



Durcor® - How To Specify

Standard Specification for Durcor® PTFE-Lined Composite Piping

Scope

This specification applies to all Durcor lined pipe and fittings manufactured by PureFlex Inc. ASTM standards are referenced where applicable. Portions of such standards may be cited as there exists today no one standard that encompasses all aspects of this piping system.

Applicable Documents

- ASTM F1545** "Plastic-Lined Ferrous Metal Pipe, Fittings, and Flanges"
- ASTM D4894** "Polytetrafluoroethylene (PTFE) Granular Molding and Ram Extrusion Materials"
- ASTM D4895** "Polytetrafluoroethylene (PTFE) Resin Produced From Dispersion"
- ASTM D1599** "Resistance To Short-Time Hydraulic Pressure of Plastic Pipe, Tubing, and Fittings"
- ASTM D5685** "Fiberglass (Glass-Reinforced Thermosetting-Resin) Pressure Pipe Fittings"
- ASTM D4024** "Machine Made "Fiberglass" (Glass-Fiber-Reinforced Thermosetting Resin) Flanges"

Section 1 – Quality Control

- 1.1** All pipe and fittings to be manufactured in dedicated tooling with written work instructions to ensure consistent and repeatable product.
- 1.2** Manufacturing operation to be certified to ISO 9001:2008.
- 1.3** PTFE pipe liners to be roll tested for sub-surface cracks.
- 1.4** PTFE liners to be candlelight inspected for defects. Neither physically damaged material nor cosmetic discolorations are allowed.
- 1.5** PTFE shall be physically tested for tensile and elongation conformance to applicable ASTM standard.
- 1.6** Pipe and fittings to be hydrostatically shell tested at 1.5X maximum allowable working pressure as per AQL Level 2.

Section 2 - Design

- 2.1** Pipe shall be tested and qualified to assure a minimum of 4X safety factor between short term burst and maximum allowable working pressure at the maximum allowable fluid temperature.
- 2.2** Flanges to conform dimensionally to ANSI B16.5, except in thickness. Flange composite shall have a nominal tensile strength of 50,000 psi as per ASTM D-256 and a notched Izod impact strength of 30 ft.-lb./in.
- 2.3** Man-made (hand lay-up or contact molded) fabrications shall not be allowed.

2.4 Fittings to be resin transfer molded in dedicated tooling. Premium vinyl ester resin to fully infuse ECR glass reinforcements which have been proven in design analysis and testing to produce repeatable safety factors of at least 4:1.

2.5 PTFE liner thicknesses to exceed the requirements of ASTM F1545.

2.6 PTFE liners to be uniform with no welds or seams. Chemical or mechanical bonding of PTFE to composite shall not be allowed.

2.7 Product to be full vacuum rated to the maximum allowable operating temperature.

2.8 Pipe shall be constructed of premium vinyl ester resin reinforced with highly dense bundles of continuous glass bundles oriented in the axial and radial directions. Pipe thermal expansion shall not exceed 6.7×10^{-6} in./in./°F.

2.9 Composite to be UV inhibited.

2.10 Flange sealing diameters to comply with ASTM F1545. Flange connection shall not require additional spacer gaskets or backup flanges when bolted in a raised face condition.

2.11 Pipe to be vented to allow release of any potential trapped permeated gases. The Durcor housing is impervious to corrosion attack from chlorinated permeates.

2.12 No metallic materials are to be used in the piping system with the exception of fasteners.

2.13 No painting or special corrosion-resistant protection is required.

Section 3 – Materials and Construction

3.1 PTFE Physical Properties

Property	ASTM Method	Unit	Value
Tensile Strength	D638	psi	3,500
Ultimate Elongation	D638	%	250
Flexural Modulus	D638	Psi	70,000
Hardness	D2240	Shore D	55
Thermal Conductivity	D435	Btu-in/hr-ft ² -°	1.7
Dielectric Strength	D149	V/mil	600
Water Absorption	D570	%	<0.01
Static Coefficient of Friction			0.05
Specific Gravity			2.14-2.19

3.2 Resin Properties

- Epoxy Vinyl Ester Resin
- <25% Styrene content
- Heat Distortion Temp. of 266°F
- Excellent Chemical Resistance
- Cobalt Octoate promoter
- MEKP Catalyst
- Carbon Pigment

3.3 Pipe Construction

- a) Minimum of (3) resin-rich surface veils of a minimum 20 mils to form the inner surface of the Durcor pipe.
- b) Dense bundles of glass rovings to be applied in both the axial and radial directions to provide the mechanical properties of Durcor pipe.
- c) A protective heavy layer of chopped strand mat is applied over the glass rovings. Pipe is to have two final layers of veil for added UV protection.
- d) Fittings shall be molded in dedicated resin transfer tooling.

3.4 Flange Torque

Durcor pipe may be bolted to mating raised face pipe flanges per the following recommended torques. Bolts should be tightened in a criss-cross fashion using lubricated fasteners. Applied torque should be in 30% increments until attaining full torque.

A final clockwise torquing of all bolts will ensure even stress. Actual sealing torque required will need to be determined based on any gasketing and condition of mating flanges.

A re-torquing of connections is recommended after 24 hours or one thermal cycle to accommodate the seating of the PTFE seal and bolt relaxation.

Size (in)	Torque (ft-lb)
1	10 – 15
1-1/2	20 – 25
2	35 – 45
3	40 – 50
4	30 – 40
6	50 – 60
8	80 – 90

3.5 Handling and Storage

Care is to be taken to not damage PTFE liner. Do not insert forklift forks into ID of pipe. Leave protective end caps on until installation. Durcor pipe is impervious to weathering; no special considerations are required for storage beyond avoiding any high energy impact onto the pipe.

3.6 Painting Requirements

Durcor pipe is UV-inhibited and does not corrode from environmental exposure. Painting not required. Coatings for corrosion protection are not required.

3.7 Approved Supplier(s)

PureFlex Inc. (616) 554-1100 or approved equal.