

FUSIBLE PVC® PIPE SYSTEMS

Fusible C-900® | Fusible C-905® | FPVC®



 **Underground Solutions®**
an AEGION® company

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
- 100 year design life (per PVC Pipe Association)
- Greater recommended safe pulling allowance than HDPE pipe of similar ID and pressure class
- Greater recommended safe pulling force than self-restrained, gasketed PVC pipe joints
- Lower installation costs due to lighter pipe weight and smaller pipe OD
- Patented 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 chlorine-based disinfectants compared to HDPE pipe
- Fused joint OD consistent with OD of pipe barrel
- Reduces casing size in jack-and-bore installations

Trenchless Technology Award Winning Projects

- 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

Installations

Trenchless

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

Open-Cut

Applications

- Water mains (AWWA C900, C905, ASTM D2241)
- Force mains and gravity sewer
- Water reuse and reclaim
- Raw water and irrigation
- Casings
- Storm drains
- Process water
- Power transmission conduit and casings

Experience

- Over 10,000 Fusible PVC® pipe installations
- Over 10 million feet installed
- Installations in all 50 U.S. states, U.S. territories, Canada, Mexico and New Zealand
- Directional drill continuous pull-ins of greater than 7,000 feet
- Over 35 HDD installations exceeding 3,000 feet
- Installed at over 40 U.S. military bases and federal sites



Pipe Engineering Data

		DIPS				
Size	OD	DR	Min. Wall (in)	Avg. ID (in)	Wt. (lb/ft)	Safe Pulling Force (lbs)
C900	4"	14	.34	4.07	3.1	13,400
		18	.27	4.23	2.5	10,600
	6"	14	.49	5.85	6.4	27,700
		18	.38	6.09	5.1	21,900
	8"	14	.65	7.68	11.0	47,700
		18	.50	7.98	8.7	37,800
10"	14	.79	9.42	16.6	71,800	
	18	.62	9.79	13.2	56,800	
12"	14	.94	11.20	23.5	101,600	
	18	.73	11.65	18.6	80,300	
14"	14	1.09	12.98	31.6	136,500	
	18	.85	13.50	25.0	108,000	
16"	14	.73	13.75	21.6	93,400	
	25	.61	14.00	18.3	79,000	
18"	14	1.24	14.76	41.5	176,600	
	18	.97	15.35	32.4	139,700	
20"	21	.83	15.64	28.0	120,800	
	25	.70	15.92	23.7	102,200	
24"	18	1.08	17.20	40.6	175,400	
	21	.93	17.53	35.1	151,700	
30"	25	.78	17.85	29.8	128,400	
	14	1.54	18.33	62.9	272,200	
36"	18	1.20	19.06	49.8	215,300	
	21	1.03	19.42	43.1	186,100	
42"	25	.86	19.77	36.5	157,500	
	18	1.43	22.76	71.1	307,100	
48"	21	1.23	23.19	61.5	265,600	
	25	1.03	23.61	52.1	224,800	
54"	32.5	.79	24.12	40.5	174,600	
	21	1.52	28.77	94.6	408,500	
60"	25	1.28	29.29	80.1	345,800	
	32.5	.99	29.91	62.3	268,700	
66"	21	1.82	34.43	135.5	585,100	
	25	1.53	35.05	114.8	495,400	
72"	32.5	1.18	35.80	89.2	384,600	

		IPS				
Size	OD	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
8"	8.63"	26	.26	6.08	3.3	14,200
		17	.51	7.55	8.4	36,200
10"	10.75"	21	.41	7.76	6.9	29,600
		26	.33	7.92	5.6	24,200
12"	12.75"	17	.63	9.41	13.2	56,200
		21	.51	9.67	10.7	46,000
14"	14.75"	26	.41	9.87	8.7	37,500
		17	.75	11.16	18.6	79,100
16"	16.75"	21	.61	11.47	15.0	64,700
		26	.49	11.71	12.3	52,800



Fusible C-900® and Fusible C-905® product lines meet:

- AWWA C900/C905 requirements
- AWWA C605
- ASTM F1674
- NSF 61, NSF 61-G
- ASTM cell class 12454 and HDB = 4,000 psi with a safety factor of 2.0, and resulting HDS = 2,000 psi

Notes:

- Safe Pulling Force based on axial tensile stress of 7,000 psi per ASTM D1784 with a safety factor of 2.5.
- Available in 40' and 45' lengths.
- Some sizes may require special order. Schedule, sewer and other pipe sizes are available upon request. Inquire for sizes.

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 fiber optic conduit

FUSIBLE PVC® PIPE SYSTEMS

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
Specific Gravity	ASTM D1505	1.40	0.94	0.95	
Modulus of Elasticity for Long Term Deflection Calculations (psi)	ASTM D638	400,000 ¹	29,000 ²		>13x
Hydrostatic Design Basis at 73°F (psi)	ASTM D2837	4,000	1,600		2.5x
Coefficient of Linear Expansion (in/100 ft/10°F)	ASTM D696	0.36	1.44		0.25x
Water Disinfectant Induced Oxidation		High Resistance	Low Resistance		
Hydrocarbon Permeation		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

24" DR 21 Fusible C-905® versus 30" DR 9 HDPE

	24" DR 21 PVC	30" 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"
2. Based on safety factor of 2.0

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.underground solutions.com/references.php

Pipe Engineering Data

Pressure Ratings

DIPS		IPS	
Dimension Ratio	Pressure (psi)	Dimension Ratio	Pressure (psi)
14	305	17	250
18	235	21	200
21	200	26	160
25	165	Critical Buckling	
32.5	125		
Dimension Ratio	Critical Buckling Pressure (psi)		
14	426		
17	228		
18	190		
21	117		
25	68		
26	60		
32.5	30		



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 ASTM F1674 and D638 confirms that fused joints are fully restrained.
- Fuse and pull or intermediate fusions are possible in space-limited areas.



Bend Radius

DIPS		IPS / Schedule	
Size	Minimum Bend Radius	Size	Minimum Bend Radius
4"	100 ft.	6"	138 ft.
6"	144 ft.	8"	180 ft.
8"	189 ft.	10"	224 ft.
10"	231 ft.	12"	266 ft.
12"	275 ft.	Bend radius based on pipe OD to allow for fittings installation, repairs and maintenance.	
14"	319 ft.		
16"	363 ft.		
18"	406 ft.		
20"	450 ft.		
24"	538 ft.		
30"	667 ft.		
36"	798 ft.		



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/ C905	●	●	●	
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

 **Underground Solutions®**
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