



# FiberSystems, Inc.

521 Kiser Street

Dayton, Ohio 45404-1641

Telephone (937) 222-9000 - Fax (937) 222-9020

## Series 9500-300-A Abrasion Resistant Filament Wound FRP Composite Pipe, Duct, and Fittings

For severely corrosive and abrasion resistant industrial and utility service

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### Uses and Applications:

Fly ash slurry handling lines  
Waste water and sewage systems  
Lime and acid slurry handling lines  
Flue Gas Scrubber Piping and Headers  
Water lines where abrasive service exists  
Ventilation ducting and lines where abrasive dust is present  
Air ducting for abrasive environments  
Floor, collection sump and roof drains  
Sewer lines and sewer force mains  
An alternative to costly alloys and specialty metals.

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### Description:

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

### Composition:

Nominal 300 mil synthetic and fiberglass reinforced combination abrasion resistant and corrosion liner/barrier, followed by a fiberglass filament wound structural pipe and fitting wall laminate. A rubber modified, "toughened" premium grade epoxy vinylester resin, pigmented dark gray/black, is used in the internal abrasion and corrosion liner/barrier. The internal corrosion liner/barrier is also further modified with a special abrasion resistant armoring modifier that provides a service life of up to ten times that available from pipe made with a standard resin matrix. A premium grade epoxy vinylester resin, pigmented dark gray or UV inhibition, is used in the filament wound structural overwrap.

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### Pipe & Duct Sizes:

### Pipe & Duct Lengths:

173+ different diameters, ranging from a teeny 3/8" diameter up to a mammoth 168" diameter. 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 (ASTM D-2996, Table 4). A current list of pipe sizes is available upon request. New sizes are being added regularly.

3/8" & 1/2" diameter pipe and duct are built in 5 ft. lengths.

3/4" & 7/8" diameter pipe and duct are built in 7 ft. lengths.

1" thru 1-1/2" diameter pipe and duct is built in 10 ft. lengths.

2" thru 24" diameter pipe and duct is available in 20 ft. lengths.

8" thru 144" diameter pipe and duct is available in 40 ft. lengths.

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**Performance:**

Good corrosion resistance over a wide temperature range. Temperatures from sub-zero to 240°F.

**Advantages:**

Working pressures from NBS-PS-15-69 duct to 450 psi+, depending upon size and wall thickness.

Vacuum to -14.7 psig for all sizes, by selection of wall thicknesses, ribs and filament wind angle.

Available for earth burial, all depths, with selection of wall thicknesses, ribs and filament wind angle.

Weighs 1/6 as much as steel. Thus, lower installed costs.

Fire-retardant pipe and duct systems available. ASTM E-84 flame spreads under 25.

Smooth inner surface produces very low frictional loss for reduced pumping and fan blower costs. Hazen-Williams flow coefficient of 150.

Recommended for a wide range of corrosion applications. Consult with FiberSystems, or the resin manufacturer, for specific recommendations.

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**Joining Systems:**

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.

Plain ends for butt and strap welding.

Threaded joints (NPT) through 12" diameter Other thread configurations available upon special order.

Flanges, all sizes through 84" diameter Including the superior filament wound socket flanges for sizes through 1/2" diameter through 36" diameter ANSI 150 lb., 300 lb. and 600 lb. all available as standard. Any pressure rating and drilling pattern available on order.

Van Stone, loose ring style, flanges

Flange Spacers - all diameters, bolt hole patterns and thicknesses, built to order.

Bell and spigot O-Ring joints, thru 84" diameter

Bell and spigot O-Ring joints with locking key for restrained ends (Kwik-Key).

Mechanical Couplings, including Victaulic and Taylor-Kerr.

Speed-Seal O-Ring true unions

Repair (maintenance) couplings.

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**Physical Properties:**

See Table 1 for typical physical properties of Series 9500-300-A abrasion resistant filament wound FRP composite pipe and duct. These are conservative properties that can be used for the design of filament wound FRP pipe and duct for pressure, vacuum, supported span and burial conditions. Contact FiberSystems for recommendations on the appropriate design formulas to be used for FRP composite pipe and duct.

**Mechanical Properties:**

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**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<sup>0</sup>, 30<sup>0</sup>, 45<sup>0</sup>, and 90<sup>0</sup>. Any angle elbow available on special order. Elbows through 48" diameter 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<sup>0</sup> 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 FiberSystems' catalog "Reinforced Fiberglass Pipe Fittings & Accessories" for sizes, dimensions and tolerances. Fittings are available from 1/2" diameter through 84" diameter. We welcome the opportunity to work with our customers on special fittings.

Table 1

# FiberSystems, Inc.

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## Properties of Series 9500-300-A Filament Wound Abrasion Resistant FRP Composite Pipe

Corrosion Barrier..... 20 mil Nexus veil reinforced  
Corrosion Liner..... 280 mil fiberglass chopped strand  
Resin (Barrier/Liner) .. Abrasion modified & "Armored" epoxy vinylester  
Structural Wall..... Filament wound overwrap  
Resin (FW Overwrap)..... Premium grade epoxy vinylester

## 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.