



Industrial Fiberglass Specialties, Inc.

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Series 9100 Filament Wound FRP Composite, Pipe, Duct, and Fittings

For moderate corrosive industrial service

Uses and applications:

Waste water and sewage systems
River water lines
Ventilation ducting
Cooling water piping
Penstock pipe for hydroelectric projects
Process plant piping
Air ducting
Roof and floor drains
Plant piping
Water treatment piping
Sewer lines and sewer force mains
Brine and brackish water
General industrial service for mildly corrosive liquids

Description: Composition:

Filament-wound fiberglass reinforced vinylester/polyester composite pipe. ASTM D-2996 Classification Type I, Grade 2, Class E.

Nominal 10 to 20 mil C-Veil reinforced corrosion barrier, followed by a nominal 90 mil corrosion liner reinforced with fiberglass chopped strands, followed by a fiberglass filament wound structural overwrap laminate. The exterior of the pipe will be post-coated after fabrication with a UV resistant polymer coating.

A premium grade vinylester resin (Reichhold's Dion 9100, Dow Chemical's Derakane 411, or equal), pigmented grey, is used for the corrosion barrier/liner. A premium grade terephthalic polyester resin, (Reichhold's Atlac 400, or equal), pigmented grey for UV inhibition, is used for the filament wound structural laminate, and the UV resistant external resin rich coating.

Pipe Sizes: Pipe Lengths:

137+ different diameters, ranging from a teeny 3/8" dia. up to a mammoth 168" dia. Pipe available built to iron pipe outside diameters (ASTM D-2996, Table 3), as well as pipe built to chemical process piping inside diameter standards. A current list of pipe sizes is available upon request. New sizes are being added regularly.

1/2" dia. pipe and smaller is built in 5 ft. lengths.

3/4" & 7/8" dia. pipe is built in 6 ft. lengths.

1" through 1-1/2" dia. pipe is built in 10 ft. lengths.

2" through 6" dia. pipe is available in 20 ft. lengths.

6" dia through 84" dia. pipe is available in 39 and 40 ft. lengths.

For selected pipe sizes in 30" dia. and larger, 60 ft. lengths are available. Longer lengths mean fewer field joints.

Performance:	Good corrosion resistance over a wide temperature range. Temperatures from sub-zero to 300° F.
Advantages:	<p>Working pressures from NBS-PS-15-69 duct to 450 psi+, depending upon size and wall thickness.</p> <p>Vacuum to -14.7 psig for all sizes, by selection of wall thicknesses, ribs and filament wind angle.</p> <p>Available for earth burial, all depths, with selection of wall thicknesses, ribs and filament wind angle.</p> <p>Weighs 1/6 as much as steel. Thus, lower installed costs.</p> <p>Smooth inner surface produces very low frictional loss for reduced pumping and fan blower costs. Hazen-Williams flow coefficient of 150.</p> <p>Recommended for a wide range of corrosion applications. Consult with Industrial Fiberglass Specialties, or the resin manufacturer, for specific recommendations.</p>

Joining systems:	<p>Bell (socket) and spigot structural adhesive weld bonded joints. Adhesive bonded joints are available as your choice of straight/straight, straight/taper and taper/taper.</p> <p>Plain ends for butt and strap welding.</p> <p>Threaded joints (NPT) through 12" dia. Other thread configurations available upon special order.</p> <p>Flanges, all sizes through 84" dia. Including the superior filament wound socket flanges for sizes through 1/2" dia. through 36" dia. ANSI 150 lb., 300 lb. and 600 lb. all available as standard. Any pressure rating and drilling pattern available on order.</p> <p>Van Stone, loose ring style, flanges</p> <p>Flange Spacers - all diameters, bolt hole patterns and thicknesses`, built to order`.</p> <p>Bell and spigot O-Ring joints, thru 84" dia.</p> <p>Bell and spigot O-Ring joints with locking key for restrained ends.</p> <p>Mechanical Couplings, including Victaulic and Taylor-Kerr.</p> <p>Speed-Seal O-Ring true unions</p> <p>Repair (maintenance) couplings.</p>
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Physical Properties:	See Table 1 for typical physical properties of Series 9100 FW FRP Pipe. These are conservative properties that can be used for the design of FW pipe for pressure, vacuum, supported span and burial conditions. Contact Industrial Fiberglass Specialties, Inc. `for recommendations on the appropriate design formulas to be used for FRP composite pipe.
Mechanical Properties:	

Burial installations:	As a custom manufacturer of pipe and fittings, we can design and build pipe to handle burial conditions ranging from live loads due to highway and rail traffic - to earth loads of 100 ft. or greater. We even have experience with underwater installations. Our engineers will welcome the opportunity to work with you on a pipe design, backfill selection and installation methods to meet your specific requirements. The result will be your lowest cost per year of service life (installed basis).
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Supported span installations:	Again, we can design and build pipe to provide you the lowest cost for supported span installed pipe. Since we are not limited to just a few pipe wall thicknesses and filament winding angles - we can select and choose the combination of pipe design and support design and cost that will provide your "best buy". Consult with our engineers for help with your specific requirements.
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Fittings:

Elbows, standard are 22-1/2°, 30°, 45°, and 90°. Any angle elbow available on special order. Elbows through 48" dia. are available as smooth radius. Mitered elbows are available in all sizes.

Reducing elbows

Tees, Reducing tees

Concentric taper body reducers

Eccentric taper body reducers

Saddles, with FRP and stainless steel threaded outlets, bell outlets, spigot outlets and flanged outlets.

Wear pads (blank saddles)

Crosses, Reducing Crosses

Laterals, Reducing Laterals

True wyes.

P-Traps and 180° U-Bends.

Floor drains

Pipe couplings, Threaded (NPT) couplings

Adapters, bell by NPT thread (male or female threads available).

Adapters, spigot by NPT thread (male or female threads available).

Pipe nipples, Threaded nipples

Reducing bushings and threaded adapter bushings.

Fitting and pipe plugs. Pipe caps.

Blind flanges, Threaded flanges

Reducing flanges, Orifice flanges

All fittings are available as adhesive socket, plain end, flanged end, bell and spigot O-Ring; or any combination. See full Industrial Fiberglass Specialties" catalog "Reinforced Fiberglass Pipe Fittings & Accessories" for sizes, dimensions and tolerances. Fittings are available from 1/2" dia. through 84" dia. We welcome the opportunity to work with our customers on special fittings.

Table 1

INDUSTRIAL FIBERGLASS SPECIALTIES, INC

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Properties of Series 9100 Pipe

Corrosion Barrier	10 mil C-Veil and/or Nexus Reinforced
Corrosion Liner	90 mil Fiberglass Chopped Strand
Resin (barrier/Liner)	Premium Grade Vinylester Resin
Structural Wall	Filament Wound FRP Overwrap
Resin (FW Overwrap)	Premium Grade Terephthalic Polyester Resin

Elastic and Strength Properties of Glass Filament Reinforced Wall

Hoop Tensile: (Based on loading of pipe hydrostatically)

Ultimate (porosity)	20,400 psi
Yield	9,300 psi
Allowable	6,800 psi
Modulus of Elasticity	3,300,000 psi

Tensile: (Based on loading of pipe as a tension member)

Ultimate (rupture)	12,400 psi
Yield	5,000 psi
Allowable	3,400 psi
Modulus of Elasticity	1,700,000 psi

Flexural: (Based on loading of pipe as a beam)

Ultimate (rupture)	13,300 psi
Yield	4,000 psi
Allowable	2,700 psi
Modulus of Elasticity	1,200,000 psi

Torsion: (Based on loading of pipe as a shaft in torsion)

Ultimate (rupture)	16,500 psi
Allowable Shear	5,600 psi
Shear Modulus	680,000 psi

Compression: (Based on loading of pipe as a "short" column)

Ultimate (rupture)	9,500 psi
Yield	6,000 psi
Allowable	3,200 psi
Modulus of Elasticity	1,200,000 psi

Thermal Properties:

Coefficient of Thermal Expansion	0.0000088 in./in./deg. F
Thermal Conductivity	2.3 BTU/hr./sq. ft./deg. F/in, thick.