Underground Solutions®
An azuria Water Solutions Company

Fusible PVC® Pipe Systems

FUSIBLE C-900® PIPE | FPVC® PIPE

Underground Solutions®

Features and Benefits

- Gasketless, leak-free, fully-restrained pipe system
- Readily connects with standard waterworks fittings, eliminating the need for fusion adapters
- Transitions easily to bell-and-spigot PVC and ductile iron pipe
- Life expectancy greater than 100 years
- Greater recommended safe pulling allowance than HDPE pipe of similar ID and pressure class
- Lower installation costs due to lighter pipe weight and smaller pipe OD
- Field testing and time proven thermal butt fusion technology and PVC formulation
- Excellent abrasion and scratch-resistance
- Superior resistance to hydrocarbon permeation compared to HDPE or gasketed pipe
- Superior resistance to oxidation from common chlorine-based water disinfectants compared to HDPE pipe
- Fused joint OD consistent with OD of pipe barrel
- Smaller OD casing sizes possible for jack and bore installations

Applications

- Water mains (AWWA C900, ASTM D2241)
- Force mains and gravity sewer
- Water reuse and reclaim
- Raw water and irrigation
- Casings
- Environmental remediation
- Storm drains
- Process and transfer water
- Power transmission conduit and casings

Installations

Trenchless

- Horizontal directional drilling
- Sliplining
- Pipe bursting
- Jack and bore carrier pipe

Open-Cut

- Restrained joint
- Installation efficiencies
- Meets “no gasket” requirements

Experience

- Over 15,000 discrete Fusible PVC® pipe installations
- Over 20 million feet installed
- Installations in all 50 U.S. states, U.S. territories, Canada, Mexico and New Zealand
- Directional drill continuous pull-ins of 7,000+ feet
- Over 60 HDD installations exceeding 3,000 feet
- Installed at over 40 U.S. military bases and federal sites

Fusible C-900® Product Line Meets

- AWWA C900
- AWWA C605
- ASTM F1674
- NSF 61-G to AWWA C900 for human health and no lead
- ASTM cell class 12454, HDB = 4,000 psi, and HDS = 2,000 psi, provide a minimum safety factor of 2.0
- NSF-14 (NSF-pw) to AWWA C900

Notes

- Safe pulling force based on axial tensile stress of 7,000 psi per ASTM D1784 with a safety factor of 2.5.
- Fusion joints qualified per AWWA C900
- Pipe is hydrostatically tested as required per AWWA C900
- 45-foot standard lengths
- Some sizes may require special order. Schedule, sewer and other pipe sizes are available upon request. Inquire for sizes or DRs not shown.

Available Fusible PVC® Colors

- Blue | Potable water
- Green | Force main and gravity sewer
- Purple | Water reuse
- White | Power cable and communications conduit and other applications

Trenchless Technology Award Winning Projects

- 2023 New Installation project of the year Honorable Mention
- 2016 New Installation Project of the Year
- 2015 New Installation Project of the Year Honorable Mention
- 2014 New Installation Project of the Year Honorable Mention
- 2013 Rehabilitation Project of the Year
- 2010 New Installation Project of the Year
- 2007 New Installation Project of the Year Honorable Mention

Pipe Engineering Data

DIPS						
Size (in)	OD (in)	DR	Min. Wall (in)	Avg.ID (in)	Wt. (lb/ft)	Safe Pulling Force (lbs)
4	4.80	14 18	.34 .27	4.07 4.23	3.1 2.5	13,400 10,600
6	6.90	14 18 25	.49 .38 .28	5.85 6.09 6.31	6.4 5.1 3.7	27,700 21,900 16,000
8	9.05	14 18 25	.65 .50 .36	7.68 7.98 8.28	11.0 8.7 6.4	47,700 37,800 27,600
10	11.10	14 18 25	.79 .62 .44	9.42 9.79 10.16	16.6 13.2 9.6	71,800 56,800 41,600
12	13.20	14 18 25	.94 .73 .53	11.20 11.65 12.08	23.5 18.6 13.6	101,600 80,300 58,800
14	15.30	14 18 21 25	1.09 .85 .73 .61	12.98 13.50 13.75 14.00	31.6 25.0 21.6 18.3	136,500 108,000 93,400 79,000
16	17.40	14 18 21 25	1.24 .97 .83 .70	14.76 15.35 15.64 15.92	41.5 32.4 28.0 23.7	176,600 139,700 120,800 102,200
18	19.50	14 18 21 25	1.39 1.08 .93 .78	16.55 17.20 17.53 17.85	52.2 40.6 35.1 29.8	221,800 175,400 151,700 128,400
20	21.60	18 21 25	1.20 1.03 .86	19.06 19.42 19.77	49.8 43.1 36.5	215,300 186,100 157,500
24	25.80	18 21 25	1.43 1.23 1.03	22.76 23.19 23.61	71.1 61.5 52.1	307,100 265,600 224,800
30	32.00	18 21 25	1.70 1.52 1.28	28.23 28.77 29.29	110.5 94.6 80.1	472,600 408,500 345,800
36	38.30	21 25	1.82 1.53	34.43 35.05	135.5 114.8	585,100 495,400

IPS						
Size (in)	OD (in)	SDR	Min.Wall (in)	Avg. ID (in)	Wt. (lb/ft)	Safe PullingForce (lbs)
6	6.63	17 21 26	.39 .32 .26	5.80 5.96 6.08	5.0 4.1 3.3	21,300 17,500 14,200
8	8.63	17 21 26	.51 .41 .33	5.85 6.09 6.31	8.4 6.9 5.6	36,200 29,600 24,200
10	10.75	17 21 26	.63 .51 .41	7.68 7.98 8.28	13.2 10.7 8.7	56,200 46,000 37,500
12	12.75	17 21 26	.75 .61 .49	11.16 11.47 11.71	18.6 15.0 12.3	79,100 64,700 52,800

Pressure Ratings

DIPS	
Dimension Ratio	Pressure (psi)
14	305
18	235
21	200
25	165

IPS	
Dimension Ratio	Pressure (psi)
17	250
21	200
26	160

Critical Buckling	
Dimension Ratio	Critical Buckling Pressure* (psi)
14	426
17	228
18	190
21	117
25	68
26	60

* Does not include a safety factor

Bend Radius

DIPS	
Size (in)	Minimum Bend Radius (ft)
4	100
6	144
8	189
10	231
12	275
14	319
16	363
18	406
20	450
24	538
30	667
36	798

IPS/Schedule	
Size (in)	Minimum Bend Radius (ft)
6	138
8	180
10	224
12	266

Bend radius based on pipe OD to allow for fittings installation, repairs and maintenance.

Fusion Process

- Fusion is performed by UGS technicians and/or licensed and trained contractors.
- Fusion times are comparable to other thermoplastic pipe materials.
- Testing performed in accordance with AWWA C900 and ASTM F1674 and D638 confirms long-term joint strength and fully-restrained performance.
- Fuse and pull or intermediate fusions are possible in space-limited areas.

The Most Tested PVC Pipe in the Industry

Test Categories	Vendor Qualification	Required Vendor Testing	UGS Lot Acceptance Testing	Fusion Joint QC Data Collection & Retention
AWWA C900	•	•	•	
ASTM D2241/ D1785/3034/F679	•	•	•	
Extrusion Quality	•	•	•	
Mechanical Properties	•	•	•	
Process Control Points				•
Trained and Licensed Operators				•

Dimension Ratio—Pressure Class Rating

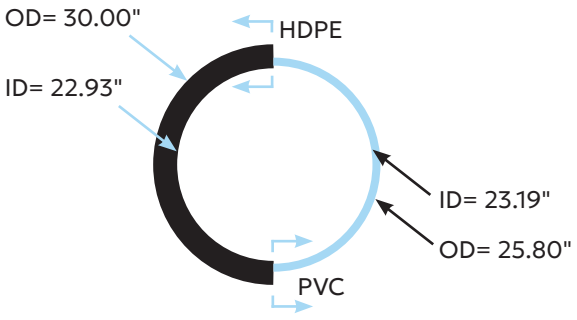
PVC SF = 2.0		HDPE 3408/3608 SF = 2.0		HDPE 4710 SF = 1.6*	
DR	Pressure Rating (psi)	DR	Pressure Rating (psi)	DR	Pressure Rating (psi)
DR 14	305	-	-	DR 7.3	317
DR 18	235	DR 7.3	255	DR 9	250
DR 21	200	DR 9	200	DR 11	200
DR 25	165	DR 11	160	DR 13.5	160

* A 20% lower margin of safety increases risk and decreases life expectancy. Not Recommended.

Material Properties

PVC vs. HDPE Material Properties				
Property	Specification	PVC	PE 4710	Difference
Tensile Strength (psi)	ASTM D638	7,000	3,500	≥2x
Hydrostatic Design Basis at 73°F (psi)	ASTM D2837	4,000	1,600	2.5x
Modulus of Elasticity for Long Term Deflection Calculations (psi)	ASTM D638	400,000[1]	29,000[2]	>13x
Specific Gravity	ASTM D1505	1.4	0.95	-
Coefficient of Linear Expansion (in/100 ft/10°F)	ASTM D696	0.36	1.44	0.25x
Water Disinfectant Induced Oxidation[3]	-	High Resistance	Low Resistance	-
Hydrocarbon Permeation[4]	-	High Resistance	Low Resistance	-

1. PVC Pipe Association—Handbook of PVC Pipe Design and Construction, Fifth Edition
2. PPI—Handbook of PE Pipe, Second Edition—Long Term Modulus of Elasticity = 29,000 PSI
3. Supported by over 39 research papers and technical references. Inquire for details.
4. Water Research Foundation - Impact of Hydrocarbons on PE/PVC Pipes and Pipe Gaskets, 2008 (www.waterrf.org/Pages/Projects.aspx?PID=2946)



24-inch DR 21 Fusible PVC® Pipe versus 30-inch DR 9 HDPE

	24-inch DR 21 PVC	30-inch DR 9 HDPE	PVC % Advantage
OD (in)	25.80	30.00	+16%
HDD Bore Vol.[1] (cu ft/ft)	7.79	9.62	+23%
Min. Wall Thickness (in)	1.23	3.33	+171%
Avg. ID (in)	23.19	22.93	+1%
Pressure Rating[2] (psi)	200	200	0%
Weight (lbs/ft)	61.5	121.6	+98%

1. OD+12 inches
2. Based on safety factor of 2.0

Horizontal Directional Drill

Pipe Burst

Slipline/Jack and Bore

Open-Cut