

Sil-O-Flex & Sil-O-Flex Ultra-Turf

Submittal Data Sheet



Job or Customer:

Engineer:

Contractor:

Submitted by: Date

Approved by: Date

Order No: Date

Specification:

< STANDARDS >



Sil-O-Flex Ultra-Turf

ASTM D2239
ASTM D3350

Sil-O-Flex

SIDR- ASTM D2239
DR- ASTM D3035
ASTM D3350



NSF 14 & 61

Please see our listing on agency websites for NSF compliant pipe and fittings.

www.nsf.org
www.CSAGroup.org

Polyethylene is flexible and easy to join, requiring minimal labor to install. It has strong chemical resistance and is not susceptible to rust, rot, or electrolysis.

Sil-O-Flex can be used for water service line from meter or well to the house, from the house to an exterior faucet, irrigation, or to hang a submersible pump or foot valve.

Sil-O-Flex Ultra-Turf is polyethylene pipe mainly used in residential irrigation applications and rated for use with potable water.

Sil-O-Flex & Sil-O-Flex Ultra-Turf pipe is made from high density polyethylene (HDPE) 4710 resin with a cell classification of 445574C. The material complies to NSF 14 & 61.

Sil-O-Flex pipe is offered 1/2" through 1-1/2" in SIDR-11.5, and 3/4" through 2" SIDR-15, SIDR-9, SIDR-7, and DR-11 with coil lengths of 100' through 1000' size dependent.

Sil-O-Flex Ultra-Turf pipe is offered in SIDR-19, 1" and 1-1/4" with coil lengths of 100', 300', 500' depending on nominal size.

Sil-O-Flex & Sil-O-Flex Ultra-Turf

Submittal Data Sheet

Material Properties

Properties	Sil-O-Flex	Standards
Cell classification	445574C	ASTM D3350
Density, g/cc	0.947 - 0.955	ASTM D1505
Tensile strength at yield, psi at 73°F	3,500 - 4,000	ASTM D638
Hydrostatic Design Basis (HDB), psi @ 73°F	1,600	ASTM D2837
Flexural Modulus, psi @ 73°F	110K - 160K	ASTM D790
Coefficient of thermal expansion in./in./°F (x 10 ⁻⁵)	8.0	
Specific Heat, BTU/lb-°F	0.46	
Thermal Conductivity, BTU-in/hr-ft ² -°F	3.1	
Melt Index, g/10min (190°C / 2.16kg)	< 0.15	ASTM D1238
Slow Crack Growth Resistance, PENT (hours)	500	ASTM F1473
Maximum operating temperature 140°F		

Sil-O-Flex & Sil-O-Flex Ultra-Turf

Submittal Data Sheet

Sil-O-Flex Ultra-Turf Pipe Availability

SIDR 19, Black – ASTM D2239 ID Controlled

Nominal Size	Inside Diameter	Min. Wall Thickness	Outside Diameter	Max Working Pressure at 73°F	Wt./100'	Lengths Available		
						100'	300'	500'
1"	1.049	0.060	1.174	100 PSI	10	x	x	x

Sil-O-Flex Pipe Availability

SIDR 15, Black – ASTM D2239 ID Controlled

Nominal Size	Inside Diameter	Min. Wall Thickness	Outside Diameter	Max Working Pressure at 73°F	Wt./100'	Lengths Available			
						100'	200'	300'	400'
3/4"	0.824	0.060	0.946	125 PSI	7	x			x
1"	1.049	0.070	1.192	125 PSI	11	x		x	
1-1/4"	1.380	0.092	1.568	125 PSI	19	x	x	x	
1-1/2"	1.610	0.107	1.828	125 PSI	25	x		x	
2"	2.067	0.138	2.349	125 PSI	42	x	x		

DR 11, Black – ASTM D3035 OD Controlled

Nominal Size	Inside Diameter	Min. Wall Thickness	Outside Diameter	Max Working Pressure at 73°F	Wt./100'	Lengths Available			
						100'	200'	300'	500'
3/4"	0.860	0.095	1.050	200 PSI	12	x			
1"	1.075	0.120	1.315	200 PSI	20	x			x
1-1/4"	1.358	0.151	1.660	200 PSI	31	x		x	x
1-1/2"	1.554	0.173	1.900	200 PSI	41	x		x	x
2"	1.943	0.216	2.375	200 PSI	64	x	x	x	x

SIDR 11.5, Black – ASTM D2239 ID Controlled

Nominal Size	Inside Diameter	Min. Wall Thickness	Outside Diameter	Max Working Pressure at 73°F	Wt./100'	Lengths Available						
						100'	150'	200'	250'	300'	400'	500'
1/2"	0.622	0.060	0.744	160 PSI	6	x						x
3/4"	0.824	0.072	0.971	160 PSI	9	x		x		x	x	
1"	1.049	0.091	1.235	160 PSI	14	x		x		x	x	x
1-1/4"	1.380	0.120	1.625	160 PSI	25	x				x		x
1-1/2"	1.610	0.140	1.895	160 PSI	34	x						x

Sil-O-Flex & Sil-O-Flex Ultra-Turf

Submittal Data Sheet

Sil-O-Flex Pipe Availability

SIDR 7, Black – ASTM D2239 ID Controlled

Nominal Size	Inside Diameter	Min. Wall Thickness	Outside Diameter	Max Working Pressure at 73°F	Wt/100'	Lengths Available									
						100'	150'	200'	250'	300'	375'	400'	500'	600'	1,000'
3/4"	0.824	0.118	1.065	250 PSI	15	x		x		x		x	x		
1"	1.049	0.150	1.355	250 PSI	25	x		x		x		x	x		x
1-1/4"	1.380	0.197	1.782	250 PSI	43	x		x		x	x		x	x	
1-1/2"	1.610	0.230	2.079	250 PSI	59	x			x	x					
2"	2.067	0.295	2.669	250 PSI	96	x		x							

SIDR 7, Blue – ASTM D2239 ID Controlled

Nominal Size	Inside Diameter	Min. Wall Thickness	Outside Diameter	Max Working Pressure at 73°F	Wt/100'	Lengths Available			
						100'	200'	300'	400'
3/4"	0.824	0.118	1.065	250 PSI	15	x		x	x
1"	1.049	0.150	1.355	250 PSI	25	x		x	
2"	2.067	0.295	2.669	250 PSI	96	x			

SIDR 9, Black – ASTM D2239 ID Controlled

Nominal Size	Inside Diameter	Min. Wall Thickness	Outside Diameter	Max Working Pressure at 73°F	Wt/100'	Lengths Available									
						100'	150'	200'	250'	300'	400'	500'	600'	1,000'	
3/4"	0.824	0.092	1.012	200 PSI	12	x		x		x	x				
1"	1.049	0.117	1.288	200 PSI	19	x	x	x	x	x	x	x	x	x	
1-1/4"	1.380	0.153	1.692	200 PSI	33	x		x		x	x	x	x		
1-1/2"	1.610	0.179	1.975	200 PSI	44	x			x	x					
2"	2.067	0.230	2.536	200 PSI	73	x		x		x					

SIDR 9, Blue – ASTM D2239 ID Controlled

Nominal Size	Inside Diameter	Min. Wall Thickness	Outside Diameter	Max Working Pressure at 73°F	Wt/100'	Lengths Available									
						100'	150'	200'	250'	300'	400'	500'	600'	1,000'	
1"	1.049	0.117	1.288	200 PSI	19	x		x		x	x	x	x		

Sil-O-Flex & Sil-O-Flex Ultra-Turf

Submittal Data Sheet

Handling & Installation Procedures

Installation

SIDR pipe made to ASTM D2239 is an ID-controlled product designed for use with barbed insert fittings.

DR 11 pipe made to ASTM D3035 is an OD-controlled product designed for use with mechanical compression fittings heat fusion fittings, and other appropriate joining methods.

Make sure to understand and follow the joining equipment manufacturer's instructions and guidelines to ensure safe operation and quality joints.

Common Fitting Types

The tables below show common fitting types for joining polyethylene pipe.

Mechanical Fittings

HDPE Pipe Category	Pipe	Fitting Type
SIDR PE Pipe (ID-controlled, D2239)	Sil-O-Flex Sil-O-Flex Ultra-Turf	Barbed Insert
DR PE Pipe (OD-controlled, D3035)	Sil-O-Flex	Compression

Ensure all mechanical fittings are intended for use with the applicable pipe (ASTM D3035) by the fitting manufacturer.

Fusion Fittings

HDPE Pipe Category	Pipe	Fitting Type
DR PE Pipe (OD-controlled, D3035)	Sil-O-Flex	Socket Fusion (ASTM D2683)
		Butt Fusion (ASTM D3261)
		Electrofusion (ASTM F1055)

NOTE:

When using mechanical fittings, consult the fitting manufacturer's installation instructions for the particular fitting being used. Some models require the use of an insert stiffener/liner, which are sold separately. If you experience difficulty inserting the fitting into the pipe, try placing the end of the pipe in hot water to soften it slightly. Never use oil or soap on pipe or fittings.

Sil-O-Flex & Sil-O-Flex Ultra-Turf

Submittal Data Sheet

Handling & Installation Procedures

Pressure Rating vs. Temperature

Temperature (°F)	Pressure De-Rating Factor
73	1.00
80	0.95
90	0.87
100	0.80
110	0.72
120	0.65
130	0.57
140	0.50

Safe Pull Stress

The safe pulling force of Polyethylene 4710 pipe is based on the duration of the stress.

Knowing the duration of the stress and the cross-sectional area of the pipe (in²), you can calculate the Safe Pull Load (in pounds) for that condition.

If the pipe will be used at temperatures above 73°F, derating factors must be used.

NOTE: More information available in Chapter 12, Table 1 of PPI's Handbook of PE Pipe.

Duration	Typical Safe Pull Stress (psi) @ 73°F
0.5 hr	1,500
1 hr	1,400
12 hr	1,150
24 hr	1,100
1,000 hr	830
1 year	720
10 years	620
50 years	552

The safe pull load for a **12 hour** duration is given in the table below for a variety of pipe sizes. Exceeding these values may lead to permanent deformation of the pipe.

Nominal Size	ASTM D2239				ASTM D3035
	SIDR 19 (125#)	SIDR 15 (125#)	SIDR 11.5 (1605#)	SIDR 9 (200#)	DR 11 (200#)
1/2"	148	148	148	172	210
3/4"	192	192	233	304	328
1"	240	283	375	493	518
1-1/4"	383	489	650	847	823
1-1/2"	521	664	885	1,157	1,079
2"	857	1,099	1,461	1,909	1,685

Sil-O-Flex & Sil-O-Flex Ultra-Turf

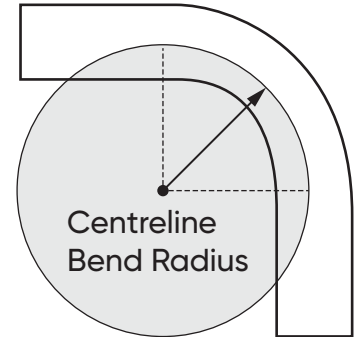
Submittal Data Sheet

Handling & Installation Procedures

Installation Considerations - Bending

When bending polyethylene pipe:

- Minimum bending radius shall be not less than 30 pipe diameters, or the minimum coil radius, whichever is greater
- When bending against the curvature of the coil, do not go beyond straight
- No bends within 10 pipe diameters of any fitting or valve



Dimension Ratio (OD-controlled)	Dimension Ratio (ID-controlled)	Pressure Rating, psi	Minimum Bend Radius
DR 11	SIDR 9	200	25 x Pipe OD
DR 13.5	SIDR 11.5	160	25 x Pipe OD
DR 17	SIDR 15	125	27 x Pipe OD
DR 21	SIDR 19	100	27 x Pipe OD
Fitting or flange present in the bend		—	100 x Pipe OD

NOTE:

PE pipe made to ASTM D2239 is ID-controlled, so its dimension ratio is determined by the pipe's ID (SIDR = ID/wall). The table has to be adjusted slightly to account for this. Other sources, such as Chapter 7 of PPI's Handbook of PE Pipe, say that the minimum bend radius of OD-controlled (D2737 & D3035) pipe should be based on its dimension ratio (OD/wall).

Sil-O-Flex & Sil-O-Flex Ultra-Turf

Submittal Data Sheet

Handling & Installation Procedures

Flow Performance

Polyethylene SIDR pipe is made to ASTM D2239 and is an ID-controlled product. It will have the same ID (and flow velocities) regardless of pressure rating. Polyethylene DR-11 pipe is made to ASTM D3035 and is OD-controlled.

SIDR Poly Pipe Capacity

Pipe Size	Length in Feet per Gallon
1/2"	63.4
3/4"	36.1
1"	22.3
1-1/4"	12.9
1-1/2"	9.46
2"	5.74

DR-11 Poly Pipe Capacity

Pipe Size	Length in Feet per Gallon
1/2"	51.8
3/4"	33.1
1"	21.2
1-1/4"	13.3
1-1/2"	10.2
2"	6.50

Flow Velocity (ft/s) is calculated using the following equation:

$$v = 0.4085 \times (Q/d)$$

Where:

Q = flow rate in gallons per minute (GPM)

d = inside diameter of the pipe (Target ID for ID-controlled pipe or Target OD - Min Wall for OD-controlled pipe)

Friction loss per 100' of pipe:

$$h_f = 0.2083 \times \left(\frac{100}{C}\right)^{1.85} \times \frac{Q^{1.85}}{d^{4.87}}$$

$$\Delta P \text{ (psi)} = h_f / 2.31$$

Where:

h_f = head loss in feet of water per 100' of pipe

Δp = pressure loss in psi per 100' of pipe

C = Hazen-Williams Friction Factor (equal to 150 for HDPE)

Sil-O-Flex & Sil-O-Flex Ultra-Turf

Submittal Data Sheet

Handling & Installation Procedures

SIDR Pipe Flow Performance

Velocity of Flow (in. ft/sec) for SIDR Poly Pipe

Flow GPM	1/2"	3/4"	1"	1-1/4"	1-1/2"	2"
1	1.06					
2	2.11	1.20				
3	3.17	1.80	1.11			
4	4.22	2.41	1.48			
5	5.28	3.01	1.86	1.07		
6	6.34	3.61	2.23	1.29		
7	7.39	4.21	2.60	1.50	1.10	
8		4.81	2.97	1.72	1.26	
9		5.41	3.34	1.93	1.42	
10		6.02	3.71	2.15	1.58	
12		7.22	4.45	2.57	1.89	1.15
14			5.20	3.00	2.21	1.34
16			5.94	3.43	2.52	1.53
18			6.68	3.86	2.84	1.72
20			7.42	4.29	3.15	1.91
25				5.36	3.94	2.39
30				6.44	4.73	2.87
35				7.51	5.52	3.35
40					6.30	3.82
50					7.88	4.78
60						5.74
70						6.69
80						7.65

Pressure Loss (in. lbs per square inch)
per 100 feet of SIDR Poly Pipe

Flow GPM	1/2"	3/4"	1"	1-1/4"	1-1/2"	2"
1	0.43					
2	1.55	0.39				
3	3.28	0.83	0.26			
4	5.59	1.42	0.44			
5	8.45	2.15	0.66	0.17		
6	11.83	3.01	0.93	0.24		
7	15.74	4.00	1.23	0.32	0.15	
8		5.12	1.58	0.42	0.20	
9		6.37	1.97	0.52	0.24	
10		7.74	2.39	0.63	0.30	
12		10.84	3.35	0.88	0.42	0.12
14			4.45	1.17	0.55	0.16
16			5.70	1.50	0.71	0.21
18			7.09	1.86	0.88	0.26
20			8.61	2.26	1.07	0.32
25				3.42	1.62	0.48
30				4.79	2.26	0.67
35				6.38	3.01	0.89
40					3.85	1.14
50					5.82	1.72
60						2.42
70						3.21
80						4.11

Use with Caution: Flow Velocity above 5 ft/second may cause turbulence or create damaging surge pressures.

Sil-O-Flex & Sil-O-Flex Ultra-Turf

Submittal Data Sheet

Handling & Installation Procedures

DR Pipe Flow Performance

Velocity of Flow (in. ft/sec) for Poly DR-11 Pipe

Flow GPM	1/2"	3/4"	1"	1-1/4"	1-1/2"	2"
1						
2	1.73	1.10				
3	2.59	1.66	1.06			
4	3.45	2.21	1.41			
5	4.32	2.76	1.77	1.11		
6	5.18	3.31	2.12	1.33	1.01	
7	6.04	3.87	2.47	1.55	1.18	
8	6.90	4.42	2.83	1.77	1.35	
9	7.77	4.97	3.18	1.99	1.52	
10		5.52	3.53	2.22	1.69	1.08
12		6.63	4.24	2.66	2.03	1.30
14		7.73	4.95	3.10	2.37	1.51
16			5.66	3.54	2.71	1.73
18			6.36	3.99	3.04	1.95
20			7.07	4.43	3.38	2.16
25				5.54	4.23	2.71
30				6.65	5.07	3.25
35				7.75	5.92	3.79
40					6.77	4.33
50						5.41
60						6.49
70						7.57
80						

Pressure Loss (in. lbs per square inch)
per 100 feet of Poly DR-11 Pipe

Flow GPM	1/2"	3/4"	1"	1-1/4"	1-1/2"	2"
1						
2	0.95	0.32				
3	2.01	0.68	0.23			
4	3.42	1.15	0.39			
5	5.17	1.74	0.59	0.19		
6	7.24	2.44	0.82	0.26	0.14	
7	9.63	3.25	1.10	0.35	0.18	
8	12.33	4.16	1.40	0.45	0.23	
9	15.33	5.17	1.74	0.56	0.29	
10		6.28	2.12	0.68	0.35	0.12
12		8.81	2.97	0.95	0.49	0.17
14		11.71	3.95	1.27	0.66	0.22
16			5.06	1.62	0.84	0.28
18			6.29	2.02	1.05	0.35
20			7.64	2.45	1.27	0.43
25				3.70	1.92	0.65
30				5.19	2.69	0.91
35				6.90	3.58	1.20
40					4.58	1.54
50						2.33
60						3.27
70						4.34
80						

Use with Caution: Flow Velocity above 5 ft/second may cause turbulence or create damaging surge pressures.

Sil-O-Flex & Sil-O-Flex Ultra-Turf

Submittal Data Sheet

Handling & Installation Procedures

System Testing with Water

Polyethylene pipe will slowly dilate in diameter (creep-strain) when pressure tested. When the internal volume of the pipe increases with the amount of water being fixed, the pressure will drop. This pressure drop doesn't mean that the pipe is leaking. This also means that if you were to hold the pipe at a constant pressure, you would need additional make-up water to maintain this pressure.

Pressure test methods have been developed to account for this creep-strain behavior, such as ASTM F2164 "Standard Practice for Field Leak Testing of Polyethylene (PE) and Crosslinked Polyethylene (PEX) Pressure Piping Systems Using Hydrostatic Pressure". In this test, the pipe is conditioned at a constant pressure for 4 hours (adding make-up water as necessary) before dropping the test pressure to inhibit (and slightly reverse) the diametric expansion and then monitoring for leakage. A summary of this method is below::

- **Determination of Test Pressure**
 - Maximum pressure may be set by the AHJ
 - Do not exceed the pressure rating of the lowest rated component in the system. Remove or isolate from the test section if needed.
 - Do not exceed more than 1.5x the pressure rating of PE piping. Account for temperatures above 73°F accordingly.
- **Test Duration**
 - If test pressure is between 1x and 1.5x the system design pressure, total time should not exceed 8 hours
 - If test pressure is 1x or less than the system design pressure, the total time should not exceed 72 hours.
 - If retesting, leave the system depressurized for 8 hours minimum
- **Test Procedure**
 - Fill the test section slowly, making sure to purge all air from the system. Entrapped air can cause inaccurate test results, as well as safety concerns due to the large amount of energy released during a rupture/failure. Allow the system to come to thermal equilibrium.

- Initial Expansion – Gradually bring the pipe up to the test pressure. Add make-up water as necessary to maintain this pressure for 4 hours.
- Test phase – Reduce the test pressure by 10psi & monitor for 1 hour. If no leakage is detected and the pressure stays within 5% of the test phase pressure during that 1 hour period, the section passes.

Notes for HDPE Water Pipe

- Additional information and best practices are provided in the Plastic Pipe Institute's TN-46 "Guidance for Field Hydrostatic Testing of High Density Polyethylene Pressure Pipelines: Owner's Considerations, Planning, Procedures, and Checklists".

References

- American Water Works Association
 - M55 PE Pipe - Design and Installation
- International Mechanical Code, Chapter 12 "Hydronic Piping"
- Plastic Pipe Institute
 - Handbook of Plastic Pipe, 2nd Edition

Sil-O-Flex & Sil-O-Flex Ultra-Turf

Submittal Data Sheet

Specifications

Sil-O-Flex

Scope

This specification sheet covers the manufacturers' requirements for Sil-O-Flex SIDR-11.5, SIDR-9, SIDR-15, SIDR-7, DR-7 and DR-11 polyethylene pipe. The pipe meets or exceeds all applicable ASTM and NSF standards and is suitable for water service lines from meter or well to the house, from the house to an exterior faucet, irrigation, or to hang a submersible pump or foot valve..

Materials

High density polyethylene resin used in Sil-O-Flex pipe complies with the material requirements of ASTM D3350 and has a material designation of 4710 and a cell classification of 445574C. The compounds used are listed to the requirements of NSF 14 & 61 for use in potable water service.

Dimensions

Physical dimensions and properties of Sil-O-Flex SIDR-11.5, SIDR-9, SIDR-7 and SIDR-15 pipe shall meet the requirements of ASTM D2239.

Physical dimensions and properties of Sil-O-Flex DR-11 & pipe shall meet the requirements of ASTM D3035.

Marking

Sil-O-Flex pipe is marked as prescribed in ASTM 2239/3035 and NSF 14 & 61. The marking includes the following: Nominal size, Sil-O-Flex, Material Classification, Dimension ratio and pressure rating, applicable ASTM & NSF standards.

Sil-O-Flex & Sil-O-Flex Ultra-Turf

Submittal Data Sheet

Specifications

Sil-O-Flex Ultra Turf

Scope

This specification sheet covers the manufacturers' requirements for Sil-O-Flex Ultra-Turf SIDR-19 polyethylene pipe. The pipe meets or exceeds all applicable ASTM and NSF standards and is suitable for use in residential irrigation applications and rated for use with potable water.

Materials

High density polyethylene resin used in Sil-O-Flex Ultra-Turf SIDR-19 pipe complies with the material requirements of ASTM D3350 and has a material designation of 4710 and a cell classification of 445574C. The compounds used are listed to the requirements of NSF 14 and 61 for use in potable water service.

Dimensions

Physical dimensions and properties of Sil-O-Flex Ultra-Turf SIDR-19 pipe shall meet the requirements of ASTM D2239 and NSF 14 and 61.

Marking

Sil-O-Flex Ultra-Turf pipe is marked as prescribed in ASTM D2239 and NSF 14 and 61. The marking includes the following: Nominal size, Sil-O-Flex Ultra-Turf, Material Classification, SIDR-19 and pressure rating, applicable ASTM & NSF standards.

Sil-O-Flex & Sil-O-Flex Ultra-Turf

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- Irrigation
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