish texture shall be consistent and even over exposed surfaces to match approved samples.
- D. Apply coatings to a properly prepared surface in accordance with coating manufacturers instructions.
1. Integrally molded gel coat thickness: As per Manufacturer's standard.
- E. Furnish accessories for securing FRP composites panel profiles to supporting and adjacent construction.
- F. Fabrication Tolerances:
1. Total Thickness: Plus or minus 1/16 inch.
  2. Length: Plus or minus 1/8 inch in 10 feet.
  3. Location of accessories, and other connecting hardware, plus or minus 1/4 inch.
  4. Variation from Square: plus or minus 1/4 inch in 10 feet.
  5. Out of plane variation plus or minus 1/4 inch in 10 feet.
  6. Warping or bowing plus or minus 1/4 inch in any 10 square foot area.

## 2.4 ACCESSORIES

- A. Metal Anchors and Fasteners: As recommended by manufacturer and conforming to the following standards:
1. Stainless steel: ASTM A666, Type 300 series.
- B. Fire Blocking: In compliance with applicable code and as indicated on approved shop drawings.
- C. Sealant: compatible silicone sealant. Compatibility and adhesion testing required on

cladding substrates.

- D. Adhesive: As recommended by manufacturer.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Observe field conditions that building lines, grades, and elevations will allow proper installation of FRP composites products.
- B. Verify that support framing has been constructed to allow accurate placement and alignment of anchor bolts, plates, dowels, or other connections to structure.
- C. Prior to installation verify all field dimensions. Report discrepancies which could affect installation. Do not proceed with installation until discrepancies are corrected.
- D. Beginning of installation means acceptance of existing conditions.

### 3.2 ERECTION

- A. Install components in accordance with manufacturer's instructions and approved shop drawings.
- B. Lifting and Positioning: Lift FRP composites with suitable lifting devices at points indicated on approved shop drawings.
- C. Set components level, plumb, square, and true within the allowable tolerances.
- D. Temporarily support and brace panels as required to maintain position, stability and alignment until permanent connection.
- E. Do not allow components to be cut, trim or in any way change the shape or connection locations without express written permission or direction from the manufacturer. Provide revised calculations and shop drawings in the event a revision is required.
- F. Fastening:
  - 1. Fasten FRP composites products as shown on approved shop drawings.
  - 2. Perform arc or gas welding in accordance with FRP composites manufacturer's instructions and approved shop drawings using materials compatible with the base material.
- G. Tolerances:

1. Warpage: Maximum permissible warpage of one corner out of the plane of the other three shall be 1/8 inch per foot, or 3/8 inch total after installation.
2. 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 inch.
3. Width of Joint: shall allow for manufacturing, thermal and engineering tolerances, but no less than 1/2 inch.
4. Maximum Offset from True Alignment: 1/4 inch in 20 feet.
5. Maximum Variation from True Position: 1/2 inch in 20 feet.
6. Gap tolerances between joints for panel dimensions of:
  - a. Less than 10 feet: plus or minus 3/16 inch.
  - b. 10 feet to 20 feet: plus or minus 1/4 inch.
  - c. Greater than 20 feet: plus or minus 5/16 inch.

### 3.3 CLEANING

- A. Clean installed products using cleaning methods and materials approved by FRP composites manufacturer.

### 3.4 PROTECTION

- A. Comply with FRP composites manufacturer's recommendations and instructions for protecting installed products during construction activities.

### 3.5 CONSTRUCTION WASTE MANAGEMENT

- A. General: Comply with the requirements of Section 01 74 19 - Construction Waste Management for removal and disposal of construction debris and waste.
- B. Separate and recycle waste materials to the maximum extent possible.

END OF SECTION