



MATERIAL SPECIFICATION SHEET

GEO-Black High Density Polyethylene Pipe

SCOPE:

This material specification designates the requirements for Vanguard GEO-Black polyethylene piping products for use in ground source heat exchanger applications. All GEO-Black IPS-OD, SDR-11 and SDR-13.5 dimension piping products meet the respective requirements of ASTM D3035, ASTM D2447, CSA B137.1, cNSF, CSA C448 and NSF-geothermal.

MATERIALS:

All GEO-Black piping products are manufactured from PE 4710 high density polyethylene resin meeting the cell classification 445574C per ASTM D3350. Material exceeds the more stringent 5000 HR ESCR Test required for this application. The material contains carbon black as a UV inhibitor and can be stored outside.

MARKING & CERTIFICATION:

All Geo-Black piping products are marked with the name VPFL as the manufacturer, product trade name, nominal size, design temperature and pressure ratings, relevant ASTM standard numbers, CSA B137.1 and C448, NSF-geothermal, material designations, material cell classification, manufacturing date, production code and decremental footage numbering on coils 200' and greater in length.

RECOMMENDED USES:

GEO-Black pipe is intended and recommended for use as the buried heat exchanger and transfer piping in open or closed loop ground source heat pump applications. Design temperature rating for GEO-Black pipe is 73.4°F; however, intermittent exposure to temperatures up to 120°F. is acceptable. For uses not listed here, consult with your Vanguard representative.

CONNECTIONS:

GEO-Black is connected by heat fusion. We have a full line of GEO-Black socket heat fusion fittings including numerous reducer tees not available elsewhere. GEO-Black may also be connected by butt fusion with the appropriate fittings and equipment. Vanguard provides pre-fab U-bend coil assemblies. Each assembly includes 2 coils of pipe connected at one end with a factory assembled U-bend. Custom U-bend coil lengths are the standard.

HANDLING AND INSTALLATION:

GEO-Black high density polyethylene piping products are tough yet flexible. Do not drag or roll GEO-Black coils across rocks or rough ground. Installation and backfill practices for GEO-Black in trenched, vertical bore or pond applications shall comply with guidelines prepared by the International Ground Source Heat Pump Association, Plastics Pipe Institute, American Water Works Association, Plastic Pipe and Fittings Association and the manufacturer.

MATERIAL PROPERTIES:

Property	ASTM Test Method	English Units	SI Units
Density (Natural)	D 4883	-	0.751 g/cc
Density (Black)		-	0.955 g/cc
Melt Index ¹	D 1238	-	8.5 g/10 min
Tensile Strength			
@ Yield (2 in/min)	D 638	3600PSI	24.8 MPa
Elongation			
@ Break (2 in/min)	D 638	740%	740%
Flexural Modulus ²	D 790	150PSI	1034 MPa
Notched Izod Impact Strength	D 256	9.1 ft-lbf/in	0.48 kJ/m
Brittleness Temperature	D 746	<-103°F	-75°C
Slow Crack Growth	F 1473	5000 Hrs.	7500 Hrs.
Carbon Black Concentration	D1603	2.3%	2.3%
Cell Classification	D 3350	445574C	445574C

1. 190°C/21600 g 2. Condition C 3. Method 1,3 point load 4. 73°F

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QUALITY ASSURANCE

When the product is marked with the ASTM D3035 or ASTM D2447 and NSF-geothermal, CSA B137.1 and CSA C448 designation, it affirms that the product was manufactured, inspected, sampled and tested in accordance with these specifications and has been found to meet the specified requirements. GEO-Black is produced with state-of-the-art extrusion equipment to maintain consistency and accuracy.

SDR-11 POLYETHYLENE PIPING

ASTM D3035/CSA B137.1/CSA C448/NSF-geothermal/
IPS-OD/160PSI/PE3408(PE4710)

Part No.	Nominal Size	Nom. O.D.	Wall Thickness	Avg. I.D.	Weight Per Ft.
BLA4	3/4"	1.05 ± .004	.095 +.020	0.84	.129
BLA5	1"	1.32 ± .005	.120 +.020	1.06	.201
BLA6	1 1/4"	1.66 ± .005	.151 +.020	1.34	.312
BLA7	1 1/2"	1.90 ± .006	.173 +.021	1.53	.412
BLA8	2"	2.38 ± .006	.216 +.026	1.92	.643

SDR-13.5 POLYETHYLENE PIPING

ASTM D3035/CSA B137.1/CSA C448/NSF-geothermal/
IPS-OD/128PSI/PE3408(PE4710)

Part No.	Nominal Size	Nom. O.D.	Wall Thickness	Avg. I.D.	Weight Per Ft.
*BTA6	1 1/4"	1.66 ± .005	.123 + .020	1.39	0.254
*BTA7	1 1/2"	1.90 ± .005	.141 + .020	1.60	0.335
*BTA8	2"	2.38 ± .006	.176 + .020	2.00	0.524

* Special Order Pipe

FLUID CAPACITY PER 100' OF PIPE:

Nominal Pipe Size		Gallons	Liters
3/4"	SDR-11	3.02	11.42
1"	SDR-11	4.73	17.91
1 1/4"	SDR-11	7.55	28.56
1 1/2"	SDR-11	9.93	37.58
2"	SDR-11	15.36	58.12
1 1/4"	SDR-13.5	8.16	30.88
1 1/2"	SDR-13.5	10.68	40.43
2"	SDR-13.5	16.78	63.52

SDR-11 Thermal Heat Transfer Coefficient

Size	O.D.	Wall	BTU/FT/HR/T
3/4"	1.050	0.083	7.5
1"	1.315	0.102	7.7

PRESSURE CORRECTION FACTOR:

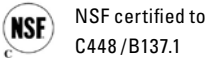
GEO-Black is rated for continuous use at 73°F but can be exposed for limited periods to temperatures up to 120°F. For design purposes, derating pressure factors for higher temperature installations are shown below.

Operating Temperature (°F)	Pressure Correction Factor
73	1.00
100	0.75
120	0.60

HEAD LOSS TABLE

Expressed as Feet of Head/100ft.

GPM	Size				
	3/4" IPS-OD SDR-11	1" IPS-OD SDR-11	1 1/4" IPS-OD SDR-11	1 1/2" IPS-OD SDR-11	2" IPS-OD SDR-11
1	0.23	0.07	0.02	0.01	0.00
2	0.83	0.27	0.09	0.04	0.01
3	1.76	0.57	0.18	0.09	0.03
4	2.99	0.96	0.31	0.16	0.05
5	4.52	1.46	0.47	0.24	0.08
6	6.34	2.04	0.65	0.34	0.11
7	8.44	2.72	0.87	0.46	0.15
8	10.80	3.48	1.11	0.58	0.19
9	13.44	4.33	1.38	0.73	0.24
10	16.33	5.27	1.68	0.88	0.29
12	22.89	7.38	2.36	1.24	0.41
14	30.45	9.82	3.14	1.65	0.55
16	39.00	12.57	4.02	2.11	0.70
18		15.64	5.00	2.62	0.87
20		19.01	6.08	3.19	1.06
22		22.68	7.25	3.80	1.26
24		26.64	8.52	4.47	1.48
26		30.90	9.88	5.18	1.72
28			11.33	5.94	1.97
30			12.88	6.75	2.24
34			16.23	8.52	2.82
38			19.95	10.46	3.47
42			24.01	12.60	4.17
46				14.91	4.94
50				17.40	5.76
54				20.06	6.65
58				22.90	7.59
62					8.58
66					9.64
70					10.75
78					13.13
86					15.73
94					18.55
102					21.58



NSF-geothermal