## SUBMITTAL FOR:

# SMACNA 10" INDUSTRIAL DUCT

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# SUBMITTAL FOR SMACNA 10" INDUSTRIAL DUCT

## SMACNA SPECIFICATION FOR FRP DUCTWORK
## Municipal Applications Rated at 10" Negative Pressure

Part 2 - **PRODUCTS**

2.01 **GENERAL**

A. Fiberglass Reinforced Plastic Duct as manufactured by Spunstrand® Inc., or pre-approved equal, and shall be used to convey and distribute air with continuous mixtures of chemical fumes, and environmental conditions as described in these specifications and drawings. Unless otherwise noted, FRP ductwork shall comply with all sections pertaining specifically to FRP ductwork.

2.02 **MATERIALS**

A. FRP DUCT:

1. Type: Filament wound rated at design pressures indicated in the drawings. Minimum wall thickness shall be in accordance with SMACNA SI at .145 for 2" through 30", S3 at .180 for 32" through 42", S5 at .220 for 48" through 60", and S7 at .260 for 72". Rectangular ductwork thickness shall be as specified in SMACNA, NBS PS 15-69, the drawings and detail sheets.
2. Grade: Type 1, Grade 2 RTRP, Class E per ASTM D2310 and D2996.
3. All duct shall be designed for not less than 30 inches water column pressure and 10 inches water column vacuum. The design, application construction and inspections shall be in accordance with SMACNA and visual inspection criteria in accordance with ASME RTP-1. Table 6, Visual Level II.
4. A minimum structural safety factor of 4 shall be used in the design of ducting.
5. Maximum deflection of rectangular duct under deadload and operating conditions shall not exceed 1% of the width of the longest side.
6. The resin used shall be Hetron 992SB, AOC K022, or Corezyn Corve8440, depending on availability, selected to meet the exposures and temperatures of the air to be exhausted. Minimum barcol hardness: 36. Fillers other than antimony trioxide added for flame retardancy when required shall not be allowed and should not exceed 5% by weight. A thixotropic agent for viscosity control may be used as recommended by the resin manufacturer. No thixotropic agent is to be used in the corrosion liner or on surfaces to be in contact with the corrosive environment. Flame spread rating shall be 25 or less per ASTM E-84. Catalyst shall be DHD9, High Point 90 or Norox MEKP-9H per resin manufacturer.

7. Corrosion Liner: Inner surface shall contain one ply of 10 mil thick minimum C-glass surfacing veil saturated with vinylester resin. The surface veil shall be overlapped a minimum of 1". Two (2) layers of 1-1/2 oz. / sq ft chopped strand mat shall follow surface veil layer. Corrosion liner is to gel completely before proceeding with structural laminates. In no case shall the interruption exceed 12 hours. Total liner thickness to be 100 mils. No thixotropic agent or fire retardant additive that inhibits the ability to visually inspect duct construction is to be used in the liner resin. Corrosion liner shall contain not less than 20% or more than 30% glass by weight. Liner shall pass ASME RTP-1 Table 6, level II visual inspection. Total glass content 25 to 30%.
8. Structural layer shall be filament wound using Hetron 992SB, AOC K022, or Corezyn CORVE8440 premium grade, vinylester resin and Type E 250 strand yield continuous glass roving. The band width is 2 1/4" using an average of (7) strands per inch. Filament winding cycle thickness to be 0.06" maximum. Glass content 55 to 65%. Winding angle shall be 65° ± 2° for increased vacuum service.
9. Exterior of all laminates shall contain sufficient resin to insure a relatively smooth surface free from exposed glass fibers or sharp projections. An ultraviolet stabilizer added to the final coat of resin that also incorporates paraffinated wax curing elements. Ductwork located outdoors shall contain an exterior colored surface coat. Color to be white unless otherwise selected by owner. Ductwork indoors shall have 2 coats of PPG 42-7 intumescent paint to provide a Class 1 flame and smoke rating. ASTM E-84 Steiner Tunnel test results shall be attached as part of the submittal packet.
10. Standard lengths shall be in accordance with the manufacturers published product data sheets and shop drawings. Wall thickness of the duct furnished shall not at any point be less than specified minimum wall thickness when measured in accordance with ASTM D3567.
11. Duct stiffness: The duct shall have a minimum pipe stiffness in accordance with ASTM D2412 for the pipe laying conditions as noted for the design conditions.

## 2.03 ACCESSORIES

A. FITTINGS:
1. Construction shall be similar to that for the ducting.
2. Radius elbow shall be formed over a removable mold for diameters up to 30"∅ and fabricated from straight duct for all sizes 32"∅ and larger as follows:
   a. Bends up to 30° - 1 miter / 2 gore
   b. 31° to 60° - 2 miter / 3 gore
   c. 61° to 90° bend - 4 miter / 5 gore

3. Turning vanes and splitters shall be provided at all single mitered bends 46° and greater and similar fittings that are not one-piece smooth radius fittings per SMACNA and ASHRAE standards. Turning vanes shall be filament wound and reinforced with unidirectional glass in lieu of stainless steel. Stainless steel does not expand and contract at the same rate as FRP, does not bond well, and is not recommended in a 50 ppm H2S environment.

B. DUCT JOINTS:
   1. Joints
      a. Duct joints shall be butt and wrap joint connections.
      b. Fittings shall be butt and wrap joint connections.
      c. Adhesive material for field joining shall be supplied in rolls and resin containers no larger than five gallons.
      d. All joints shall be per SMACNA standard and per attached laminate schedule.
   2. Flanges
      a. Flanges shall be per SMACNA Thermoset Duct construction manual and supplied undrilled for field drilling and alignment. Flange dimensions shall comply with NBS PS 15-69.
      b. All gaskets, bolts, nuts and washers shall be 316 stainless steel and supplied by contractor.

C. DAMPERS:
   1. Round Dampers:
      a. FRP dampers shall be fabricated with the same materials as the duct. No resin variations will be acceptable. Blade shall be FRP 2 piece molded including blade stiffeners per schedule on drawing. Damper blade shall be offset 5° in closed position to form a normal stop at wall of duct. Axle to be pultruded FRP made with same resin and continuous strand roving. Bearings to be Teflon. O-rings shall be Viton. No metal parts or cut edges in airstream will be allowed.
      b. Volume dampers to be manually operated Spunstrand® Inc. single blade, plain end by plain end volume dampers.
      c. Balancing dampers to be Spunstrand® Inc. BA Series or Swartwout model 912 with blade stop, axle shaft seal, and locking hand quadrant.
      d. Isolation dampers to be Spunstrand® Inc. ZL Series (Zero Leak), Ershigs type "B", or Swartwout model 914 with blade seals, axle shaft seals, and gear operator. Flanges included on all isolation dampers and on balancing dampers when shown on drawings. Either damper submitted shall have AMCA certified leakage rates or shall be individually water tested and certified leak free. No other shop-fabricated dampers shall be allowed. See separate specifications for Zero Leak Dampers and cut-sheets.

2. Rectangular Dampers:
    a. Rectangular volume dampers to be single blade manual dampers manufactured by Spunstrand® Inc.
    b. Rectangular multi-blade dampers shall be Swartwout 426AF with airfoil blade seals, rated with certified AMCA leakage rates and shall not exceed 20 cfm per sq / ft.

D. SILENCERS:
1. Fiberglass Reinforced Plastic Silencers shall be manufactured by Spunstrand® Inc. and David P. Wilson **FiberSonic Model FS-00-00-00**, or pre-approved equal. Silencer shall be tested for insertion loss, self-noise, and pressure drop in an independent NVLAP accredited laboratory in full accordance with ASTM E477. Testing shall be completed and data available for review 72 hours prior to bid date. Test data for insertion losses to meet or exceed the acoustical data published in the specification tables.
2. Silencers above ground to be installed per manufacturer's recommendations.
3. Silencers installed below ground should either be accessible inside a watertight concrete vault, or fitted with a schedule 80 PVC drain at the lowest point for piping back to plenum. Water entering the duct by any means will find a low point in the silencer, and must have a provision for draining.
4. See Fibersonic Silencer™ Construction Specification for details.

E. SUPPORT AND HANGERS:
1. Supports and hangers shall be designed, fabricated, and installed in accordance with the requirements of SMACNA's FRP Duct Construction Manual or equivalent. Supports and hangers to be by others.

F. MISCELLANEOUS REQUIREMENTS:
1. Markings on duct and spool pieces shall be in accordance with shop drawings.
2. Fabricators bid shall include as a standard to wrap all gel coated or intumescent painted duct and fittings in bubble wrap to completely protect the finishes. The bubble wrap should then be left on while being unloaded and stored on site. After transportation to the final installation point the wrap should finally be removed. Since storage, installation schedules and transportation around the job site present many challenges, this method is a worthy precaution. While shipping from the factory, the duct can be stacked in layers to 3 high in diameter up to 24"∅ and 2 high in diameters over 30"∅. Stagger stacking and blocking with the use of bubble wrap will provide full length support along the length of the duct and eliminate bouncing and point wear to the coatings. Fabricators shall fully warranty this method and use only dedicated trucks, factory pre-qualified in this method.
3. Pre-approved Vendors:
    a. Spunstrand® Inc. Wallace, ID
    b.
    c.

    Note: All vendors not listed may obtain pre-approval by complying with preapproval process of the Quality Assurance section of this section. No other bidders will be accepted.

## 2.04 QUALITY ASSURANCE

A. Manufacturer shall provide the following information with the pre-approval package, as required:
   1. (2) sample cutouts demonstrating 100 to 110 mils clear liner with no antimony and filament wound structural laminate. Samples to be a minimum of 8"∅ cut out and a 12"∅ piece of duct at least 12" long complying with RTP-1 visual level II.
   2. Company filament winding history and at least (2) FRP duct job names with similar type construction, including contact names and phone numbers.
   3. (2) copies of the fabricators ISO 9000 based Quality Control Manual, or equal.
   4. A letter from an outside testing agency confirming RTP-1 visual level II quality and the quantity and the size of the specimens examined.
   5. Certified testing data from an outside testing agency confirming the resin and glass contents of the liner and structural layers separately.
   6. Copies of burial calculations for at least 3 sizes of duct between 18" and 48"∅.
   7. Any fabricator unable to provide this information and samples to the engineer 48 hours prior to bid will not be considered.

B. All FRP ductwork shall be fabricated and installed by qualified, experienced mechanics, who have a minimum of 5 years experience with the lay-up, fabrication and joining of this type of material.

C. FACTORY INSPECTION:
   1. Owner shall be given access to the FRP ductwork and all quality control records during fabrication and upon completion for the purpose of verifying compliance to the Contract Documents.
   2. The owner shall maintain the right to tour the FRP duct manufacturer's plant anytime that fabrication is in process prior to final shipment. The owner and engineer may exercise the option, without any advance notice, to tour the plant and inspect all stages of fabrication to ensure that quality control is being maintained.
   3. Inspection by owner does not relieve any responsibility of the fabricator to meet the requirements of this specification.
   4. Final Inspection: The engineer and owner may carry out a final inspection of the equipment prior to shipment. Fabricator shall give the owner a minimum of 5 days advance notice of scheduled ductwork shipment. Prior to final inspection by owner, the ductwork shall be cleaned of all foreign material and shall be in a position that allows easy access and viewing.

D. ACCEPTANCE:
   1. Lack of compliance with any aspect of the specifications and drawings will be grounds for rejection of the equipment.
   2. Repair of rejected equipment: Repair procedures must be approved by the owner prior to implementation. No more than 5% of the surface area of each FRP duct component may be repaired.

E. The fabricator's inspector (Quality Control Manager) will provide the owner with a complete Quality Control report for the job. The report will be available within 15 days after the final parts are shipped. The fabricator will have available after each shipment the completed QC sheets for review upon request at any time.

## 2.05 SUBMITTALS

A. The following information has been provided with the standard submittal requirements:

1. The fabricator shall submit for approval all reference standards, fabrication drawings and any engineering details of the duct design prior to beginning fabrication.
    a. The submittal should include all information utilized by the fabricator which describes specifically how their FRP duct and fittings are manufactured. This should be in the form of shop drawings, standards, specifications, other shop instructions and QC records. This should include, but not be limited to:
        1. Resin type
        2. Types and amounts of filler
        3. Corrosion liner description
        4. Reinforcement types for hand lay-up or chopped laminates
        5. For filament-wound laminates:
            a. Helix angle
            b. Glass content range
            c. Strand yield
            d. Strands per inch in the winding band
            e. Ply thickness
            f. Amount of chop or unidirectional roving interspersed with winding, if any, and location within laminate
        6. For all fabricated parts
            a. Construction type
            b. Laminate thickness
            c. Ply sequences
            d. Glass content range
        7. For all secondary overlays (both interior and exterior)
            a. Laminate thickness
            b. Ply sequences and widths
        8. Construction details for all other special configurations and fabricated parts.
2. FRP round duct sample, minimum size 12" diameter by 12" long and a 45° elbow showing the quality of workmanship and glass / resin being quoted. These will be retained for quality comparison on materials shipped to jobsite.
3. Recommended procedure for the protection and handling of materials prior to installation.
4. ISO 9000 based Quality Control Manual detailing shop QC inspection procedures, documentation and samples of all shop QC forms utilized in the process.