

# FUSIBLE PVC® PIPE SYSTEMS

Fusible C-900® pipe | FPVC® pipe



# FUSIBLE PVC® PIPE SYSTEMS



## 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

## Trenchless Technology Award Winning Projects

- 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

## 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 12,000 discrete Fusible PVC® pipe installations
- Over 15 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 40 HDD installations exceeding 3,000 feet
- Installed at over 40 U.S. military bases and federal sites



## 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	.34	4.07	3.1	13,400
		18	.27	4.23	2.5	10,600
6	6.90	14	.49	5.85	6.4	27,700
		18	.38	6.09	5.1	21,900
8	9.05	25	.28	6.31	3.7	16,000
		14	.65	7.68	11.0	47,700
10	11.10	18	.50	7.98	8.7	37,800
		25	.36	8.28	6.4	27,600
12	13.20	14	.79	9.42	16.6	71,800
		18	.62	9.79	13.2	56,800
14	15.30	25	.44	10.16	9.6	41,600
		14	.94	11.20	23.5	101,600
16	17.40	18	.73	11.65	18.6	80,300
		25	.53	12.08	13.6	58,800
18	19.50	14	1.09	12.98	31.6	136,500
		18	.85	13.50	25.0	108,000
20	21.60	21	.73	13.75	21.6	93,400
		25	.61	14.00	18.3	79,000
24	25.80	14	1.24	14.76	41.5	176,600
		18	.97	15.35	32.4	139,700
30	32.00	21	.83	15.64	28.0	120,800
		25	.70	15.92	23.7	102,200
36	38.30	18	1.08	17.20	40.6	175,400
		21	.93	17.53	35.1	151,700
42	45.00	25	.78	17.85	29.8	128,400
		14	1.54	18.33	62.9	272,200
48	51.00	18	1.20	19.06	49.8	215,300
		21	1.03	19.42	43.1	186,100
54	57.00	25	.86	19.77	36.5	157,500
		18	1.43	22.76	71.1	307,100
60	63.00	21	1.23	23.19	61.5	265,600
		25	1.03	23.61	52.1	224,800
72	75.00	32.5	.79	24.12	40.5	174,600
		21	1.52	28.77	94.6	408,500
84	87.00	25	1.28	29.29	80.1	345,800
		32.5	.99	29.91	62.3	268,700
96	99.00	21	1.82	34.43	135.5	585,100
		25	1.53	35.05	114.8	495,400
108	111.00	32.5	1.18	35.80	89.2	384,600

IPS						
Size (in)	OD (in)	SDR	Min. Wall (in)	Avg. ID (in)	Wt. (lb/ft)	Safe Pulling Force (lbs)
6	6.63	17	.39	5.80	5.0	21,300
		21	.32	5.96	4.1	17,500
		26	.26	6.08	3.3	14,200
8	8.63	17	.51	7.55	8.4	36,200
		21	.41	7.76	6.9	29,600
		26	.33	7.92	5.6	24,200
10	10.75	17	.63	9.41	13.2	56,200
		21	.51	9.67	10.7	46,000
		26	.41	9.87	8.7	37,500
12	12.75	17	.75	11.16	18.6	79,100
		21	.61	11.47	15.0	64,700
		26	.49	11.71	12.3	52,800



### 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 for sizes up to 30 inches and 40-foot lengths for 36 inches
- Some sizes may require special order. Schedule, sewer and other pipe sizes are available upon request. Inquire for sizes or DRs not shown.

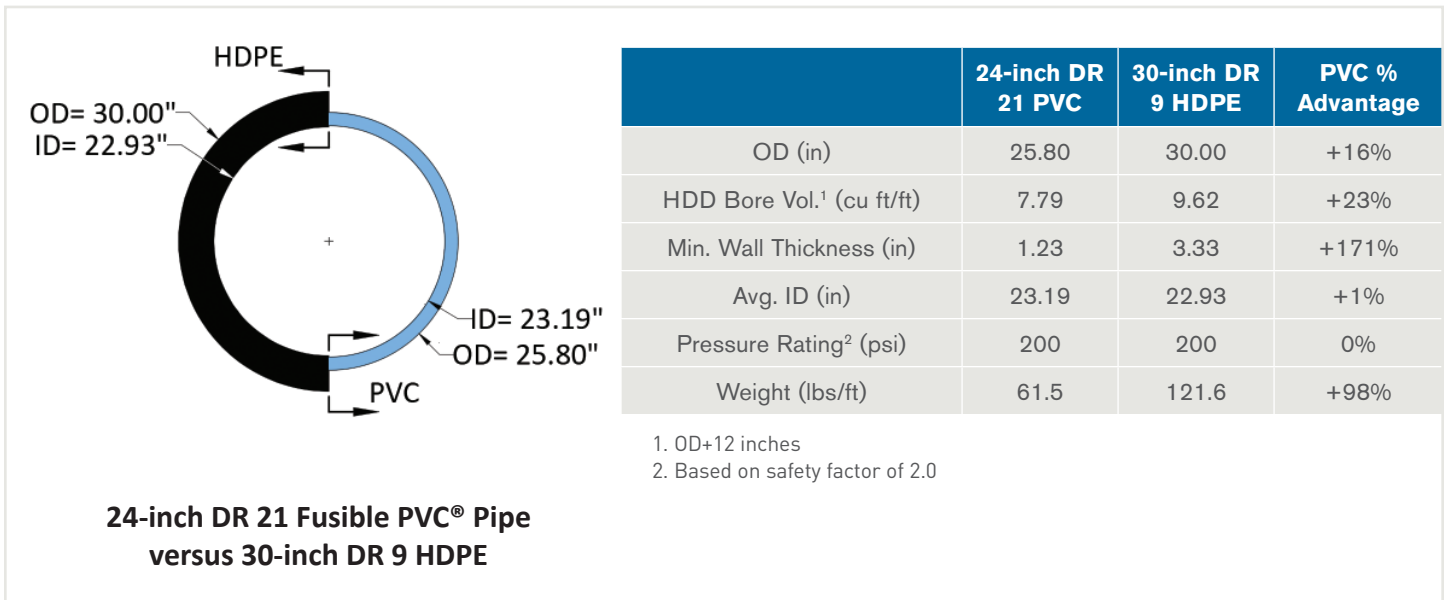
### Fusible PVC® pipe is available in the following colors:

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

## Material Properties

PVC vs. HDPE Material Properties					
Property	Specification	PVC	PE 3408	PE 4710	Difference
Tensile Strength (psi)	ASTM D638	7,000	3,000	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 <sup>1</sup>	29,000 <sup>2</sup>		>13x
Specific Gravity	ASTM D1505	1.40	0.94	0.95	
Coefficient of Linear Expansion (in/100 ft/10°F)	ASTM D696	0.36	1.44		0.25x
Water Disinfectant Induced Oxidation <sup>3</sup>		High Resistance	Low Resistance		
Hydrocarbon Permeation <sup>4</sup>		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 (<http://www.waterrf.org/Pages/Projects.aspx?PID=2946>)



## Dimension Ratio—Pressure Class Rating

PVC		HDPE 3408/4710		HDPE 4710	
SF = 2.0		SF = 2.0		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
DR 32.5	125	DR 13.5	128	DR 17	125

Supporting references at [www.aegion.com/about/our-brands/underground-solutions](http://www.aegion.com/about/our-brands/underground-solutions)

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

## Pipe Engineering Data

### Pressure Ratings

DIPS	
Dimension Ratio	Pressure (psi)
14	305
18	235
21	200
25	165
32.5	125

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
32.5	30

\* 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				●

# FUSIBLE PVC® PIPE SYSTEMS



Horizontal Directional Drill



Pipe Burst



Slipline/Jack and Bore



Open-Cut



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