



FUTURE PIPE INDUSTRIES
Complete pipe system solutions

Fiberstrong™ R-V series
Fiberglass Reinforced Vinyl ester
Plant piping systems

Large diameter
Product Specification



All information was correct at the time of going to press. However, we reserve the right to alter, amend and update any product, information and services described in this brochure.

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Fiberstrong™ R-V Series

Large diameter Fiberglass Reinforced Vinyl Ester (FRV) Restrained Pipe Systems

A. Description

1. General

Fiberstrong™ R-V pressure pipes and joints are a corrosion-resistant composite restrained piping system constructed for aggressive environments, aboveground, or underground without requiring thrust blocks. It consists of a thermosetting chemical-resistant Vinylester resin, fiberglass reinforcements, ultra-violet stabilizers (for aboveground use) and additives as required. Standard pressure classes are 75, 100, 150, 175 and 250 Psig. Full vacuum series are also available. Nominal internal diameter is 16" and larger. Fiberstrong™ R-V series are manufactured with Vinylester resin for highly corrosive environments up to a service temperature of 180° F (82° C). Pipe manufactured with premium grade VE resins is available for service temperatures up to 230° F (110° C) Temperature limits vary with service.

2. Manufacturing

State of the art continuous filament winding machines are used by Future Pipe Industries (FPI) for the manufacturing of the FRV composite pipes.



3. Construction

The standard pipe shall be a composite laminate consisting of a corrosion resistant liner, a structural layer, and an exterior layer.

- a. The interior resin-rich liner of the pipe shall approximately be 40 mil (1 mm) thick, consisting of fiberglass "C" glass mat and chopped rovings impregnated with VE resin. A 100 mil (2.5 mm) thick liner heavy duty liner is also available.
- b. The structural layer of the pipe shall be reinforced with closely spaced continuous fiberglass filament winding and/or fiberglass woven roving and chopped roving impregnated with VE resin.
- c. The exterior layer of the pipe shall be resin-rich with a minimum thickness of 0.3 mm, reinforced with a C glass mat or tveil.

4. Applicable Codes / Standards

- ASTM D 2996
- AWWA M 45
- ASME B 31.3

5. The product series identifies the type of installation:

Series **A** stands for **A**boveground, **B** stands for **B**uried pipe systems.

6. Pressure Class

The pressure class indicates the maximum allowable internal pressure (psig) that the pipe can resist for a design life of 50 years including an adequate service or safety factor.

- C75** : stands for **75** Psig operating pressure
- C75 FV** :stands for **75** psig operating pressure; **F**ull **V**acuum
- C100** : stands for **100** Psig operating pressure
- C150** : stands for **150** Psig operating pressure
- C175** : stands for **175** Psig operating pressure
- C250** : stands for **250** Psig operating pressure

B. Use and Application



1. Service Environment

Fiberstrong™ R-V restrained pipe is suitable for use in corrosive environments, including many industrial effluents compatible with VE resins.

2. Pressure and Loading Limitations

| | |
|--|---|
| Pressure classes | C75, C100, C125, C150, C175, C250 and C75 FV (full vacuum) |
| Maximum Allowable Vacuum | Variable, refer tables in section E 9 |
| Maximum installed (Field) test Pressure: | 1.33 x Design Pressure |
| Minimum Pipe Factory test Pressure | : 2 x Pressure Class |

C. Joints

1. Flanges

Flanges are filament wound or contact molded, utilizing Neoprene flat faced gaskets for sizes up to DN 36" and O ring gaskets for larger sizes. Standard flanges are drilled to AWWA C207 Class B pattern. Other drilling standards are also available.

2. Lamination (Butt & Wrap)

Pipe and fittings are normally provided with plain ends suitable for lamination joint (Butt & Wrap).

D. Pipe Thickness*

Aboveground series – pipe total wall thickness (with standard liner) is as follows:

| Inner Diameter ID (Inch) | Thickness Series A, C75 (inch) | Thickness Series A, C100 (inch) | Thickness Series A C150 (inch) | Thickness Series A C175 (inch) | Thickness Series A C250 (inch) | Thickness Series A C75 FV (inch) |
|--------------------------|--------------------------------|---------------------------------|--------------------------------|--------------------------------|--------------------------------|----------------------------------|
| 16 | 0.209 | 0.252 | 0.354 | 0.406 | 0.563 | 0.366 |
| 18 | 0.228 | 0.280 | 0.394 | 0.449 | 0.626 | 0.390 |
| 20 | 0.248 | 0.303 | 0.433 | 0.496 | 0.689 | 0.409 |
| 24 | 0.287 | 0.354 | 0.508 | 0.583 | 0.819 | 0.453 |
| 27 | 0.315 | 0.390 | 0.563 | 0.650 | 0.913 | 0.480 |
| 30 | 0.346 | 0.429 | 0.622 | 0.717 | 1.008 | 0.508 |
| 33 | 0.374 | 0.465 | 0.677 | 0.783 | 1.106 | 0.535 |
| 36 | 0.406 | 0.504 | 0.736 | 0.846 | 1.201 | 0.606 |
| 42 | 0.461 | 0.579 | 0.846 | 0.980 | 1.394 | 0.661 |
| 48 | 0.520 | 0.654 | 0.961 | 1.114 | 1.583 | 0.713 |
| 54 | 0.579 | 0.728 | 1.075 | 1.244 | - | 0.760 |
| 60 | 0.638 | 0.803 | 1.189 | 1.378 | - | 0.862 |
| 63 | 0.665 | 0.839 | 1.244 | 1.445 | - | 0.886 |
| 66 | 0.697 | 0.878 | 1.303 | 1.512 | - | 0.909 |
| 72 | 0.756 | 0.953 | 1.417 | 1.642 | - | 0.957 |
| 75 | 0.783 | 0.988 | 1.472 | 1.709 | - | 0.976 |
| 78 | 0.815 | 1.028 | 1.528 | 1.776 | - | 1.118 |
| 81 | 0.843 | 1.063 | 1.587 | 1.843 | - | 1.142 |
| 84 | 0.870 | 1.102 | 1.642 | 1.909 | - | 1.165 |
| 90 | 0.929 | 1.177 | 1.756 | 2.039 | - | 1.213 |

* Thickness based on standard 40 mil (1 mm) liner.

Continued – wall thickness table, Aboveground pipe series

| Inner Diameter ID (Inch) | Thickness Series A, C75 (inch) | Thickness Series A, C100 (inch) | Thickness Series A C150 (inch) | Thickness Series A C175 (inch) | Thickness Series A C250 (inch) | Thickness Series A C75 FV (inch) |
|--------------------------|--------------------------------|---------------------------------|--------------------------------|--------------------------------|--------------------------------|----------------------------------|
| 96 | 0.99 | 1.25 | 1.87 | 2.17 | - | 1.26 |
| 99 | 1.02 | 1.29 | 1.93 | 0.00 | - | 1.28 |
| 102 | 1.05 | 1.33 | 1.98 | - | - | 1.30 |
| 105 | 1.08 | 1.36 | 2.04 | - | - | 1.32 |
| 108 | 1.11 | 1.40 | 2.10 | - | - | 1.34 |
| 114 | 1.17 | 1.48 | - | - | - | 1.51 |
| 120 | 1.22 | 1.55 | - | - | - | 1.56 |
| 123 | 1.25 | 1.59 | - | - | - | 1.58 |
| 126 | 1.28 | 1.63 | - | - | - | 1.60 |
| 129 | 1.31 | 1.66 | - | - | - | 1.63 |
| 132 | 1.34 | 1.70 | - | - | - | 1.65 |
| 138 | 1.40 | 1.78 | - | - | - | 1.69 |
| 144 | 1.46 | 1.85 | - | - | - | 1.73 |
| 147 | 1.48 | 1.89 | - | - | - | 1.75 |
| 150 | 1.52 | 1.93 | - | - | - | 1.77 |
| 156 | 1.58 | 2.00 | - | - | - | 1.81 |
| 158 | 1.59 | 2.02 | - | - | - | 1.83 |

* Thickness based on standard 40 mil (1 mm) liner.

Buried Series-pipe total wall thickness (with standard liner) is as follows:

| Inner Diameter ID (Inch) | Thickness – Series B, C75 (inch) | Thickness – Series B, C100 (inch) | Thickness – Series B C150 (inch) | Thickness – Series B C175 (inch) | Thickness – Series B C250 (inch) |
|-------------------------------|--|---|--|--|--|
| 16 | 0.213 | 0.260 | 0.366 | 0.406 | 0.559 |
| 18 | 0.228 | 0.283 | 0.406 | 0.449 | 0.622 |
| 20 | 0.248 | 0.311 | 0.445 | 0.492 | 0.681 |
| 24 | 0.287 | 0.358 | 0.520 | 0.579 | 0.807 |
| 27 | 0.315 | 0.394 | 0.575 | 0.642 | 0.902 |
| 30 | 0.346 | 0.433 | 0.634 | 0.709 | 0.992 |
| 33 | 0.374 | 0.469 | 0.689 | 0.772 | 1.087 |
| 36 | 0.406 | 0.508 | 0.748 | 0.835 | 1.181 |
| 42 | 0.461 | 0.579 | 0.858 | 0.965 | 1.366 |
| 48 | 0.520 | 0.654 | 0.972 | 1.094 | 1.551 |
| 54 | 0.579 | 0.728 | 1.087 | 1.224 | - |
| 60 | 0.638 | 0.799 | 1.201 | 1.350 | - |
| 63 | 0.665 | 0.839 | 1.256 | 1.417 | - |
| 66 | 0.697 | 0.874 | 1.315 | 1.480 | - |
| 72 | 0.756 | 0.949 | 1.429 | 1.610 | - |
| 75 | 0.783 | 0.984 | 1.484 | 1.673 | - |
| 78 | 0.815 | 1.024 | 1.543 | 1.736 | - |
| 81 | 0.843 | 1.059 | 1.598 | 1.803 | - |
| 84 | 0.870 | 1.094 | 1.654 | 1.866 | - |
| 90 | 0.929 | 1.169 | 1.768 | 1.996 | - |

* Thickness based on standard 40 mil (1 mm) liner.

Continued - Wall thickness table, Buried pipe series

| Inner Diameter ID (Inch) | Thickness – Series CTB 75 (inch) | Thickness – Series CTB 100 (inch) | Thickness – Series CTB 150 (inch) | Thickness – Series CTB 175 (inch) | Thickness – Series CTB 250 (inch) |
|-------------------------------|--|---|---|---|---|
| 96 | 0.988 | 1.244 | 1.882 | 2.126 | - |
| 99 | 1.020 | 1.280 | 1.941 | - | - |
| 102 | 1.047 | 1.319 | 1.996 | - | - |
| 105 | 1.075 | 1.354 | 2.051 | - | - |
| 108 | 1.106 | 1.390 | 2.110 | - | - |
| 114 | 1.165 | 1.465 | - | - | - |
| 120 | 1.224 | 1.539 | - | - | - |
| 123 | 1.252 | 1.575 | - | - | - |
| 126 | 1.280 | 1.614 | - | - | - |
| 129 | 1.311 | 1.650 | - | - | - |
| 132 | 1.339 | 1.685 | - | - | - |
| 138 | 1.398 | 1.760 | - | - | - |
| 144 | 1.457 | 1.835 | - | - | - |
| 147 | 1.484 | 1.870 | - | - | - |
| 150 | 1.516 | 1.909 | - | - | - |
| 156 | 1.575 | 1.980 | - | - | - |
| 158 | 1.594 | 2.008 | - | - | - |

* Thickness based on standard 40 mil (1 mm) liner.

E. Physical / Mechanical Properties

1. Thermal Expansion

The approximate axial co-efficient of thermal expansion of Fiberstrong™ restrained pipe is 18 to 27 x 10⁻⁶ cm/cm/Deg. C (measured according to ASTM D696).

2. Poisson's Ratio

Axial/Hoop due to load in Hoop direction: 0.3

Hoop/Axial due to load in Axial direction: 0.17

3. Flow Characteristics

Pipe wall friction factors:

Hazen Williams C = 150

4. Fluid (Water) Hammer

Specific Gravity of pipe wall: 1.85

Volumetric Elasticity modulus : $E_v = 2,509,150$ psi (17,300 MPa) .

5. Material Properties

Fiberstrong™ restrained pipe structural wall has the following properties:

| <u>Property</u> | <u>Test Method</u> | <u>Value</u> | <u>Unit</u> |
|--|--------------------|--------------|--------------------|
| Hydrostatic Design Basis (Biaxial - @ 50 years) | ASTM D 2992 | 8,700 | psi |
| | | 60 | MPa |
| Lower Confidence Limit (Biaxial - @ 50 years) | ASTM D 2992 | 8,122 | psi |
| | | 56 | MPa |
| Hydrostatic Design Stress – HDS $S_{A,W}^*$ | ASTM D 2992 | 4,060 | psi |
| | | 28 | MPa |
| Axial Tensile Modulus | ASTM D 638 | 1,595,400 | psi |
| | | 11,000 | MPa |
| Axial Tensile Strength | ASTM D 638 | 12,330 | psi |
| | | 85 | MPa |
| Hoop Tensile Modulus | ASTM D 2290 | 2,900,750 | psi |
| | | 20,000 | MPa |
| Hoop Flexural Modulus | ASTM D 2412 | 2,900,750 | psi |
| | | 20,000 | MPa |
| Hoop Tensile Strength | ASTM D 2290 | 36,260 | psi |
| | | 250 | MPa |
| Hoop Tensile Strength | ASTM D 1599 | 29,000 | psi |
| | | 200 | MPa |
| Shear Modulus | | 1,696,850 | psi |
| | | 11,700 | MPa |
| Glass Content | ASTM D 2584 | 65 | % |
| Laminate Density | | 115.44 | Lb/ft ³ |
| | | 1.85 | gm/cm ³ |

6. Support Distances

The maximum recommended pipe support distances* for fluid service are as follows:

| NOMINAL DIA (Inch) | Span - Ft Series A, C75 | Span - Ft Series A, C100 | Span - Ft Series A C150 | Span - Ft Series A C175 | Span - Ft Series A C250 | Span - Ft Series A C75FV |
|--------------------|-------------------------|--------------------------|-------------------------|-------------------------|-------------------------|--------------------------|
| 16 | 16.2 | 17.1 | 20.5 | 22.0 | 25.8 | 13.1 |
| 18 | 17.2 | 18.6 | 22.0 | 23.3 | 27.3 | 13.1 |
| 20 | 18.1 | 19.3 | 23.3 | 24.9 | 28.8 | 13.1 |
| 24 | 19.9 | 21.3 | 25.4 | 27.1 | 31.8 | 13.1 |
| 27 | 20.9 | 22.3 | 26.8 | 28.8 | 33.6 | 13.1 |
| 30 | 22.3 | 23.8 | 28.5 | 30.4 | 35.4 | 13.1 |
| 33 | 23.2 | 24.7 | 29.7 | 32.0 | 37.3 | 13.1 |
| 36 | 24.5 | 26.0 | 31.3 | 33.1 | 38.9 | 16.4 |
| 42 | 26.0 | 28.0 | 33.5 | 35.9 | 40.0 | 16.4 |
| 48 | 27.9 | 29.9 | 35.9 | 38.5 | 40.0 | 16.4 |
| 54 | 29.6 | 31.7 | 38.1 | 40.0 | - | 16.4 |
| 60 | 31.3 | 33.4 | 40.0 | 40.0 | - | 19.7 |
| 63 | 31.9 | 34.0 | 40.0 | 40.0 | - | 19.7 |
| 66 | 32.8 | 35.0 | 40.0 | 40.0 | - | 19.7 |
| 72 | 34.3 | 36.5 | 40.0 | 40.0 | - | 19.7 |
| 75 | 34.9 | 37.1 | 40.0 | 40.0 | - | 19.7 |
| 78 | 35.8 | 38.0 | 40.0 | 40.0 | - | 26.2 |
| 81 | 36.3 | 38.6 | 40.0 | 40.0 | - | 26.2 |
| 84 | 36.9 | 39.4 | 40.0 | 40.0 | - | 26.2 |
| 90 | 38.2 | 40.0 | 40.0 | 40.0 | - | 26.2 |

* Spans to be confirmed by case specific stress analysis of the pipeline system.

Note: Above values are based on using the continuous span theory (pipes having rigid joints), a ½" (12.5 mm) maximum allowable sag and a fluid density of 62.4 lb/ft³ (1000 Kg/m³).

Continued-Support distance tables

| NOMINAL DIA (Inch) | Span - Ft Series A, C75 | Span - Ft Series A, C100 | Span - Ft Series A C150 | Span - Ft Series A C175 | Span - Ft Series A C250 | Span – Ft Series A C75FV |
|--------------------|-------------------------|--------------------------|-------------------------|-------------------------|-------------------------|--------------------------|
| 96 | 39.5 | 40.0 | 40.0 | 40.0 | - | 26.2 |
| 99 | 40.0 | 40.0 | 40.0 | - | - | 26.2 |
| 102 | 40.0 | 40.0 | 40.0 | - | - | 26.2 |
| 105 | 40.0 | 40.0 | 40.0 | - | - | 26.2 |
| 108 | 40.0 | 40.0 | 40.0 | - | - | 26.2 |
| 114 | 40.0 | 40.0 | - | - | - | 32.8 |
| 120 | 40.0 | 40.0 | - | - | - | 32.8 |
| 123 | 40.0 | 40.0 | - | - | - | 32.8 |
| 126 | 40.0 | 40.0 | - | - | - | 32.8 |
| 129 | 40.0 | 40.0 | - | - | - | 32.8 |
| 132 | 40.0 | 40.0 | - | - | - | 32.8 |
| 138 | 40.0 | 40.0 | - | - | - | 32.8 |
| 144 | 40.0 | 40.0 | - | - | - | 32.8 |
| 147 | 40.0 | 40.0 | - | - | - | 32.8 |
| 150 | 40.0 | 40.0 | - | - | - | 32.8 |
| 156 | 40.0 | 40.0 | - | - | - | 32.8 |
| 158 | 40.0 | 40.0 | - | - | - | 32.8 |

* Spans to be confirmed by case specific stress analysis of the pipeline system.

Note: Above values are based on using the continuous span theory (pipes having rigid joints), a ½” (12.5 mm) maximum allowable sag and a fluid density of 62.4 lb/ft³ (1000 Kg/m³).

7.0 Buckling Capability

Buckling rating for pipes installed underground is calculated in accordance with AWWA M 45 design manual. For pipes installed above ground the allowable buckling pressure is as shown below. Buckling pressure indicates the difference between external and internal pressure (positive if external pressure is larger than internal pressure).

| Series | Inner Diameter ID (Inch) | Allowable Buckling Pressure (psig) for Various Supports Spans (ft) | | | | | | |
|-------------------------|-------------------------------|--|------|------|-----|-----|-----|----|
| | | 3 | 6 | 12 | 18 | 24 | 30 | 40 |
| Series A C75 | | | | | | | | |
| | 16 | 11.6 | 5.8 | 2.9 | - | - | - | - |
| | 18 | 13.1 | 6.5 | 3.3 | - | - | - | - |
| | 20 | 14.5 | 7.3 | 3.6 | 2.4 | - | - | - |
| | 24 | 17.4 | 8.7 | 4.4 | 2.9 | - | - | - |
| | 27 | 19.2 | 9.6 | 4.8 | 3.2 | - | - | - |
| | 30 | 21.8 | 10.9 | 5.4 | 3.6 | - | - | - |
| | 33 | 23.6 | 11.8 | 5.9 | 3.9 | - | - | - |
| | 36 | 26.1 | 13.1 | 6.5 | 4.4 | 3.3 | - | - |
| | 42 | 29.8 | 14.9 | 7.4 | 5.0 | 3.7 | - | - |
| | 48 | 34.1 | 17.1 | 8.5 | 5.7 | 4.3 | - | - |
| | 54 | 38.5 | 19.2 | 9.6 | 6.4 | 4.8 | - | - |
| | 60 | 42.8 | 21.4 | 10.7 | 7.1 | 5.4 | 4.3 | - |
| | 63 | 44.7 | 22.3 | 11.2 | 7.4 | 5.6 | 4.5 | - |
| | 66 | 47.2 | 23.6 | 11.8 | 7.9 | 5.9 | 4.7 | - |
| | 72 | 51.6 | 25.8 | 12.9 | 8.6 | 6.4 | 5.2 | - |
| | 75 | 53.4 | 26.7 | 13.3 | 8.9 | 6.7 | 5.3 | - |
| | 78 | 55.9 | 28.0 | 14.0 | 9.3 | 7.0 | 5.6 | - |
| | 81 | 57.7 | 28.9 | 14.4 | 9.6 | 7.2 | 5.8 | - |
| | 84 | 59.6 | 29.8 | 14.9 | 9.9 | 7.4 | 6.0 | - |
| 90 | 63.9 | 32.0 | 16.0 | 10.7 | 8.0 | 6.4 | - | |
| 96 | 68.3 | 34.1 | 17.1 | 11.4 | 8.5 | 6.8 | - | |
| 99 | 70.8 | 35.4 | 17.7 | 11.8 | 8.9 | 7.1 | 5.3 | |
| 102 | 72.6 | 36.3 | 18.2 | 12.1 | 9.1 | 7.3 | 5.4 | |

Continued - Allowable buckling pressure table – Series A C75

| Series | Inner Diameter | Allowable Buckling Pressure (psig) for Various Supports Spans (ft) | | | | | | |
|-------------------------|----------------|--|------|------|------|------|------|-----|
| | | ID (Inch) | 3 | 6 | 12 | 18 | 24 | 30 |
| Series A C75 | 105 | 74.4 | 37.2 | 18.6 | 12.4 | 9.3 | 7.4 | 5.6 |
| | 108 | 77.0 | 38.5 | 19.2 | 12.8 | 9.6 | 7.7 | 5.8 |
| | 114 | 81.3 | 40.7 | 20.3 | 13.6 | 10.2 | 8.1 | 6.1 |
| | 120 | 85.7 | 42.8 | 21.4 | 14.3 | 10.7 | 8.6 | 6.4 |
| | 123 | 87.5 | 43.8 | 21.9 | 14.6 | 10.9 | 8.8 | 6.6 |
| | 126 | 89.3 | 44.7 | 22.3 | 14.9 | 11.2 | 8.9 | 6.7 |
| | 129 | 91.9 | 45.9 | 23.0 | 15.3 | 11.5 | 9.2 | 6.9 |
| | 132 | 93.7 | 46.8 | 23.4 | 15.6 | 11.7 | 9.4 | 7.0 |
| | 138 | 98.0 | 49.0 | 24.5 | 16.3 | 12.3 | 9.8 | 7.4 |
| | 144 | 102.4 | 51.2 | 25.6 | 17.1 | 12.8 | 10.2 | 7.7 |
| | 147 | 104.2 | 52.1 | 26.1 | 17.4 | 13.0 | 10.4 | 7.8 |
| | 150 | 106.8 | 53.4 | 26.7 | 17.8 | 13.3 | 10.7 | 8.0 |
| | 156 | 111.1 | 55.6 | 27.8 | 18.5 | 13.9 | 11.1 | 8.3 |
| | 158 | 112.6 | 56.3 | 28.1 | 18.8 | 14.1 | 11.3 | 8.4 |

| Series | Inner Diameter ID (Inch) | Allowable Buckling Pressure (psig) for Various Supports Spans (ft) | | | | | | |
|--------------------------|-------------------------------|---|------|------|------|------|------|------|
| | | 3 | 6 | 12 | 18 | 24 | 30 | 40 |
| Series A C100 | | | | | | | | |
| | 16 | 21.2 | 10.6 | 5.3 | - | - | - | - |
| | 18 | 24.5 | 12.3 | 6.1 | 4.1 | - | - | - |
| | 20 | 26.8 | 13.4 | 6.7 | 4.5 | - | - | - |
| | 24 | 32.4 | 16.2 | 8.1 | 5.4 | - | - | - |
| | 27 | 35.8 | 17.9 | 8.9 | 6.0 | - | - | - |
| | 30 | 40.2 | 20.1 | 10.1 | 6.7 | - | - | - |
| | 33 | 43.6 | 21.8 | 10.9 | 7.3 | 5.5 | - | - |
| | 36 | 48.0 | 24.0 | 12.0 | 8.0 | 6.0 | - | - |
| | 42 | 55.9 | 27.9 | 14.0 | 9.3 | 7.0 | - | - |
| | 48 | 63.7 | 31.9 | 15.9 | 10.6 | 8.0 | - | - |
| | 54 | 71.6 | 35.8 | 17.9 | 11.9 | 8.9 | 7.2 | - |
| | 60 | 79.4 | 39.7 | 19.8 | 13.2 | 9.9 | 7.9 | - |
| | 63 | 82.8 | 41.4 | 20.7 | 13.8 | 10.3 | 8.3 | - |
| | 66 | 87.2 | 43.6 | 21.8 | 14.5 | 10.9 | 8.7 | - |
| | 72 | 95.1 | 47.5 | 23.8 | 15.8 | 11.9 | 9.5 | - |
| | 75 | 98.5 | 49.2 | 24.6 | 16.4 | 12.3 | 9.8 | - |
| | 78 | 102.9 | 51.4 | 25.7 | 17.1 | 12.9 | 10.3 | - |
| | 81 | 106.3 | 53.2 | 26.6 | 17.7 | 13.3 | 10.6 | - |
| | 84 | 110.7 | 55.4 | 27.7 | 18.5 | 13.8 | 11.1 | - |
| | 90 | 118.6 | 59.3 | 29.6 | 19.8 | 14.8 | 11.9 | 8.9 |
| | 96 | 126.4 | 63.2 | 31.6 | 21.1 | 15.8 | 12.6 | 9.5 |
| | 99 | 129.8 | 64.9 | 32.5 | 21.6 | 16.2 | 13.0 | 9.7 |
| | 102 | 134.2 | 67.1 | 33.6 | 22.4 | 16.8 | 13.4 | 10.1 |
| | 105 | 137.6 | 68.8 | 34.4 | 22.9 | 17.2 | 13.8 | 10.3 |
| | 108 | 142.1 | 71.0 | 35.5 | 23.7 | 17.8 | 14.2 | 10.7 |
| | 114 | 149.9 | 75.0 | 37.5 | 25.0 | 18.7 | 15.0 | 11.2 |
| 120 | 157.7 | 78.9 | 39.4 | 26.3 | 19.7 | 15.8 | 11.8 | |
| 123 | 161.2 | 80.6 | 40.3 | 26.9 | 20.1 | 16.1 | 12.1 | |
| 126 | 165.6 | 82.8 | 41.4 | 27.6 | 20.7 | 16.6 | 12.4 | |
| 129 | 169.0 | 84.5 | 42.2 | 28.2 | 21.1 | 16.9 | 12.7 | |
| 132 | 173.4 | 86.7 | 43.4 | 28.9 | 21.7 | 17.3 | 13.0 | |
| 138 | 181.3 | 90.6 | 45.3 | 30.2 | 22.7 | 18.1 | 13.6 | |
| 144 | 189.1 | 94.5 | 47.3 | 31.5 | 23.6 | 18.9 | 14.2 | |

Continued - Allowable buckling pressure table – Series A C100

| Series | Inner Diameter ID (Inch) | Allowable Buckling Pressure (psig) for Various Supports Spans (ft) | | | | | | |
|--------------------------|-------------------------------|---|-------|------|------|------|------|------|
| | | 3 | 6 | 12 | 18 | 24 | 30 | 40 |
| Series A C100 | 147 | 192.5 | 96.2 | 48.1 | 32.1 | 24.1 | 19.2 | 14.4 |
| | 150 | 196.9 | 98.5 | 49.2 | 32.8 | 24.6 | 19.7 | 14.8 |
| | 156 | 204.8 | 102.4 | 51.2 | 34.1 | 25.6 | 20.5 | 15.4 |
| | 158 | 207.0 | 103.5 | 51.8 | 34.5 | 25.9 | 20.7 | 15.5 |
| Series | Inner Diameter ID (Inch) | Allowable Buckling Pressure (psig) for Various Supports Spans (ft) | | | | | | |
| | | 3 | 6 | 12 | 18 | 24 | 30 | 40 |
| Series A C150 | | | | | | | | |
| | 16 | 58.9 | 29.5 | 14.7 | 15.7 | - | - | - |
| | 18 | 67.0 | 33.5 | 16.8 | 11.2 | - | - | - |
| | 20 | 75.1 | 37.5 | 18.8 | 12.5 | - | - | - |
| | 24 | 89.3 | 44.7 | 22.3 | 14.9 | 11.2 | - | - |
| | 27 | 99.6 | 49.8 | 24.9 | 16.6 | 12.4 | - | - |
| | 30 | 111.7 | 55.8 | 27.9 | 18.6 | 14.0 | - | - |
| | 33 | 121.9 | 60.9 | 30.5 | 20.3 | 15.2 | - | - |
| | 36 | 134.0 | 67.0 | 33.5 | 22.3 | 16.8 | 13.4 | - |
| | 42 | 154.5 | 77.2 | 38.6 | 25.7 | 19.3 | 15.4 | - |
| | 48 | 176.8 | 88.4 | 44.2 | 29.5 | 22.1 | 17.7 | - |
| | 54 | 199.1 | 99.6 | 49.8 | 33.2 | 24.9 | 19.9 | - |
| | 60 | 221.5 | 110.7 | 55.4 | 36.9 | 27.7 | 22.1 | 16.6 |
| | 63 | 231.7 | 115.8 | 57.9 | 38.6 | 29.0 | 23.2 | 17.4 |
| | 66 | 243.8 | 121.9 | 60.9 | 40.6 | 30.5 | 24.4 | 18.3 |
| | 72 | 266.1 | 133.1 | 66.5 | 44.4 | 33.3 | 26.6 | 20.0 |
| | 75 | 276.4 | 138.2 | 69.1 | 46.1 | 34.5 | 27.6 | 20.7 |
| | 78 | 286.6 | 143.3 | 71.6 | 47.8 | 35.8 | 28.7 | 21.5 |
| | 81 | 298.7 | 149.3 | 74.7 | 49.8 | 37.3 | 29.9 | 22.4 |
| | 84 | 308.9 | 154.5 | 77.2 | 51.5 | 38.6 | 30.9 | 23.2 |
| 90 | 331.2 | 165.6 | 82.8 | 55.2 | 41.4 | 33.1 | 24.8 | |
| 96 | 353.6 | 176.8 | 88.4 | 58.9 | 44.2 | 35.4 | 26.5 | |
| 99 | 363.8 | 181.9 | 91.0 | 60.6 | 45.5 | 36.4 | 27.3 | |
| 102 | 375.9 | 188.0 | 94.0 | 62.7 | 47.0 | 37.6 | 28.2 | |
| 105 | 386.1 | 193.1 | 96.5 | 64.4 | 48.3 | 38.6 | 29.0 | |
| 108 | 398.3 | 199.1 | 99.6 | 66.4 | 49.8 | 39.8 | 29.9 | |

| Series | Inner Diameter ID (Inch) | Allowable Buckling Pressure (psig) for Various Supports Spans (ft) | | | | | | |
|--------------------------|-------------------------------|---|-------|-------|------|------|------|------|
| | | 3 | 6 | 12 | 18 | 24 | 30 | 40 |
| Series A C175 | | | | | | | | |
| | 16 | 86.6 | 43.3 | 21.7 | 24.9 | - | - | - |
| | 18 | 96.9 | 48.4 | 24.2 | 16.1 | - | - | - |
| | 20 | 109.5 | 54.7 | 27.4 | 18.2 | 25.2 | - | - |
| | 24 | 129.9 | 65.0 | 32.5 | 21.7 | 16.2 | - | - |
| | 27 | 146.5 | 73.2 | 36.6 | 24.4 | 18.3 | - | - |
| | 30 | 163.0 | 81.5 | 40.8 | 27.2 | 20.4 | 16.3 | - |
| | 33 | 179.6 | 89.8 | 44.9 | 29.9 | 22.4 | 18.0 | - |
| | 36 | 193.7 | 96.9 | 48.4 | 32.3 | 24.2 | 19.4 | - |
| | 42 | 226.8 | 113.4 | 56.7 | 37.8 | 28.4 | 22.7 | - |
| | 48 | 259.9 | 129.9 | 65.0 | 43.3 | 32.5 | 26.0 | - |
| | 54 | 290.6 | 145.3 | 72.7 | 48.4 | 36.3 | 29.1 | 21.8 |
| | 60 | 323.7 | 161.8 | 80.9 | 53.9 | 40.5 | 32.4 | 24.3 |
| | 63 | 340.2 | 170.1 | 85.1 | 56.7 | 42.5 | 34.0 | 25.5 |
| | 66 | 356.8 | 178.4 | 89.2 | 59.5 | 44.6 | 35.7 | 26.8 |
| | 72 | 387.5 | 193.7 | 96.9 | 64.6 | 48.4 | 38.7 | 29.1 |
| | 75 | 404.0 | 202.0 | 101.0 | 67.3 | 50.5 | 40.4 | 30.3 |
| | 78 | 420.6 | 210.3 | 105.1 | 70.1 | 52.6 | 42.1 | 31.5 |
| 81 | 437.1 | 218.5 | 109.3 | 72.8 | 54.6 | 43.7 | 32.8 | |
| 84 | 453.6 | 226.8 | 113.4 | 75.6 | 56.7 | 45.4 | 34.0 | |
| 90 | 484.3 | 242.2 | 121.1 | 80.7 | 60.5 | 48.4 | 36.3 | |
| 96 | 517.4 | 258.7 | 129.4 | 86.2 | 64.7 | 51.7 | 38.8 | |

| Series | Inner Diameter ID (Inch) | Allowable Buckling Pressure (psig) for Various Supports Spans (ft) | | | | | | |
|--------------------------|-------------------------------|---|-------|-------|-------|------|------|------|
| | | 3 | 6 | 12 | 18 | 24 | 30 | 40 |
| Series A C250 | | | | | | | | |
| | 16 | 214.1 | 107.1 | 53.5 | 72.8 | 72.8 | - | - |
| | 18 | 239.9 | 119.9 | 60.0 | 72.4 | 72.4 | - | - |
| | 20 | 265.7 | 132.8 | 66.4 | 72.2 | 72.2 | - | - |
| | 24 | 321.2 | 160.6 | 80.3 | 53.5 | 72.8 | 72.8 | - |
| | 27 | 359.8 | 179.9 | 90.0 | 60.0 | 72.4 | 72.4 | - |
| | 30 | 398.5 | 199.2 | 99.6 | 66.4 | 49.8 | 72.2 | - |
| | 33 | 441.1 | 220.6 | 110.3 | 73.5 | 55.1 | 72.7 | - |
| | 36 | 479.8 | 239.9 | 119.9 | 80.0 | 60.0 | 48.0 | - |
| | 42 | 561.1 | 280.5 | 140.3 | 93.5 | 70.1 | 56.1 | 72.7 |
| | 48 | 638.4 | 319.2 | 159.6 | 106.4 | 79.8 | 63.8 | 47.9 |

| Series | Inner Diameter ID (Inch) | Allowable Buckling Pressure (psig) for Various Supports Spans (ft) | | | | | | |
|----------------------------|------------------------------|---|------|------|------|------|------|----|
| | | 3 | 6 | 12 | 18 | 24 | 30 | 40 |
| Series A C75 FV | | | | | | | | |
| | 16 | 64.8 | 32.4 | 16.2 | - | - | - | - |
| | 18 | 65.1 | 32.6 | 16.3 | - | - | - | - |
| | 20 | 64.1 | 32.1 | 16.0 | - | - | - | - |
| | 24 | 65.0 | 32.5 | 16.2 | - | - | - | - |
| | 27 | 64.4 | 32.2 | 16.1 | - | - | - | - |
| | 30 | 64.3 | 32.1 | 16.1 | - | - | - | - |
| | 33 | 64.6 | 32.3 | 16.1 | - | - | - | - |
| | 36 | 79.6 | 39.8 | 19.9 | 13.3 | - | - | - |
| | 42 | 80.2 | 40.1 | 20.0 | 13.4 | - | - | - |
| | 48 | 80.4 | 40.2 | 20.1 | 13.4 | - | - | - |
| | 54 | 80.1 | 40.0 | 20.0 | 13.3 | - | - | - |
| | 60 | 95.8 | 47.9 | 23.9 | 16.0 | 12.0 | - | - |
| | 63 | 95.7 | 47.8 | 23.9 | 15.9 | 12.0 | - | - |
| | 66 | 95.7 | 47.9 | 23.9 | 16.0 | 12.0 | - | - |
| | 72 | 96.1 | 48.0 | 24.0 | 16.0 | 12.0 | - | - |
| | 75 | 95.4 | 47.7 | 23.9 | 15.9 | 11.9 | - | - |
| | 78 | 128.2 | 64.1 | 32.1 | 21.4 | 16.0 | 12.8 | - |
| | 81 | 128.0 | 64.0 | 32.0 | 21.3 | 16.0 | 12.8 | - |
| | 84 | 127.9 | 64.0 | 32.0 | 21.3 | 16.0 | 12.8 | - |
| | 90 | 128.0 | 64.0 | 32.0 | 21.3 | 16.0 | 12.8 | - |
| | 96 | 127.4 | 63.7 | 31.9 | 21.2 | 15.9 | 12.7 | - |
| | 99 | 127.8 | 63.9 | 31.9 | 21.3 | 16.0 | 12.8 | - |
| | 102 | 127.2 | 63.6 | 31.8 | 21.2 | 15.9 | 12.7 | - |
| | 105 | 127.6 | 63.8 | 31.9 | 21.3 | 16.0 | 12.8 | - |
| | 108 | 127.2 | 63.6 | 31.8 | 21.2 | 15.9 | 12.7 | - |
| | 114 | 159.3 | 79.7 | 39.8 | 26.6 | 19.9 | 15.9 | - |
| | 120 | 159.8 | 79.9 | 40.0 | 26.6 | 20.0 | 16.0 | - |
| 123 | 159.1 | 79.6 | 39.8 | 26.5 | 19.9 | 15.9 | - | |
| 126 | 159.5 | 79.7 | 39.9 | 26.6 | 19.9 | 15.9 | - | |
| 129 | 159.9 | 80.0 | 40.0 | 26.7 | 20.0 | 16.0 | - | |
| 132 | 159.4 | 79.7 | 39.8 | 26.6 | 19.9 | 15.9 | - | |
| 138 | 159.5 | 79.7 | 39.9 | 26.6 | 19.9 | 15.9 | - | |
| 144 | 159.8 | 79.9 | 39.9 | 26.6 | 20.0 | 16.0 | - | |

Continued - Allowable buckling pressure table – Series A C75 FV

| Series | Inner Diameter | Allowable Buckling Pressure (psig) for Various Supports Spans (ft) | | | | | | |
|---------------------|----------------|---|------|------|------|------|------|----|
| | ID (Inch) | 3 | 6 | 12 | 18 | 24 | 30 | 40 |
| A C75 FV | 147 | 159.5 | 79.7 | 39.9 | 26.6 | 19.9 | 15.9 | - |
| | 150 | 159.3 | 79.6 | 39.8 | 26.5 | 19.9 | 15.9 | - |
| | 156 | 159.0 | 79.5 | 39.7 | 26.5 | 19.9 | 15.9 | - |
| | 158 | 159.5 | 79.7 | 39.9 | 26.6 | 19.9 | 15.9 | - |

8.0 Pipe Stiffness

Pipe Stiffness (PS) * values for series **A** (Aboveground pipe) is:

| Inner Diameter ID (Inch) | PS Series A C75 (psi) | PS Series A C100 (psi) | PS Series A C 150 (psi) | PS Series A C175 (psi) | PS Series A C250 (psi) | PS Series A C75FV (psi) |
|----------------------------|-----------------------|------------------------|-------------------------|------------------------|------------------------|-------------------------|
| 16 | 11.0 | 22.7 | 76.7 | 121.3 | 355.5 | 85.8 |
| 18 | 11.0 | 23.4 | 77.8 | 120.6 | 354.1 | 75.1 |
| 20 | 11.0 | 23.0 | 78.6 | 123.2 | 353.0 | 65.1 |
| 24 | 11.0 | 23.2 | 77.9 | 121.7 | 356.6 | 53.3 |
| 27 | 10.8 | 22.7 | 77.1 | 122.1 | 355.0 | 45.8 |
| 30 | 11.0 | 23.0 | 78.0 | 122.4 | 353.8 | 40.4 |
| 33 | 10.9 | 22.7 | 77.3 | 122.7 | 356.7 | 36.2 |
| 36 | 11.1 | 22.9 | 78.1 | 121.1 | 355.5 | 42.0 |
| 42 | 10.8 | 22.9 | 77.0 | 121.7 | 356.8 | 35.2 |
| 48 | 10.8 | 22.8 | 77.2 | 122.1 | 355.0 | 30.1 |
| 54 | 10.8 | 22.8 | 77.3 | 121.3 | - | 26.1 |
| 60 | 10.9 | 22.7 | 77.4 | 121.7 | - | 28.5 |
| 63 | 10.8 | 22.6 | 77.1 | 121.8 | - | 26.8 |
| 66 | 10.9 | 22.7 | 77.5 | 122.0 | - | 25.4 |
| 72 | 10.9 | 22.7 | 77.6 | 121.4 | - | 23.0 |
| 75 | 10.8 | 22.5 | 77.3 | 121.5 | - | 21.7 |
| 78 | 10.9 | 22.7 | 77.0 | 121.6 | - | 29.5 |
| 81 | 10.8 | 22.5 | 77.4 | 121.8 | - | 28.1 |
| 84 | 10.8 | 22.7 | 77.1 | 121.9 | - | 26.9 |
| 90 | 10.8 | 22.6 | 77.2 | 121.4 | - | 24.8 |

* Based on structural wall thickness

Continued - Pipe Stiffness (PS)^{*} values for series A (Aboveground pipe)

| Inner Diameter ID (Inch) | PS Series A C75 (psi) | PS Series A C100 (psi) | PS Series A C 150 (psi) | PS Series A C175 (psi) | PS Series A C250 (psi) | PS Series A C75FV (psi) |
|-------------------------------|-----------------------------|------------------------------|-------------------------------|------------------------------|------------------------------|-------------------------------|
| 96 | 10.8 | 22.6 | 77.3 | 121.6 | - | 22.9 |
| 99 | 10.9 | 22.5 | 77.1 | - | - | 22.1 |
| 102 | 10.8 | 22.6 | 77.4 | - | - | 21.2 |
| 105 | 10.8 | 22.5 | 77.2 | - | - | 20.6 |
| 108 | 10.8 | 22.6 | 77.4 | - | - | 19.8 |
| 114 | 10.9 | 22.6 | - | - | - | 24.3 |
| 120 | 10.9 | 22.6 | - | - | - | 22.9 |
| 123 | 10.8 | 22.5 | - | - | - | 22.2 |
| 126 | 10.8 | 22.6 | - | - | - | 21.6 |
| 129 | 10.8 | 22.5 | - | - | - | 21.1 |
| 132 | 10.8 | 22.6 | - | - | - | 20.4 |
| 138 | 10.8 | 22.6 | - | - | - | 19.4 |
| 144 | 10.8 | 22.6 | - | - | - | 18.4 |
| 147 | 10.8 | 22.5 | - | - | - | 18.0 |
| 150 | 10.8 | 22.6 | - | - | - | 17.5 |
| 156 | 10.8 | 22.6 | - | - | - | 16.7 |
| 158 | 10.8 | 22.5 | - | - | - | 16.5 |

* Based on structural wall thickness

Pipe Stiffness (PS)^{*} values for series **B** (Buried pipe) is:

| Inner Diameter ID (Inch) | PS– Series B C75 (psi) | PS– Series B C100 (psi) | PS– Series B C150 (psi) | PS– Series B C175 (psi) | PS– Series B C 250 (psi) |
|-------------------------------|------------------------------|-------------------------------|-------------------------------|-------------------------------|--------------------------------|
| 16 | 11.8 | 25.4 | 85.8 | 121.3 | 347.6 |
| 18 | 11.0 | 24.7 | 85.9 | 120.6 | 347.1 |
| 20 | 11.0 | 25.2 | 86.0 | 120.0 | 340.4 |
| 24 | 11.0 | 24.1 | 84.0 | 119.1 | 340.8 |
| 27 | 10.8 | 23.5 | 82.5 | 117.4 | 341.1 |
| 30 | 11.0 | 23.8 | 82.9 | 118.2 | 337.1 |
| 33 | 10.9 | 23.3 | 81.7 | 116.9 | 337.7 |
| 36 | 11.1 | 23.5 | 82.1 | 115.9 | 338.1 |
| 42 | 10.8 | 22.9 | 80.4 | 115.7 | 335.9 |
| 48 | 10.8 | 22.8 | 80.2 | 115.6 | 334.2 |
| 54 | 10.8 | 22.8 | 80.0 | 115.5 | - |
| 60 | 10.9 | 22.4 | 79.8 | 114.4 | - |
| 63 | 10.8 | 22.6 | 79.4 | 114.9 | - |
| 66 | 10.9 | 22.4 | 79.7 | 114.4 | - |
| 72 | 10.9 | 22.4 | 79.6 | 114.4 | - |
| 75 | 10.8 | 22.3 | 79.2 | 114.0 | - |
| 78 | 10.9 | 22.4 | 79.5 | 113.7 | - |
| 81 | 10.8 | 22.3 | 79.1 | 114.1 | - |
| 84 | 10.8 | 22.2 | 78.8 | 113.7 | - |
| 90 | 10.8 | 22.2 | 78.8 | 113.8 | - |

* Based on structural wall thickness

continued - Pipe Stiffness (PS)^{*} for series B (Buried pipe)

| Inner Diameter ID (Inch) | PS– Series B C75 (psi) | PS– Series B C100 (psi) | PS– Series B C150 (psi) | PS– Series B C175 (psi) | PS– Series B C 250 (psi) |
|-------------------------------|------------------------------|-------------------------------|-------------------------------|-------------------------------|--------------------------------|
| 96 | 10.8 | 22.2 | 78.8 | 113.9 | - |
| 99 | 10.9 | 22.1 | 79.0 | - | - |
| 102 | 10.8 | 22.2 | 78.8 | - | - |
| 105 | 10.8 | 22.1 | 78.5 | - | - |
| 108 | 10.8 | 22.0 | 78.7 | - | - |
| 114 | 10.9 | 22.0 | - | - | - |
| 120 | 10.9 | 22.1 | - | - | - |
| 123 | 10.8 | 22.0 | - | - | - |
| 126 | 10.8 | 22.1 | - | - | - |
| 129 | 10.8 | 22.0 | - | - | - |
| 132 | 10.8 | 21.9 | - | - | - |
| 138 | 10.8 | 22.0 | - | - | - |
| 144 | 10.8 | 22.0 | - | - | - |
| 147 | 10.8 | 21.9 | - | - | - |
| 150 | 10.8 | 22.0 | - | - | - |
| 156 | 10.8 | 21.9 | - | - | - |
| 158 | 10.8 | 22.0 | - | - | - |

* Based on structural wall thickness

9. Nominal weight

The nominal pipe weight in lbs /foot is (for handling purposes only) :

| Inner Diameter ID (Inch) | Weight Series A C75 (lb/ft) | Weight Series A C100 (lb/ft) | Weight Series A C 150 (lb/ft) | Weight Series A C175 (lb/ft) | Weight Series A C250 (lb/ft) | Weight Series A C75FV (lb/ft) |
|-------------------------------|-------------------------------------|--------------------------------------|---------------------------------------|--------------------------------------|--------------------------------------|---------------------------------------|
| 16 | 8.8 | 10.1 | 14.8 | 16.8 | 23.6 | 15.5 |
| 18 | 10.8 | 12.8 | 18.2 | 20.9 | 29.6 | 18.2 |
| 20 | 12.8 | 15.5 | 22.2 | 25.6 | 36.3 | 20.9 |
| 24 | 17.5 | 21.6 | 31.6 | 36.3 | 51.1 | 28.3 |
| 27 | 21.6 | 26.9 | 39.0 | 45.1 | 64.6 | 33.6 |
| 30 | 26.9 | 33.0 | 48.4 | 55.8 | 78.7 | 39.0 |
| 33 | 31.6 | 39.0 | 57.8 | 66.6 | 95.5 | 45.1 |
| 36 | 37.0 | 46.4 | 68.6 | 78.7 | 112.9 | 55.8 |
| 42 | 49.1 | 61.9 | 91.4 | 106.2 | 152.6 | 71.3 |
| 48 | 63.9 | 80.0 | 118.3 | 137.8 | 197.6 | 87.4 |
| 54 | 80.0 | 101.0 | 150.0 | 174.0 | - | 105.0 |
| 60 | 98.0 | 123.0 | 184.0 | 214.0 | - | 133.0 |
| 63 | 107.0 | 136.0 | 202.0 | 235.0 | - | 143.0 |
| 66 | 117.0 | 148.0 | 222.0 | 258.0 | - | 154.0 |
| 72 | 139.0 | 176.0 | 263.0 | 305.0 | - | 177.0 |
| 75 | 150.0 | 190.0 | 284.0 | 331.0 | - | 187.0 |
| 78 | 162.0 | 205.0 | 307.0 | 357.0 | - | 224.0 |
| 81 | 175.0 | 220.0 | 330.0 | 385.0 | - | 237.0 |
| 84 | 187.0 | 237.0 | 355.0 | 414.0 | - | 250.0 |
| 90 | 214.0 | 271.0 | 406.0 | 474.0 | - | 279.0 |

Continued – Weight tables – Series A

| Inner Diameter ID (Inch) | Weight Series A C75 (lb/ft) | Weight Series A C100 (lb/ft) | Weight Series A C 150 (lb/ft) | Weight Series A C175 (lb/ft) | Weight Series A C250 (lb/ft) | Weight Series A C75FV (lb/ft) |
|-------------------------------|--|---|--|---|---|--|
| 96 | 241 | 307 | 461 | 538 | - | 308 |
| 99 | 257 | 325 | 490 | - | - | 323 |
| 102 | 272 | 345 | 520 | - | - | 338 |
| 105 | 288 | 365 | 550 | - | - | 354 |
| 108 | 304 | 386 | 582 | - | - | 370 |
| 114 | 338 | 429 | - | - | - | 440 |
| 120 | 374 | 475 | - | - | - | 478 |
| 123 | 392 | 498 | - | - | - | 496 |
| 126 | 411 | 523 | - | - | - | 515 |
| 129 | 431 | 547 | - | - | - | 536 |
| 132 | 450 | 573 | - | - | - | 554 |
| 138 | 491 | 626 | - | - | - | 595 |
| 144 | 534 | 680 | - | - | - | 636 |
| 147 | 555 | 708 | - | - | - | 657 |
| 150 | 579 | 737 | - | - | - | 677 |
| 156 | 626 | 796 | - | - | - | 720 |
| 158 | 641 | 816 | - | - | - | 736 |

| Diameter ID (Inch) | Weight-Series B C75 (lb/ft) | Weight-Series B C100 (lb/ft) | Weight-Series B C150 (lb/ft) | Weight-Series B C175 (lb/ft) | Weight-Series B C250 (lb/ft) |
|-------------------------|-------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|
| 16 | 8.7 | 10.8 | 15.5 | 16.8 | 23.5 |
| 18 | 10.8 | 13.4 | 18.8 | 20.8 | 29.6 |
| 20 | 12.8 | 16.1 | 22.8 | 25.5 | 35.6 |
| 24 | 17.5 | 22.2 | 32.3 | 35.6 | 50.4 |
| 27 | 21.5 | 27.6 | 40.3 | 45.0 | 63.2 |
| 30 | 26.9 | 33.6 | 49.1 | 55.1 | 77.3 |
| 33 | 31.6 | 39.6 | 58.5 | 65.9 | 93.4 |
| 36 | 37.0 | 47.0 | 69.2 | 77.3 | 111 |
| 42 | 49.1 | 61.8 | 92.7 | 105 | 150 |
| 48 | 63.9 | 80.0 | 121 | 136 | 194 |
| 54 | 80 | 101 | 152 | 171 | - |
| 60 | 97 | 123 | 186 | 209 | - |
| 63 | 107 | 136 | 204 | 230 | - |
| 66 | 117 | 148 | 224 | 252 | - |
| 72 | 139 | 175 | 265 | 300 | - |
| 75 | 150 | 189 | 287 | 324 | - |
| 78 | 162 | 204 | 310 | 349 | - |
| 81 | 175 | 220 | 333 | 377 | - |
| 84 | 187 | 235 | 357 | 404 | - |
| 90 | 214 | 269 | 409 | 464 | - |

Continued – Weight tables – Series B

| Diameter | Weight-Series B C75 | Weight-Series B C100 | Weight-Series B C150 | Weight-Series B C175 | Weight-Series B C250 |
|-------------|------------------------|-------------------------|-------------------------|-------------------------|-------------------------|
| ID (Inch) | (lb/ft) | (lb/ft) | (lb/ft) | (lb/ft) | (lb/ft) |
| 96 | 242 | 306 | 465 | 526 | - |
| 99 | 258 | 324 | 494 | - | - |
| 102 | 273 | 344 | 523 | - | - |
| 105 | 288 | 363 | 554 | - | - |
| 108 | 305 | 384 | 586 | - | - |
| 114 | 339 | 427 | - | - | - |
| 120 | 375 | 472 | - | - | - |
| 123 | 392 | 495 | - | - | - |
| 126 | 411 | 519 | - | - | - |
| 129 | 431 | 543 | - | - | - |
| 132 | 450 | 568 | - | - | - |
| 138 | 492 | 620 | - | - | - |
| 144 | 535 | 675 | - | - | - |
| 147 | 556 | 702 | - | - | - |
| 150 | 579 | 732 | - | - | - |
| 156 | 626 | 789 | - | - | - |
| 158 | 642 | 810 | - | - | - |

F. Quality Control

Quality Control testing will include thorough checks of all raw materials against Future Pipe’s strict written standards, parallel plate stiffness testing, loss on ignition testing, wall thickness measurement, Barcol hardness, Glass Transition Temperature (Tg) checks, and complete visual inspection before shipment. Records of all testing on pipe sections will be maintained by Future Pipe Industries.

| TYPE OF TEST | EACH PIPE | ONCE PER LOT | STANDARD REFERENCE |
|------------------------------|-----------|--------------|--------------------|
| Wall thickness | X | - | FPI |
| Visual Inspection | X | - | FPI |
| Diameter Spigot End | X | - | FPI |
| Hydrostatic Pressure* | X | - | FPI |
| Length | X | - | FPI |
| Stiffness* | - | X | ASTM D2412 |
| Barcol Hardness | X | - | ASTM D2583 |
| Loss on Ignition (LOI) | - | X | ASTM D2584 |
| Axial Tensile Strength | - | X | ASTM D 638 |
| Hoop Tensile Strength* | - | X | ASTM D 2290 |
| Glass Transition Temperature | - | X | ASTM D 3418 |

* size limitations apply; please check with FPI.

G. Visual Properties

- The exterior surface of Future Pipe Industries pipes and joints are to be commercially free of the following visual properties:

| <u>Visual Property</u> | <u>Definition</u> |
|------------------------|--|
| Fuzz | Glass fibers loosely adhering to the pipe, which are not wet out with resin. |
| Protruding Fibers | Glass fibers sticking out from pipe surface that are wet out with resin. |
| Resin Runs | Runs of resin on surface of pipe |
| Dry Area | Area in laminate with glass not wet out with resin. |
| Hand Lay-up | Areas at the end of hand lay-up that are not rolled |
| Rugged Edges | down properly and that are rough. |

H. Repairs

Repairs of the pipe will not exceed 3% of the interior surface and 3% of the exterior surface. Number of repairs will not exceed an average of 1 per 3 ft of length of pipe in each surface.

I. Marking and Identification

Each pipe section shall be marked with the the manufacturers name and:

1. The word **Fiberstrong™- R-V**
2. Nominal Diameter in inches
3. Product series; A or B (**A**boveground or **B**uried)
4. Pressure Class in psig
5. Inspection mark

Example : FPI Fiberstrong R-V 64" – Series A – C100

J. Packaging

Pipe shall be suitably cradled, wedged or braced to prevent damage during shipment per packaging specification.

K. Handling and Storage

1. Do not stack for storage without prior written approval from Future Pipe Industries.
2. When storing the pipe directly on the ground, be sure that the ground is flat and free of potentially damaging debris.
3. Pipe sections 40 ft or less in length may be lifted using one support point. Any pipe section may be lifted using two support points separated by half of the section length and located equidistant from the pipe section center.
2. Pipe supports for lifting must be pliable straps or ropes and shall not be steel cables or chain unless sufficient padding is used to protect the pipe surface.
5. DO NOT DROP OR IMPACT THE PIPE, PARTICULARLY AT PIPE ENDS.
6. CAUTION: Workmen should wear gloves when handling pipe to protect hands from rough exterior surface.
7. Additional detailed handling instructions are available from Future Pipe Industries Inc.



FUTURE PIPE INDUSTRIES

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