PRIMARY PLASTICS

SPECIFICATION

1. PART 1 GENERAL

1.1. SUMMARY

A. Furnish all labor, equipment, materials, and accessories as shown on drawings, specified, and required for the correct fabrication and installation of fiberglass reinforced plastic ductwork system, consisting of ducting and including fasteners, field joints, expansion joints, fittings, appurtenances, and supports.

1.2. REFERENCES

A. Referenced Standards: This section contains references to the following documents. They are part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section will prevail. Comply with applicable provisions and recommendations of the following, except where otherwise shown or specified.

1) SMACNA Thermoset FRP Duct Construction Manual.
2) ASME B 16.5, Pipe Flanges and Flanged Fittings.
3) AWWA M 45, Fiberglass Pipe Design.
4) AWWA C 950, Standard for Fiberglass Pressure Pipe.
5) ASTM C 581, Standard Practice for Determining Chemical Resistance of Thermosetting Resins. Used in Glass-Fiber-Reinforced Structures Intended for Liquid Service.
6) ASTM C 582, Specification for Contact-Molded Reinforced Thermosetting Plastic Laminates for Corrosion Resistant Equipment.
7) ASTM D 628, Test Methods for Tensile Properties of Plastics.
8) ASTM D 695, Standard Test Method for Compressive Properties of Rigid Plastics.
9) ASTM D 1599, Standard Test Method for Resistance to Short-Term Hydraulic Failure Pressure of Plastic Pipe, Tubing and Fittings.
10) ASTM D 2105, Standard Test Method for Longitudinal Tensile Properties of Fiberglass (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe and Tube.
11) ASTM D 2412, Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading.
12) ASTM D 2563, Practice for Classifying Visual Defects in Glass reinforced Plastic Laminate Parts.
13) ASTM D 2992, Standard Practice of Obtaining Hydrostatic or Pressure Design Basis for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe and Fittings.
14) ASTM D 2996, Standard Specification for Filament Wound "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe.
15) ASTM D 2997, Standard Specification for Centrifugal Cast "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe.
16) ASTM D 3567, Practice for Determining Dimensions of Fiberglass (Glass-Fiber Reinforced-Thermosetting-Resin) Pipe and Fittings.
17) ASTM D 3982, Standard Specification for Contact Molded Fiberglass Duct and Hoods or NBS PS 15-69 Custom Contact-Molded Reinforced Polyester Chemical-Resistant Process Equipment.

18) ASTM D 4024, Specification for Machine Made Fiberglass (Glass Fiber Reinforced Thermosetting Resin) Flanges.
19) ASTM D 6041, Standard Specification for Contact-Molded "Fiberglass" (Glass-Fiber-Reinforced Thermosetting Resin) Corrosion Resistant Pipe and Fittings.
20) ASTM E 84, Surface Burning Characteristics of Building Materials.
21) ASTM F 593, Standard Specification for Stainless Steel Bolts, Hex Cap Screws and Studs.
22) ASTM F 594, Standard Specification for Stainless Steel Nuts.
23) PS15-69, Custom Contact Molded Reinforced-Polyester Chemical Resistant Process Equipment. Standards of Society of the Plastic Industry.
24) NAIMA-01 (North American Insulation Manufacturers' Association), Fibrous Glass Duct Construction Standards.

1.3. SUBMITTALS

A. Certification letter stating that any shop fabrications have been constructed by the pipe manufacturer or pipe manufacturer's certified pipe fabrication source.
B. Product data: Composition of materials, configuration of external stiffeners, and flexible connections.
C. Resin system data, including chemical environment service test data, case history data of similar installations (with contact addresses), resin pot life and time versus temperature data required for complete resin cure for laminate thicknesses proposed.
D. Shop drawings specific to the project and applicable product data will be provided in a single package and submitted as part of the FRP ductwork Manufacturer's submittal. The following information shall be submitted as a minimum:
    1) Shop Drawings:
        i. Drawings showing ductwork layout, dimensions, fittings, transitions, bracing, fasteners, and support locations. Specific design parameters for this project as specified herein.
            a. 1/4-inch scale duct layouts, dimensioned to show length of duct runs, duct sizes, support spacing and expansion provisions.
        ii. Locations of external stiffeners and expansion joints.
        iii. Fabrication details.
        iv. Support locations, types, and details.
        v. Flexible connections.
        vi. Duct sealants.
        vii. Specifications for FRP resins and reinforcing material used.
        viii. Specifications for fire-retardant epoxy FRP ductwork coating and reinforcing material used.
        ix. Submit FRP duct schedule with laminate construction, sizes, thickness, vacuum pressure, weight per foot pressure, spans, joint type and flange data.
        x. Gasket material.
E. Manufacturer's Installation Instructions. Submit a certificate from the manufacturer of the castings indicating that they meet all applicable requirements of these specifications.
F. Other calculations, dimensions or materials related to the specified product as requested by Engineer.

1.4. QUALITY ASSURANCE

A. Qualifications:
1) All equipment shall be the product of a single manufacturer having at least ten (10) U.S. installations of the type being proposed, each with a minimum of 5 years of satisfactory service.
2) A list of similar installations shall be furnished with the shop drawing submittal, including names and telephone numbers of contacts.
B. Inspection of the factory assembled equipment shall be accomplished by manufacturer prior to shipment. Skid mounted units shall be delivered fully assembled.
C. Comply with regulatory requirements of local, state and federal agencies having jurisdiction.
D. FRP ductwork and accessories shall be fabricated in a heated and well-ventilated structure protected from weather and temperature extremes. Entire fabrication, curing and assembly process of any piece of FRP equipment shall occur under appropriate temperature and humidity conditions as recommended by the FRP fabricator and resin provider. Contractor shall submit an affidavit certifying that all FRP equipment shall be fabricated, cured, and assembled as described in this Section.

1.5. DELIVERY, STORAGE, AND HANDLING

A. Deliver/Store/Handle materials according to manufacturer's recommendations. Properly protect all parts so that no damage or deterioration will occur during a prolonged delay from the time of shipment until installation is completed and until the units and equipment are ready for operation.
B. An inspection of the pipe will be made by a representative of the Owner after delivery. Pipe with visible defects shall be rejected and replaced without cost to the Owner. Any pipe rejected shall not be returned to the Project under any condition.
C. Store materials to permit easy access for inspection and identification. Keep all material off the ground, using pallets, platforms, or other supports. Protect packaged materials from deterioration.
D. Store all materials in covered storage off the ground and prevent condensation and in accordance with the manufacturer's recommendations for long-term storage.

2. PART 2 PRODUCT

2.1. ACCEPTABLE MANUFACTURERS

A. Virtual Polymer Compounds, 10478 Ridge Road Medina NY 14103, www.vpcfiberglass.com.

2.2. FIBERGLASS REINFORCED PLASTIC (FRP) DUCTWORK AND ACCESSORIES

A. The fiberglass reinforced plastic duct system shall be specifically designed, constructed, and installed as shown on the Drawings for the following minimum conditions:
1) General Temperature: -10°F to 240°F
2) Corrosion resistance to airstream gases as needed. Corrosion barrier can be adjusted to meet resistance requirements.
3) Pressure rating as required per. Duct can be designed to accommodate pressure as needed.
B. FRP Duct Construction:
1) Standard resin used in the laminate shall be premium corrosion resistant and fire-retardant AOC K022 brominated biphenol-A vinylester resin.
2) FRP Fiberglass reinforced plastic (FRP) ductwork shall be of filament wound (SMACNA Type X) or hand lay-up construction as needed (SMACNA Type II).

3) FRP ductwork shall be of flame-retardant material inside and outside and meet ASTM E 84 Class 1 flame spread of 25 or less. Resin shall be Class 1 without any added fillers.
4) Duct shall meet or exceed all applicable construction requirements of SMACNA FRP Duct Construction Manual.
   i. Corrosion Barrier – Inner surface shall contain a resin rich layer. Thickness will be 20 mils and composed of 1 layer of surfacing veil and 2 plies of 1.5 oz/ft2 chopped strand mat minimum.
   ii. Structural Layer – Shall consist of filament wound continuous strand roving as required for design conditions. Minimum wall thickness of 0.125" for 2" up to 12" diameter, 0.188 13" up to 36" and 0.25" 37" up to 72" diameter.
   iii. Flanges and bolt drilling circles and diameters shall conform to SMACNA Thermoset FRP Duct Construction Manual.
   iv. Exterior surfaces shall have a factory applied paraffinated pigmented gel Coat finish with UV inhibitors added. Color standard is gray.

C. Maximum allowable deflection for any size ductwork shall be 0.5-inch between supports and for any side of duct under worse case operating conditions.
D. Fittings: All fittings such as elbows, laterals, tees, and reducers shall be of the same resin as duct, and equal or superior in strength to the adjacent duct section and shall have the same internal diameter as the adjacent duct.
E. Joints: All duct joints shall be butt wrapped or bell and spigot joints as shown on the Drawings as required. Bell and spigot joints shall be sealed with a standard butt joint overlay as provided by VPC. Flange joints can be provided as required and will be per SMACNA standards.
F. Total width of overlay for butt-wrap joints shall be not less than 6-inches for diameters from 2-inches up to and including 30-inches, 36-inch and larger shall be not less than 8-inches.
G. Standard Elbows:
   1) Standard elbow centerline radius shall be equal to 1.5 times the diameter.
   2) Standard elbows up to 24-inch diameter shall be smooth radius molded elbows.
   3) Standard elbows 30-inch diameter and greater may be mitered sections as specified below.
      i. 0° to 44° elbows shall contain one (1) mitered joint and two (2) sections. Elbows 45 or greater shall have a minimum of two (2) mitered joints and three (3) sections.
H. Dampers:
   1) Control Dampers - All dampers shall be manufactured with the same material as corresponding duct. Blades will be solid FRP with stiffeners. Damper pivot rod will be FRP and bushings will be Teflon. Locking hand quadrant will be standard. Actuators can be provided as required.
I. Accessories: All gaskets required shall be EPDM. Bolts, nuts, and washers shall be Type 316 stainless steel.

2.3. DUCT SUPPORTS

A. Provide duct supports as indicated on the Drawings. Supports and hangers shall be designed to accommodate all forces from duct work.

3. PART 3 EXECUTION

3.1. INSTALLATION

A. Install all ductwork in accordance with manufacturer's recommendations and instructions and as indicated on the contract drawings.
B. All ductwork shall conform accurately to the dimensions shown on the Drawings, the ducts shall be straight and smooth inside with joints neatly finished; ductwork shall be installed so as to preclude the possibility of vibration under all operating conditions.
C. Install all ductwork and accessories to provide a system free from buckling, warping, breathing or vibration.
D. All expansion joints and ducts shall be suitably supported at each end by support guides within 12-inches of joint.
E. All ducts at flexible connections with fans shall be supported at free end within 12-inches of flexible connection.
F. Provisions shall be made for supporting all ductwork, dampers, and other ductwork accessories, where required.
G. All low points in the corrosion resistant ductwork shall be provided with 1-inch FNTP drains, unless otherwise noted. Above grade ductwork drains shall be piped as shown on the Drawings.
H. Contractor shall receive field assistance, if required, from the corrosion resistant ductwork manufacturer to ensure that the corrosion resistant ductwork is installed and jointed correctly.

3.2. ADJUSTMENT

A. Set volume control devices for approximate positions in preparation for final testing and balancing.
B. Start fan system and check for excessing leaks and vibration, and correct.

3.3. BALANCING

A. Systems shall be completely tested, adjusted, and balanced by a qualified engineer. A complete balancing procedure shall be submitted for approval. All equipment and connections required to balance the systems shall be provided.

3.4. EXAMINATION

A. Examine areas to receive ductwork. Notify the Engineer of conditions that would adversely affect installation or subsequent utilization and maintenance of ductwork. Do not proceed with installation until unsatisfactory conditions are corrected.

3.5. CLEANING

A. Remove all loose materials and obstructions from interior of ducts.
B. Remove debris and waste materials resulting from installation.

3.6. INSPECTION

A. ENGINEER reserves the right to reject any and all equipment found to have the following: blisters, chips, crazing, exposed glass, dry cracks, burned areas, dry spots, foreign matter, or entrapped air at the laminate surfaces which do not satisfy the tolerances specified in ASTM D 2563, Table I Acceptance Level II inside and outside surfaces. Unacceptable Barcol hardness and acetone sensitivity shall also be cause for rejection.