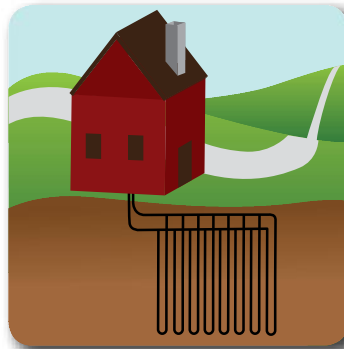


Polyethylene Technology, inc.

21670 Hamburg Avenue • Lakeville, MN 55044
952-469-2198

Geo Thermal Piping for Heating & Cooling



Reduce monthly heating
& cooling energy costs
significantly

Sizeable Stimulus Bill
Tax Credits are available

Go Green -
environmentally affordable, efficient & reliable



As a regional manufacturer, Polyethylene Technology, Inc. has been producing a variety of extreme quality, long life, trouble free, cold-water pressure, High Density Polyethylene Piping Products since 1979.

Polyethylene Technology has been manufacturing polyethylene pipe for geothermal heating & cooling application for many years, but only recently have our U.S. markets begun to embrace its simplicity, affordability and efficiency benefits.

Environmental trends, high cost energy and the movement towards “green,” affordable & more efficient energy, coupled with tax incentives at the federal, state and municipal levels, has lead to the re-emergence of the Geothermal Industry for heating and cooling of residential, commercial and industrial buildings.

As a result, the installation of geothermal heat pump systems have become today’s preferred method of obtaining the most long-term, cost effective and efficient heating and cooling systems for buildings.

Poly Technology’s Geothermal pipe is strong, long lasting and trouble free with a Lifetime Warranty. This result starts with the wise choice of using only the industries best virgin resin to manufacture our pipe. Our resin specifications and properties are stated below –

Resin Properties – PPI TR 4 - PE 3408/3608

Specification for polyethylene plastic molding and extrusion material – PE 3408/3608, PPI TR4

Class III, A, 5, P34		ASTM D – 1248
Density	.944g/cc	ASTM D – 4883
Melt Index	12.5g/10 min	ASTM D – 1238
Tensil Strength	3,300 psi (2”/ min yield)	ASTM D - 638
	4,500 psi (2”/min break)	ASTM D - 638
Elongation	>800% (2”/min break)	ASTM D - 638
	>2,000 hours	ASTM D - 1693
Environmental Stress Crack Resin	>5,000 hours	ASTM D - 1693
Hardness (Shore D)	68	ASTM D - 2240
Vicat Softening Point	259 F	ASTM D - 1525
Flexural Modulus	120,000 psi	ASTM D - 790
Brittleness Temperature	< - 180 F	ASTM D - 746
Hydrostatic Design Basis	1600 psi @ 23 C	ASTM D - 2837
Carbon Black Concentration	2.30%	
Cell Classification	345464 C	ASTM D - 3350

The resin we use is listed under National Sanitation Foundation Standard 61 and our Geothermal Pipe and U-Bend is listed & by NSF Standard 14.

THE IMPORTANCE OF NSF FOR GEOTHERMAL PIPE

- The National Sanitation Foundation Standards 14 & 61 safeguards that Poly Technology's Geothermal piping products conform to the highest quality standards in terms of resin type used, pipe dimension control and quality of workmanship.

SAMPLE INSPECTION & TESTING

- Our Geothermal products and production plant is inspected by NSF, with unannounced plant visits three times per year to do a production audit that includes the collection of pipe & resin samples of all NSF Certified products of our manufacture.
- These samples are sent to the NSF Laboratory at Ann Arbor Michigan and tested by them to confirm our conformance with the applicable standards.
- Upon receipt of samples, NSF tests the resin for compliance. Only if the resin passes their compliance tests, can one expect that the pipe (made from the resin) can also pass the compliance tests.
- After the resin tests and only if the resin passes the tests, our pipe samples are tested for dimensions, environmental stress crack resistance, elevated temperature & sustained pressure, burst pressure, tensile strength, resin density, carbon black content and overall workmanship.

PRODUCTION PLANT INSPECTION

- NSF, upon each visit, tests our Laboratory equipment and production lines
- Reviews our production records for accuracy & completeness,
- Reviews & confirms our records to assure that our test & measuring Lab Equipment is accurate,
- Reviews our daily production logs for completeness, compliance and accuracy.

GEOTHERMAL PIPING PRODUCTS BY POLYETHYLENE TECHNOLOGY

All of our Geothermal Piping products are manufactured at our Lakeville Minnesota production facility. At this single location, over many years of refinement, we have developed key features that make our Geothermal products somewhat unique in the industry.

FEATURES OF OUR GEOTHERMAL PIPE

- **PERMANENTLY INDENTED PRINT WITH Sequential Footage Marking EVERY 2 FEET**
- **COLOR CODED PRINT STATEMENT BY PRESSURE RATING**
- **COLOR CODED COIL LABELS**
- **BAR CODED LABELS**
- **COILS BUNDLED, STRETCH WRAPPED AND PALLETIZED**
- **PRESSURIZED COILS WITH HEAT SEALED, CRIMPED ENDS THROUGH 1-1/4" & 1-1/2" – 2" COILS & STRAIGHT LENGTHS HAVE PLUGGED ENDS**
- **U-BEND COILS ARE FACTORY PRESSURE TESTED UPON FUSE COMPLETION**

PIPE CONFORMING INDUSTRY STANDARDS

Poly Technology's Geothermal Pipe conforms to all of the industries appropriate standards as follows –

- ASTM D-3035 AND D-3350
- AWWA C-901 AND C-906
- IGSHA Section 1C
- NATIONAL SANITATION FOUNDATION STANDARD 14 & 61

Poly Technology Geothermal polyethylene coils are manufactured in two basic configurations with one variant—Coils with Factory Joined Integrally Fused U-Bends in sizes ¾” through 1-1/4” in a variety of coil lengths & configurations (also a reverse coil variant is available) & coils only in ¾” to 2” (less the U-Bend). All Geo coils are also available in a variety of Dimension Ratio's as shown on the next page. The example below is for SDR (DR) 11 – showing size, dimensional specs, weight and standard coil lengths. All SDR'S are available in these specifically stated coil lengths (custom lengths available) and all SDR'S are available in 20-foot straight lengths. Our Factory Integrally Fused U-Bend Coils are pressure tested at completion to assure their pressure integrity.

GEO THERMAL 160 PSI, ASTM D-3035 SDR 11, NSF LISTED, PE 3408/3608 WITH INTEGRAL FUSED U-BENDS

Size	O.D.	I.D.	Wall	WT/100'	STD Coil Length	Bundle Qty
1/2"						
3/4"	1.050"	.860"	.095"	12.2#	155', 175', 205', 230' & 255'	
1"	1.315"	1.077"	.120"	19.1#	205', 255', 305', 355', 405'	
1-1/4"	1.660"	1.358"	.151"	30.6#	205', 305', 355', 405'	
1-1/2"	1.900"	1.554"	.173"	40.2#	COIL LENGTH AS NEEDED	
2"	2.375"	1.943"	.216"	62.7#	COIL LENGTH AS NEEDED	

COIL LENGTHS ABOVE SHOULD BE X 2 FOR TOTAL COIL FOOTAGE

Geothermal SDR (DR) 11 is the most popular of the various Dimension Ratio piping products that we offer. Factory Joined Integrally Fused U-Bends are produced to your specific requirements. Our U-Bends incorporate a patented, superior flow pattern to assure that the best flow performance is obtained.

At this time, Poly Technology chooses not to become a fusion equipment or fusion fitting source nor do we intend on selling our U-Bend as a single item. Our U-Bend is only available as an Integrally Fused Coil.

Additionally, Poly Technology Geothermal polyethylene coils are also available in coil only form, with no fused U-Bend attached. They are available in sizes from ¾” through 2” in all of the industry Standard Dimension Ratio's, in a large variety of standard stocked coil lengths and 20 foot straight lengths.

Below are our specifications of all SDR (DR) Ratings for Geothermal coils only (No U-Bends). It displays all of the various SDR'S (DR) that Polyethylene Technology presently offers, be it in coil only form or coils with U-Bend. Standard coil lengths for coils only are different than standard coil lengths for coils with Factory Integrally Fused U-Bend, although, custom coil lengths are available in all SDR'S (DR) in either configuration.

COILS ONLY WITHOUT U-BENDS

GEO THERMAL 100 PSI, ASTM D-3035 SDR 17, NSF LISTED, PE 3408/3608

Size	O.D.	I.D.	Wall	WT/100'	Coil Length 100'	Bundle Qty
3/4"	1.050"	.926"	.062"	8.2#		
1"	1.315"	1.161"	.077"	12.8#		
1-1/4"	1.660"	1.464"	.098"	20.6#		
1-1/2"	1.900"	1.676"	.112"	26.9#		
2"	2.375"	2.095"	.140"	42.1#		

GEO THERMAL 110 PSI, ASTM D-3035, SDR 15.5, NSF LISTED, PE 3408/3608

Size	O.D.	I.D.	Wall	WT/100'	Coil Length 100'	Bundle Qty
3/4"						
1"						
1-1/4"	1.660"	1.446"	.107"	22.3#		
1-1/2"	1.900"	1.654"	.123"	29.4#		
2"	2.375"	2.069"	.153"	45.7#		

GEO THERMAL 128 PSI, ASTM D-3035, SDR13.5, NSF LISTED, PE 3408/3608

Size	O.D.	I.D.	Wall	WT/100'	Coil Length 100'	Bundle Qty
3/4"	1.050"	.894"	.078"	10.2#		
1"	1.315"	1.121"	.097"	15.9#		
1-1/4"	1.660"	1.414"	.123"	25.4#		
1-1/2"	1.900"	1.618"	.141"	33.3#		
2"	2.375"	2.023"	.176"	52.0#		

GEO THERMAL 160 PSI, ASTM D-3035, SDR 11, NSF LISTED, PE 3408/3608

Size	O.D.	I.D.	Wall	WT/100'	STD Coil Length	PALLETS/
						TRAILER
3/4"	1.050"	.860"	.095"	12.2#	1, 2, 3, 5, 6, 7, 8, 1000'	28
1"	1.315"	1.077"	.120"	19.1#	1, 2, 3, 5	28
1-1/4"	1.660"	1.358"	.151"	30.6#	1, 2, 3, 5	26 EST
1-1/2"	1.900"	1.554"	.173"	40.2#	1, 2, 3, 5	
2"	2.375"	1.943"	.216"	62.7#	1, 2, 3, 5	

REFER TO COIL WITH INTEGRAL U-BEND PAGE IF NEEDED

GEO THERMAL 200 PSI, ASTM D-3035, SDR 9, NSF LISTED, PEN 3408/3608

Size	O.D.	I.D.	Wall	WT/100'	Coil Lengths	Bundle Qty
3/4"	1.050"	.818"	.117"	14.6#		
1"	1.315"	1.023"	.146"	22.9#		
1-1/4"	1.660"	1.292"	.184"	36.5#		
1-1/2"	1.900"	1.478"	.211"	47.9#		
2"	2.375"	1.847"	.264"	74.9#		

GEO THERMAL 267 PSI, ASTM D-3035 SDR 7, NSF LISTED, PE 3408/3608

Size	O.D.	I.D.	Wall	WT/100'	Coil Lengths	Bundle Qty
3/4"	1.050"	.750"	.150"	18.1#		
1"	1.315"	.939"	.188"	28.5#		
1-1/4"	1.660"	1.186"	.237"	45.3#		
1-1/2"	1.900"	1.358"	.271"	59.3#		
2"	2.375"	1.358"	.271"	92.8#		

ALL SDR'S ARE ALSO AVAILABLE IN 20' STRAIGHT &/OR SPECIAL COIL LENGTHS

ALL SDR'S ARE IRON PIPE SIZE (IPS), OD CONTROLLED, FUSION COMPATIBLE



PRODUCT SUBMITTAL SHEET

PRODUCT TYPE

Geo Thermal pipe as manufactured by Polyethylene Technology, Inc. for geo thermal heating & cooling applications.

RESIN

Polyethylene Technology Geo Thermal pipe is manufactured from virgin high-density NSF polyethylene resin meeting Cell Classification of 345464 as listed in ASTM D 3035. The Resin formulation contains a minimum of 2% & not exceeding 3.5% Carbon Black color concentrate that provides Ultra-Violet ray protection sufficient to protect the pipe from outside elements. The Resin is tested to meet 1600 psi Hydrostatic Design Stress at 73 degrees Fahrenheit as listed in ASTM D 2837 and PPI TR4 – PE 3408/3608.

PIPE

All SDR ratings of Polyethylene Technology Geo Thermal Pipe are manufactured from the materials stated herein - ASTM D 3035, AWWA 901 & 906, meets & is listed by the National Sanitation Foundation (NSF), Standard 14 & 61.

ACCREDITATION

Polyethylene Technology, Inc. hereby certifies that all SDR categories of our Geo Thermal pipe meets and/or exceeds the standards stated within.

In the mid-nineties Polyethylene Technology, Inc. launched our 1st limited offering of HDPE pipe for geo thermal application. Since then, our product offering has expanded into six different SDR ratings.

GEO THERMAL PIPE PURITY GUARANTEE & WARRANTY

GEO THERMAL polyethylene pipe is certified by the National Sanitation Foundation (NSF) for its purity and use in “Earth Loop” and “Exchange” applications and is guaranteed to be free from lead, chlorine and solvent contaminants.

LIMITED LIFETIME WARRANTY

GEO THERMAL pipe, which includes manufactured earth loops, carries a limited lifetime warranty to the original retail purchaser whose property the product is installed when used in ordinary “Earth Loop” and “Exchange” applications. **GEO THERMAL** pipe is warranted against rust, rot and electrolytic corrosion or from any manufacturing defects in material or workmanship that cause failure in normal installations.

Having been satisfied of proper installation in acceptable applications, should **GEO THERMAL** pipe fail due to manufacturing defect in material or workmanship the manufacturer agrees to:

Supply a like amount of GEO THERMAL pipe no charge, freight prepaid to the original retail purchaser at the location installed. The manufacturer agrees to reimburse the original retail purchaser for reasonable labor costs actually incurred in replacing the GEO THERMAL pipe with identical pipe acknowledged to be defective in an amount not greater than \$5.00 per linear foot.

Compression joints, insert fittings, flared fittings and non-manufactured fusion joints are not covered under this warranty nor is failure resulting from elevated temperatures, mechanical damage, misuse, improper applications or installations. This warranty is void if heat, lubricants, detergents, soap products, pipe dope compounds, or surfactants of any type are used during installation. Chemicals present in the water that have adverse consequences to the quality and longevity of **GEO THERMAL** pipe also void this warranty.

All claims under this warranty must be accompanied by a pipe sample not less than two feet in length along with the name and address of the original retail purchaser and a specific statement of the alleged defect along with a proof of purchase addressed to:

**Polyethylene Technology, Inc.
21670 Hamburg Ave
Lakeville, MN 55044
952-469-2198**

This Limited Warranty is not transferable or assignable by the original retail purchaser of the Pipe. This is the sole and exclusive remedy offered by Polyethylene Technology, Inc. for the pipe. Polyethylene Technology, Inc. specifically excludes any warranties of merchantability or fitness for a particular purpose. Polyethylene Technology, Inc. will not be liable for any other expense or costs associated with the performance or failure of the pipe should it occur, including but not limited to any incidental, consequential or other damages based upon breach of contract, breach of warranty, negligence, strict tort liability, or other legal theory.

JOINTS

Geothermal pipe made by Polyethylene Technology is based on IPS outside (OD) dimensions with heat fusing being the preferred method for making joints. To assure a proper working system, installation and fusion joints should only be made by an experienced and qualified professional who has been properly trained.

Our Geothermal pipe can also be mechanically joined as a secondary method, by using OD dimensioned compression fittings meeting ASTM D-3035 specifications (with insert stiffener) on less than 2" in diameter. Never use lubricants on the pipe nor subject the pipe to direct flame exposure.

INSTALLATION

All Geothermal, Geo Loop pipe manufactured by Polyethylene Technology for vertical, down-hole application should be properly and carefully grouted with bentonite. As there are different types and grades of bentonite, the experienced & professional installer should be careful to select the proper bentonite used.

Horizontal installations must be buried below the frost level and incorporate the use of an embedment material such as gravel or sand that surrounds and supports the pipe. If layering the pipe, there must be sufficient embedment between each layer.

We make no further recommendations in regards to joining and installation methods and procedures - however, we strongly suggest following the guidelines as published by the Plastic Pipe Institute – TR 33.

OTHER SUGGESTIONS

The Plastic Pipe Institute publishes various manuals. One such manual is the "Handbook of Polyethylene Pipe" and within their publication - TN 13-2001, is valuable information.

Additional information can be obtained by going to www.geoexchange.org

There are now in place various forms of lucrative tax benefits provided. One should review these various incentives to go "green" to maximize your payback while reducing your acquisition cost. Be sure to check, federal, state and local incentives.

MISCELLANEOUS

From time to time, we will update the information contained within this Geothermal Brochure. To the best of our knowledge, the information contained herein is accurate.

At this printing, we are estimating some of the information that is contained in the "**PART NUMBERS & PACKAGING**" section that follows on the next page. Part numbers (sku #'s) should be accurate but coils per pallet & pallets per truck may be subject to future modification.

PART NUMBERS & PACKAGING INFORMATION

<u>SKU # Item</u>	<u>Coils/Pallet</u>	<u>Pallets/Truck</u>
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COILS ONLY – NO U-BEND

83110 3/4" x 100'		
83120 3/4" x 200'	13	28
83130 3/4" x 300'	10	28
83150 3/4" x 500'	8	28
83160 3/4" x 600'	8	28
83170 3/4" x 700'	8	28
83180 3/4" x 800'	8	28
831100 3/4"x 1000'	6	28

COILS WITH U-BENDS

881155 3/4" - 155' x2=310'	12	28
881175 3/4" - 175' x2=350'	12	28
881205 3/4" - 205' x2=410'	10	28
881230 3/4" - 230' x2=460'	8	28
881255 3/4" - 255' x2=510'	8	28

COILS ONLY – NO U-BEND

83210 1" x 100'		
83220 1" x 200'	8	28
83230 1" x 300'	10	28
83250 1" x 500'	8	26

COILS WITH U-BENDS

882205 1" - 205' x2=410'	8	26
882255 1" - 255' x2=510'	8	26
882305 1" - 305' x2=610'	8	26
882355 1" - 355' x2=710'	8	26
882405 1" - 405' x2=810'	5	26

COILS ONLY – NO U-BEND

83310 1-1/4" x 100'	12	24
83320 1-1/4" x 200'	12	24
83330 1-1/4" x 300'	10	24
83350 1-1/4" x 500'	10	24

COILS WITH U-BENDS

883205 1-1/4"-205' x2=410'	10	
883305 1-1/4"-305' x2=610'	10	
883355 1-1/4"-355' x2=710'	8	
883405 1-1/4"-405' x2=810'	5	

COILS ONLY – NO U-BEND

83410 1-1/2" x 100'	10	
83420 1-1/2" x 200'	10	
83430 1-1/2" x 300'	9	
83450 1-1/2' x 500'	8	

COILS ONLY – NO U-BEND

83510 2" x 100'	10	
83520 2" x 200'	8	
83530 2" x 300'	7	
83550 2" x 500'	5	

PRESENTLY, THESE COILS/PALLET & PALLETS/TRUCK ARE APPROXIMATE