PROJECT NAME:_____

PROJECT LOCATION: CITY:_____ **STATE:**_____ **ZIP:**_____

CONTRACTOR:_____

CenFuse 4710 HDPE Pipe, Earth Loops™, and Patented Bullet U-Bend Fittings for Geothermal Heat Pump Systems

SCOPE: **This Product Submittal is for CenFuse polyethylene pipe and Centennial Plastics' Earth Loops™ with Centennial Plastics' Bullet U-Bend fitting for Geothermal Heating and Cooling applications.**

MATERIAL: **CenFuse HDPE and Bullet U-Bend fittings are manufactured from virgin high density polyethylene resin, specifically designed for geothermal applications. Resin cell classification for CenFuse and "Bullet" U-Bend fittings: 445576C per ASTM D 3350. CenFuse pipe is manufactured in accordance with ASTM D 3035. This material contains a minimum 2% Carbon Black as a UV inhibitor to accommodate outside storage. The material has a 1600 psi Hydrostatic Design Basis at 73^0 F. per ASTM D 2837 and is listed in Centennial Plastics name in PPI TR4 as a PE 4710 material.**

CERTIFICATION: **Centennial Plastics certifies that CenFuse polyethylene pipe, Earth Loops and "Bullet" U-Bend fittings meet the specifications and requirements stated here.**

WARRANTY: **CenFuse polyethylene pipe comes with a limited non prorated warranty of 50 years. Centennial Plastics' Earth Loops™ come with a limited non prorated warranty of 50 years. (See Full Limited Warranty for complete conditions).**

Effective April 18, 2005
1830 Centennial Avenue
Hastings, NE 68901
PH: (402) 462-2227
FAX: (402) 462-5529
Toll Free: (866) 851-2227
centennialplastics.com

Gene Warner
Technical and ESH Manager

Product Description and Print Line

CenFuse HDPE 4710 Polyethylene Pipe

Material:

All CenFuse HDPE 4710 pipe is manufactured from virgin high density polyethylene resin with the cell classification of 345464C per ASTM D 3350. The material contains a minimum 2% Carbon Black as a UV inhibitor to accommodate outside storage.

Print Line:

All CenFuse HDPE 4710 is permanently indent printed with white print stating the following:

1. Identification of Centennial Plastics as the manufacturer.
2. The appropriate SDR, SIDR and/or CTS designation and nominal diameter.
3. Product trade name.
4. All relevant ASTM standards to which CenFuse is manufactured.
5. Relevant NSF and AWWA standards.
6. Manufacturing dates using the Julian calendar.
7. Incremental footage marking every two feet.
8. Design temperature rating.
9. Production shift designation.
10. Identification of PE 4710 high density resin.

Recommended Usage:

CenFuse HDPE 4710 is recommended for use as the piping material for buried or submerged closed loop exchangers.

Connections:

CenFuse HDPE 4710 is manufactured to accommodate heat fusion. Centennial Plastics pre fabricates dual coils with the “Bullet” U-Bend fitting. The “Bullet” U-Bend fitting and CenFuse HDPE 4710 are manufactured with identical raw materials, allowing for the entire buried heat exchange system to be constructed from the same resin. It is recommended that closed loop applications requiring a dual coil, use Centennial Plastics “Bullet” U-Bend fitting. CenFuse is compatible with the normal butt and socket fusion fittings currently in use in the Geothermal industry.

Handling:

Any handling of the pipe shall avoid contact with sharp edged objects. If stored outside for long periods of time, the pipe should be covered with a UV resistant tarp or cover. If the wall of the pipe is penetrated by more than 10% of its thickness, the damaged pipe should be cut out, disposed of and replaced.

CENTENNIAL PLASTICS, INC.

1830 Centennial Avenue
Hastings, NE 68901
Phone: (402) 462-2227
Fax: (402) 462-5529

5098 Treasure Valley Way
Nampa, ID 83687
Phone: (208) 855-4779

SPECIFICATIONS
Effective September. 2020
Supersedes Jan. 2019
1830 Centennial Ave.
Hastings, NE 68901
Ph: 402-462-2227
Fax: 402-462-5529
Toll Free: 866-851-2227
centennialplastics.com

Centennial PLASTICS, INC.

CenFuse

HDPE 4710—ASTM D3035

- Flexible polyethylene pipe
- Produced from only the finest virgin material
- Backed by a 50-YEAR WARRANTY
- All diameters are IPS, OD controlled and compatible with heat fusion.
- Chlorine resistance: CC3 per ASTM F2263

ASTM D3035			3/4"	1"	1-1/4"	1-1/2"	2"	3"	4"	6"	8"
125 PSI	SDR 17	O.D.	N/A	N/A	1.660"	1.900"	2.375"	3.500"	4.500"	6.625"	8.625"
		I.D.	N/A	N/A	1.464"	1.676"	2.095"	3.088"	3.970"	5.971"	7.549"
		Wall	N/A	N/A	.098"	.112"	.140"	.206"	.265"	.390"	.507"
		Wt./Ft	N/A	N/A	.206#	.269#	.421#	.912#	1.508#	3.268#	5.535#
138 PSI	SDR 15.5	O.D.	N/A	N/A	N/A	1.900"	2.375"	3.500"	4.500"	6.625"	8.625"
		I.D.	N/A	N/A	N/A	1.654"	2.069"	3.048"	3.920"	5.771"	7.513"
		Wall	N/A	N/A	N/A	.123"	.153"	.226"	.290"	.427"	.556"
		Wt./Ft	N/A	N/A	N/A	.294#	.457#	.994#	1.641#	3.5557#	6.034#
160 PSI	SDR 13.5	O.D.	N/A	1.315"	1.660"	1.900"	2.375"	3.500"	4.500"	6.625"	N/A
		I.D.	N/A	1.121"	1.414"	1.618"	2.023"	2.982"	3.834"	5.643"	N/A
		Wall	N/A	.097"	.123"	.141"	.176"	.259"	.333"	.491"	N/A
		Wt./Ft	N/A	.159#	.254#	.333#	.520#	1.128#	1.865#	4.048#	N/A
200 PSI	SDR 11	O.D.	1.050"	1.315"	1.660"	1.900"	2.375"	3.500"	4.500"	6.625"	8.625"
		I.D.	.860"	1.077"	1.358"	1.554"	1.943"	2.864"	3.682"	5.421"	6.936"
		Wall	.095"	.120"	.151"	.173"	.216"	.318"	.409"	.602"	.784"
		Wt./Ft	.122#	.191#	.306#	.402#	.627#	1.36#	2.249#	4.873#	8.263#
250 PSI	SDR 9	O.D.	1.050"	1.315"	1.660"	1.900"	2.375"	3.500"	4.500"	N/A	N/A
		I.D.	.818"	1.023"	1.292"	1.478"	1.847"	2.722"	3.500"	N/A	N/A
		Wall	.117"	.146"	.184"	.211"	.264"	.389"	.500"	N/A	N/A
		Wt./Ft	.146#	.229#	.365#	.479#	.749#	1.626#	2.688#	N/A	N/A

Note: Please see Centennial Plastics website for stocking coil lengths: www.centennialplastics.com

CenFuse HDPE is suitable for connections by heat fusion or compression fittings of the same SDR CenFuse
CenFuse meets AWWA C901 requirements in 3/4" - 3", SDR 9 and 11
CenFuse meets AWWA C906 requirements in 4" - 8" all SDRs

NSF

CenFuse ¾" – 6" is tested and certified to NSF/ANSI Standard 14 and 61 (NSF-pw).
CenFuse 8" is tested and certified to NSF/ANSI Standard 61.
All applicable CenFuse SDR's bear the NSF/ANSI 358-1 Certification Mark.

CenFuse is Certified to NSF/ANSI 372 and conforms with the lead content requirements for "lead free" plumbing as defined by California, Vermont, Maryland, and Louisiana state laws and the U.S. Safe Drinking Water Act.

Centennial Plastics follows Proposition 65 (also known as the Safe Drinking Water and Toxic Enforcement Act of 1986). Our products in their finished form, do not require a California Proposition 65 warning label.

Centennial Plastics, Inc. is an ISO 9001 Certified Company.

CENFUSE 4710
HDPE MATERIAL DATA SHEET

CENFUSE 4710 HDPE MEETS OR EXCEEDS:
ASTM D 3035
ASTM D 3350, CELL CLASSIFICATION PE 445576C

CENFUSE 4710 PIPE FOR:
GEOTHERMAL, GROUND SOURCE HEAT PUMP APPLICATIONS.

NOMINAL PIPE PROPERTIES

	ASTM METHOD	ENGLISH UNITS	SI UNITS
DENSITY (BLACK)	D 4883	-	.959 g/cc
MELT INDEX [1]	D 1238	-	8.5 g/10 min
HYDROSTATIC DESIGN BASIS @ (23° C)	D 2837	1600 psi	11.0 MPa
HYDROSTATIC DESIGN BASIS @ (60° C)	D 2837	1000 psi	6.9 MPa
CARBON BLACK CONCENTRATION	D 1603	2.30%	2.30%

NOMINAL RAW MATERIAL PROPERTIES

TENSILE STRENGTH			
@ YIELD (2 in/min)	D 638	3625 psi	25.0 MPa
@ BREAK (2 in/min)	D 638	5500 psi	38.0 MPa
ELONGATION			
@ BREAK (2 in/min)	D 638	>600%	>600%
FLEXURAL MODULUS [2]	D 790	150,000 psi	1,035 MPa
NOTCHED IZOD IMPACT STRENGTH	D 256	9.0 ft-lbf/in	0.49 kJ/m
HARDNESS (SHORE D)	D 2240	66	66
VICAT SOFTENING POINT	D 1525	259° F	126° C
BRITTLENESS TEMPERATURE	D 746	<-180° F	<-118° C
ENVIRONMENTAL STRESS CRACK RESISTANCE [3]	D 1693	>5000 hrs.	>5000 hrs.
NOTCH TENSILE (PENT)	F 1473	>10,000 hrs.	>10,000 hrs.
CELL CLASSIFICATION	D 3350	445576C	445576C

[1] 190°C21600 g

[2] 2% Secant-Method 1

[3] Condition C

Available in Size 3/4" - 6"
SDR 9 - 17.

Centennial Plastics is an ISO 9001 certified company.
CenFuse is certified by NSF.
CenFuse meets AWWA C901 and C906 Requirements.
CenFuse HDPE 4710 is certified by NSF Standards 14 and 61.

CENTENNIAL PLASTICS INC. I 1830 CENTENNIAL AVENUE I HASTINGS, NE 68901
PHONE: (866) 851-2227 I FAX: (402) 462-5529
WWW.CENTENNIALPLASTICS.COM

W-751021-A
August 15, 2014

BULLET U-BEND 4710
HDPE MATERIAL DATA SHEET

BULLET U-BEND 4710 HDPE MEETS OR EXCEEDS:
ASTM D 3350, CELL CLASSIFICATION PE 445576C

BULLET U-BEND 4710 FOR:
USE IN MANUFACTURE OF BULLET U-BEND FIITTING.

NOMINAL PIPE PROPERTIES

	ASTM METHOD	ENGLISH UNITS	SI UNITS
DENSITY (BLACK)	D 4883	-	.959 g/cc
MELT INDEX [1]	D 1238	-	8.5 g/10 min
HYDROSTATIC DESIGN BASIS @ (23° C)	D 2837	1600 psi	11.0 MPa
HYDROSTATIC DESIGN BASIS @ (60° C)	D 2837	1000 psi	6.9 MPa
CARBON BLACK CONCENTRATION	D 1603	2.30%	2.30%

NOMINAL RAW MATERIAL PROPERTIES

TENSILE STRENGTH			
@ YIELD (2 in/min)	D 638	3625 psi	25.0 MPa
@ BREAK (2 in/min)	D 638	5500 psi	38.0 MPa
ELONGATION			
@ BREAK (2 in/min)	D 638	>600%	>600%
FLEXURAL MODULUS [2]	D 790	150,000 psi	1,035 MPa
NOTCHED IZOD IMPACT STRENGTH	D 256	9.0 ft-lbf/in	0.49 kJ/m
HARDNESS (SHORE D)	D 2240	66	66
VICAT SOFTENING POINT	D 1525	259° F	126° C
BRITTLENESS TEMPERATURE	D 746	<-180° F	<-118° C
ENVIRONMENTAL STRESS CRACK RESISTANCE [3]	D 1693	>5000 hrs.	>5000 hrs.
NOTCH TENSILE (PENT)	F 1473	>10,000 hrs.	>10,000 hrs.
CELL CLASSIFICATION	D 3350	445576C	445576C

[1] 190°C21600 g
[2] 2% Secant-Method 1
[3] Condition C

Centennial Plastics is an ISO 9001 certified company.
CenFuse is certified by NSF.
CenFuse meets AWWA C901 and C906 Requirements.
CenFuse HDPE 4710 is certified by NSF Standards 14 and 61.

CENTENNIAL PLASTICS INC. I 1830 CENTENNIAL AVENUE I HASTINGS, NE 68901
PHONE: (866) 851-2227 I FAX: (402) 462-5529
WWW.CENTENNIALPLASTICS.COM

W-751021-A
March 17, 2016
Supersedes: August 15, 2014

50 Year Warranty

Centennial Plastics Inc. warrants to the original retail purchaser that in the event the CenFuse HDPE Earth Loop which includes the Pipe, fitting and fusion joint ("Earth Loop") purchased at the time of delivery of this Limited Warranty fails to perform in accordance with its specifications due to a defect in the materials or workmanship of the "Earth Loop"within fifty (50) years from the date of the original retail purchase of the "Earth Loop", Centennial Plastics Inc. will provide to the holder of the Limited Warranty the following:

1. Replacement "Earth Loop" of substantially equivalent or better quality freight prepaid;

2. The cost of reasonable direct labor charges up to One Dollar ($1.00) per linear foot incurred by the holder of the Limited Warranty for the removal of the defective "Earth Loop" and its replacement.

THIS LIMITED WARRANTY IS THE EXPRESS WARRANTY RELATING TO THE "Earth Loop". THE LIMITED WARRANTY IS THE ONLY WARRANTY ISSUED BY CENTENNIAL PLASTICS INC. FOR THE DUAL COIL AND IS ISSUED IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

The limited Warranty is not applicable in the event of installation and/or use of the "Earth Loop" by the holder of the Limited Warranty or any third party which is not in accordance with the specifications for installation and use of the "Earth Loop", and is not applicable with respect to any failure in performance of the "Earth Loop" which is due in whole or in part to any reason other than a defect in the materials or workmanship of the "Earth Loop".

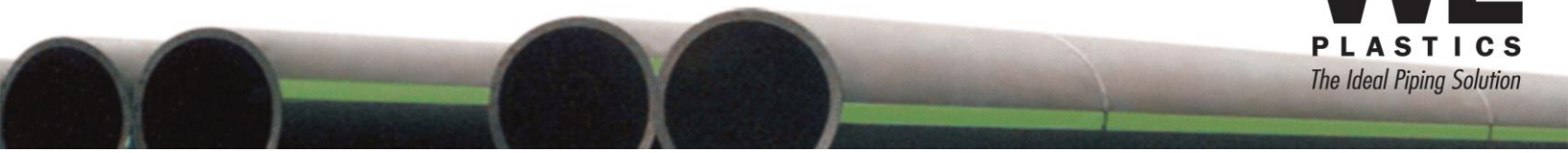
If the "Earth Loop" fails to perform in accordance with its specifications due to a defect in the materials or workmanship of the "Earth Loop" within fifty (50) years from the date of original retail purchase of the "Earth Loop", the holder of the Limited Warranty shall submit to Centennial Plastics Inc. written notice of the defect and a sample of the defective "Earth Loop", clearly identifiable as CenFuse HDPE, Centennial Fitting and fusion joint within thirty (30) days after the defect becomes or should become known to the holder. Written notice and the sample must be sent to:

Centennial Plastics Inc.
1830 Centennial Avenue
Hastings, NE 68901

This Limited Warranty is not transferable or assignable by the original retail purchaser of the "Earth Loop".

THIS IS THE SOLE AND EXCLUSIVE REMEDY OFFERED BY CENTENNIAL PLASTICS INC. FOR THE "Earth Loop". CENTENNIAL PLASTICS INC. WILL NOT BE LIABLE FOR ANY OTHER COSTS ASSOCIATED WITH FAILURE OR PERFORMANCE OF THE "Earth Loop". WHICH MAY ARISE, INCLUDING BUT NOT LIMITED TO, ANY SPECIAL, CONSEQUENTIAL OR INCIDENTAL DAMAGES BASED UPON BREACH OF WARRANTY, BREACH OF CONTRACT, NEGLIGENCE, STRICT TORT LIABILITY, OR OTHER LEGAL THEORY.

WL106B PE4710 PIPE COMPOUND



Typical Physical Properties for WL Plastics PE4710 Pipe Compound

- WL Plastics PE4710 pipe is manufactured from pressure rated PE4710 polyethylene compounds that meet or exceed ASTM D 3350 requirements and Cell Classification PE445574C. WL Plastics PE4710 compound meets or exceed ASTM D3350 requirements and Cell Classification PE345464C and material code designations PE3608 and PE3408
- WL Plastics PE4710 polyethylene pipe compounds are Listed by PPI in TR-4 and are stress rated for pressure pipe with PPI HDS ratings for water at 73°F (23ºC) and PPI HDB ratings at 73°F (23°C) and 140°F (60ºC)
- WL Plastics PE4710 exceeds PPI TR-3 and ASTM D3350 SCG resistance requirements per ASTM F 1473 (PENT). WL Plastics PE4710 ductility is substantiated with greater than 438,300 hours (50 years) at 73ºF (23ºC) before the onset of SCG.
- For potable water service, WL Plastics PE4710 black polyethylene compounds are certified to NSF-61

Physical Property	*Test Method*	*Typical Value*[(1)]
Cell classification (black compound)	ASTM D3350	PE445574C
Melt Index (190/2.16)	ASTM D1238	0.1 g/10 min
High Load Melt Index[(2)](190/21.6)	ASTM D1238	4 – 20 g/10 min
Density with 2% minimum carbon black (73°F/23°C)	ASTM D792	0.960 g/cm^3
Tensile strength at yield (2 in/min; 73°F/23°C)	ASTM D638	3500 < 4000 psi
Tensile elongation (2 in/min; 73°F/23°C)	ASTM D638	>700%
Flexural modulus (73°F/23°C)	ASTM D790	110,000 < 160,000 psi
SCG Resistance, PENT (80°C, 2.4 MPa)	ASTM F1473	> 2500 h[(4)]
Thermal stability	ASTM D3350	>428ºF (> 220°C)
Brittleness temperature	ASTM D746	<-103°F (<-75ºC)
Thermal expansion coefficient	ASTM D696	9 x 10^{-5} in/in/°F
HDB[(3)] at 140°F (60ºC)	ASTM D2837/PPI TR-3	1000 psi (6.9 MPa)
HDS[(3)] for water at 73°F (23ºC)	ASTM D2837/PPI TR-3	1000 psi (6.9 MPa)
HDS for water at 140ºF (60ºC)	ASTM D2837/PPI TR-3	630 psi (4.3 MPa)
RCP Resistance, Critical Pressure at 32ºF (0ºC)	ISO 13477	>174 psi (>1.2 MPa)[(4)]
RCP Resistance, Critical Temp. at 72.5 psi (0.5 MPa)	ISO 13477	<2ºF (<-17ºC)[(4)]

Contact WL Plastics Customer Service for availability. (1) Typical values determined from laboratory tests of samples of compounds (resins) prepared as plaque specimens in accordance with industry standard test methods. Values determined on samples prepared from pipe may vary. The typical values presented herein are for PE4710 polyethylene pipe compounds (resins) but do not constitute engineering properties for pipe. (2) Overall range of HLMI values for all compounds from all WL Plastics compound suppliers; HLMI variation for an individual compound will be well within the overall range. (3) Listed HDB and HDS ratings in accordance with ASTM D 2837 and PPI TR-3 are published in PPI TR-4 by the compound manufacturer (independent listing) and by WL Plastics (dependent listing). WL Plastics dependent listing compounds are identified by a compound code for the supplier: D (Dow); E (Lyondell Basell); S (Ineos); T (Total); C (Chevron-Phillips). (4) RCP data not available for compound code C.

ISO 9001:2008 Certified

CASPER PLANT: 2075 North Pyrite ● P. O. Box 1120 ● Mills, WY 82644 ● **Customer Service 307-472-6000** ● Fax: 307-472-6200
CEDAR CITY PLANT: 4660 W. Highway 56 ● P. O. Box 627 ● Cedar City, UT 84721 ● **Customer Service 435-867-8908** ● Fax: 435-865-2703
ELIZABETHTOWN PLANT: 2151 West Park Road ● Elizabethtown, KY 42702 ● **Customer Service: 270-765-1020** ● Fax: 270-765-1030
BOWIE PLANT: 1110 Old Wise Road ● PO Box 32 ● Bowie, TX 76230 ● **Customer Service 940-872-8300** ● Fax: 940-872-8304
SNYDER PLANT: 2160 South Business 84 ● Snyder, TX 79549 ● **Customer Service: 325-574-6100**
CROSSFIELD PLANT: PO Box 860 ● 1030 Western Drive ● Crossfield, AB T0M 0S0 Canada ● **Customer Service 403-946-0202** ● Fax: 403-946-0252

WL116 WL Plastics Pipe Standards

Industry Standards for WL Plastics Pipe

WL Plastics HDPE pipe is produced to Customer Purchase Order specifications, and may be limited by industry standards and third party certifications. WL Plastics typically manufactures pipe in accordance with the API, ASTM, AWWA, FM, NSF and AASHTO standards listed below. Upon request and review by WL Plastics prior to order, pipe may be special order manufactured to other industry standards, or custom standards, or proprietary standards or specifications. Contact WL Plastics Customer Service for information, pricing, and availability. Some lower DR's are not available in larger sizes. *Related WL Plastics literature*: IPS Pipe Sizes – WL102A, WL102B; DIPS (DIOD) Pipe Sizes – WL104; PE Compounds – WL106A, WL106B; Internal, surge and external (vacuum) pressure ratings – WL118.

Industry standards are for different service applications, may or may not be compatible with each other, and differ in requirements for materials, sizes, dimensions, tolerances, performance and marking; therefore, pipe made to an industry standard for one service application may be unsuitable for a different service or application although the material and size may be the same. Regulations and Codes frequently require compliance with specific standards, and pipe not so marked may be unacceptable to the jurisdictional authority. Before placing an order, confirm that the pipe specified is acceptable to the jurisdictional authority. WL Plastics offers pre-sale specification review service without charge. Upon receipt, inspect and verify that the pipe received conforms to the Customer Purchase Order. All sales are subject to WL125 WL Plastics Terms and Conditions of Sale.

Industry Standard	Table Notes	Sizing System	OD Size	DR	Application
API 15LE	1	IPS	¾ – 54 in	7 – 32.5	Oil &gas gathering
ASTM D 2513	1, 2	IPS	¾ - 24 in	7 – 32.5	Gas gathering
ASTM F 2619	1	IPS	¾ – 54 in	7 – 32.5	Oil & gas gathering
ASTM D 3035	3, 4, 7	IPS	¾ - 24 in	7 – 32.5	Pressure & non-pressure fluids; municipal & industrial water; sewer & culvert; rehabilitation; geothermal; heat transfer
ASTM F 714	1, 3, 4, 7	IPS	3 – 54 in	7 – 32.5	
		DIPS	4 – 30 in	Class 100, 150, 200, 250, 300, 350	
AWWA C901	3, 4, 7	IPS	¾ – 3 in	9 – 21	Water service & distribution
AWWA C906	3, 5, 7	IPS	4 – 54 in	7.3 – 32.5	Water distribution & transmission
	3, 5	DIOD (DIPS)	4 – 30 in	Class 100, 150, 200, 250, 300, 350	
FM1613	5, 6	IPS	4 – 36 in	Class 150, 200, 267	Underground fire main
NSF-61 & 14	1, 7	(See table notes)			Potable water
AASHTO M-326	8	IPS	12 – 54 in	26, 32.5, 41	Sewer & culvert sliplining
CSA B137.1	7	NPS	2 – 6	Series 50-200	Potable Water

1. PE pipe for non-jurisdictional oil and gas gathering may be API 15LE and/or ASTM D2513 and/or ASTM F2619 and/or ASTM F714. Jurisdictional gas gathering in the US requires ASTM D2513. Jurisdictional gas gathering in Canada requires API 15LE. ***ASTM D2513, API 15LE and ASTM F2619 pipe is not for potable water use that is subject to municipal code regulations. NSF potable water certification is not available for API 15LE, ASTM D2513 and ASTM F2619 pipe.***
2. WL Plastics ASTM D2513 PE pipe for gas distribution in the US is available on special order only. ***Per ASTM D2513, optional yellow stripes are available; colors other than yellow are not permitted.***
3. General purpose PE pipe may be ASTM F714 and/or ASTM D3035 and/or AWWA C901 and/or AWWA C906 and/or AASHTO M-326. When produced to comply with more than one standard, compatibility is limited to the most restrictive application, material, size, DR and requirement(s) in the compatible standards. General purpose PE pipe is not allowed in jurisdictional gas gathering, gas distribution or gas transmission.
4. OD controlled sizes only. Compatible with 3-in and smaller ASTM D3035, and 3-in ASTM F714.
5. Pipe manufactured using PE4710, but PC rated as PE3408; PE4710 ratings not applicable.
6. By certification agreement with FM approvals, FM Approved pipe is manufactured in accordance with FM1613 and is available only in the sizes and pressure classes specified in WL130. Per FM1613, WL Plastics FM Approved pipe complies with AWWA C906-99. WL Plastics FM Approved pipe complies with NFPA 24. NSF-61 certification for potable water service fire main available upon request. Underground service only.
7. Potable water and geothermal applications require NSF-61 certified PE compound. Specify NSF-61 certification when ordering. NSF-14 certified pipe available from Elizabethtown, KY, and Crossfield, AB as follows (Note special sizes and some diameters and DR's excluded. Contact Customer Service for specific listing information.) – ASTM D3035 PE4710 IPS 2-24 DR 7-32.5; ASTM F714 PE4710 IPS 3-24 DR 7.3-41; AWWA C901 PE4710 IPS 2-3 DR 7.3-21; AWWA C906 PE3608 IPS 4-24 DR 7.3-32.5; CSA B137.1 PE4710 NPS 3-6 Series 50-200.
8. AASHTO M-326 PE pipe is limited to rehabilitation lining applications; available in DR 26 and 32.5; DR 41 special order.

WL102B – IPS PIPE SIZES & PRESSURE RATINGS – PE4710

CONTACT WL PLASTICS CUSTOMER SERVICE TO CONFIRM AVAILABILITY AND FOR SIZES AND DR'S NOT SHOWN. SEE FOOTNOTES ON PAGE 2.

IPS SIZE[A]	AVG OD, in	DR	7	7.3	9	11	13.5	15.5	17	19	21	26	32.5
		PR[B], psi	336	320	252	202	161	139	126	112	101	81	64
		Min wall, in	0.188	0.180	0.146	0.120							
1	1.315	Avg ID[C], in	0.917	0.933	1.005	1.062							
		Weight, lb/ft	0.288	0.278	0.232	0.195							
		Min wall, in	0.237	0.227	0.184	0.151							
1 1/4	1.660	Avg ID[C], in	1.157	1.178	1.269	1.340							
		Weight, lb/ft	0.459	0.442	0.369	0.310							
		Min wall, in	0.271	0.260	0.211	0.173							
1 1/2	1.900	Avg ID[C], in	1.325	1.348	1.452	1.534							
		Weight, lb/ft	0.600	0.580	0.485	0.406							
		Min wall, in	0.339	0.325	0.264	0.216	0.176	0.153	0.140				
2	2.375	Avg ID[C], in	1.656	1.685	1.816	1.917	2.002	2.050	2.079				
		Weight, lb/ft	0.939	0.906	0.758	0.634	0.526	0.462	0.425				
		Min wall, in	0.411	0.394	0.319	0.261	0.213	0.185	0.169				
2 ½	2.875	Avg ID[C], in	2.004	2.040	2.198	2.321	2.424	2.482	2.516				
		Weight, lb/ft	1.377	1.329	1.109	0.928	0.771	0.677	0.622				
		Min wall, in	0.500	0.479	0.389	0.318	0.259	0.226	0.206	0.184	0.167		
3	3.500	Avg ID[C], in	2.440	2.484	2.676	2.825	2.950	3.021	3.064	3.109	3.147		
		Weight, lb/ft	2.040	1.968	1.646	1.376	1.141	1.006	0.923	0.830	0.757		
		Min wall, in	0.643	0.616	0.500	0.409	0.333	0.290	0.265	0.237	0.214	0.173	0.138
4	4.500	Avg ID[C], in	3.137	3.193	3.440	3.633	3.793	3.885	3.939	3.998	4.046	4.133	4.206
		Weight, lb/ft	3.372	3.253	2.720	2.275	1.887	1.660	1.526	1.374	1.247	1.018	0.819
		Min wall, in	0.795	0.762	0.618	0.506	0.412	0.359	0.327	0.293	0.265	0.214	0.171
5	5.563	Avg ID[C], in	3.878	3.947	4.253	4.491	4.689	4.802	4.869	4.942	5.001	5.109	5.200
		Weight, lb/ft	5.154	4.975	4.156	3.479	2.886	2.540	2.328	2.100	1.909	1.557	1.254
		Min wall, in	0.946	0.908	0.736	0.602	0.491	0.427	0.390	0.349	0.315	0.255	0.204
6	6.625	Avg ID[C], in	4.619	4.701	5.064	5.348	5.585	5.719	5.799	5.886	5.956	6.085	6.193
		Weight, lb/ft	7.305	7.059	5.894	4.930	4.095	3.599	3.307	2.978	2.703	2.209	1.781
		Min wall, in							0.419	0.375	0.339	0.274	0.219
7	7.125	Avg ID[C], in							6.236	6.330	6.406	6.544	6.660
		Weight, lb/ft							3.821	3.442	3.128	2.553	2.057
		Min wall, in	1.232	1.182	0.958	0.784	0.639	0.556	0.507	0.454	0.411	0.332	0.265
8	8.625	Avg ID[C], in	6.013	6.120	6.593	6.963	7.271	7.445	7.549	7.663	7.754	7.922	8.062
		Weight, lb/ft	12.385	11.963	9.988	8.359	6.939	6.100	5.597	5.044	4.591	3.744	3.012
		Min wall, in	1.536	1.473	1.194	0.977	0.796	0.694	0.632	0.566	0.512	0.413	0.331
10	10.750	Avg ID[C], in	7.494	7.628	8.218	8.678	9.062	9.280	9.409	9.551	9.665	9.873	10.049
		Weight, lb/ft	19.245	18.581	15.515	12.983	10.774	9.490	8.695	7.838	7.128	5.805	4.689
		Min wall, in	1.821	1.747	1.417	1.159	0.944	0.823	0.750	0.671	0.607	0.490	0.392
12	12.750	Avg ID[C], in	8.889	9.047	9.747	10.293	10.748	11.006	11.160	11.327	11.463	11.710	11.918
		Weight, lb/ft	27.062	26.138	21.837	18.267	15.155	13.348	12.238	11.021	10.023	8.169	6.587
		Min wall, in	2.000	1.918	1.556	1.273	1.037	0.903	0.824	0.737	0.667	0.538	0.431
14	14.000	Avg ID[C], in	9.760	9.934	10.702	11.302	11.801	12.085	12.254	12.438	12.587	12.858	13.087
		Weight, lb/ft	32.635	31.511	26.329	22.030	18.279	16.082	14.763	13.292	12.093	9.848	7.952

Material Safety Data Sheet
WL Plastics Polyethylene Pipe
All Grades – All Colors – All Materials
MSDS #: WL131

Section 1 – Product and Company identification

Product Name	WL Plastics polyethylene pipe
MSDS #	WL131
Product Description	Polyethylene pipe (various colors, and with and without external color stripes, and with and without internal color layer)
Product Use	Component for conveying gases, liquids and other fluid media
Company Identification	WL Plastics Corporation 3575 Lone Star Cir, Ste 315 Fort Worth, TX 76177
	Product Information: 1-435-867-8908 Technical Information: 1-435-867-8908 General Information: www.wlplastics.com
24-Hour Emergency Telephone Number	CHEMTREC – 1-800-424-9300

Section 2 – Composition / Information on Ingredients

INGREDIENT NAME	CAS NUMBER	AMOUNT
Polyethylene	9002-88-4	> 96% by weight
Polyethylene Hexene Copolymer	25213-02-9	> 96% by weight
Polyethylene Butene Copolymer	25807-34-7	> 96% by weight
May include carbon black	1333-86-4	0 - 4% by weight
May include cadmium sulphide pigment	1306-23-6	< 0.1% by weight
May include lead chromate pigment	1344-37-2	0 - 1% by weight
May include flux calcined diatomaceous earth	68855-54-9	<1% by weight
May include crystalline silica (cristobalite)	14464-46-1	<1% by weight

Section 3 – Hazards Identification

Emergency Overview

Physical Appearance:

- Black polyethylene pipe
- Black polyethylene pipe with external longitudinal contrasting color stripes
- Black polyethylene pipe with contrasting internal color layer
- Yellow polyethylene pipe
- Yellow polyethylene pipe with external longitudinal contrasting color stripes
- Polyethylene pipe is supplied in straight lengths or coils

Hazards of Product

- This product is not a “Hazardous Chemical” as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.
- Injury or death can result from product falling from a height or unexpected movement during storage, unloading or handling. Call 1-435-867-8908 for unloading and handling instructions or obtain unloading and handling instructions from www.wlplastics.com.
- Product surface can be slippery especially if there is water, snow or ice on the surface. Do not walk on product.
- May contain an ingredient that can cause cancer. See Section 11. Not expected to be harmful if all recommendations in this MSDS are followed. See Section 7 and Section 8.
- EYE: Not expected to cause prolonged or significant eye irritation. If this material is heated, thermal burns may result from eye contact.
- SKIN: Contact with the skin is not expected to cause prolonged or significant irritation or cause an allergic skin response. If this material is heated, thermal burns may result from skin contact.
- INHALATION: Not expected to be harmful if inhaled. If this material is heated, fumes may be unpleasant and produce nausea and irritation of the upper respiratory tract.
- INGESTION: Not expected to be harmful if swallowed.

Section 4 – First Aid Measures

Eye contact: Hot material: Flush eyes with plenty of cold water for at least 15 minutes. Do not remove contact lenses if worn. Seek medical assistance for mechanical removal of this material from the eye. The use of flush fluid, other than water, is not recommended.
Cold material: Flush eyes with plenty of cold water. Get medical attention if irritation occurs.

Skin contact: Hot material: If burned by contact with hot material, flush skin immediately with large amounts of cold water. If possible, submerge area in cold water. No attempt should be made to detach polymer adhering to the skin or to remove clothing attached with molten material. Thermal burns require immediate medical attention.
Cold material: Wash with soap and water.

Inhalation: If affected by fumes from heated material, remove from source of exposure and move the affected person into fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Ingestion: Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately.

Section 5 – Fire Fighting Measures

Flammability of the Product:	May be combustible at high temperatures.		
NFPA	Health: 0	Flammability: 1	Instability: 0
HMIS	Health: 0	Flammability: 1	Instability: 0
Auto-ignition temperature:	Greater than 343°C (649°F)		
Flash point:	Above 300°C (572°F) decomposition occurs and flash of fumes may occur.		
Products of combustion:	Products of combustion are carbon oxides (CO, CO_2). May also contain low levels of aldehydes, ketones, organic acids or hydrocarbons.		
Unusual fire/explosion hazards:	High dust concentrations have a potential for combustion or explosion. This material is not explosive as defined by established regulatory criteria.		
Fire-fighting media and instructions:	In case of fire, use water spray (fog), foam or dry chemicals. Do not use water jet.		
Protective clothing (fire):	Fire-fighters should wear positive pressure self-contained breathing apparatus (SCBA) and full turnout gear.		

Section 6 – Accidental Release Measures

Protective measures: Eliminate sources of ignition in vicinity of spilled material.

Spill management: If heated material is spilled, allow it to cool before proceeding with disposal methods. Shavings, chips or segments from cutting and cooled, spilled heated material may cause a slipping hazard. Isolate and contain to prevent entry into sewers and waterways. Sweep or vacuum shavings, chips, segments and cooled heated material and place in appropriate containers for disposal. Recycle where possible. Use appropriate safety equipment.

Reporting: USA regulations may require reporting spills of this material that could reach any surface waters. Report spills to local authorities and/or the National Response Center at (800) 424-8802 as appropriate or required.

Section 7 – Handling and Storage

Read and observe all precautions published in WL101 *Joining And Field Procedures For Pipe* and WL111 *Unloading Guidelines For WL Plastics Polyethylene Pipe*. Call 1-435-867-8908 to obtain copies of WL101 and WL111 or obtain copies from www.wlplastics.com.

Section 7 – Handling and Storage (continued)

Precautionary measures: Avoid heated material contact with eyes, skin and clothing. Avoid breathing vapor or fumes from heated material.

Unusual handling hazards: Potentially toxic / irritating fumes may evolve from heated material. At high temperatures, above 177°C (350°F), polyethylene can release vapors and gases that are irritating to mucous membranes of the eyes, mouth, throat and lungs. These substances may include acetaldehyde, acetone, acetic acid, formic acid, formaldehyde and acrolein. Based on animal data and limited epidemiological evidence, NTP, IARC (2A) and OSHA have listed formaldehyde as a probable human carcinogen. Following all recommendations within this MSDS should minimize exposure to thermal processing emissions.

Section 8 – Exposure Controls and Personal Protection

Exposure limits:	Component	Exposure Limits	Form
	Particulates (Insoluble) Not Otherwise Specified (PNOS)	10 mg/m3 TWA8 ACGIH	Inhalable fraction Particulate matter containing no asbestos and crystalline silica <1%
		3 mg/m3 TWA8 ACGIH	Respirable fraction Particulate matter containing no asbestos and crystalline silica <1%
		5 mg/m3 TWA8 OSHA	Respirable fraction
		15 mg/m3 TWA8 OSHA	Total dust
Personal protection:	Respiratory Protection:	Use NIOSH-Approved respirator if unable to control airborne dust, fumes and vapor.	
	Ventilation:	Local exhaust ventilation is recommended for control of airborne dust, fumes and vapor, especially in confined areas.	
	Other Protective Equipment:	Wear gloves and suitable eye protection.	

Engineering controls: If dust is generated, provide local exhaust ventilation to keep exposure to airborne contaminants below exposure limits.

Section 9 – Physical and Chemical Properties

Physical state and appearance:	Polyethylene pipe is supplied in straight lengths or coils as black polyethylene pipe, or black polyethylene pipe with external longitudinal contrasting color stripes, or black polyethylene pipe with contrasting internal color layer, or yellow polyethylene pipe, or yellow polyethylene pipe with external longitudinal contrasting color stripes.
Odor:	Negligible
pH:	NA
Vapor pressure:	NA
Vapor density (air = 1)	NA
Boiling point:	NA
Solubility (in water):	Insoluble in water
Melting point:	100 - 135°C (212 - 275°F)
Specific gravity:	0.93 – 0.99
Density:	0.93 – 0.99 g/cm3

Section 10 – Stability and Reactivity

Chemical stability:	This material is considered stable under ambient temperature and pressure and normally anticipated storage and handling conditions.
Conditions to avoid:	Avoid heating above recommended processing temperature.
Incompatibility with other materials:	None
Hazardous decomposition products:	Carbon oxides
Hazardous polymerization:	Hazardous polymerization will not occur

Section 11 – Toxicological Information

Immediate Health Effects:

Acute oral toxicity:	LD50 / Not known
Acute dermal toxicity:	LD50 / Not known
Acute inhalation toxicity:	LD50 / Not known
Eye irritation:	Not expected to be irritating to the eyes.
Skin irritation:	Not expected to be irritating to the skin.
Sensitization:	Dermal – not a sensitizer / human
Additional toxicological information:	o This product contains POLYMERIZED OLEFINS. During thermal processing (>177°C; >350°F) polyethylene can release vapors and gases (aldehydes, ketones and organic acids) that are irritating to the mucous membranes of the eyes, mouth, throat, and lungs. Generally these irritant effects are transitory. However, prolonged exposure to irritating off-gases can lead to pulmonary edema. Formaldehyde (an aldehyde) has been classified as a probable human carcinogen by NTP, IARC (2A) and OSHA based on animal data and limited epidemiological evidence. o Pigments containing carbon black, lead chromate, nickel, antimony or titanium compounds may have been incorporated into this product. The International Agency for Research on Cancer (IARC) has classified carbon black as a Group B carcinogen (possibly carcinogenic to humans) based on sufficient evidence in animals and inadequate evidence in humans. However, the pigments in this product are bound in a polymer matrix that severely limits its extractability, bioavailability and toxicity. The lead chromate pigment is also silica-encapsulated as well as bound in a polymer matrix. None of these pigments is likely to cause adverse health effects under recommended conditions of use. o Product marked “NSF-61” is safe for use with potable water (drinking water for human consumption).

Section 12 – Ecological Information

Ecotoxicity:	This material is not expected to be harmful to aquatic organisms.
Environmental fate:	This material is not expected to be readily biodegradable.
Mobility:	This product has not been found to migrate through soils.
Persistence and degradability:	This product does not readily degrade. Under normal oxidation conditions, >99% of polyethylene will remain intact after exposure to microbial actions. Product will slowly change (embrittle) in the presence of sunlight, but will not fully break down. Product buried in landfill has been found to be stable over time. No toxic degradation products are known to be produced.
Other ecological information:	Wildlife may ingest waste cuttings, shavings, segments or chips. Although not toxic, such materials may physically block the digestive system, causing starvation or death.

Section 13 – Disposal Considerations

Disposal consideration / Waste information: Recycle to process if possible. Waste cuttings, segments, chips and shavings should be swept up or vacuumed and placed in appropriate containers for disposal and to avoid runoff into waterways. This product as manufactured is a non-hazardous waste but may become contaminated upon use. If this material must be discarded, depending upon use and application, it may meet the criteria as hazardous waste as defined by the US EPA under RCRA (40 CFR 261) or other State or Local regulations. Consult an environmental professional to determine if local, regional or national regulations would classify this material or contaminated material as hazardous waste. Use only approved transporters, recyclers, treatment, storage or disposal facilities. Dispose of in accordance with all applicable National, State, Provincial and Local regulations.

Section 14 – Transport Information

US DOT	Not regulated as hazardous material or dangerous goods for transportation.
ICAO /IATA	Not regulated as hazardous material or dangerous goods for transportation.
IMO / IMDG	Not regulated as hazardous material or dangerous goods for transportation.
RID / ADR	Not regulated as hazardous material or dangerous goods for transportation.
TDG	Not regulated as hazardous material or dangerous goods for transportation.
Other transportation information:	The description shown may not apply to all shipping situations. Consult appropriate Dangerous Goods Regulations for additional description requirements (e.g., technical name) and mode-specific or quantity-specific shipping requirements.

Section 15 – Regulatory Information

SARA 311/312 Categories:	Immediate (acute) health effects	No
	Delayed (chronic) health effects	No
	Fire hazard	No
	Sudden release of pressure hazard	No
	Reactivity hazard	No

Regulatory Status:

Country	Inventory	Status
Australia	AICS	All components are included or otherwise exempt from inclusion on this inventory.
Canada	DSL	All components are included or otherwise exempt from inclusion on this inventory.
Canada	NDSL	
China	IECS	All components are included or otherwise exempt from inclusion on this inventory.
European Union	EINECS	All components are included or otherwise exempt from inclusion on this inventory.
European Union	ELINCS	
European Union	NLP	
Japan	ENCS	All components are included or otherwise exempt from inclusion on this inventory.
Korea	ECL	All components are included or otherwise exempt from inclusion on this inventory.
Philippines	PICCS	All components are included or otherwise exempt from inclusion on this inventory.
United States	TSCA	All components are included or otherwise exempt from inclusion on this inventory.

Regulatory Lists:

01 = CA Prop 65 18 = FDA 179 35 = RCRA Waste P-List

Regulatory Lists (continued):

02 = LA RTK	19 = FDA 180	36 = RCRA Waste U-List
03 = MA RTK	20 = FDA 181	37 = SARA Section 311/312
04 = MN Hazardous Substance	21 = FDA 182	38 = SARA Section 313
05 = NJ RTK	22 = FDA 184	39 = TSCA 12 (b)
06 = PA RTK	23 = FDA 186	40 = TSCA Section 4
07 = CAA Section 112 HAPs	24 = FDA 189	41 = TSCA Section 5(a)
08 = CWA Section 307	25 = IARC Group 1	42 = TSCA Section 8(a) CAIR
09 = CWA Section 311	26 = IARC Group 2A	43 = TSCA Section 8(a) PAIR
10 = DOT Marine Pollutant	27 = IARC Group 2B	44 = TSCA Section 8(d)
11 = FDA 172	28 = IARC Group 3	45 = WHIMS - IDL
12 = FDA 173	29 = IARC Group 4	46 = Germany D TAL
13 = FDA 174	30 = NTP Carcinogen	47 = Germany WKG
14 = FDA 175	31 = OSHA Carcinogen	48 = DEA List 1
15 = FDA 176	32 = OSHA Highly Hazardous	49 = DEA List 2
16 = FDA 177	33 = RCRA Waste Appendix VIII	
17 = FDA 178	34 = RCRA Waste D-List	

The following components of this material are found on the regulatory lists indicated:

Polyethylene	4
May include: carbon black	1, 3, 4, 5, 6, 27, 45
May include: lead chromate pigment	1, 3, 4, 5, 6, 25, 26, 30, 34, 38, 39, 45, 46

CERCLA reportable quantities (RQ) / SARA 302 threshold planning quantities (TPQ):

Component	Component RQ	Component TPQ	Product RQ
May include: lead chromate pigment	10 lbs	None	1000 lbs

WHMIS Classification:

This product is not considered a controlled product according to the criteria of the Canadian Controlled Products Regulations.

Section 16 – Other Information

Notice to reader:

NOTICE: This Material Safety Data Sheet is based on data considered to be accurate at the time of its preparation, but despite our efforts, it may not be up to date or applicable to the circumstances of any particular case. The information on this MSDS was obtained from sources that we believe are reliable. However, the information is provided without warranty, expressed or implied, regarding its correctness. Some information presented and conclusions drawn herein are from sources other than direct test data on the substance itself. The conditions or methods of handling, storage, use and disposal are beyond our control and may be beyond our knowledge. For this and other reasons, WL Plastics does not assume responsibility and expressly disclaims liability for loss, damage, injury or expense arising out of or in any way connected with handling, storage, use or disposal of this product, or resulting from abnormal use, or resulting from any failure to follow appropriate practices, or from hazards inherent in the nature of the product. If the product is used as a component in another product or system, this MSDS information may not be applicable.

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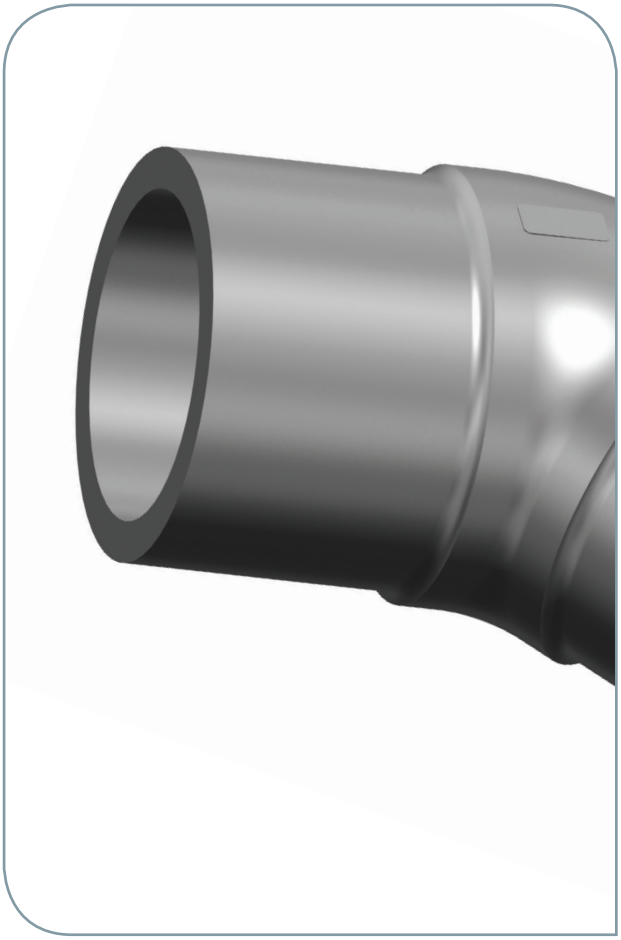
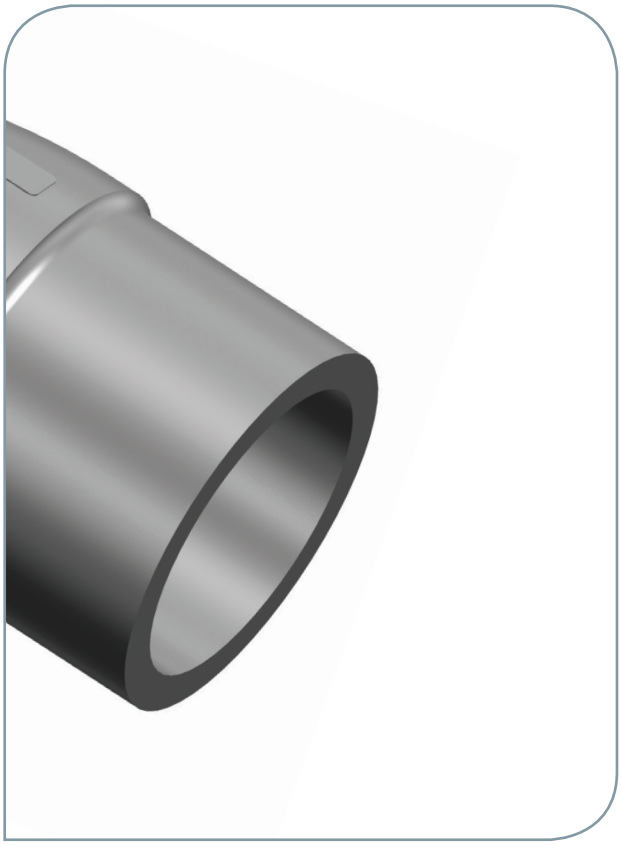




GEORG FISCHER
CENTRAL PLASTICS

CONVENTIONAL PE FUSION FITTINGS

+GF+

GEORG FISCHER
PIPING SYSTEMS

PRECISION IS CENTRAL.

As experts in pipe joining solutions, we know precision is vital to every fitting and how they are fused. We offer the most complete range of conventional fusion fittings, injection molded and tested in our state of the art manufacturing facilities to exacting quality standards.

Georg Fischer Central Plastics can custom build to suit your needs.

Gas | Water | Energy

UNRIVALED EXPERIENCE

Georg Fischer Central Plastics has taken the lead in creating pipe joining solutions since plastics were first used in the industry.

Since the early 1960s, researching and developing top of the line pipe fittings, and manufacturing them to perfection has been at the core of our business. We've learned a lot along the way, and are confident that when it comes to creating durable, leak-free piping systems we have the best solutions.

We have the broadest and most complete line of Butt, Saddle, and Socket Fusion Fittings available, all manufactured and tested in our facility in Shawnee, Oklahoma. Our high-capacity manufacturing plant, certified ISO 9001, is built around advanced technologies, including fully automated injection molding to ensure precision and quality.

With leading edge, in-house engineering design capabilities and testing facilities, we design and manufacture over 10,000 pipe joining solutions for the gas, water and energy sectors.

ADVANCED IN-HOUSE TESTING

Georg Fischer Central Plastics has a comprehensive in-house lab and testing facility. The following tests are performed on all of our Butt, Saddle and Socket fittings:

- ASTM D 1599 - Minimum Hydraulic Burst Pressure Test
- ASTM D 1598 - Sustained Pressure Test Results
- ASTM D638 Tensile Strength Test
- PE3408/PE4710 Fittings are tested to the requirements of AWWA C906 (where applicable)
- PE3408/PE4710 FM Tested and Approved (where applicable)

STATE-OF-THE ART MANUFACTURING

- Fully controlled production system
- ISO 9001 quality system
- High volume capabilities
- Robotic welding
- Fully-automated injection molding
- Tool & die facility
- Advanced powder coating system
- Many proprietary processes

Polyethylene is the ideal material to create leak-free systems with no connections to corrode or loosen.

Butt Fusion Fittings.

Call us for availability of other sizes and dimensions. Visit gfcp.com to view product details in our catalog.

~~MOLDED PE2406/PE2708:~~

- Manufactured and tested to the requirements of ASTM D2513 and ASTM D3261 and are sized for use with pipe conforming to ASTM D2513 and with Butt fittings con-forming to ASTM D3261.
- PE2406 /PE2708 Butt fittings are molded from a virgin yellow medium density resin in accordance with the material specifications listed in ASTM D3350 with a designation of PE2406/ PE2708.
- All PE2406/ PE2708 Butt Fittings are compatible for heat fusion with any pipe or fitting manufactured from a like or similar resin.
- PE2406/PE2708 fittings have been qualified for fusion using PPI generic fusion procedures.

MOLDED PE3408/PE4710:

- Manufactured and tested to the requirements of ASTM D2513, ASTM D3261, and ANSI/AWWA C906 for use with outside diameter controlled pipe and fittings conforming to ASTM D2513, ASTM D3035, ASTM F-714.
- Butt fittings are molded from an NSF listed resin in accordance with the material specifications listed in ASTM D3350 with a designation of PE3408/PE4710.
- GFCP PE3408/PE4710 Butt fittings are manufactured and tested to the requirements of ASTM D2513 and ASTM D3261 (where applicable) and are compatible for heat fusion with any pipe and or fitting manufactured from a like or similar resin.
- PE3408/PE4710 fittings have been qualified for fusion using PPI generic fusion procedures.

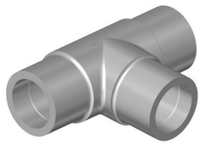
FEATURES:

- Pressure rated for natural gas and potable water applications
- IAPMO Approved (where applicable)
- CSA Approved (where applicable)
- PE3408/PE4710 FM Approved (where applicable)
- PE3408/PE4710 fittings are tested to the requirements of AWWA C906
- Can be joined by butt, socket, electrofusion or mechanical methods
- Can be heat fused with all conventional and electrofusion fusion methods

90º ELBOWS

~~PE2406/PE2708~~
¾" – 12" IPS
1" CTS

PE3408/PE4710
¾" - 12" IPS and 4" - 12" DIPS



TEES

PE2406/PE2708
¾" - 12" IPS
½" - 1" CTS

PE3408/PE4710
¾" - 12" IPS and ½" & 1" CTS and 4" - 12" DIPS

45º ELBOWS

PE2406/PE2708
3" – 12" IPS

PE3408/PE4710
2" – 12" IPS and 4" – 12" DIPS

REDUCERS

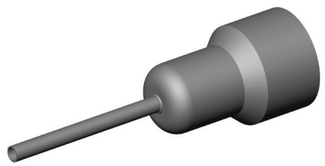
~~PE2406/PE2708~~ and PE3408/PE4710

Wide range of sizes and dimensions available.

END CAPS

PE2406/PE2708
½" – 12" IPS
½" - 1" CTS

PE3408/PE4710
½" & 1" CTS
¾" - 12" IPS



PURGE CAPS

Socket Fusion:
PE2406/PE2708
Main sizes 2"- 8" IPS
Outlet Sizes ½" & 1" CTS

Butt Fusion:
PE2406/PE2708
Main sizes 2"- 8" IPS
Outlet Sizes ½" & 1" CTS

Purge caps are available for socket fusion or butt fusion. Available with PE pups fused on (as shown) or without.

PURGE POINTS

PE2406/PE2708
1¼" & 2" IPS

PE 3408/PE4710
1¼" & 2" IPS

Socket Fusion Fittings.

Call us for availability of other sizes and dimensions. Visit gfcp.com to view product details in our catalog.

MOLDED PE2406/PE2708:

- Manufactured and tested to the requirements of ASTM D2513 and ASTM D2683 and are sized for use with pipe conforming to ASTM D2513.
- Molded from a virgin yellow medium density resin in accordance with the material specifications listed in ASTM D3350.
- Compatible for heat fusion with any pipe or fitting manufactured from a like or similar resin.
- PE2406/PE2708 fittings have been qualified for fusion using ASTM D2657 generic fusion procedures.

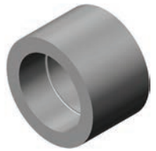
MOLDED PE3408/PE4710:

- Fully manufactured and tested to the requirements of ASTM D2513 and ASTM D2683
- Manufactured for use with outside diameter controlled pipe and fittings conforming to ASTM D2513 and ASTM F-714.
- Molded from a virgin black high density resin in accordance with the material specifications listed in ASTM D3350.
- PE3408/PE4710 Fusion fittings are manufactured and tested to the requirements of ASTM D2513 and ASTM D2683 and are compatible for heat fusion with any pipe and or fitting manufactured from a like or similar resin.
- PE3408/PE4710 fittings have been qualified for fusion using ASTM D2657 generic fusion procedures.

FEATURES:

- Pressure ratings up to SDR7 on most sizes
- IAPMO Approved (where applicable)
- CSA Approved (where applicable)
- Can be used with all socket fusion methods

COUPLINGS



PE 2406/PE2708
Main Size: ½" - 4" IPS
and½" & 1" CTS
PE 3408/PE4710
Main Size: ½" – 4" IPS
and ½" & 1" CTS

ELBOWS

~~PE2406/PE2708~~
Main Size: ½" - 4" IPS
and ½" & 1" CTS
PE 3408/PE4710
Main Size: ½" – 4" IPS
and ½" & 1" CTS

TEES

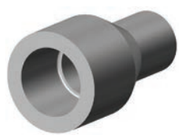
PE2406/PE2708
Main Size: ½" - 4" IPS
and ½" & 1" CTS
PE 3408/PE4710
Main Size: ½" – 4" IPS
and ½" & 1" CTS

REDUCING TEES

~~PE2406/PE2708~~
and PE 3408/PE4710

Wide range of sizes and dimensions available.

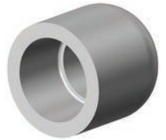
REDUCERS



PE2406/PE2708 and
PE 3408/PE4710

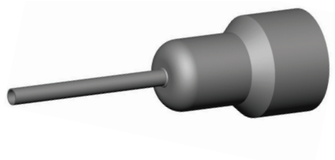
Wide range of sizes and dimensions available.

END CAPS



PE2406/PE2708
Main Size: ½" - 4" IPS
and ½" & 1" CTS
PE 3408/PE4710
Main Size: ½" – 3" IPS
and ½" CTS

PURGE CAPS



PE2406/PE2708
Main sizes 2"- 8" IPS
Outlet Sizes ½" & 1" CTS

PE Adapters.

Call us for availability of other sizes and dimensions. Visit gfcp.com to view product details in our catalog.

PE3408/PE4710:

- Manufactured and tested to the requirements of ASTM D3261 and ANSI/ AWWA C906 for use with pipe conforming to ASTM D2513/3035, F-714 and with Butt fittings conforming to ASTM D3261 as applicable.
- Molded from an NSF listed resin in accordance with the material specifications listed in ASTM D3350.
- Compatible for heat fusion with any pipe or fitting manufactured from a like or similar resin.

FEATURES:

- Pressure rated for municipal and industrial applications
- FM Approved (where applicable)
- Tested to the requirements of AWWA C906
- Can be heat fused using conventional and electrofusion fusion methods
- Can be beveled for butterfly valves when requested
- MJ Adapters can be provided with stiffeners when requested

GASKETED BALL VALVES

Nominal Size:
4" & 6" IPS
Outlet Size:
4" & 6" PSM
and 4" & 6" Sch 40

Full Port PE3408/PE4710
1 ¼" – 12" IPS
NSF rated
The trunnion-pin design allows easy opening and closing of valves in large diameter pressure
piping systems.

MJ ADAPTERS

PE 3408/PE4710
2" – 24" IPS to IPS
and 2" – 24" DIPS to DIPS
Beveled for Butterfly Valves available on request.
Standard 45° bevel unless otherwise specified by customer.
Gland Packs sold separately (includes gasket, ring and bolts).

FLANGE ADAPTER BACK-UP RINGS

PE 3408/PE4710
3/4" – 54" IPS and 3" – 30" DIPS
Beveled for Butterfly Valves available on request. Standard 45° bevel unless otherwise specified by customer.

3/4" – 54" IPS and 3" – 30" DIPS
Material: ASTM A536, GR 65/45/12
Standard: Convoluted Type, Ductile Iron, 150 lb. Drilling
Finish: Red Oxide Primer
Epoxy coated and stainless steel back-up rings available.

MJ ACCESSORY KITS

2"–24" IPS/DIPS
MJ Accessory Kits Include: ductile iron gland ring, rubber gasket, T-bolts & hex nuts

CARBON STEEL GLAND RING
14"–24" IPS/DIPS
MJ Accessory Kits Include: rubber gasket, T-bolts, heavy flat washers & hex nuts. Does not include gland ring – black carbon steel ring must be ordered separately.

+GF+

GEORG FISCHER
PIPING SYSTEMS

GEORG FISCHER CENTRAL PLASTICS

To build quality piping systems that are efficient, reliable and safe, you need pipe joining products & solutions with unparalleled integrity.

Georg Fischer Central Plastics is a global leader to the leading utilities and corporations around the world.

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39605 Independence
Shawnee, OK 74804
1.800.654.3872

Texas
4949 Joseph Hardin Drive
Dallas, TX 75236

South Carolina
217 Old Calhoun Falls Road
Abbeville, SC 29620

gfcp.com

Gas | Water | Energy

50 Year
Limited Warranty
of
Geothermal Polyethylene Fittings

Warranty. Central Plastics Company ("We," "us," or "our") warrants to Professional Installers the geothermal polyethylene fittings we manufactured for use in a closed-loop, geothermal heat pump system when properly installed in accordance with installation guidelines we from time to time issue and used under normal conditions, will be free from failure as a result of defects in workmanship or materials, for a period of 50 years from the date of manufacture.

Limitations. Our obligation to honor this Limited Warranty is subject to certain limitations, as follows:

- We will replace, free of charge and freight prepaid, a quantity of new fittings equal to that proved to be defective, after we have been provided reasonable written notice and an opportunity to inspect the defective fittings in question.

- During the first five years after the date of manufacture, we will, in addition to replacing any defective fittings, pay all reasonable direct labor charges for removing the defective fittings and replacing the same with new fittings. In no event will our liability hereunder exceed ten times the actual amount received by us for the original sale of the fittings.

- The warranties contained in this Limited Warranty are in lieu of all other express warranties, whether written or oral.

- The express warranties contained in this Limited Warranty are in lieu of any and all implied warranties of merchantability or fitness for a particular purpose. Notwithstanding the foregoing, any claim under an implied warranty must be made within one year from the date of sale.

- In no event will we be liable for loss of use, or incidental or consequential damages, under any legal theory and whether asserted by direct action, for contribution, indemnity or otherwise.

Procedure. In the event of a leak or other failure in the system, you must promptly notify us at the address below or call your customer service representative, identifying your claim as a warranty claim and providing us reasonable information to determine the nature of the claim. Any removal or replacement of our fittings for which we are liable for any direct labor charges must be performed by a professional installer approved in advance by us.

Other Matters. Other than this Limited Warranty, we do not authorize any person or firm to make any statements or warranties with regard to our products or to create any other obligations or liabilities in connection with our products. Some states do not allow the exclusion or limitation of damages in certain types of transactions, so the above exclusions or limitations may not apply to you. This Limited Warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

CENTRAL®

Central Plastics Company
1901 W. Independence Street
Shawnee, OK USA 74801

Phone: 405-273-6302
Fax: 405-273-5993

CIRCUIT MAKER GEOTHERMAL VAULT®

SUBMITTAL DOCUMENT

ISCO INDUSTRIES

GEOTHERMAL System Solutions

800-345-ISCO | www.isco-pipe.com

Specification for Circuit Maker Vault®

W/ Metal Valves

1. GENERAL

This specification shall govern the materials and fabrication of the Circuit Maker Vault®, a high-density polyethylene(HDPE) valve vault for geothermal applications as supplied by ISCO Industries, Inc (800/345-4726 or www.isco-pipe.com).

2. SCOPE OF WORK

These specification cover the fabrication and supply of the Circuit Maker Vault®, HDPE valve vault for geothermal use.

3. MATERIALS

The raw materials for the Circuit Maker Vault® shall be made from materials meeting the following requirements:

3.1. HDPE MATERIAL SPECIFICATIONS

3.1.1. HDPE Extruded Solid Wall Pipe Material – Solid wall pipe under this specification shall be a minimum grade of PE 3608 with a minimum cell classification value of 345464C as defined in ASTM D3350. Dimensions of all pipe will meet ASTM F714 requirements unless otherwise approved.

3.1.2. HDPE Profile Wall Pipe Material – Profile wall pipe supplied under this specification shall be manufactured to the dimensions and material requirements of ASTM F894 with a minimum cell classification value of 334433E for gray colored cylinder or 334433C for black colored cylinder, including those with a yellow interior, as defined in ASTM D3350.

3.1.3. HDPE sheet and fittings material- Sheet, plate and other HDPE materials under this specification shall be minimum grade of PE 3608 with a minimum cell classification value of 345464C as defined in ASTM D3350.

3.2. Valves

3.2.1. The isolation shut-off valves shall be Butterfly valves suitable for above ground and/or buried service applications.

3.2.2. Body shall be Cast Iron, Wafer or Lug Style.

3.2.3. Disc shall be aluminum bronze with stainless steel stem.

3.2.4. Flange locating holes or tapered holes shall be as per ANSI 125/150.

3.2.5. Elastomeric sealing members of valves shall be made of EPDM or Buna-N material selected for use in water service.

3.2.6. Wrench / lever operated valves shall be available in sizes ½” through 6”. Gear operated valves shall be available in sizes 8” and above.

3.2.7. Valves shall have a position indicator.

3.2.8. Valves shall be suitable for use at temperatures of 0° F to 140º F, and shall be suitable for pressures and vacuums compatible with the piping.

3.2.9. Purge Valves shall be quarter-turn type brass full port ball valves. The valves shall provide positive stops at the full-open and full closed positions.

3.3. Pressure Temperature (P/T) Test Ports

3.3.1. Test ports shall be suitable for use in geothermal applications.

3.3.2. Test ports shall be located per project drawing. At a minimum, (1) Test port shall be located on the Return main piping, and (1) Test port on each of the Circuit piping with flow coming from the bore field.

3.3.3. Test ports shall be capable of receiving a thermometer probe with a minimum diameter of 1/16” and a maximum diameter of 1/8”.

3.3.4. The test ports shall be capable of allowing the injection/extraction of liquids through an inducement probe not to exceed 1/8” in diameter.

3.3.5. The test ports outer body shall be of all brass construction including a 9/16” knurled cap with a plastic retainer.
3.3.6. Test ports shall have a dual seal core design of Nordel allowing sealing of the system before complete removal of any probe, good up to 350º F for water.
3.3.7. Core membrane shall be of a design that maintains proper alignment for increase ease when inserting probes.
3.3.8. Test ports shall be rated zero leakage from full vacuum to 1000 PSIG.

4. SUBMITTALS AND QUALITY ASSURANCE

4.1. QA/QC CERTIFICATION-
4.1.1. The vault supplier shall submit certification that the HDPE material meets the specifications.
4.1.2. The fabricator of the vault structure shall submit drawings showing the position of the inlets, outlets and the overall dimensions along with any other special features such as manways, ladders, etc.
4.1.3. The fabricator of vertical structures shall submit calculations for review by the project engineer, or owner, indicating that the manholes meet the requirements of ASTM F1759, “Design of High Density Polyethylene (HDPE) Manholes for Subsurface Applications”. The data shall contain information related to the following areas: Ring Compressive Strain, Combined Ring Compressive and Ring Bending Strain, Ring Buckling, Axial Strain, Axial Buckling, and Thickness of the bottom based on depth and groundwater. Thickness of the bottom should be based on acceptable stress and deflection limits. Horizontally oriented vaults should provide calculations that prove the vault cylinder can withstand burial and traffic loads with acceptable design criteria for pipe deflection, wall buckling and wall crush.
4.1.4. Data and calculations supplied for informational purposes will be part of the submittal package that are reviewed and approved by the project engineer. The project engineer will review any data submitted for accuracy, including any site specific variables, and confirm the vault structure is suitable for the intended service including installation and operating conditions.
4.1.5. The fabrication technician shall perform fusions accordance in accordance with ASTM F2620. When required, the fabrication technician will be qualified to perform extrusion and hot air welding per ASTM C1147. The fabricator shall submit the written quality assurance program used during fabrication. The fabricator may be required to submit their QA/QC program for thermoplastic fabrication prior to beginning work and the welding certification for the fabrication technician upon beginning of work on the vault structure.
4.1.6. All internal piping will be tested with water during the fabrication process, and the vault structure shall be tested with air when the fabrication process is completed. When requested, a written certification shall be sent as an addendum to original submittal package, certifying the geothermal vault is leak free. The test results shall become part of the submittals. When requested, an identification plate indicating, the job number, testing data, and when built and by whom, shall be attached to the geothermal vault.
4.2. Approval or Rejection
4.2.1. Engineer or record (or owner) will review submittal information and provide written approval or rejection of submittal data, and verify proposed manhole will meet installation and service requirements.
4.2.2. ENGINEER reserves the right to require changes to the proposed product so as to meet intended installation and service conditions.
4.2.3. In the event such changes impact price or timing, the purchase contract will be adjusted to reflect those changes.
4.3. THIRD PARTY TESTING-The owner or the specifying engineer may request certified lab data to verify the physical properties of materials not meeting the requirements of this specification.
4.4. REJECTION – The HDPE manholes may be rejected for failure to meet any of the requirements of this specification.

5. HDPE VAULT CONSTRUCTION

5.1. The Circuit Maker Vault® shall be made from a HDPE profile wall cylinder with a nominal ID of at least 72” for horizontal construction/orientation and meet the minimum requirements of section 3.1.2 of this specification.

5.2. The internal HDPE pipe and fitting material shall meet the minimum requirements of section 3.1.1 of this specification.
5.3. The end cap thickness of the vault shall be no less than 1-1/2" and meet the minimum requirements of section 3.1.3 of this specification.
5.4. The inlets and outlets shall be extrusion welded on the outside of the structure using trained welders with documented training records.
5.5. All external field connections to structure shall be butt fusion welded or electrofusion welded, when 3" larger. Socket fusion is allowed for 2" connections and smaller.
5.6. Structures shall be factory tested with a 1 psi Air Test for no less than 30 minutes, with no leaks. The Piping system shall be hydrostatically tested to 100 psi with water for no less than 30 minutes, with no leaks. The owner or their representative may request to observe the test.
5.7. Entry Way
  5.7.1. Man-way
    5.7.1.1. The man-way shall be constructed of the same material as specified in 3.1.1 and 3.1.3.
    5.7.1.2. The man-way shall be attached by means of extrusion welding to outside wall of the structure.
    5.7.1.3. The minimum ID of the man-way cylinder shall be no less than 24".
  5.7.2. Ladder
    5.7.2.1. The entry ladder shall conform to current OSHA guidelines.
    5.7.2.2. Ladders constructed from HDPE Pipe shall not be allowed.
5.8. Top of the man-way shall be built to the requirements of the drawings. If air testing is required, flanged tops or manways will be required. A reinforced concrete pad around the HDPE man-way will be required when HDPE structures are used in traffic areas. A traffic rated frame and cover will be required. A professional engineer shall approve the design of the concrete pad, and shall be included in the submittal.
5.9. Reinforced concrete pads at surface level around the HDPE man-way will be required when the geothermal vault is used in traffic areas. A traffic rated frame and cover will be required. A professional engineer shall approve the design of the concrete pad. Integration of the pad with the manway will be coordinated with the geothermal vault manufacturer

6. CONSTRUCTION PRACTICES

6.1. Handling of units. HDPE structures shall be stored on clean, level, and dry ground to prevent undue scratching or gouging of the pipe or cylinder. The handling of HDPE structures shall be done in such a manner that there is no damage. Nylon slings are preferred.
6.2. Pipe Joining - HDPE pipe joined in the field external to the Vault shall be joined using fusion welding. All butt fusion welds shall be made as described in ASTM F 2620. Electrofusion welding can be substituted for making pipe welds. Hot air and extrusion welding are not permitted for pipe joining. Welds on pipe and fittings larger than 4" OD shall be recorded using a McElroy Manufacturing DataLogger. The contractor shall maintain records of the temperature, pressure, and graph of the fusion cycle for all recorded welds joining the pipe to the structure at the jobsite.
6.3. Handling of Fused Pipe- Fused segments of pipe shall be handled so as to avoid damage to the pipe. Limit bending of the pipe welded to fittings or to the structure. Nylon slings are preferred.
6.4. Equipment Mounting- Special provisions must be made when mounting equipment inside a Circuit Maker Vault®. Bolting directly to the wall of an HDPE structure is not recommended under normal circumstances.

7. DIRECT BURIAL INSTALLATION

7.1. Trench Construction- The trench and trench bottom shall be constructed in accordance with ASTM D 2321, Section 6, Trench Excavation, and Section 7, Installation. The HDPE structure shall be installed on a stable base consisting of 12" of Class I materials compacted to 95% proctor density per ASTM F 1759, Section 4.2. All required safety precautions for vault installation are the responsibility of the contractor.
7.2. Embedment materials- Embedment materials shall be Class I or Class II materials as defined by ASTM D 2321, Section 5, Materials. Class I materials are preferred. Backfill and bedding materials shall be free of debris.
7.3. Bedding of the structure shall be preformed in accordance with ASTM D 2321, Section 7.2. Compaction shall conform to Section 7.5 and 7.51.
7.4. Backfilling shall be shall be done to conform to the ASTM F 1759, Section 4.2, "Design Assumptions". This Specification indicates that backfill shall extend at least 3.5 feet beyond the edge of the structure for the full height of the structure and extend laterally to undisturbed soils. Compaction shall be to 90% proctor density.

7.5. H-20 Highway Loads- A reinforced concrete pad designed by a licensed professional engineer will be required when HDPE structures are used in traffic areas. A traffic rated frame and cover or hatch shall be required along with 24" minimum cover above the top of HDPE structure. A drawing showing key design features must be submitted as indicated in Section 5.7 of this specification.

7.6. Groundwater Consideration- If high groundwater conditions are suspected, anti-buoyancy calculations are to be provided as part of the submittal package, specifying the expected buoyant forces and the counteraction of those forces, including amount and location/placement of concrete around the structure to anchor the HDPE vault.

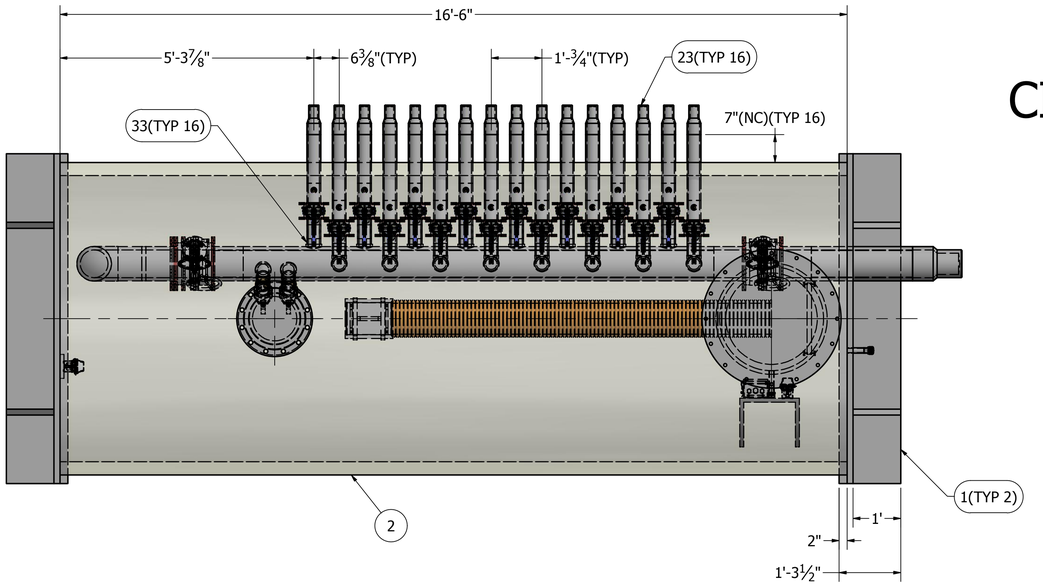
8. Warranty Conditions

8.1. The Circuit Maker Vault is factory tested to be leak-free and free of defectives before shipment. To ensure leak free condition after installation, a field air test must be performed on the structure after all fusion connections are made and backfilling is complete. A 1" male threaded port will be provided in the manway to use for a low pressure air test(1 psi or less), for a period not to exceed 30 minutes. The installing contractor along with the owner representative and/or general contractor should witness the test and provide a signed document to the manufacturer with the location, date, witnesses and test conditions. The manufacturer or its representative should be contacted to be available to witness the testing, which is expected to occur within 60 days of structure delivery. A successful test will extend the warranty to one year from the test date.

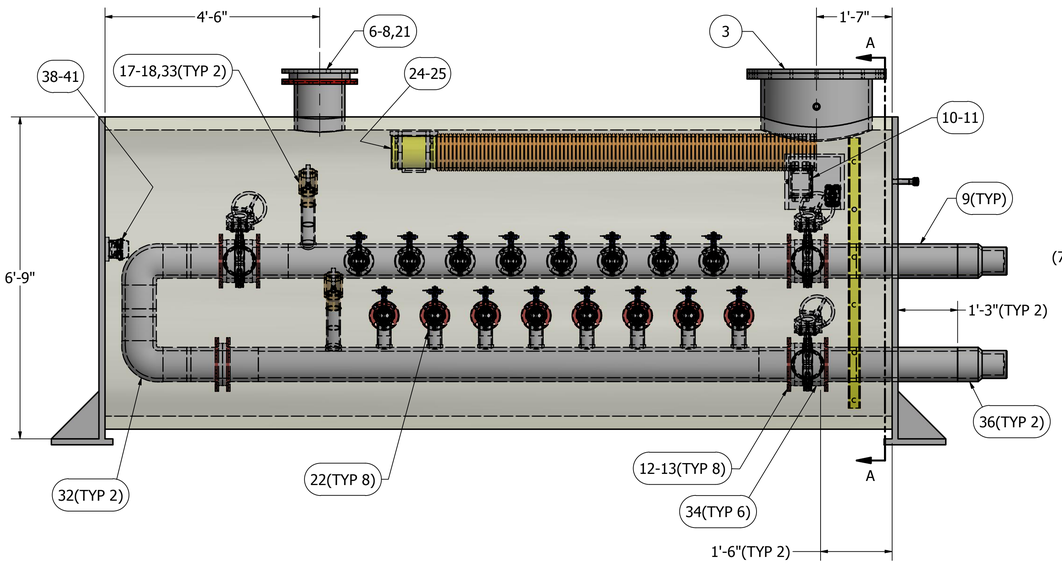
(Revised 04/2011)

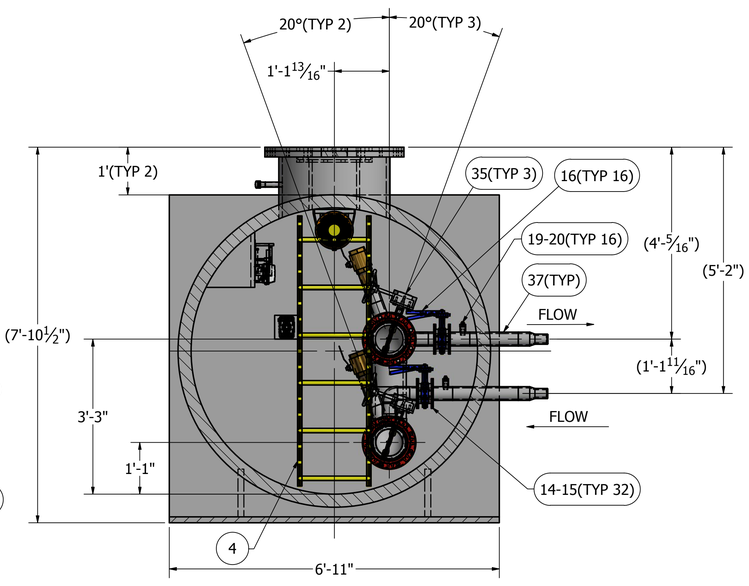
CIRCUIT MAKER VAULT®

8" MAIN w(8) 3" CIRCUITS



PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	2	29010010	1-1/2" HDPE END PLATE
2	16.5 ft	20722353	72" RSC 250 HDPE PROFILE WALL PIPE
3	1	53280024	28" HDPE MANWAY KIT (INCLUDES COVER SET, PIPE, TRANSITION, & CAP)
4	1	98000180	FIBERGLASS MANHOLE LADDER
5	2	98000207	LADDER INSTALLATION KIT
6	1	50121711	12" DR 17 IPS FLANGE ADAPTER HDPE
7	1	53120030	12" DR 11 IPS BACKUP RING DUCTILE IRON
8	1	49120011	12" IPS BLIND FLANGE 1" THICK HDPE
9	25 ft	10081122	8" DR 11 IPS HDPE PIPE
10	1	53000036	GEO ELECTRICAL KIT (INCLUDES ENCLOSURE w/COVER, GANG BOX, WEATHERPROOF COVER, RECEPTACLE, TRANSITION, & CAP)
11	1	29010012	BIRDHOUSE FROM 1" HDPE SHEET (ELECTRIC MOUNT)
12	8	50081121	8" DR 11 IPS FLANGE ADAPTER HDPE
13	8	53080032	8" DR 11 IPS BACKUP RING DUCTILE IRON
14	32	50031112	3" DR 11 IPS FLANGE ADAPTER HDPE
15	32	53030022	3" DR 11 IPS BACKUP RING DUCTILE IRON
16	16	59030075	3" NIBCO BFV
17	2	53031116	3" DR 11 MPT TRANSITION FITTING BRASS
18	2	59030019	3" FULL PORT BRASS BALL VALVE THRD ENDS
19	16	52000010	1/2" BRASS P/T PORT
20	16	52000019	1/2" BRASS FPT x 3/4" HDPE SOCKET TRANSITION
21	0.5 ft	10121714	12" DR 17 IPS HDPE PIPE
22	8	50031114	3" DR 11 IPS 90 DEG ELBOW MOLDED HDPE
23	16	50031115	3" DR 11 IPS CAP MOLDED HDPE
24	1	53080138	8" UTILITY BLOWER (STRONGWAY)
25	1	53080139	8" VENTILATION HOSE (20 ft)
26	3	53080073	8" BFV BOLTPACK
27	7	53080076	8" NEOPRENE GASKET
28	1	53080070	8" STANDARD BOLTPACK
29	16	53031014	3" BFV BOLTPACK
30	1	53120038	12" STANDARD BOLTPACK
31	1	53120046	12" NEOPRENE GASKET
32	2	50081123	8" DR 11 IPS 90 DEG ELBOW MOLDED HDPE
33	18	50081133	8" x 3" DR 11 IPS BRANCH SADDLE ROUND BASE HDPE
34	6	49081112	8" VALVE SPACER 2" THICK FABBED HDPE
35	3	59080046	8" NIBCO GEAR OPERATED BFV
36	2	50081124	8" DR 11 IPS CAP MOLDED HDPE (FOR TESTING AND SHIPPING)
37	19.5 ft	10031118	3" DR 11 IPS HDPE PIPE
38	1	29010012	MOUNTING PLATE FOR OUTLET FROM 1" HDPE SHEET
39	1	53000039	WEATHERPROOF SINGLE GANG BOX
40	1	53000037	20 AMP GFCI DUPLEX COM GRADE RECEPTACLE
41	1	53000158	WEATHERPROOF WHILE-IN-USE OUTLET COVER





SECTION A-A

TOLERANCE STANDARDS AS MEASURED AT AMBIENT TEMPERATURE:
-ISCO SHALL MAINTAIN A FABRICATION TOLERANCE OF ± 1/2" FOR ALL DIMENSIONS SHOWN.
-ISCO SHALL MAINTAIN A FABRICATION TOLERANCE OF ± 2° FOR ALL ANGLES SHOWN.
-(X'X") MARKS A DIMENSION THAT IS FOR REFERENCE ONLY.
-(NC) MARKS A DIMENSION THAT IS NOT CRITICAL AND REQUIRES NO NOTIFICATION OF DEVIATION BY FABRICATOR.
-SPECIFIC TOLERANCES MAY BE PROVIDED BY CUSTOMER BUT MUST BE APPROVED BY ISCO INDUSTRIES AND NOTED ON DRAWING PRIOR TO FABRICATION.
*UNLESS OTHERWISE SPECIFIED.

GENERAL NOTES:
-STRUCTURE OUTLETS NOT DESIGNED AS ANCHOR POINTS FOR CONNECTED PIPING.

REVISION HISTORY

REV	DESCRIPTION	DATE	BY

TESTING
REQUIRED: YES
TYPE: AIR(STRUCTURE); HYDRO(MANIFOLD)
PRESSURE: 1.5 PSI(AIR); (90 PSI)(HYDRO)
DURATION: 30 MIN(AIR); 30 MIN(HYDRO)

APPROVED BY: DATE:
WO #:

ISCO
www.isco-pipe.com 1-800-345-4726

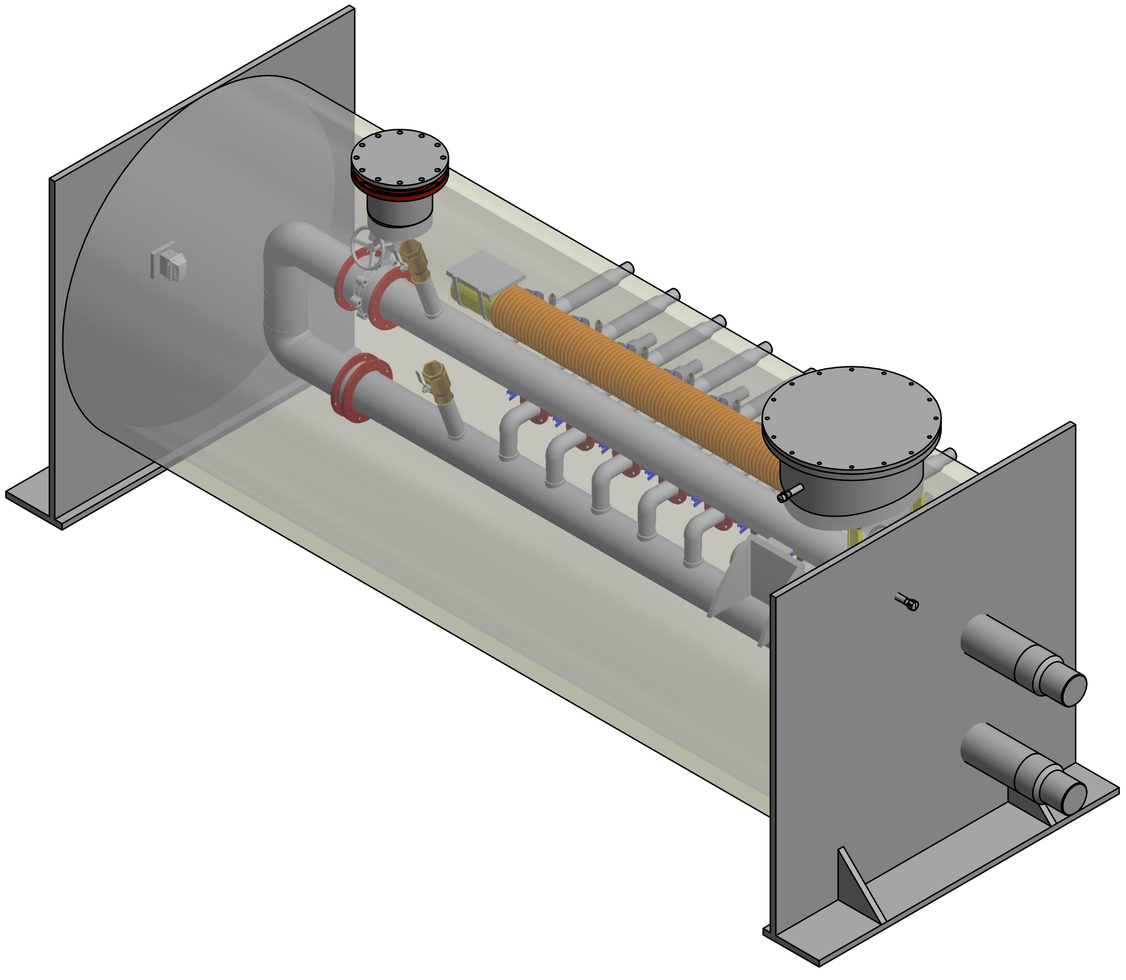
DRAWN BY: BM DATE: 11/15/2019
REVIEWED BY: BS DATE: 11/15/2019

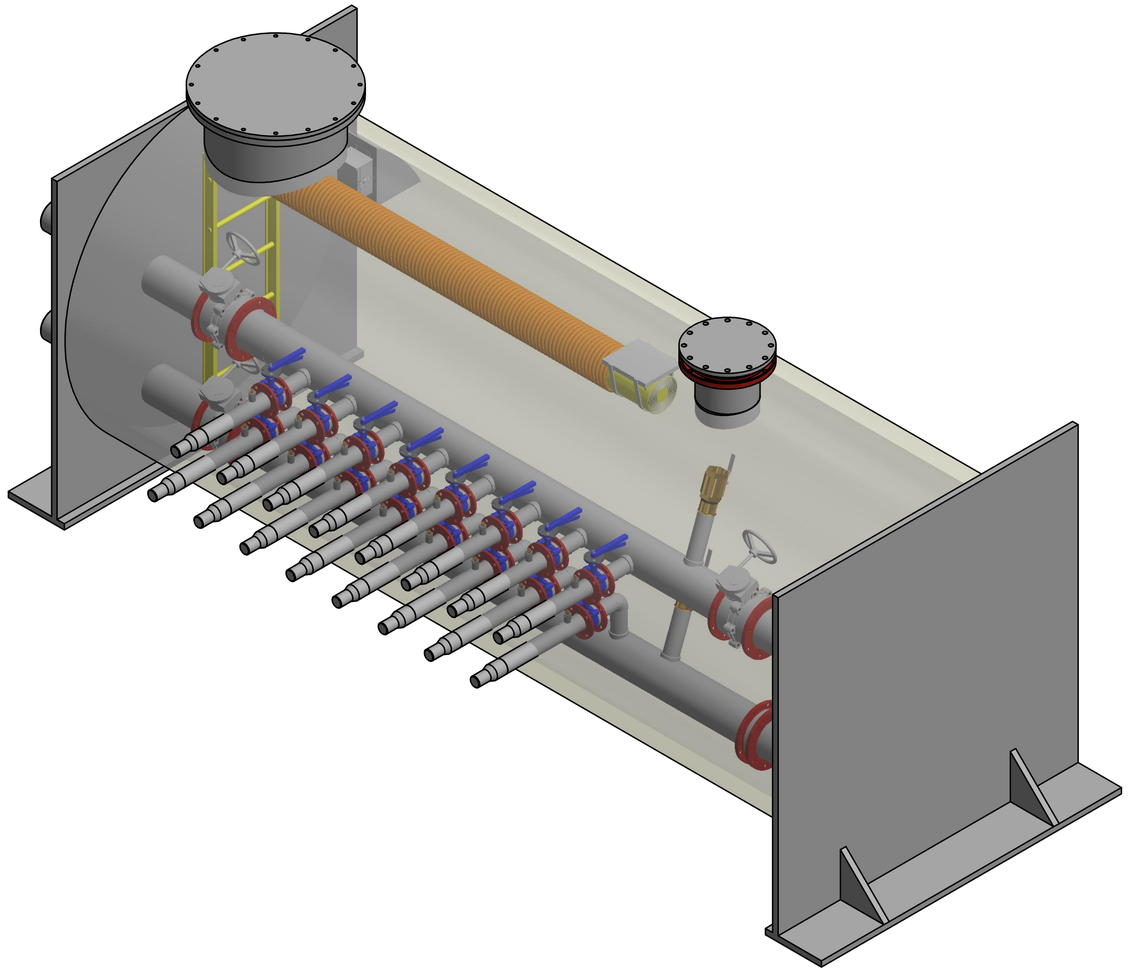
CUSTOMER NAME: WOLD AE (MN VETS HOME)

DRAWING TITLE: 72" GEO VAULT w(8) 8" x 3" CIRCUITS

SIZE: D
DWG FILE LOCATION: DN/AS/SL/WOLD AE (MN VETS HOME)-111519
SHEET 1 OF 2

TERRITORY REPRESENTATIVE: STUART LYLE





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TOLERANCE STANDARDS AS MEASURED AT AMBIENT TEMPERATURE:
-ISCO SHALL MAINTAIN A FABRICATION TOLERANCE OF ± 1/2" FOR ALL DIMENSIONS SHOWN.
-ISCO SHALL MAINTAIN A FABRICATION TOLERANCE OF ± 2° FOR ALL ANGLES SHOWN.
-(X'X") MARKS A DIMENSION THAT IS FOR REFERENCE ONLY.
-(NC) MARKS A DIMENSION THAT IS NOT CRITICAL AND REQUIRES NO NOTIFICATION OF DEVIATION BY FABRICATOR.
-SPECIFIC TOLERANCES MAY BE PROVIDED BY CUSTOMER BUT MUST BE APPROVED BY ISCO INDUSTRIES AND NOTED ON DRAWING PRIOR TO FABRICATION.
*UNLESS OTHERWISE SPECIFIED.

GENERAL NOTES:
-STRUCTURE OUTLETS NOT DESIGNED AS ANCHOR POINTS FOR CONNECTED PIPING.

REVISION HISTORY

REV	DESCRIPTION	DATE	BY

TESTING
REQUIRED: YES
TYPE: AIR(STRUCTURE); HYDRO(MANIFOLD)
PRESSURE: 1.5 PSI(AIR); (90 PSI)(HYDRO)
DURATION: 30 MIN(AIR); 30 MIN(HYDRO)

APPROVED BY: DATE:

WO #:

ISCO
www.isco-pipe.com 1-800-345-4726

DRAWN BY: BM DATE: 11/15/2019

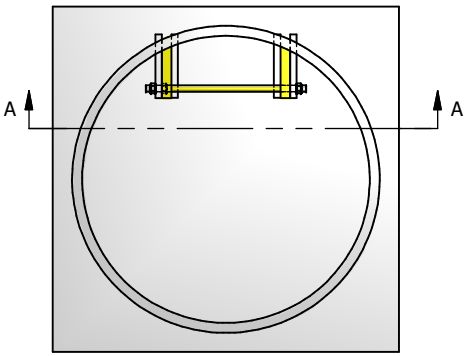
REVIEWED BY: BS DATE: 11/15/2019

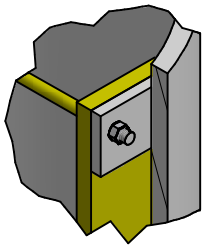
CUSTOMER NAME:
WOLD AE (MN VETS HOME)

DRAWING TITLE:
72" GEO VAULT
w(8) 8" x 3" CIRCUITS

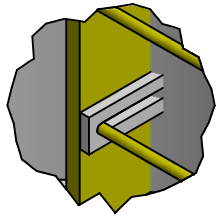
SIZE D | DWG FILE LOCATION: DN/AS/SL/WOLD AE (MN VETS HOME)-111519 | SHEET 2 OF 2

TERRITORY REPRESENTATIVE: STUART LYLE

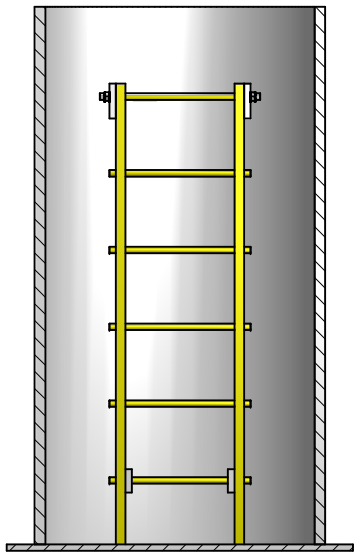




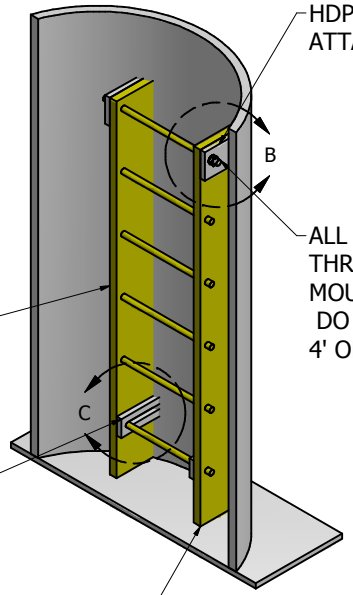
DETAIL B



DETAIL C



SECTION A-A



ISCO INDUSTRIES

CUSTOMER NAME:

CONCEPT DRAWING

DRAWING TITLE

MANHOLE LADDER INSTALLATION DETAIL

DRAWN	DATE
NLA	12/10/2009

APPROVED: DATE

ORDER #

SIZE	FILE LOCATION	REV
C		

SCALE

SHEET 1 OF 1

S7900 SERIES

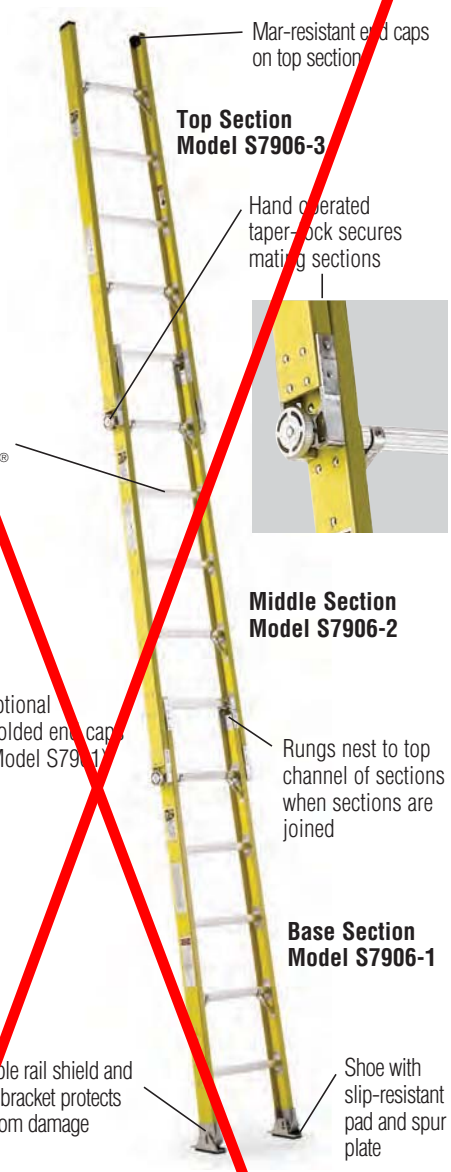
★★★★★ **375** lbs. LOAD CAPACITY **3 SECTIONS**

★★★★ **300** lbs. LOAD CAPACITY **4 SECTIONS** **TYPE I** DUTY RATING

STYLE: Interchangeable Tapered Sectional Ladder

Exclusive Alflo rung joint means Twist-Proof® performance

- Maximum number of sections to be used – 4



Mar-resistant end caps on top section

Top Section Model S7906-3

Hand operated taper-lock secures mating sections

Slip-resistant Traction-Tred® round rung

Middle Section Model S7906-2

Optional molded end caps (Model S7901)

Rungs nest to top channel of sections when sections are joined

Base Section Model S7906-1

Durable rail shield and shoe bracket protects rail from damage

Shoe with slip-resistant pad and spur plate

SPECIFICATIONS

Model No.	Description	Top of Section	Bottom of Section	Approx. Cu. Ft. Per Unit	Approx. Shipping Wt. Lbs.
S7906-1	6' tapered base with swivel shoes	15-3/4"	19-3/4"	2.3	17.0
S7906-2	6' intermediate	15-3/4"	18-3/4"	3.5	15.5
S7906-3	6' top with molded end caps	16-3/16"	18-3/4"	3.4	13.0
S7901 (Accessory)	End caps for middle or base sections	N/A	N/A	0.1	1.0 ea.

ASSEMBLY DESCRIPTION

Quantity of Sections	Model No.	Total Assembled Size
1	S7906-1 base	6' 2"
1	S7906-1 base	15' 11"
1	S7906-2 middle	
1	S7906-3 top	
1	S7906-1 base	20' 11"
2	S7906-2 middle	
1	S7906-3 top	

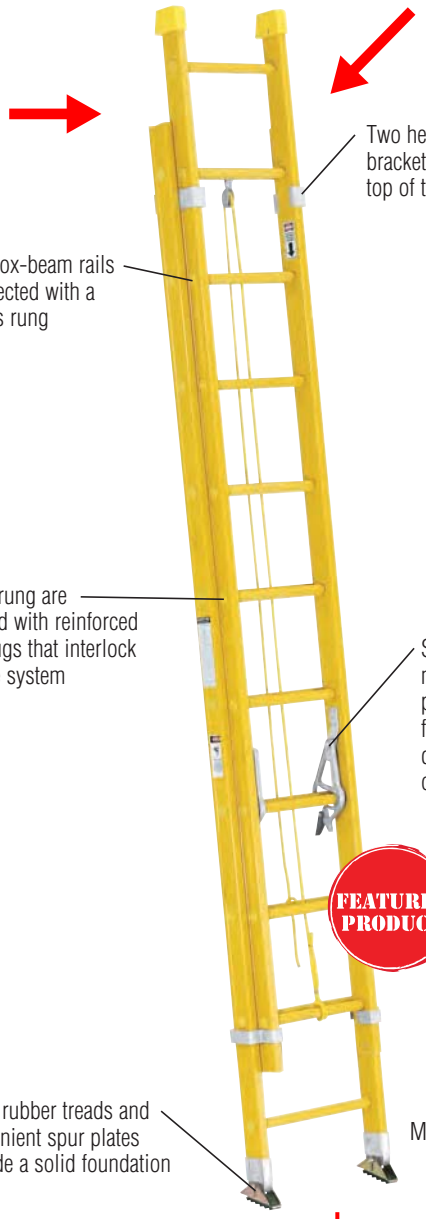
DIMENSIONS

Rails:	3-5/16" wide
Flange:	1-3/16" wide
Rungs:	1-1/4" diameter

9500-2/9500-1 SERIES

★★★★ **300** lbs. LOAD CAPACITY **TYPE IA** DUTY RATING

STYLE: All-Fiberglass Extension/Straight Ladder



Two heavy duty guide brackets are secured to the top of the base section

Unique box-beam rails are connected with a fiberglass rung

Rail and rung are connected with reinforced nylon plugs that interlock the entire system

Spring-assisted mechanism has polymer flippers for longer life and a quiet sliding action over the rungs

FEATURED PRODUCT

Thick rubber treads and convenient spur plates provide a solid foundation

Model 9520-2

SPECIFICATIONS

Model No.	Total Length of Sections	Max. Working Length	Approx. Cu. Ft. Per Unit	Approx. Shipping Wt. Lbs.	Single Ladder Model No.	Total Length	Approx. Cu. Ft. Per Unit	Approx. Shipping Wt. Lbs.
9516-2	16'	13'	8.3	41.0	9508-1	8'	5.5	18.0
9520-2	20'	17'	10.2	49.0	9510-1	10'	6.8	22.0
9524-2	24'	21'	12.2	56.0	9512-1	12'	8.0	26.0
9528-2	28'	25'	14.1	64.0	9514-1	14'	9.4	30.0
9532-2	32'	29'	16.0	72.0	9516-1	16'	10.7	34.0
					9518-1	18'	11.2	38.0
					9520-1	20'	12.5	42.0

DIMENSIONS

Rails:	3-1/4" wide	Fly Width:	15-1/2" outside rails
Flange:	1-3/16" wide	Base Width:	19" outside shoes
Rungs:	1-1/4"		

200 PSI Butterfly Valves

Cast Iron Body • Extended Neck
Cartridge Seat Liner • Wafer Style

Sizes 2" through 12"

Install between Std. ASME Class 125/150 Flanges

DESIGNED TO MEET MSS SP-67 STANDARD

N200135
Wafer Style
EPDM Liner
Aluminum Bronze Disc

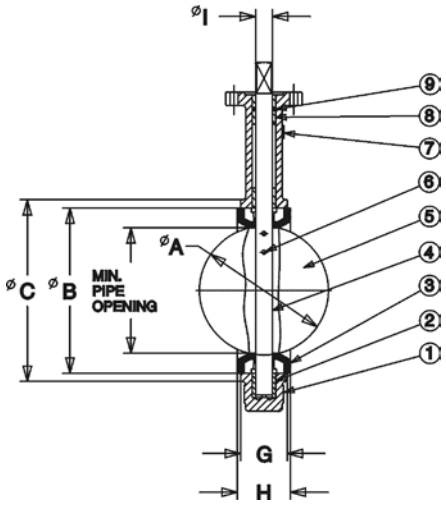
N200136
Wafer Style
EPDM Liner
Ductile Iron Disc

N200145
Wafer Style
Buna Liner
Aluminum Bronze Disc

N200146
Wafer Style
Buna Liner
Ductile Iron Disc

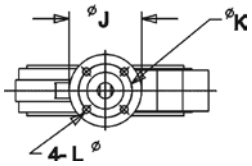
MATERIAL LIST

	PART	SPECIFICATION
1.	Body	Cast Iron, Epoxy coated ASTM A126 CL.B
2.	Body Bushing	Bronze ASTM B584 Grade C83600
3.	Liner	EPDM Rubber w/Phenolic Backing Buna-N Rubber Nitrile w/Phenolic Backing
4.	Stem	Stainless Steel ASTM A582 Type 416
5.	Disc	Alum. Brz. ASTM B148 Alloy C95400 Ductile Iron ASTM A536 Grade 65-45-12 (plated)
6.	Taper Pin (2 pin 6" - 12")	Stainless Steel ASTM A582 Type 416
7.	Name Plate	Aluminum
8.	Shaft Bushing	Bronze ASTM B584 Grade C83600
9.	Stem Seal	Buna-N Rubber Nitrile

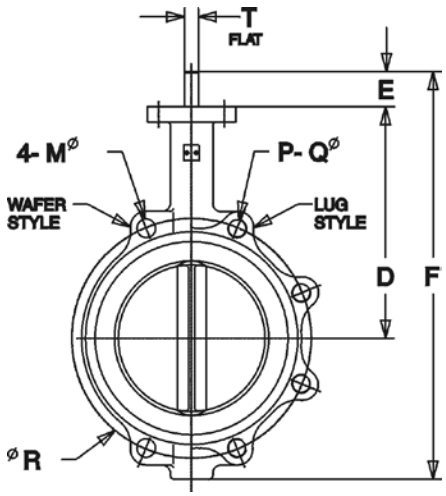


DIMENSIONS — WEIGHTS

Size In.	Size mm.	Dia.	A Pipe I.D.	Min. Dia.	B Dia.	C D	E	F	G Body	H Seat	I Dia.
2	50	2.08	1.38	3.00	3.94	6.34	1.26	10.75	1.655	1.81	0.496
2½	65	2.54	1.95	3.50	4.72	6.89	1.26	11.65	1.759	1.93	0.496
3	80	3.10	2.66	4.09	5.00	7.13	1.26	12.12	1.780	1.93	0.496
4	100	4.10	3.67	5.32	6.14	7.87	1.26	13.62	2.050	2.18	0.621
5	125	4.85	4.48	6.26	7.48	8.39	1.26	14.65	2.140	2.31	0.745
6	150	6.12	5.84	7.42	8.35	8.90	1.26	15.62	2.195	2.33	0.745
8	200	7.97	7.85	9.38	10.55	10.24	1.77	18.90	2.385	2.52	0.870
10	250	9.86	9.76	11.51	12.79	11.50	1.77	21.26	2.584	2.83	1.120
12	300	11.87	11.72	13.55	15.87	13.27	1.77	24.57	3.029	3.19	1.244



Size In.	Size mm.	J Dia.	B.C. Dia.	L Dia.	M Dia.	R Dia	P	Q Dia.	T Flats	Lug Weight Lbs.	Lug Weight Kg.
2	50	3.00	2.25	0.28	0.75	4.75	4	⅝-11UNC	.350	5.7	2.6
2½	65	3.03	2.25	0.28	0.75	5.50	4	⅝-11UNC	.350	7.5	3.9
3	80	3.03	2.25	0.28	0.75	6.00	4	⅝-11UNC	.350	8.4	3.8
4	100	3.62	2.75	0.39	0.75	7.50	8	⅝-11UNC	.437	12.3	5.6
5	125	3.62	2.75	0.39	0.88	8.50	8	¾-10UNC	.500	17.2	7.8
6	150	3.62	2.75	0.39	0.88	9.50	8	¾-10UNC	.500	19.6	8.9
8	200	4.50	3.50	0.47	0.88	11.75	8	¾-10UNC	.625	29.7	13.5
10	250	4.50	3.50	0.47	1.00	14.25	12	⅞-9UNC	.812	44.0	20.0
12	300	5.50	4.25	0.47	1.00	17.00	12	⅞-9UNC	.875	65.8	29.9



NOT RECOMMENDED
FOR STEAM SERVICE

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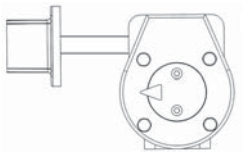
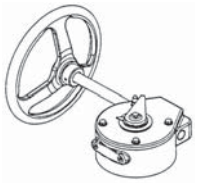
Butterfly Valves
Options and Accessories

Gear Operator options and accessories (2" through 12" 2000/3000/5022 Series only)

2" Square Operating Nut



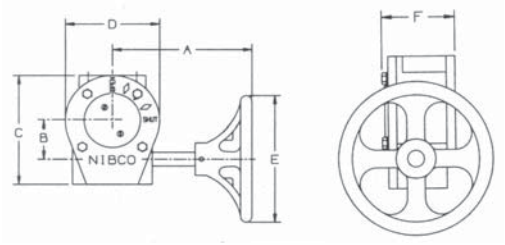
Memory Stop



Flag Indicator

Cast Iron Gear Operator

The NIBCO butterfly valve can be provided with heavy-duty operator and indicator. Recommended for valves 8" and larger, for trouble-free operation in all moisture and weather conditions (not submersible). Operator is a self-locking worm gear type. Equipped with adjustable stops at open and shut positions. Ordering: Specify by adding (-5) to Fig. No., i.e., WD2000-5. Babbit Sprocket may be added to handwheel. See below for sizing information. Available options: Memory Stop Gear Operator Kit, 2" Square Operating Nut, Flag Indicator and Handwheel for GO.



2"-24"

GEAR OPERATOR DETAIL FOR SIZES 2" TO 24" (LCS6822 & LCS7822)*												GEAR OPERATOR ACCESSORIES & REPLACEMENT PARTS		
LCS6822 CL 150 HPBFV	LCS7822 CL 300 HPBFV	GEAR OPERATOR NUMBER	RATIO	GEAR OP WEIGHT	DIMENSIONS (INCHES)						STEM ADAPTER BUSHING	SPROCKET RIM MODEL	REPLACEMENT HANDWHEEL
					A	B	C	D	E	F			
2"	2"	RG70001	24:1	12	5.77	1.73	5.07	4.00	8.00	2.65	DIRECT	#2	RG70014
2½", 3", 4"	2½", 3", 4"	RG70002	24:1	12	5.77	1.73	5.07	4.00	8.00	2.65	RG70022	#2	RG70014
5", 6"	5", 6"	RG70003	24:1	12	5.77	1.73	5.07	4.00	8.00	2.65	RG70023	#2	RG70014
8"	-	RG70004	30:1	26	9.50	2.50	6.90	6.00	12.00	3.00	RG70024	#2½	RG70015
-	8"	RG70005	30:1	26	9.50	2.50	6.90	6.00	12.00	3.00	RG70025	#2½	RG70015
10"	-	RG70006	30:1	26	9.50	2.50	6.90	6.00	12.00	3.00	RG70025	#2½	RG70015
-	10"	RG70008	50:1	37	9.00	3.00	7.80	6.70	16.00	3.00	RG70026	#3	RG70016
12"	-	RG70007	50:1	37	9.00	3.00	7.80	6.70	16.00	3.00	RG70025	#3	RG70016
-	12"	RG70009	80:1	72	10.75	4.75	11.50	10.25	16.00	4.40	RG70027	#3	RG70017
14"	-	RG70008	50:1	37	9.00	3.00	7.80	6.70	16.00	3.00	RG70026	#3	RG70016
16"	-	RG70010	80:1	72	10.75	4.75	11.50	10.25	16.00	4.40	RG70028	#3	RG70017
18"	-	RG70011	80:1	74	10.75	4.75	11.50	10.25	20.00	4.40	RG70028	#4	RG70018
20"	-	RG70012	320:1	200	15.51	6.06	17.00	11.81	20.00	6.46	RG70029	#4	RG70019
24"	-	RG70013	320:1	200	15.51	6.06	17.00	11.81	20.00	6.46	RG70030	#4	RG70019

*** No square operating nuts, flag indicators, or memory stop kits are available for this series butterfly valves.**

GEAR OPERATOR DETAIL FOR SIZES 2" TO 48" (1000/2000/3000/5022)												GEAR OPERATOR ACCESSORIES & REPLACEMENT PARTS					
LD / WD VALVE SIZE	FC / FD / GD VALVE SIZE	GEAR OPERATOR NUMBER	RATIO	GEAR OP WEIGHT	DIMENSIONS (INCHES)						STEM ADAPTER BUSHING	SPROCKET RIM MODEL	SQUARE OPERATING NUT	FLAG INDICATOR	MEMORY STOP KIT	REPLACEMENT HANDWHEEL
					A	B	C	D	E	F						
2"	-	T117118PP	24:1	10	7.64	1.77	5.04	4.24	5.91	2.79	T046652PP	#1½	T117792FC	T116682PP	T026196PP	T117122PP
2½"- 3"	2"-2½"-3"	T117118PP	24:1	10	7.64	1.77	5.04	4.24	5.91	2.79	T046653PP	#1½	T117792FC	T116682PP	T026196PP	T117122PP
4"	-	T117118PP	24:1	10	7.64	1.77	5.04	4.24	5.91	2.79	T046654PP	#1½	T117792FC	T116682PP	T026196PP	T117122PP
5"- 6"	4"- 5"	T117118PP	24:1	10	7.64	1.77	5.04	4.24	5.91	2.79	T046655PP	#1½	T117792FC	T116682PP	T026196PP	T117122PP
8"	6"- 8"	T117119PP	24:1	14	9.53	1.77	5.04	4.24	9.84	2.79	T046656PP	#2½	T117792FC	T116682PP	T026196PP	T117123PP
10"	-	T117120PP	30:1	23	11.54	2.48	6.93	6.06	9.84	3.26	-	#2½	T117793FC	T116682PP	T026197PP	T117124PP
12"	10"- 12"	T117121PP	30:1	23	11.54	2.48	6.93	6.06	9.84	3.26	-	#2½	T117793FC	T116682PP	T026197PP	T117124PP
14"	-	T116697PP	50:1	26	12.87	3.08	7.48	6.28	11.81	3.26	-	#2½	T117793FC	T116682PP	T026198PP	T117169PP
16"	-	T026150PP	80:1	58	13.58	4.72	10.24	9.84	11.81	4.27	-	#2½	T118099FC	T116682PP	T026199PP	T026131PP
18"	-	T026151PP	80:1	57	15.04	4.72	10.24	9.84	15.75	4.27	-	#3½	T118099FC	T116682PP	T026199PP	T026142PP
20"	-	T026211PP	291:1	90	18.11	4.13	11.42	9.84	11.81	5.24	-	#2½	T118099FC	T116682PP	T026199PP	T026131PP
24"	-	T026212PP	291:1	90	18.11	4.13	11.42	9.84	11.81	5.24	-	#2½	T118099FC	T116682PP	T026199PP	T026131PP
30"	-	-	540:1	174	13.23	5.98	15.16	11.81	15.75	6.54	-	#3½	-	-	-	T117836PP
36"	-	-	648:1	332	15.71	8.46	20.40	17.17	15.75	7.83	-	#3½	-	-	-	T117836PP
42"	-	-	800:1	510	17.17	14.21	21.02	19.69	17.72	11.85	-	#3½	-	-	-	T117837PP
48"	-	-	800:1	510	17.17	14.21	21.02	19.69	17.72	11.85	-	#3½	-	-	-	T117837PP

Notes:

1. Gear operator comes with handwheel. Larger sizes come with handwheel unattached. Pin is taped to handwheel.

2. Stem adapter bushing must be ordered seperately when needed for smaller size valves.

3. All other accessories must be ordered separately. (Sprocket rim, square operator nut, flag indicator & memory stop kit.)

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Brass Ball Valves

Two-Piece Body • Full Port • Blowout-Proof Stem • PTFE Seats

¼"-2" 600 PSI/41.4 Bar Non-Shock Cold Working Pressure
2½"-4" 400 PSI/27.6 Bar Non-Shock Cold Working Pressure

CSA CERTIFIED TO ASME B16.44
AND CR91-002 (THREADED ¼"-4") • UL LISTED (THREADED ¼"-4")
• FM APPROVED (THREADED ¼"-2")

Threaded

CSA (¼" - 4"):

- CR91-002: ½ psig, 2 psig, and 5 psig (these are specific approved categories)
- ASME B13.44: 125 psig (maximum)
- Temperature is -4° F to 194° F

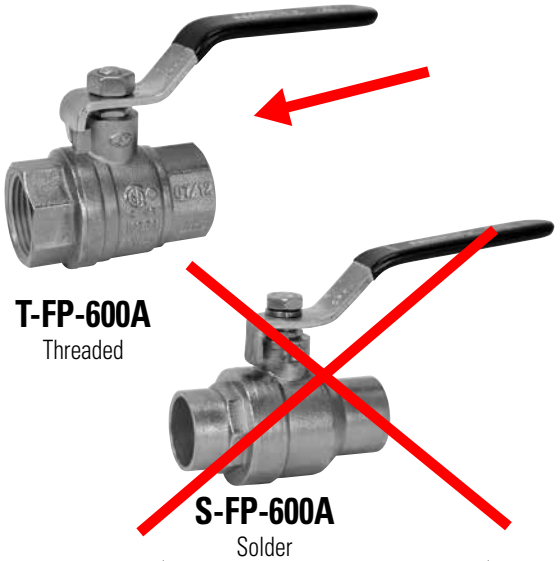
Threaded

FM (1/4" - 2"):

- 175wwp Threaded

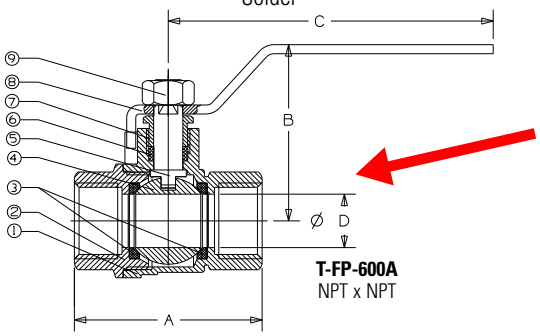
UL, Gas and Oil (¼" - 4"):

- YQNZ, Compressed Gas Shutoff Valves: 250 psi
- YRBX, Flammable Liquid Shutoff Valves: 250 psi
- YRPV, Gas Shutoff Valves: 250 psi
- YSDT, LP-Gas Shutoff Valves: 250 psi
- MHKZ, Manual Valves: 250 psi

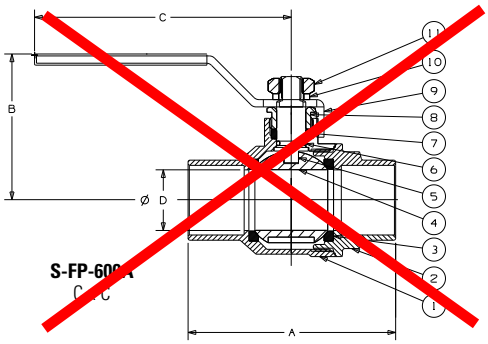


T-FP-600A
Threaded

S-FP-600A
Solder



T-FP-600A
NPT x NPT



S-FP-600A
Solder x Solder

MATERIAL LIST

PART		SPECIFICATION
1.	Body	Forged Brass[2] CU > 57%
2.	End Cap	Forged Brass[2] CU > 57%
3.	Ball Seat	PTFE
4.	Ball	Brass, Chrome Plated
5.	Stem	Brass
6.	O-Ring (Stem Seal)*	Fluorocarbon (FKM)
7.	Stem Packing	PTFE
8.	Packing Nut	Brass
9.	Lever Handle[1]	Steel, Plated
10.	Lock Washer*	Stainless Steel
11.	Handle Nut[1]	Stainless Steel

Note: * Parts 6 and 10 are applicable of S-FP-600A only.

[1] Due to Standard Approvals, Lever Handles and Nuts are not interchangeable between Solder and Threaded.

[2] For Material Certification, contact NIBCO Technical Services.

DIMENSIONS—WEIGHTS—QUANTITIES

NOT FOR USE WITH POTABLE DRINKING WATER APPLICATIONS AFTER JANUARY 3, 2014.

Size		Dimensions T-FP-600A A		S-FP-600A A		T-FP-600A B		S-FP-600A B		T-FP-600A C		S-FP-600A C		Port D		T-FP-600A		S-FP-600A		T-FP-600A	S-FP-600N
In.	mm.	In.	mm.	In.	mm.	In.	mm.	In.	mm.	In.	mm.	In.	mm.	In.	mm.	Lbs.	Kg.	Lbs.	Kg.	Ctn. Qty.	Ctn. Qty.
¼	8	1.76	45	—	—	1.73	44	—	—	3.54	90	—	—	.39	10	.33	.15	—	—	18	—
⅜	10	1.76	45	1.75	44	1.73	44	1.58	40	3.54	90	3.78	96	.39	10	.30	.14	.38	.17	18	18
½	15	2.05	52	2.01	51	1.92	49	1.78	45	3.54	90	3.78	96	.59	15	.44	.20	.40	.18	18	18
¾	20	2.36	60	2.74	70	2.09	53	2.13	54	3.78	96	3.98	101	.75	19	.66	.30	.67	.30	12	12
1	25	2.76	70	3.35	85	2.56	65	2.52	64	4.53	115	4.41	112	.98	25	1.10	.50	1.12	.51	6	6
1¼	32	3.31	84	3.78	96	2.95	75	2.65	67	4.53	115	5.04	128	1.26	32	1.57	.71	1.49	.67	4	4
1½	40	3.66	93	4.42	112	3.35	85	3.12	79	5.51	140	6.22	158	1.57	40	2.40	1.09	2.38	1.08	2	2
2	50	4.18	106	5.34	136	3.68	93	3.41	87	5.51	140	6.22	158	1.97	50	3.37	1.53	3.62	1.64	2	2
2½	65	5.38	137	6.28	160	4.76	121	4.76	121	8.66	220	8.66	220	2.56	65	7.60	3.45	6.36	2.88	3	3
3	75	6.04	153	7.15	182	5.08	129	5.08	129	8.66	220	8.66	220	2.95	75	9.36	4.24	8.32	3.77	2	2
4	100	7.39	188	—	—	5.87	149	—	—	9.61	244	—	—	3.89	99	16.85	7.64	—	—	1	—

FM APPROVED

NOT FOR USE WITH POTABLE DRINKING WATER APPLICATIONS AFTER JANUARY 3, 2014.

NIBCO INC. WORLD HEADQUARTERS • 1516 MIDDLEBURY ST. • ELKHART, IN 46516-4740 • USA • PH: 1.800.234.0227
TECH SERVICES PH: 1.888.446.4226 • FAX: 1.888.336.4226 • INTERNATIONAL OFFICE PH: +1.574.295.3327 • FAX: +1.574.295.3455
www.nibco.com

NIBCO® Pressure Rated Valves Warranty

5 year 125% warranty

NIBCO INC. 125% LIMITED WARRANTY
Applicable to NIBCO INC. Pressure Rated Metal Valves

NIBCO INC. warrants each NIBCO® pressure rated metal valve to be free from defects in materials and workmanship under normal use and service for a period of five (5) years from date put into service.

In the event any defect occurs which the owner believes is covered by this warranty, the owner should immediately contact NIBCO Technical Services, either in writing or by telephone at 1.888.446.4226 or 1.574.295.3000. The owner will be instructed to return said product, at the owner's expense, to NIBCO INC., or an authorized representative for inspection. In the event said inspection discloses to the satisfaction of NIBCO INC. that said valve is defective, it will be replaced at the expense of NIBCO INC.. Replacements shall be shipped free of charge to the owner. In the event of the replacement of any valve, NIBCO INC. shall further pay the owner the greater of twenty-five (25%) percent of the price of the valve according to the published suggested list price schedule of NIBCO INC. in effect at the time of purchase, or ten ($10.00) dollars, to apply on the cost of the installation of said replacement valve.

TO THE EXTENT PERMITTED BY LAW, THIS WARRANTY SPECIFICALLY EXCLUDES INCIDENTAL AND CONSEQUENTIAL DAMAGES OF EVERY TYPE AND DESCRIPTION RESULTING FROM ANY CLAIMED DEFECT IN MATERIAL OR WORKMANSHIP, INCLUDING BUT NOT LIMITED TO, PERSONAL INJURIES AND PROPERTY DAMAGES.

Some states or countries do not allow the exclusion or limitation of incidental or consequential damages so these limitations may not apply to you.

TO THE EXTENT PERMITTED BY LAW, IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE LIMITED IN DURATION.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state and country to country.

How to Order

State quantity, figure number and size for each valve or fitting you wish to order. See individual catalog pages for specific or special product designations.

HOW MANY TO ORDER

NIBCO® valves and fittings are decimal packed for your convenience in handling, shipping and stock-keeping. Number in master carton varies with item.

POLICY ON RETURNS TO FACTORY

No NIBCO valves and fittings are to be returned without prior written agreement. Transportation must be prepaid. A 20% charge will be made to cover cost of rehandling and reinspection.

TECHNICAL ASSISTANCE

Engineers, contractors, wholesalers or manufacturers may obtain special or technical assistance from any factory representative of NIBCO. Write, fax or phone.

NIBCO INC.
World Headquarters
1516 Middlebury Street
Elkhart, IN 46516-4740
USA

PH: 1.574.295.3000 or 1.888.446.4226
FAX: 1.574.295.3307 or 1.888.336.4226

NIBCO

Strongway Utility Carpet Blower — 8in., 1/8 HP, 1,575 CFM

Item# 49944 4.5 stars 6 Reviews

- 120V motor moves air at 1,575 CFM
- Rolled steel opening
- Auto reset thermal protection for optimal use in hot location
- Industrial-grade grounded cord
- Durable carrying handle for portability

Product Summary

This Strongway™ Utility Blower is perfect for cooling, exhausting, ventilating and drying. This blower features a rolled steel opening and auto-reset thermal protection for optimal use in hot locations. A carrying handle and 10ft. grounded cord make these blowers very portable. The 120V motor has 2 settings for precise venting.

What's Included
(1) Utility blower

Features + Benefits

- 120V motor moves air at 1,575 CFM
- Rolled steel opening
- Auto reset thermal protection for optimal use in hot location
- Industrial-grade grounded cord
- Durable carrying handle for portability

Key Specs

Item#	49944	**Volts**	120
Brand	Strongway	**HP**	0.12
Manufacturer's Warranty	1 year Limited Warranty	**Watts**	165
Ship Weight	20.0 lbs	**Speeds (qty.)**	2
Fan Diameter (in.)	8		
Air Delivery (CFM)	1,575		

Strongway Ventilating Hose for 8in. Utility Blower, Item# 49944 — 20ft.

Item# 49931 (7) Write a Review Ask a Question

Buy It in a Store

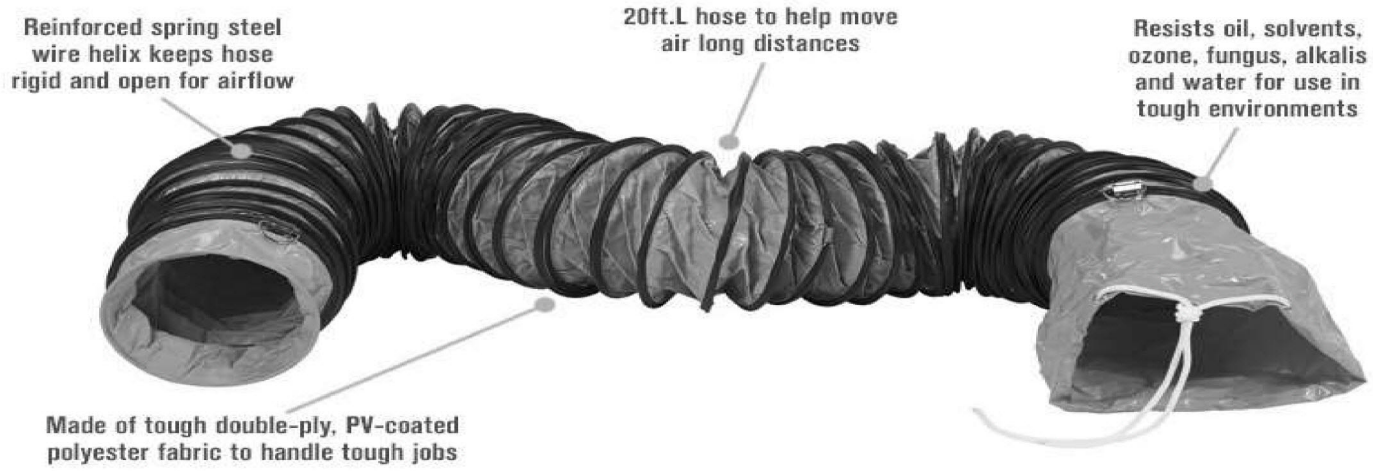
- For 8in. utility blower, Item# 49944
- Lightweight, flexible ventilating hose directs fumes out of closed-in areas
- Can be easily moved
- For industrial air movement and fume control
- Made of double-ply PVC-coated polyester fabric to resist water

Product Summary

This Strongway™ Ventilating Hose is a lightweight and flexible solution to vent fumes out of closed-in areas and can be easily moved. Ideal for industrial air movement and fume control. Made of double-ply PVC-coated polyester fabric to resist water and reinforced with spring steel wire helix to keep it rigid, allowing air to move easily. Designed for an impressive temperature range of -22°F to 212°F. Resists oil and solvents, ozone, fungus, alkalis and water to use in many applications.

What's Included
(1) Hose

Features + Benefits



- For 8in. utility blower, Item# 49944
- Lightweight, flexible ventilating hose directs fumes out of closed-in areas
- Can be easily moved
- For industrial air movement and fume control
- Made of double-ply PVC-coated polyester fabric to resist water
- Reinforced with spring steel wire helix to keep hose rigid, allowing air to move easily
- Designed for temperature range of -22°F to 212°F
- Resists oil and solvents, ozone, fungus, alkalis and water to use in many applications
- Flame resistant construction
- 20 ft.L to help move air long distances
- Not recommended for continuous flexing

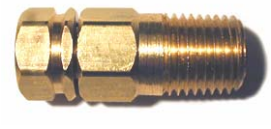
Key Specs

Item#	49931	**Temperature Range (°F)**	-22–212
Brand	Strongway	**Compatible With Item Number(s)**	49944
Manufacturer's Warranty	1 year Limited Warranty	**Pipe Diameter (in.)**	8

Ship Weight	9.0 lbs
Accessory Type	Ventilating hose
Material Type	PVC

Dimensions L x W x H (in.)	240 x 8

PRESSURE / TEMPERATURE TEST PLUG SPECIFICATIONS | TEXAS FAIRFAX COMPANY

¼" NPT Pressure/Temperature Test Plug & Cap			
	**Body Material:** Brass		
	Part Number	**Core Material**	**Max Temp**
	N-76-01	Neoprene	200° F
	N-76-02	Nordel	275° F

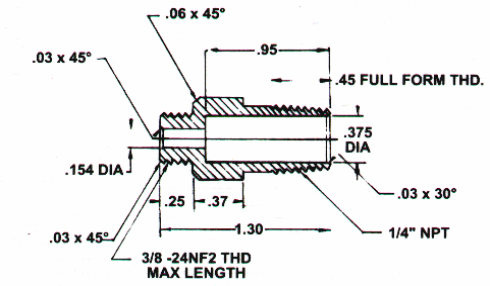
¼" NPT Lagg Pressure/Temperature Test Plug & Cap			
	**Body Material:** Brass		
	Part Number	**Core Material**	**Max Temp**
	N-76L-01	Neoprene	200° F
	N-76L-02	Nordel	275° F

½" NPT Pressure/Temperature Test Plug & Cap			
	**Body Material:** Brass		
	Part Number	**Core Material**	**Max Temp**
	N-78-01	Neoprene	200° F
	N-78-02	Nordel	275° F

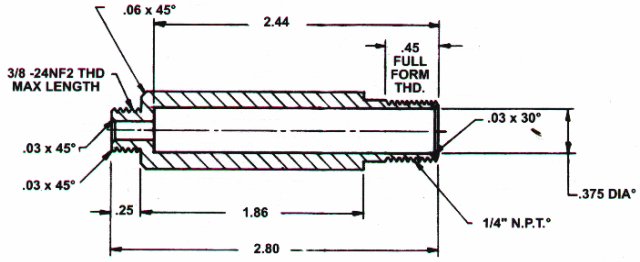
½" NPT Lagg Pressure/Temperature Test Plug & Cap			
	**Body Material:** Brass		
	Part Number	**Core Material**	**Max Temp**
	N-78L-01	Neoprene	200° F
	N-78L-02	Nordel	275° F

► **Pressure limits to 1000 PSI depending on application.**
► **Nordel core → blue cap**

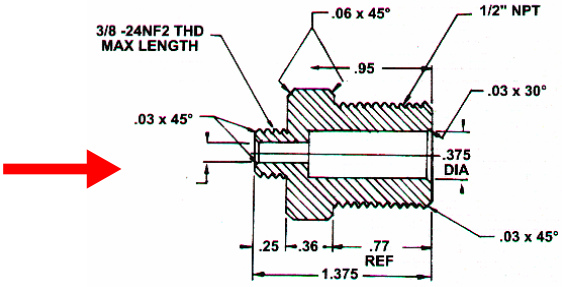
►**Cap Retainer Strap available for all sizes.**
► **Neoprene core → red cap**



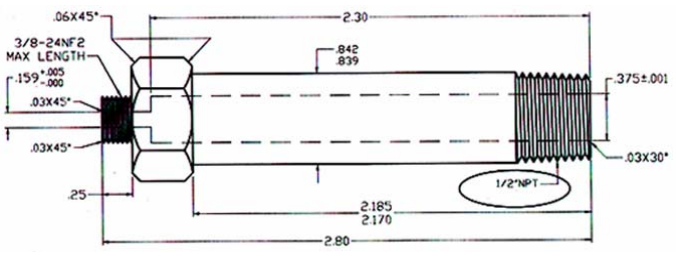
N-76 ¼" NPT P/T Plug



N-76L ¼" NPT Lagg P/T Plug



N-78 ½" NPT P/T Plug



N-78L ½" NPT Lagg P/T Plug

TEXAS FAIRFAX COMPANY | 998 CR 3860 Hawkins, Texas 75765-5389 | (903) 769-3358 | FAX (903) 769-4749 **Toll Free:** (800) 769-9488 | www.texasfairfax.com service@texasfairfax.com

GRAINGER
FOR THE ONES WHO GET IT DONE

printed February 3, 2010

Enclosure, NEMA 3r, 16ga

Enclosure With Hinged Cover, NEMA Type 3R, Knockout Pattern (2) 1/2-3/4 Inch, Knockout Pattern (1) 3/4-1 Inch, Height 8.00 Inches, Width 6.00 Inches, Depth 4.00 Inches, Usable Depth 3.50 Inches, Gauge 16, Mounting Hole Height 9.00 Inches, Mounting Hole Width 3.00 Inches, Padlockable Draw Latch Type, Accepts Interior Panel 2W821, Interior Panel Not Included

Grainger Item #	3A913
Your Price (ea.)	**$47.43**
Brand	WIEGMANN
Mfr. Model #	RHC060804
Ship Qty.	1
Sell Qty. (Will-Call)	1
Ship Weight (lbs.)	5.05
Usually Ships	Today
Catalog Page No.	450

Additional Info

NEMA 1 and 3R Enclosures

Steel with ANSI 61 gray polyester powder-coated finish.

UL Listed and CSA Certified.

NEMA 3R

Can be used outdoors to protect against rain, sleet, and snow, or indoors to protect against dripping water.

Drip-shield top and smooth, seamless sides prevent rain, snow, and sleet from entering the enclosure.

Tech Specs

Type: Small Cabinets Hinged
NEMA Rating: 3R
Material of Construction: Steel
Width (In.): 6.00
Depth (In.): 4.00
Finish: ANSI 61 Gray Polyester Powder
Latch Type: Padlockable Draw Latch
Interior Panel: 2W821
Gauge (Steel): 16
Height (In.): 8.00
Mounting Hole Height (In.): 9.00
Mounting Hole Width (In.): 3.00
Usable Opening Depth (In.): 3.50

Notes & Restrictions

There are currently no notes or restrictions for this item.

MSDS

This item does not require a **Material Safety Data Sheet (MSDS).**

Required Accessories

There are currently no required accessories for this item.

Optional Accessories

Enclosure Inner Panel

Item #: 2W821
Brand: WIEGMANN
Usually Ships: Today
Your Price (ea): $4.40

Alternate Products

Enclosure, NEMA 3r, 16ga

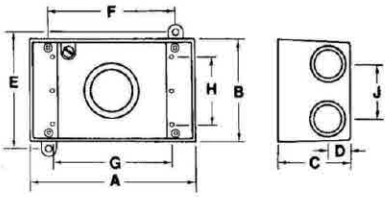
Item #: 6C717
Brand: WIEGMANN
Usually Ships: Today
Your Price (ea): $62.01

Enclosure, NEMA 3r, 16ga

Item #: 6C725
Brand: WIEGMANN
Usually Ships: Today
Your Price (ea): $29.41

Repair Parts

A Repair Part may be available for this item. Visit our Repair Parts Center or contact your local branch for more information.



Device Boxes, Covers & Accessories

T&B Catalog Number: IH3-1-LM
UPC Number: 04226939215
Status: Active
Description:

1-gang 17.3 cu. in. Universal weatherproof Box with Three 1/2 in. Holes and Mounting Lugs - Silver

Features

	Alloy A380 aluminum, certified zinc alloy and stainless steel springs provide increased corrosion resistance
	Die Cast construction and industrial design combine to produce a rugged protective enclosure for devices.
	Clean cover edges provide good gasket sealing.
	Precision cast and machined surfaces permit safer wire pulling.
	Clear UL and cubic content markings speed approval by inspectors
	Convenient mounting lugs for a variety of mounting methods
	Securely fastened mounting plates reduce costly call backs

Application

	Dry-tite boxes and covers protect wiring devices, switches, electronic components and terminal blocks in dry, damp and wet locations
	Accessible wiring chamber provides a convenient location to maintain or change a system, pull conductors and make splices
	Junction box for branch conduits

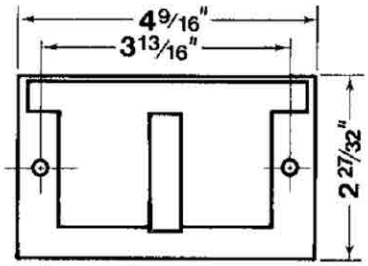
General

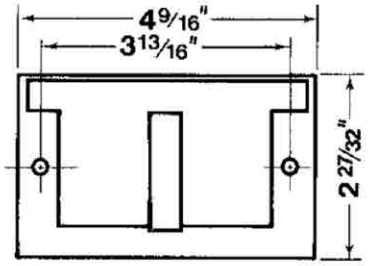
Material	Die Cast Aluminum
Finish	Powder-coated
Color	Silver
Volume (cu.in.)	17
Number of Gangs	One

Dimension Information

Hub Size (inches)	1/2
A (inches)	4 9/16
B (inches)	2 13/16
C (inches)	2
D (inches)	5/8
E (inches)	3 13/16
F (inches)	3 1/2
G (inches)	3 1/4
H (inches)	1 7/8
J (inches)	1 1/2

Thomas&Betts





Device Boxes, Covers & Accessories

T&B Catalog Number: CCG

UPC Number: 04226935020

Status: Active

Description:

1-gang weatherproof Horizontal Mount GFCI Receptacle Box Cover - Silver

Features

	Die Cast construction and industrial design combine to product a rugged protective enclosure for devices.
	Clean cover edges provide good gasket sealing.
	Precision cast and machined surfaces permit safer wire pulling.
	Convenient mounting lugs for a variety of mounting methods and securely fastened mounting plates reduce costly call backs.

Application

	Dry-tite boxes and covers protect wiring devices, switches, electronic components, and terminal block in Dry, Damp and Wet Locations.
	Accessible wiring chamber provides a convenient location to maintain or change a system, pull conductors and make splices.

General

Material	Die Cast Aluminum
Finish	Aluminum lacquer
Color	Silver
Mounting	Device Mount
Number of Gangs	One

Packaging

T&B Inner Pack	1
Package in Units	25
T&B Sold in UOM	Each
T&B Weight Per UOM	33.4 lbs. per 100

Application Support

D-Pak Merchandising System	Available on Website
Industry Cross Reference	Available on Website

Notes

Rain tight when used with appropriate Red Dot covers.

Certifications

File Nbr:

E 28688

Ground Fault Products

Heavy Duty Commercial and Hospital Grade GFCI Receptacles with Auto Grounding

15 and 20 Ampere, 125 Volts AC
2 Pole, 3 Wire Grounding

Meets UL Standard 943 Class A GFCI

10kA Short Circuit Current Rating

Comprehensive diagnostics
- When test button is actuated, both the electronic components and mechanical trip mechanism are functionally tested

Ground fault EOL indicator
- Flashing **RED** indicates device has lost capability to provide protection

No power at face if reverse wired
- Open circuit condition eliminates false assumption of protection at face

Installation ease
- Internal back wiring
- Automatic grounding feature
- Captive mounting screws

GF15ILA

GF20GYLA

GF15ILA

GF20WLA

GFR8200HOWLA

Circuit Guard® GFCI Receptacles

15A 125V NEMA 5-15R UL CSA 0.5 HP

20A 125V NEMA 5-20R UL CSA 1 HP

Description	Rating	Color	Catalog Number	
Flush, nylon face, back and side wired, multiple drive screws, automatic grounding clip.	15 and 20A 125V AC	Almond	**GF15ALLA**	**GF20ALLA**
		Black	**GF15BKLA**	**GF20BKLA**
		Brown	**GF15LA**	**GF20LA**
		Gray	**GF15GYLA**	**GF20GYLA**
		Ivory	**GF15ILA**	**GF20ILA**
		Light Almond	**GF15LALA**	**GF20LALA**
		Office White	**GF15OWLA**	**GF20OWLA**
		Red	**GF15RLA**	**GF20RLA**
		White	**GF15WLA**	**GF20WLA**

Hospital Grade ● Circuit Guard® GFCI Receptacles

15A 125V NEMA 5-15R UL CSA 0.5 HP

20A 125V NEMA 5-20R UL CSA 1 HP

Description	Rating	Color	Catalog Number	
Flush, nylon face, back and side wired, multiple drive screws, automatic grounding clip.	15 and 20A 125V AC	Almond	**GFR8200HALLA**	**GFR8300HALLA**
		Black	**GFR8200HBKLA**	**GFR8300HBKLA**
		Brown	**GFR8200HLA**	**GFR8300HLA**
		Gray	**GFR8200HGYLA**	**GFR8300HGYLA**
		Ivory	**GFR8200HILA**	**GFR8300HILA**
		Light Almond	**GFR8200HLAA**	**GFR8300HLAA**
		Office White	**GFR8200HOWLA**	**GFR8300HOWLA**
		Red	**GFR8200HRLA**	**GFR8300HRLA**
		White	**GFR8200HWLA**	**GFR8300HWLA**

Note: GFCI type receptacles should not be used in critical care patient areas or for electrical life support equipment applications because of the possibility of power interruption. All GFCI receptacles listed above are furnished with a matching color nylon wallplate. 20 amp feed-through capability.

Circuit Maker Vault® H-20 Load Rating Back-Fill Recommendations

ISCO Industries, LLC recommends that installation contractors follow the general guidelines as outlined in the *"Underground Installation of Polyethylene Piping"* as published by the Plastics Pipe Institute (see attached document). This document outlines the concept of a pipe soil system and the importance that the soil, design and preparation of the backfill materials play in the long-term performance of the entire system. It is recommended that HDPE manhole structures be designed and installed in accordance to the ASTM F 1759-97 standard. This standard addresses the material and structural design requirements for a manhole barrel. Additionally, the steps below outline a typical back fill material mix for a support structure required to achieve the H20 load rating:

1) A sandy mix of pea gravel can be used to fill in the bottom of the trench after the Circuit Maker Vault® has been set in place. The fill in mix should be taken to twelve (12) inches below the circuits and mains.

2) At this point, it is recommended that a layer of clean sand be taken to twelve (12) inches above the circuits and mains. Sand is self-compacting and will settle around the circuits and mains and will not put undo stress on the Circuit Maker Vault®.

3) At a level twelve (12) inches above the circuits and mains, it is recommended that the installation contractor uses a native soil for further compaction. The installation contractor is required to know the proper soils in the area that have good compaction qualities. The native soil can be used to take the fill to a level that is flush with the beginning of the concrete or asphalt layer.

4) We refer our customers to the ASTM F 1759-97 standard for a comprehensive outline on installing a concrete pad around the manhole structure that will rest on the soil surrounding the manhole area (a sample pre-engineered drawing is attached). A properly designed pad will work to disperse the live load into the soil surrounding the manhole. Attached is a short document that explains the general details of the ASTM F 1759-97 standard. The complete ASTM standard can be found by going to www.ASTM.org.

MANHOLES DESIGN AND INSTALLATION STANDARDS

ISCO Industries recommends that HDPE manholes be designed and installed in accordance with ASTM F 1759-97, “Standard Practice for Design of High Density Polyethylene (HDPE) Manholes for Subsurface Applications”. This standard addresses the material, structural design requirements of the manhole barrel, floor (or bottom) and top.

This standard assumes that the HDPE manhole will be installed in backfill consisting of Class I or Class II material as defined in ASTM D 2321, which has been compacted to a minimum of 90% standard proctor density. The backfill should extend 3.5 feet from the perimeter of the manhole for the full height of the manhole. This extends laterally to undisturbed soil. Manholes should be placed on a base of stable soil, a concrete base, or bedding. Bedding should be 12 inches in depth and have 95% standard proctor density. The foundation materials must provide adequate bearing strength for the manhole and downdrag loads.

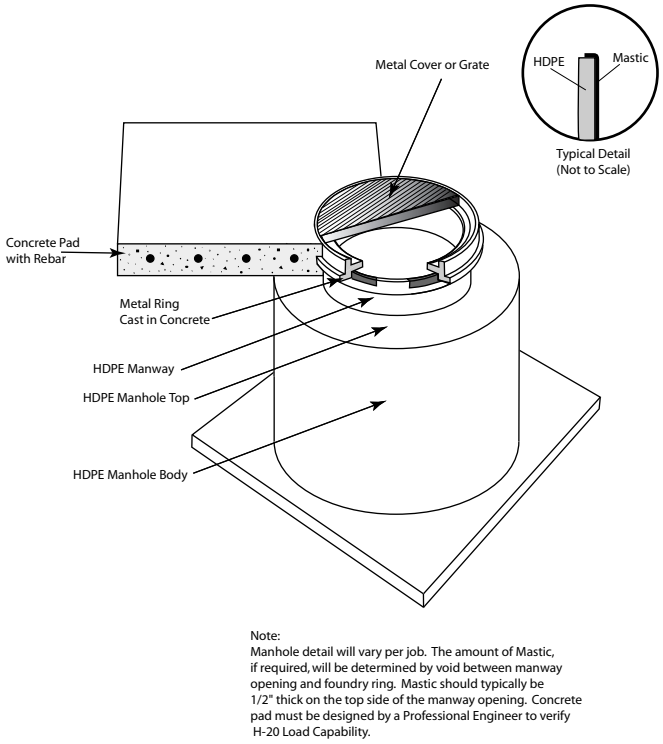
Manholes used in landfills and other areas which experience soil settlement will require special designs. The designer should prepare special specifications for these particular applications.

VEHICULAR LOADS

When HDPE manholes are installed in roads or areas subject to vehicular traffic, a concrete pad which rests on the soil surrounding the manhole is required. The pad should be designed to disperse the live load into the soil. Drawing 1 shows a concrete with rebar and foundry cover.

UNLOADING

Nylon slings are used to unload HDPE manholes from trucks. A fork lift, boom truck or backhoe can be used. Match the weight and size of the manhole with the lifting capabilities of the equipment. A timber beam can be used inside the manhole between inlets and outlets for easy lifting. Lifting lugs can be fabricated on the manhole when requested.



Note:
Manhole detail will vary per job. The amount of Mastic, if required, will be determined by void between manway opening and foundry ring. Mastic should typically be 1/2" thick on the top side of the manway opening. Concrete pad must be designed by a Professional Engineer to verify H-20 Load Capability.

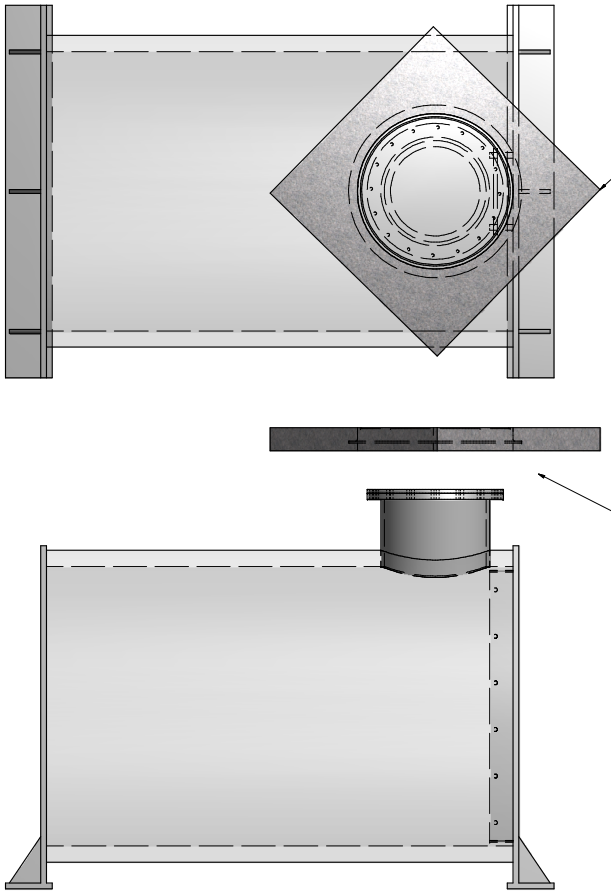
Drawing 2
Foundry Connection Cover Detail

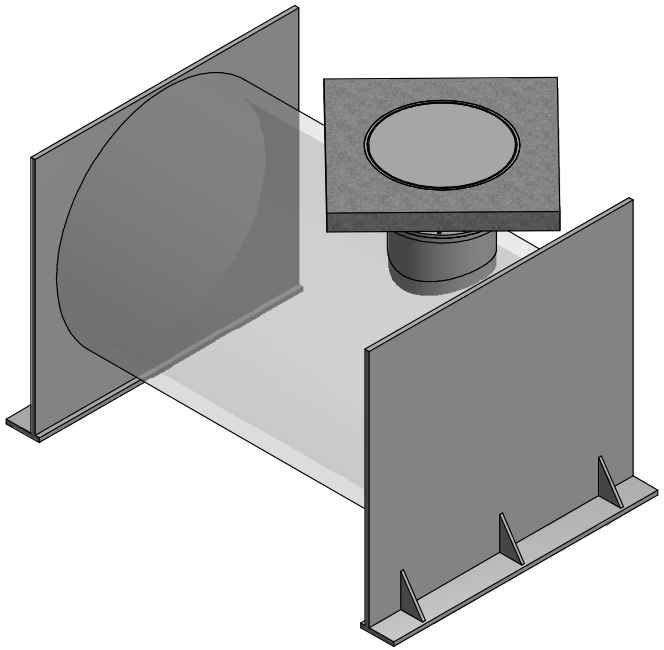
FLOTATION AND DEFLECTION

When HDPE manholes are installed in areas with groundwater, floatation must be considered. Depending upon the level of the water table, the HDPE manhole must be anchored in place. Reinforced concrete collars are used to prevent flotation. Attachment to the manhole is important. Drawing 4 below, shows a typical buried HDPE manhole with a lip on the bottom to reduce flotation. The upward lift of the water displaced by the HDPE manhole applies pressure on the bottom of the manhole. This can cause deflection in the bottom. The bottom must be thick enough or reinforced to limit deflection to acceptable levels.

Circuit Maker Vault®
Foundry Cover Casting

* FOUNDRY & CONCRETE PAD ARE NOT TO REST DIRECTLY ON THE HDPE MANWAY COVER OR OPENING
* CONCRETE PAD TO REST ON SURROUNDING BACKFILL TO DISPERSE TRAFFIC LOADS AWAY FROM MANWAY ENTRY COMPONENTS
* GEOTHERMAL VAULT SHALL BE INSTALLED ON A STABLE BASE CONSISTING OF 12" OF CLASS 1 MATERIAL (DEFINED ON ASTM D2321) COMPACTED TO 95% PROCTOR DENSITY
* PLASTIC PIPE SYSTEM RELY ON THE STRENGTH OF COMPACTED EMBEDMENT MATERIALS. EMBEDMENT MATERIALS SHALL BE CLASS 1 OR CLASS II MATERIAL AS DEFINED ASTM D2321, SECTION 5. CLASS 1 MATERIAL ARE PREFERRED. BACKFILL & BEDDING MATERIALS SHALL BE FREE FO DEBRIS. BEDDING OF THE VAULT SHOULD BE PERFORMED IN ACCORDANCE WITH ASTM D 2321, SECTION 7. COMPACT SHALLL BE AT LEAST 90%.





TOLERANCE STANDARDS AS MEASURED AT AMBIENT TEMPERATURE:
-ISCO shall maintain a fabrication tolerance of ± 2" for all dimenision shown on fabricated item(s).
-ISCO shall maintain a fabrication tolerance of ± 5° for fabricated elbows.
*Specific tolerances may be provided by customer but must be approved by ISCO Industries prior to fabrication.
*Machined item tolerance will vary between size and part. Contact ISCO for available tolerance.

REVISION HISTORY

REV	DESCRIPTION	DATE

DRAWN BY: JAYSON AKRIDGE DATE: 03-04-14
REVIEWED BY: DON MCGRIFF DATE: 03-04-14
APPROVED BY: DATE

ISCO INDUSTRIES
www.isco-pipe.com 1-800-345-4726
SO #: WO #:
PROJECT SITE LOCATION:

CUSTOMER NAME: FOUNDRY COVER
DRAWING TITLE: FOUNDRY-030414
SIZE D | DWG FILE LOCATION GC/FCI/FC | SHEET 1 OF 1
TERRITORY REPRESENTATIVE: SALESMAN

MARKING TAPE

DETECTABLE TAPE (5.0 MIL)

DETECTABLE TAPE (5.0 MIL)

Solid Aluminum Foil Core • Virgin Clear Polypropylene Film Laminated Top Structure
Virgin Clear Polyethylene Film Laminated Base Structure • Reverse Printed Polypropylene Structure
Acid, Alkali, Chemical, and Oil Resistant • Direct Burial Rated • Made in the USA

Applications and Information

- **Pro-Line's Detectable Marking Tape** is used for detecting, locating, identifying, and protecting buried utility lines for gas, water, sewer, telecommunication, and electrical markets. The width of tape used, is determined by the size of, and depth at which the underground utility line is buried. The depth at which detectable tape is buried, is determined by the width of the tape used.
- **DETECT:** Aluminum core is detected through means of inductive locating.
- **LOCATE:** Line is located and marked after inductive locating is performed.
- **IDENTIFY:** Utility type is identified by both the APWA color-code and utility legend printed on the marking tape.
- **PROTECT:** Detectable tape works 24 hours a day and year round, even if tape is not inductively located during excavation, the tape provides a "stop-sign" effect that is highly visible.

Standards and References

Pro-Line's Detectable Marking Tape meets or exceeds all applicable ASTM specifications.

- ASTM D2103-08: Standard Specification for Polyethylene Films and Sheeting.
- ASTM D882-09: Standard Test Method for Tensile Properties and Elongation of Thin Plastic Sheeting.
- ASTM D2578-08: Standard Test Method for Wetting Tension of Polyethylene and Polypropylene Films.
- ASTM D792-08: Standard Test Methods for Density of Plastics by Displacement.
- ASTM D671-93: Standard Test Method for Flexural Fatigue of Plastics.

Construction

Pro-Line's Detectable Marking Tape consists of a minimum 5.0 mil overall thickness. Construction is 0.8 mil clear virgin polypropylene film, reverse printed and laminated to a 0.35 solid aluminum foil core and then laminated to a 3.75 mil clear virgin polyethylene film. Tape is printed with our APWA Color-Coded, patented "Diagonally Striped" design with big, bold, black lettering to identify a specific buried utility line.

Specifications

DETECTABLE UNDERGROUND MARKING TAPE

Underground marking tape shall be a (2", 3", 4", 6", or 12" width), detectable marking tape, with a minimum 5.0 mil overall thickness. Tape shall be manufactured using a 0.8 mil clear virgin polypropylene film, reverse printed and laminated to a **0.35 mil solid aluminum foil core**, and then laminated to a 3.75 mil clear virgin polyethylene film. Tape shall be printed using a diagonally striped design for maximum visibility, and meet the APWA Color-Code standard for identification of buried utilities. Detectable marking tape shall be **Pro-Line Safety Products** or approved equal and made in the USA.

DETECTABLE TAPE (5.0 MIL)

TABLE 1: DETECTABLE TAPE CONSTRUCTION (Polypropylene, Aluminum Foil, and Polyethylene)

PROPERTY	2" WIDTH	3" WIDTH	4" WIDTH	6" WIDTH	12" WIDTH
Nominal Overall Thickness	5.0 mil	5.0 mil	5.0 mil	5.0 mil	5.0 mil
Aluminum Foil Core Thickness	0.35 mil	0.35 mil	0.35 mil	0.35 mil	0.35 mil
Polyethylene Film Thickness	3.75 mil	3.75 mil	3.75 mil	3.75 mil	3.75 mil
Polypropylene Film Thickness	0.80 mil	0.80 mil	0.80 mil	0.80 mil	0.80 mil
Polypropylene Print Method	Reverse Printed	Reverse Printed	Reverse Printed	Reverse Printed	Reverse Printed
Print Design #1 (Patented)	**Diagional Striped**	**Diagional Striped**	**Diagional Striped**	**Diagional Striped**	**Diagional Striped**
Print Design #2 (Custom)	Solid Block	Solid Block	Solid Block	Solid Block	Solid Block
Print Design #3 (Custom)	Solid Flood	Solid Flood	Solid Flood	Solid Flood	Solid Flood
Print Design Color-Code	APWA Color-Code	APWA Color-Code	APWA Color-Code	APWA Color-Code	APWA Color-Code

Diagional striped design is a PATENTED design of Pro-Line Safety Products that enhances tape visibility for superior protection.

Please note that there may be a nominal + or - 10% difference throughout the overall thickness.

TABLE 2: TESTING SPECIFICATIONS (Physical and Mechanical Properties)

TEST DESCRIPTION	STANDARD	2" WIDTH	3" WIDTH	4" WIDTH	6" WIDTH	12" WIDTH
Aluminum Foil Core	MFG. SPECS	Virgin Grade	Virgin Grade	Virgin Grade	Virgin Grade	Virgin Grade
Polyethylene Film	MFG. SPECS	Virgin Grade	Virgin Grade	Virgin Grade	Virgin Grade	Virgin Grade
Polypropylene Film	MFG. SPECS	Virgin Grade	Virgin Grade	Virgin Grade	Virgin Grade	Virgin Grade
Adhesive Type	MFG. SPECS	AV1257/CA100	AV1257/CA100	AV1257/CA100	AV1257/CA100	AV1257/CA100
Adhesive Bond Strength	BOILING WATER	5 hrs W/O Peel	5 hrs W/O Peel	5 hrs W/O Peel	5 hrs W/O Peel	5 hrs W/O Peel
Printed Inks	MFG. SPECS	Chromabond	Chromabond	Chromabond	Chromabond	Chromabond
Print Repeat	MFG. SPECS	Varies by Legend	Varies by Legend	Varies by Legend	Varies by Legend	Varies by Legend
Coefficient Friction	ASTM D4521-96	0.247 Static	0.247 Static	0.247 Static	0.247 Static	0.247 Static
Density	ASTM D792-66	1.09 g/cm^3	1.09 g/cm^3	1.09 g/cm^3	1.09 g/cm^3	1.09 g/cm^3
Elongation (MD)	ASTM D882-80A	139%	139%	139%	139%	139%
Elongation (TD)	ASTM D882-80A	80%	80%	80%	80%	80%
Flexural Fatigue	ASTM D671-93	Pliable Hand	Pliable Hand	Pliable Hand	Pliable Hand	Pliable Hand
Printability	ASTM D2578-08	45 Dynes	45 Dynes	45 Dynes	45 Dynes	45 Dynes
Tensile Strength	ASTM D882-09	15,000 psi	15,000 psi	15,000 psi	15,000 psi	15,000 psi

WEIGHTS, MEASUREMENTS AND PACKAGING

PRODUCT PART NO.	SIZE (WIDTH)	NOMINAL OVERALL THICKNESS	NOMINAL THICKNESS OF STRUCTURAL MATERIALS			RECOMMENDED BURIAL DEPTHS FOR DETECTION	PRODUCT WEIGHT PER ROLL	STANDARD PACKAGING
			ALUMINUM FOIL THICKNESS	POLYETHYLENE THICKNESS	POLYPROPYLENE THCINKESS			
10311**XXX**3	2" x 1000'	5.0 MIL	0.35 MIL	3.75 MIL	0.80 MIL	6-9 inches	4.75 lbs	9 / CARTON
10312**XXX**3	3" x 1000'	5.0 MIL	0.35 MIL	3.75 MIL	0.80 MIL	9-12 inches	7.13 lbs	6 / CARTON
10313**XXX**3	4" x 1000'	5.0 MIL	0.35 MIL	3.75 MIL	0.80 MIL	12-15 inches	9.50 lbs	4 / CARTON
10314**XXX**3	6" x 1000'	5.0 MIL	0.35 MIL	3.75 MIL	0.80 MIL	15-18 inches	14.25 lbs	3 / CARTON
10316**XXX**3	12" x 1000'	5.0 MIL	0.35 MIL	3.75 MIL	0.80 MIL	18-24 inches	28.50 lbs	1 / CARTON

****FOR CUSTOM LEGENDS OR SIZES CALL 800.554.3424****

PRINT LEGEND	PART #
CAUTION BURIED CHILLED WATER LINE BELOW	103
CAUTION BURIED GEOTHERMAL LINE BELOW	128
CAUTION BURIED POTABLE WATER LINE BELOW	115
CAUTION BURIED WATER LINE BELOW	125
CAUTION BURIED FORCE MAIN BELOW	208
CAUTION BURIED FORCE MAIN BELOW	308
CAUTION BURIED SANITARY SEWER LINE BELOW	318
CAUTION BUIRED SEWER LINE BELOW	319
CAUTION BURIED STORM DRAIN LINE BELOW	321
CAUTION BURIED STORM SEWER LINE BELOW	322

PRINT LEGEND	PART #
CAUTION BURIED CATV LINE BELOW	402
CAUTION BURIED COMMUNICATION LINE BELOW	404
CAUTION BURIED FIBER OPTIC CABLE BELOW	406
CAUTION BURIED TELEPHONE LINE BELOW	423
CAUTION BURIED NON-POTABLE WATER LINE	512
CAUTION BURIED RECLAIMED WATER LINE BELOW	517
CAUTION BURIED ELECTRIC LINE BELOW	605
CAUTION BURIED HIGH VOLTAGE LINE BELOW	610
CAUTION BURIED GAS LINE BELOW	809
CAUTION BURIED PIPELINE BELOW	814

MARKING TAPE

DETECTABLE TAPE (5.0 MIL)

PRO-LINE SAFETY PRODUCTS
A DIVISION OF PRO-PAK IND. INC.

PRO-LINE SAFETY PRODUCTS COMPANY
1099 ATLANTIC DRIVE, UNIT 1 • WEST CHICAGO, IL 60185
TOLL FREE: 800.554.3424

MADE IN THE U.S.A. WITH PRIDE

CU HDPE 45 MIL

Copper Tracer Wire • 600 Volts • Oxygen Free Copper Conductor • Dead Soft Annealed
High Molecular Weight Polyethylene (HMWPE) Insulation • Direct Burial Rated
Moisture, Chemical, Oil, and Sunlight Resistant • Impact, Crush, and Abrasion Resistant
RoHS Compliant • Made in the USA

Applications and Information

- Pro-Line **Type CU HDPE 45 MIL** conductors are used for tracer wire applications not exceeding 600 Volts. Tracer wire is used to conductively locate buried utility lines for the gas, water, sewer, telecommunication, and electrical markets.
- When used as **Type CU HDPE 45 MIL**, conductor is suitable for use direct burial applications not locations at temperatures not to exceed 75°C.
- Tracer wire is RoHS Compliant and manufacturered in the USA.

Standards and References

Pro-Line **Type CU HDPE 45 MIL** conductors meets or exceeds all applicable ASTM specifications, requirements of the National Electrical Code.

- ASTM B-3: Standard Specification for Soft or Annealed Copper Wire
- ASTM B170: Standard Specification for Oxygen-Free Electrolytic Copper
- ASTM D1248: Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable
- ASTM D1238: Standard Test Method for Melt Flow Rates of Thermoplastics by Extrusion Plastometer

Construction

- Pro-Line **Type CU HDPE 45 MIL** copper conductors are annealed copper (soft drawn), insulated with a high-density, high molecular weight polyethylene (HDPE) insulation. HDPE provides an excellent balance of surface smoothness, processing ease and electrical consistency. HDPE provides superior strength against underground elements that help prevent accidental breaks caused buy rocks in shifting soil conditions.
- Available in black, blue, green, orange, purple, red, white, and yellow. Some colors standard, some subject to economic order quantity.

Specifications

TYPE: CU HDPE 45 MIL TRACER WIRE
Tracer wire shall be a (14, 12 or 10 AWG SOLID HDPE 45 MIL) copper conductor with a 45 mil thick, high-density, high molecular weight polyethylene (HDPE) insulation and rated for 600 volts. Insulation and jacket shall be RoHS compliant and utilize virgin grade material. Insulation color shall meet the APWA color code standard for identification of buried utilities. Tracer wire shall be **Pro-Line Safety Products** or approved equal and made in the USA.

CU HDPE 45 MIL

CU HDPE 45 MIL Tracer Wire (Weights, Measurements, and Packaging)

WEIGHTS, MEASUREMENTS AND PACKAGING

PRODUCT PART NO.	CONDUCTOR		INSULATION THICKNESS (HDPE)	NOMINAL O.D. (inches)	APPROX. WEIGHT PER 1,000 FT (lbs)		STANDARD PACKAGES
	SIZE (AWG)	STRANDING			COPPER WEIGHT/MFT	PRODUCT WEIGHT/MFT	
CU HDPE 45 MIL (SOLID) TRACER WIRE							
74103XXXX	14 AWG	SOLID	0.045" (45 MIL)	0.157"	12.400 lbs	19.000 lbs	32, 47
74104XXXX	12 AWG	SOLID	0.045" (45 MIL)	0.174"	19.500 lbs	27.000 lbs	32, 47
74105XXXX	10 AWG	SOLID	0.045" (45 MIL)	0.195"	30.996 lbs	40.000 lbs	32, 47
74106XXXX	8 AWG	SOLID	0.045" (45 MIL)	0.219"	49.975 lbs	65.000 lbs	32, 47
CU HDPE 45 MIL (STRANDED) TRACER WIRE							
74108XXXX	14 AWG	7-STRAND	0.045" (45 MIL)	0.163"	12.600 lbs	19.000 lbs	32, 47
74110XXXX	12 AWG	7-STRAND	0.045" (45 MIL)	0.182"	19.600 lbs	28.000 lbs	32, 47
74112XXXX	10 AWG	7-STRAND	0.045" (45 MIL)	0.206"	31.136 lbs	41.000 lbs	32, 47
74114XXXX	8 AWG	7-STRAND	0.045" (45 MIL)	0.236"	49.824 lbs	66.000 lbs	32, 47

PART # DESIGNATION (AWG & COLOR)

COLOR	14 AWG SOLID	12 AWG SOLID	10 AWG SOLID	8 AWG SOLID
BLACK	7410301xx	7410401xx	7410501xx	7410601xx
BLUE	7410302xx	7410402xx	7410502xx	7410602xx
GREEN	7410305xx	7410405xx	7410505xx	7410605xx
ORANGE	7410306xx	7410406xx	7410506xx	7410606xx
PURPLE	7410308xx	7410408xx	7410508xx	7410608xx
RED	7410309xx	7410409xx	7410509xx	7410609xx
WHITE	7410311xx	7410411xx	7410511xx	7410611xx
YELLOW	7410312xx	7410412xx	7410512xx	7410612xx
COLOR	**14 AWG STRND**	**12 AWG STRND**	**10 AWG STRND**	**8 AWG STRND**
BLACK	7410801xx	7411001xx	7411201xx	7411401xx
BLUE	7410802xx	7411002xx	7411202xx	7411402xx
GREEN	7410805xx	7411005xx	7411205xx	7411405xx
ORANGE	7410806xx	7411006xx	7411206xx	7411406xx
PURPLE	7410808xx	7411008xx	7411208xx	7411408xx
RED	7410809xx	7411009xx	7411209xx	7411409xx
WHITE	7410811xx	7411011xx	7411211xx	7411411xx
YELLOW	7410812xx	7411012xx	7411212xx	7411412xx

PART # DESIGNATION (PACKAGE SIZE)

SIZE	PACKAGING	TYPE	PART NO.
14 AWG SOLID	4 x 500 FT REEL	CARTON	xxxxxxx32
	1 x 2500 FT REEL	BULK REEL	xxxxxxx47
12 AWG SOLID	4 x 500 FT REEL	CARTON	xxxxxxx32
	1 x 2500 FT REEL	BULK REEL	xxxxxxx47
10 AWG SOLID	2 x 500 FT REEL	CARTON	xxxxxxx32
	1 x 2500 FT REEL	BULK REEL	xxxxxxx47
8 AWG SOLID	1 x 500 FT REEL	BULK REEL	xxxxxxx32
	1 x 2500 FT REEL	BULK REEL	xxxxxxx47
14 AWG STRANDED	4 x 500 FT REEL	CARTON	xxxxxxx32
	1 x 2500 FT REEL	BULK REEL	xxxxxxx47
12 AWG STRANDED	4 x 500 FT REEL	CARTON	xxxxxxx32
	1 x 2500 FT REEL	BULK REEL	xxxxxxx47
10 AWG STRANDED	2 x 500 FT REEL	CARTON	xxxxxxx32
	1 x 2500 FT REEL	BULK REEL	xxxxxxx47
8 AWG STRANDED	1 x 500 FT REEL	BULK REEL	xxxxxxx32
	1 x 2500 FT REEL	BULK REEL	xxxxxxx47

TRACER WIRE

CU HDPE 45 MIL

PRO-LINE SAFETY PRODUCTS
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TOLL FREE: 800.554.3424

MADE IN THE U.S.A. WITH PRIDE

BAROTHERM® GOLD

Two-Part Thermally Conductive Grout

Description

BAROTHERM® GOLD thermally conductive grout is a bentonite material designed for use in grouting boreholes containing ground source heat loops, and related applications BAROTHERM GOLD thermally conductive grout when combined with silica sand at various concentrations yields a grout with thermal conductivity values ranging between 0.4 and 1 2 BTU/hr·ft·°F (0.69 – 2 08 watts/m·°C).

Applications/Functions

The use of BAROTHERM GOLD thermally conductive grout assists and promotes the following:

- A thermally conductive grout medium with low permeability for sealing ground source heat loops

Advantages

- Promotes efficient heat transfer
- Creates a low permeability seal
- Develops a permanent, flexible seal to prevent commingling between aquifers
- No heat of hydration
- No Portland or aluminum cement added
- No gypsum added
- NSF/ANSI Standard 60 Certified

Typical Properties

Appearance	Beige to tan powder
Specific gravity	2.6
Thermal Conductivity (k) range	0.4 – 1.2 BTU/hr·ft·°F 0.69 – 2.08 watts/m °C
Yield Volume range	17.6– 41 8 gal/batch 66.7 – 158.2 liters/batch
Grout Weight range	10.1 – 15.0 lb/gal 1.21 – 1 80 SG
Permeability	< 1.0×10^{-7} cm/sec

Recommended Treatment

The recommended treatment is based on the desired thermal conductivity value or k. Please refer to the treatment tables below.

k Btu/hr·ft·°F	Silica Sand lb/50 lb	Water gal/50 lb	Slurry Volume Yield (gallons)	Density lb/gal	Total Solids
0.4	0	15.3	17.6	10.1	28.1%
0.69	100	15 3	22.2	12.5	54.0%
0.76	150	16 3	25.5	13.2	59 5%
0.88	200	17.3	28 8	13.7	63.4%
1	250	18.3	32.1	14.1	66 3%
1 1	350	20.0	38 5	14 7	70.6%
1.2	400	21 0	41.8	15.0	72 0%

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Recommended Treatment (continued)

k watts/m·°C	Silica Sand kg/22.7 kg	Water liters/22.7kg	Slurry Volume Yield (liters)	Density SG	Total Solids
0 69	0	57 9	66.7	1 21	28.1%
1.19	45.4	57 9	84 0	1 50	54 0%
1.32	68.0	61 7	96 5	1.58	59 5%
1 52	90 7	65 5	109.0	1 64	63.4%
1 73	113 4	69 3	121.5	1 69	66 3%
1 90	158 8	75.7	145 7	1 76	70.6%
2 08	181 4	79.5	158 2	1 80	72 0%

Recommended Mixing Procedure

- Using a mixing device, blend one sack of BAROTHERM® GOLD thermally conductive grout into water Rate of addition should be about 20 to 30 seconds per 50-lb (22.7 kg) bag Mix adequately, typically 30 to 90 seconds, depending on the mixer Add sand at a rate of 20 to 30 seconds per sack and pump
- Dry sand ranging between 50 and 70 mesh and containing greater than 99% silica is recommended
- Blend, do not over mix and do not use a centrifugal pump. Place through a 1.25 inch (32 mm) minimum I.D tremie into hole without delay
- Bentonite grouts may not be appropriate for formation water chemistries where total hardness is greater than or equal to 500 parts per million and/or the chloride content is greater than or equal to 1500 parts per million In the event that questions regarding subsurface environments arise, it is always best to consult your local Baroid IDP representative to determine if the Baroid product of choice is appropriate for the given conditions.

Packaging

BAROTHERM GOLD thermally conductive grout is packaged in 50-lb (22 7 kg) multiwall paper bags, containing 0.7 ft^3 (0 02 m^3). 3000-lb supersacks are available by special order.

Availability

BAROTHERM GOLD thermally conductive grout can be purchased through any Baroid Industrial Drilling Products Retailer. To locate the Baroid IDP retailer nearest you contact the Customer Service Department in Houston or your area IDP Sales Representative

Baroid Industrial Drilling Products
Product Service Line, Halliburton
3000 N Sam Houston Pkwy E
Houston, TX 77032

Customer Service	(800) 735-6075 Toll Free	(281) 871-4612
Technical Service	(877) 379-7412 Toll Free	(281) 871-4613

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HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **BAROTHERM® GOLD**

Revision Date: 02-Jun-2009

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: BAROTHERM® GOLD
Synonyms: None
Chemical Family: Mineral
Application: Grouting Material

Manufacturer/Supplier
Baroid Fluid Services
a Product Service Line of Halliburton Energy Services, Inc.
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By
Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

SUBSTANCE	CAS Number	PERCENT	ACGIH TLV-TWA	OSHA PEL-TWA
Sodium carbonate	497-19-8	1 - 5%	Not applicable	Not applicable
Bentonite	1302-78-9	60 - 100%	Not applicable	Not applicable
Crystalline silica, quartz	14808-60-7	1 - 5%	0.025 mg/m³	$\frac{10\ mg/m^3}{\%SiO2 + 2}$
Crystalline silica, cristobalite	14464-46-1	0 - 1%	0.025 mg/m³	$1/2 \times \frac{10\ mg/m^3}{\%SiO2 + 2}$
Crystalline silica, tridymite	15468-32-3	0 - 1%	0.05 mg/m³	$1/2 \times \frac{10\ mg/m^3}{\%SiO2 + 2}$

More restrictive exposure limits may be enforced by some states, agencies, or other authorities.

3. HAZARDS IDENTIFICATION

Hazard Overview

CAUTION! - ACUTE HEALTH HAZARD
May cause eye and respiratory irritation.

DANGER! - CHRONIC HEALTH HAZARD
Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.

This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposures below recommended exposure limits. Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. Review the Material Safety Data Sheet (MSDS) for this product, which has been provided to your employer.

4. FIRST AID MEASURES

Inhalation — If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Skin — Wash with soap and water. Get medical attention if irritation persists.

Eyes — In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Ingestion — Under normal conditions, first aid procedures are not required.

Notes to Physician — Treat symptomatically.

5. FIRE FIGHTING MEASURES

Flash Point/Range (F):	Not Determined
Flash Point/Range (C):	Not Determined
Flash Point Method:	Not Determined
Autoignition Temperature (F):	Not Determined
Autoignition Temperature (C):	Not Determined
Flammability Limits in Air - Lower (%):	Not Determined
Flammability Limits in Air - Upper (%):	Not Determined

Fire Extinguishing Media — All standard firefighting media.

Special Exposure Hazards — Not applicable.

Special Protective Equipment for Fire-Fighters — Not applicable.

NFPA Ratings: Health 0, Flammability 0, Reactivity 0
HMIS Ratings: Health 0*, Flammability 0, Physical Hazard 0 , PPE: E

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures — Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures — None known.

Procedure for Cleaning / Absorption	Collect using dustless method and hold for appropriate disposal. Consider possible toxic or fire hazards associated with contaminating substances and use appropriate methods for collection, storage and disposal.

7. HANDLING AND STORAGE

Handling Precautions	This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet.
Storage Information	Use good housekeeping in storage and work areas to prevent accumulation of dust. Close container when not in use. Do not reuse empty container. Product has a shelf life of 12 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls	Use approved industrial ventilation and local exhaust as required to maintain exposures below applicable exposure limits listed in Section 2.
Respiratory Protection	Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product.
Hand Protection	Normal work gloves.
Skin Protection	Wear clothing appropriate for the work environment. Dusty clothing should be laundered before reuse. Use precautionary measures to avoid creating dust when removing or laundering clothing.
Eye Protection	Wear safety glasses or goggles to protect against exposure.
Other Precautions	None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Powder
Color:	Tan
Odor:	Mild earthy
pH:	8-10
Specific Gravity @ 20 C (Water=1):	2.6
Density @ 20 C (lbs./gallon):	Not Determined
Bulk Density @ 20 C (lbs/ft3):	50- 73
Boiling Point/Range (F):	Not Determined
Boiling Point/Range (C):	Not Determined
Freezing Point/Range (F):	Not Determined
Freezing Point/Range (C):	Not Determined
Vapor Pressure @ 20 C (mmHg):	Not Determined
Vapor Density (Air=1):	Not Determined
Percent Volatiles:	Not Determined
Evaporation Rate (Butyl Acetate=1):	Not Determined
Solubility in Water (g/100ml):	Insoluble
Solubility in Solvents (g/100ml):	Not Determined
VOCs (lbs./gallon):	Not Determined
Viscosity, Dynamic @ 20 C (centipoise):	Not Determined
Viscosity, Kinematic @ 20 C (centistrokes):	Not Determined
Partition Coefficient/n-Octanol/Water:	Not Determined

9. PHYSICAL AND CHEMICAL PROPERTIES

Molecular Weight (g/mole): Not Determined

10. STABILITY AND REACTIVITY

Stability Data:	Stable
Hazardous Polymerization:	Will Not Occur
Conditions to Avoid	None anticipated
Incompatibility (Materials to Avoid)	Hydrofluoric acid
Hazardous Decomposition Products	Amorphous silica may transform at elevated temperatures to tridymite (870 C) or cristobalite (1470 C).
Additional Guidelines	Not Applicable

11. TOXICOLOGICAL INFORMATION

Principle Route of Exposure	Eye or skin contact, inhalation.
Inhalation	Inhaled crystalline silica in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (IARC, Group 1). There is sufficient evidence in experimental animals for the carcinogenicity of tridymite (IARC, Group 2A). Breathing silica dust may cause irritation of the nose, throat, and respiratory passages. Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may also have serious chronic health effects (See "Chronic Effects/Carcinogenicity" subsection below).
Skin Contact	May cause mechanical skin irritation.
Eye Contact	May cause eye irritation.
Ingestion	None known
Aggravated Medical Conditions	Individuals with respiratory disease, including but not limited to asthma and bronchitis, or subject to eye irritation, should not be exposed to quartz dust.

Chronic Effects/Carcinogenicity	Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling, and sometimes-fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness, and reduced pulmonary function. This disease is exacerbated by smoking. Individuals with silicosis are predisposed to develop tuberculosis. Cancer Status: The International Agency for Research on Cancer (IARC) has determined that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources can cause lung cancer in humans (Group 1 - carcinogenic to humans) and has determined that there is sufficient evidence in experimental animals for the carcinogenicity of tridymite (Group 2A - possible carcinogen to humans). Refer to IARC Monograph 68, Silica, Some Silicates and Organic Fibres (June 1997) in conjunction with the use of these minerals. The National Toxicology Program classifies respirable crystalline silica as "Known to be a human carcinogen" Refer to the 9th Report on Carcinogens (2000). The American Conference of Governmental Industrial Hygienists (ACGIH) classifies crystalline silica, quartz, as a suspected human carcinogen (A2). There is some evidence that breathing respirable crystalline silica or the disease silicosis is associated with an increased incidence of significant disease endpoints such as scleroderma (an immune system disorder manifested by scarring of the lungs, skin, and other internal organs) and kidney disease.
Other Information	For further information consult "Adverse Effects of Crystalline Silica Exposure" published by the American Thoracic Society Medical Section of the American Lung Association, American Journal of Respiratory and Critical Care Medicine, Volume 155, pages 761-768 (1997).

Toxicity Tests

Oral Toxicity:	Not determined
Dermal Toxicity:	Not determined
Inhalation Toxicity:	Not determined
Primary Irritation Effect:	Not determined
Carcinogenicity	Refer to IARC Monograph 68, Silica, Some Silicates and Organic Fibres (June 1997).
Genotoxicity:	Not determined
Reproductive / Developmental Toxicity:	Not determined

12. ECOLOGICAL INFORMATION

Mobility (Water/Soil/Air)	Not determined
Persistence/Degradability	Not determined
Bio-accumulation	Not Determined

Ecotoxicological Information

Acute Fish Toxicity: Not determined
Acute Crustaceans Toxicity: Not determined

Acute Algae Toxicity:	Not determined
Chemical Fate Information	Not determined
Other Information	Not applicable

13. DISPOSAL CONSIDERATIONS

Disposal Method	Bury in a licensed landfill according to federal, state, and local regulations.
Contaminated Packaging	Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

Land Transportation

DOT
Not restricted

Canadian TDG
Not restricted

ADR
Not restricted

Air Transportation

ICAO/IATA
Not restricted

Sea Transportation

IMDG
Not restricted

Other Shipping Information

Labels:	None

15. REGULATORY INFORMATION

US Regulations

US TSCA Inventory	All components listed on inventory or are exempt.
EPA SARA Title III Extremely Hazardous Substances	Not applicable
EPA SARA (311,312) Hazard Class	Acute Health Hazard Chronic Health Hazard
EPA SARA (313) Chemicals	This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372).
EPA CERCLA/Superfund Reportable Spill Quantity	Not applicable.

EPA RCRA Hazardous Waste Classification	If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA.
California Proposition 65	The California Proposition 65 regulations apply to this product.
MA Right-to-Know Law	One or more components listed.
NJ Right-to-Know Law	One or more components listed.
PA Right-to-Know Law	One or more components listed.

Canadian Regulations

Canadian DSL Inventory	All components listed on inventory
WHMIS Hazard Class	D2A Very Toxic Materials Crystalline silica

16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS
Not applicable

Additional Information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

*****END OF MSDS*****

TECHNICAL DATA

Granusil
MINERAL FILLERS

FEATURES AND BENEFITS

OTTAWA, MN

GRANUSIL® Mineral Fillers are produced from high purity industrial quartz sands for a wide variety of industrial and contractor mixed applications which need a reliable silica contribution or require a chemically inert structural filler. Consistently uniform grain shapes and particle size distributions offer excellent placement, compaction and mechanical properties. High silica content combined with low level soluble ions, alkalis and alkaline oxides provide non-reactive service in most corrosive and exposed environments.

These durable monocrystalline structures resist abrasion in high traffic-excessive wear applications and provide the stability formulators seek in high solids emulsions, elastomerics, cemented and modified cementious systems. GRANUSIL® is the preferred structural component in systems ranging from polymerized floor overlays to artificial sports turf.

All GRANUSIL® grades are processed and sized under rigid SPC and UNIMIN QIP℠ statistical and quality assurance programs. The result is chemical purity and consistently uniform particle size distributions for predictable performance in either manufactured or site-prepared products.

PARTICLE SIZE ANALYSIS AND PROPERTIES

Mean Values. These Do Not Represent A Specification.

	Mesh ASTM E-11	4095	4075	4060	4030	4020	5020	5010	7020
	16	---	---	---	---	---	---	---	---
Typical Mean %	20	1.2	0.4	0.3	---	---	---	---	---
Retained on	30	36.1	29.0	11.4	0.1	---	---	---	---
Individual	40	57.2	55.5	40.2	22.5	18.1	2.4	0.4	0.1
Sieves	50	5.1	12.0	30.6	54.7	35.8	19.9	12.2	1.2
	70	---	---	10.1	17.4	29.1	37.2	30.9	24.1
	100	---	---	---	4.2	12.4	26.5	32.8	42.7
	140	---	---	---	0.9	3.8	11.0	17.7	23.5
	200	---	---	---	---	0.8	2.7	5.3	7.2
	270	---	---	---	---	---	0.3	0.7	1.1
	PAN	0.4	3.1	7.4	0.2	---	---	---	0.1

Grain Shape	Rounded	Visual
Hardness	7.0 Mohs	Mohs Scale
Moisture Content	<0.1%	ASTM C-566
Specific Gravity	2.65 g/cm^3	ASTM C-128
Bulk Density, aerated	92-95 lb/ft^3	ASTM C-29
Bulk Density, compacted	98-100 lb/ft^3	ASTM C-29

TECHNICAL DATA

Granusil

CHEMICAL ANALYSIS

Mean Values. These Do Not Represent A Specification.

	Mean Percent by Weight
Silicon Dioxide (SiO_2)	99.692
Iron Oxide (Fe_2O_3)	.038
Aluminum Oxide (Al_2O_3)	.073
Calcium Oxide (CaO)	.014
Titanium Dioxide (TiO_2)	.006
Magnesium Oxide (MgO)	.012
Potassium Oxide (K_2O)	.020
Sodium Oxide (Na_2O)	.005
Loss on Ignition (LOI)	.121

ORDERING INFORMATION

Shipping Point: OTTAWA, MN
ORIGINATING CARRIER: UNION PACIFIC (UP)

Availability: BULK, 50# AND 100# PAPER BAGS, AND IBC'S
TRUCK AND RAIL

UNIMIN

FOR PRODUCT INFORMATION AND CUSTOMER SERVICE:
U.S. and CANADA 800-243-9004 · FAX 800-243-9005
WORLDWIDE 203-966-1306 · FAX 203-972-1378

UNIMIN CORPORATION

GRADE NUMBERS INDICATE RELATIVE VALUES OR RESULTS. THEY ARE NOT A SPECIFICATION OR WARRANTY OF PERFORMANNCE.

HEALTH HAZARD WARNING: Prolonged inhalation of dust associated with the materials described in this data sheet can cause delayed lung injury including Silicosis, a progressive, disabling and sometimes fatal lung disease. IARC has determined that crystalline silica, inhaled from occupational sources, can cause cancer in humans. Risk of injury is dependent on the duration and level of exposure. Follow OSHA or other relevant safety and health standards for the form of crystalline silica called Quartz. Current material safety data sheets, containing safety information, is available and should be consulted before usage.

Silica/Silica Containing

SECTION 1: IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/ UNDERTAKING

UNIMIN CORPORATION
258 Elm Street
New Canaan, CT 06840

Emergency Telephone Number
(203) 966-8880

Telephone Number for Information
(203) 966-8880

PRODUCT NAME: Crystalline Silica in the form of Quartz – various grades

SYNONYMS: Quartz, Crystalline Silica, Silicon Dioxide

Date Prepared: May 2009

SECTION 2: HAZARDS IDENTIFICATION

This product is a chemically inert, non-combustible mineral.

EMERGENCY OVERVIEW
WARNING!

Lung injury and cancer hazard. Do not breathe dust. May cause delayed lung injury. Long term exposure can cause silicosis. Silicosis is a respiratory disease, which can result in delayed, disabling and sometimes fatal lung injury. IARC and NTP have determined that crystalline silica inhaled from occupational sources can cause cancer in humans. Risk of injury is dependent on the duration and level of exposure. A single exposure will not result in serious adverse effects. **See "Health Hazards" in Section 11 for detailed information.** See exposure limit presentation in Section 8 for further information.

Avoid creating dust when handling, using or storing. Use only with adequate ventilation to keep exposure below recommended exposure limits.

EU Classification of Substance/Preparation: Harmful (Xn) R48/20

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

CAS# / EINECS #	Component	Percentage	EU Classification (67/548/EEC)
14808-60-7 / 238-878-4	Crystalline Silica in the form of Quartz	87 - 99.9%	Xn R48/20

Refer to section 16 for further information on EU Classification.

See Section 8 for occupational exposure limit information

SECTION 4: FIRST AID MEASURES

Gross Inhalation: Remove victim to fresh air. If breathing has stopped, perform artificial respiration. If breathing is difficult have qualified personnel administer oxygen. Get prompt medical attention.

Skin Contact: No first aid should be needed since dermal contact with this product does not affect the skin. Wash exposed skin with soap and water before breaks and at the end of the shift.

Eye Contact: Flush the eyes immediately with large amounts of running water, lifting the upper and lower lids occasionally. If irritation persists or for imbedded foreign body, get immediate medical attention.

Ingestion: If large amounts are swallowed, get immediate medical attention.

SECTION 5: FIREFIGHTING MEASURES

Extinguishing Media: This product will not burn but is compatible with all extinguishing media. Use any media that is appropriate for the surrounding fire.

Special Fire Fighting Procedures: None required with respect to this product. Firefighters should always wear self-contained breathing apparatus for fires indoors or in confined areas.

Unusual Fire and Explosion Hazards: None.

Hazardous Combustion Products: None.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Wear appropriate protective equipment. If uncontaminated, collect using dustless method (HEPA vacuum or wet method) and place in appropriate container for use. If contaminated: a) use appropriate method for the nature of contamination, and b) consider possible toxic or fire hazards associated with the contaminating substances. Collect for appropriate disposal.

SECTION 7: HANDLING AND STORAGE

Do not breathe dust. Do not rely on your sight to determine if dust is in the air. Silica may be in the air without a visible dust cloud. Use normal precautions against bag breakage or spills of bulk material. Avoid creation of respirable dust. Do not use as a dry abrasive blasting agent. ANSI/AIHA Z9.4:1997 recommends that silica sand be prohibited as an abrasive blasting agent for use in fixed location abrasive-blast enclosures. Use good housekeeping in storage and use areas to prevent accumulation of dust in work area.

To reduce the risk of developing silicosis, lung cancer and other adverse health effects, the ACGIH recommends that the industrial hygienist use every means available to keep exposures below the recommended TLV. NIOSH recommends reducing airborne exposure levels as low as possible below NIOSH's recommended exposure limit, substituting less hazardous materials when feasible, using appropriate respiratory protection when source controls cannot keep exposures below the recommended limit and making medical examinations available to exposed workers.

Use adequate ventilation and dust collection. To minimize exposure, wear a respirator approved for silica dust when using, handling, storing or disposing of this product or bag. Refer to the most recent standards of ANSI (Z88.2), OSHA (29 CFR 1910.134), MSHA (30 CFR Parts 56 and 57) and NIOSH Respirator Decision Logic. Maintain, clean and fit test respirators in accordance with OSHA regulations. Maintain and test ventilation and dust collection equipment. Launder clothing that has become dusty. Empty containers (bags, bulk containers, storage tanks, etc.) retain silica residue and must be handled in accordance with the provisions of this Material Safety Data Sheet. **WARN and TRAIN** employees in accordance with state and federal regulations.

WARN YOUR EMPLOYEES (AND YOUR CUSTOMERS AND USERS IN CASE OF RESALE) BY POSTING, AND OTHER MEANS, OF THE HAZARDS AND OSHA AND ANY OTHER APPLICABLE REGULATORY PRECAUTIONS TO BE USED. PROVIDE TRAINING FOR YOUR EMPLOYEES ABOUT OSHA PRECAUTIONS.

See also American Society for Testing and Materials (ASTM) Standard Practice E1132-99a, "Standard Practice for Health Requirements Relating to Occupational Exposure to Respirable Crystalline Silica".

Additional information on silica hazards and precautionary measures can be found at the following websites:

NIOSH Joint Campaign on Silicosis Prevention http://www.cdc.gov/niosh/topics/silica/#campaign
OSHA Crystalline Silica Website http://www.osha.gov/SLTC/silicacrystalline/index.html
MSHA Silicosis Prevention Website http://www.msha.gov/S&HINFO/SILICO/SILICO.HTM
NIOSH Hazard Review – Health Effects of Occupational Exposure to Respirable Crystalline Silica Website
http://www.cdc.gov/niosh/docs/2002-129/02-129a.html

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure Limits

Definitions:
MSHA means Mine Safety and Health Administration.
NIOSH means National Institute for Occupational Safety and Health.
OSHA means Occupational Safety and Health Administration.
PEL means OSHA Permissible Exposure Limit.
REL means the NIOSH Recommended Exposure Limit.
TLV means American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value
TWA means time-weighted average.

OSHA PEL and MSHA Exposure Limit for Crystalline Silica, Quartz	10 mg/m^3
(Respirable measured as an 8-hour TWA)	% Silica + 2

TLV- 0.025 mg/m^3 8-hour TWA (respirable fraction)

In 2006 the ACGIH lowered the TLV for Silica, Crystalline: α-Quartz and Cristobalite to 0.025 mg/m3 stating in the *Documentation of the TLV* "Because the time between exposure and signs of fibrosis is characteristically very long, as much as 30 to 40 years, the margin of safety for exposure to crystalline silica at the proposed TLV-TWA is not known precisely. Given the observed association between silicosis and lung cancer, it is recommended that air concentrations be maintained as far below the proposed TLV as prudent practices permit. The recommended TLV-TWA of 0.025 mg/m3, respirable particulate mass, is intended to prevent pulmonary fibrosis that may be a risk factor for lung cancer. An A2, Suspected Human Carcinogen, notation is based on the demonstrated association between lung cancer and the presence of silicosis." The documentation further states "A lack of toxicological and industrial hygiene data does not permit the recommendation of a TLV-STEL. However, it should be noted that high exposures of short duration to freshly fragmented crystalline particles do produce an acute and rapidly progressive form of silicosis. The reader is encouraged to review the section on *Excursion Limits* in the "Introduction to the Chemical Substances" of the current TLVs® and BEIs® book for guidance and control of excursions above the TLV-TWA, even when the 8-hour TWA is within the recommended limits"

NIOSH has issued its REL of 50 micrograms respirable free silica per cubic meter of air (0.05 mg/m^3) as determined by a full shift sample up to 10-hour working day, 40 hours per week. NIOSH has recommended that OSHA and MSHA adopt the NIOSH REL as the OSHA PEL and the MSHA Exposure Limit. The 1974 NIOSH Criteria for a Recommended Standard for Occupational Exposure to Crystalline Silica should be consulted for more detailed information. Additionally, NIOSH, in a publication entitled NIOSH Hazard Review Health Effects of Occupational Exposure to Respirable Silica (April 2002), NIOSH stated "…that workers have a significant risk of developing chronic silicosis when they are exposed to respirable crystalline silica over a working lifetime at the current Occupational Safety and Health Administration (OSHA) permissible exposure limit (PEL), the Mine Safety and Health Administration (MSHA) PEL, or the National Institute for Occupational Safety and Health (NIOSH) recommended exposure limit (REL). …Current sampling and analytical methods used to evaluate occupational exposure to respirable crystalline silica do not meet the accuracy criterion needed to quantify exposures at concentrations below the NIOSH REL of 0.05 mg/m^3 as a time-weighted average (TWA) for up to a 10-hr workday during a 40-hr workweek. Until improved sampling and analytical methods are developed for respirable crystalline silica, NIOSH will continue to recommend an exposure limit of 0.05 mg/m^3 to reduce the risk of developing silicosis, lung cancer, and other adverse health effects. NIOSH also recommends minimizing the risk of illness that remains for workers exposed at the REL by substituting less hazardous materials for crystalline silica when feasible, by using appropriate respiratory protection when source controls cannot keep exposures below the NIOSH REL, and by making medical examinations available to exposed workers."

Crystalline silica exists in several forms, the most common of which are quartz (i.e. this product), trydimite and cristobalite, with quartz being the most common form found in nature. If quartz is heated to more than 870°C, it can change form to trydimite and if quartz is heated to more than 1450°C, it can change form to cristobalite. The OSHA PELs and MSHA Exposure Limits for trydimite and cristobalite are one-half of the PEL for quartz.

Ventilation: Use local exhaust as required to maintain exposures as far as possible below applicable occupational exposure limits. See also ACGIH "Industrial Ventilation - A Manual for Recommended Practice" (current edition). Control of exposure to dust must be accomplished as far as feasible by accepted engineering control measures (for example, enclosure or confinement of the operation, general or local exhaust ventilation and substitution of less toxic materials).

Respiratory Protection: When effective engineering controls are not feasible, or while they are being implemented, appropriate respiratory protection must be used. Use appropriate respiratory protection for respirable particulates based on consideration of airborne workplace concentrations and duration of exposure arising from intended end use. Refer to the most recent standards of ANSI (Z88.2), OSHA (29 CFR 1910.134), MSHA (30 CFR Parts 56 and 57) and NIOSH Respirator Decision Logic.

Gloves: Protective gloves recommended.

Eye Protection: Safety glasses or goggles recommended.

Other Protective Equipment/Clothing: As appropriate for the work environment. Dusty clothing should be laundered before reuse.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Appearance and Odor: White powder, odorless.

pH: Not applicable
Boiling Point: 4046°F / 2230°C
Melting Point: 2930°F / 1610°C
Solubility in Water: Negligible
Percent Volatile: 0%
Autoignition Temp: Will not burn

Specific Gravity (water=1): 2.65
Vapor Pressure: Not applicable
Vapor Density: Not applicable
Evaporation Rate: Not applicable
Flash Point (Method Used): Fully oxidized, will not burn
Flammable Limits: LEL: Not applicable
UEL: Not applicable

SECTION 10: STABILITY AND REACTIVITY

Stability: Stable
Conditions to Avoid: None

Incompatibility: Powerful oxidizing agents such as fluorine, chlorine trifluoride, manganese trioxide, etc.

Hazardous Decomposition Products: Silica will dissolve in hydrofluoric acid producing a corrosive gas, silicon tetrafluoride.

Hazardous Polymerization: Will not occur
Conditions to Avoid: None

SECTION 11: TOXICOLOGICAL INFORMATION

HEALTH HAZARDS:

Inhalation: Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may have the following serious chronic health effects:

Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling and sometimes fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness and reduced pulmonary function. This disease is exacerbated by smoking. Individuals with silicosis are predisposed to develop mycobacterial infections (tuberculous and non-tuberculous) and fungal infections. Inhalation of air with a very high concentration of respirable silica dust can cause the most serious forms of silicosis in a matter of

months or a few years. Some epidemiologic studies have concluded that there is significant risk of developing silicosis even at airborne exposure levels that are equal to the recommended NIOSH REL, the ACGIH TLV, the OSHA PEL, and the MSHA Exposure Limit.

Cancer Status: The International Agency for Research on Cancer has determined that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (Group 1 - carcinogenic to humans). Refer to IARC Monograph 68, Silica, Some Silicates and Organic Fibres (published in June 1997) in conjunction with the use of these materials. The National Toxicology Program classifies respirable crystalline silica as "known to be a human carcinogen". Refer to the Eleventh Report on Carcinogens (2005). The American Conference of Governmental Industrial Hygienists (ACGIH) classifies crystalline silica, quartz, as a suspected human carcinogen (A2).

Other Data with Possible Relevance to Human Health:

There is some evidence that breathing respirable crystalline silica or the disease silicosis is associated with an increased incidence of significant disease endpoints such as scleroderma (an immune system disorder manifested by fibrosis of the lungs, skin and other internal organs) rheumatoid arthritis, systemic lupus, erythematosus, sarcoidosis, chronic bronchitis, chronic obstructive pulmonary disease (COPD), emphysema, chronic kidney disease and end-stage renal disease.

For further information consult "Adverse Effects of Crystalline Silica Exposure" published by the American Thoracic Society Medical Section of the American Lung Association, American Journal of Respiratory and Critical Care Medicine, Volume 155, pages 761-768, 1997, and see also NIOSH Hazard Review – Health Effects of Occupational Exposure to Respirable Crystalline Silica, April 2002 (see Section 7 for NIOSH Hazard Review Website).

Skin Contact: No adverse effects expected.

Eye Contact: Contact may cause mechanical irritation and possible injury.

Ingestion: No adverse effects expected for normal, incidental ingestion.

Chronic Health Effects: See "Inhalation" subsection above with respect to silicosis, cancer status and other data with possible relevance to human health.

Medical Conditions Aggravated by Exposure: Individuals with respiratory disease, including but not limited to asthma and bronchitis, or subject to eye irritation, should not be exposed to respirable quartz dust.

Signs and Symptoms of Exposure: Exposure to dust may cause mucous membrane and respiratory irritation, cough, sore throat, nasal congestion, sneezing and shortness of breath. However, there may be no immediate signs or symptoms of exposure to hazardous concentrations of respirable crystalline silica (quartz). See "Inhalation" subsection above for symptoms of silicosis. The absence of symptoms is not necessarily indicative of safe conditions.

Acute Toxicity Values: Silica: LD50 oral rat >22,500 mg/kg

SECTION 12: ECOLOGICAL INFORMATION

Silica: LC50 carp >10,000 mg/L/72 hr. This product is not expected to present an environmental hazard.

SECTION 13: DISPOSAL CONSIDERATIONS

Waste Disposal Method: Silica is not classified as a hazardous waste under US EPA RCRA regulations. If uncontaminated, dispose as an inert, non-metallic mineral. If contaminated, dispose in accordance with all applicable local, state/provincial and federal regulations in light of the contamination present. Local regulations may be more stringent than regional and

national requirements. It is the responsibility of the waste generator to determine the toxicity and physical characteristics of the material to determine the proper waste identification and disposal in compliance with applicable regulations.

SECTION 14: TRANSPORT INFORMATION

U.S. DOT HAZARD CLASSIFICATION
Proper Shipping Name: Not Regulated
Technical Name: N/A
UN Number: N/A
Hazard Class/Packing Group: N/A
Labels Required: None
DOT Packaging Requirements: N/A
Exceptions: N/A

SECTION 15: REGULATORY INFORMATION

SARA 311/312: Hazard Categories for SARA Section 311/312 Reporting: Chronic Health

SARA 313 This Product Contains the Following Chemicals Subject to Annual Release Reporting Requirements Under the SARA Section 313 (40 CFR 372): None

CERCLA Section 103 Reportable Quantity: None

California Proposition 65: This product contains crystalline silica (respirable) which is known to the State of California to cause cancer.

Toxic Substances Control Act: All of the components of this product are listed on the EPA TSCA Inventory or exempt from premanufacture notification requirements.

European Inventory of Commercial Chemical Substances: All of the components of this product are listed on the EINECS Inventory or exempt from notification requirements. (The EINECS number for Quartz: 238-878-4)

European Community Labeling: Harmful Xn
Contains crystalline silica, quartz (238-878-4)
R48/20 Harmful: Danger of serious damage to health by prolonged exposure by inhalation.
S22 Do not breathe dust
S38 In case of insufficient ventilation, wear suitable respiratory equipment.

Canadian Environmental Protection Act: All the components of this product are listed on the Canadian Domestic Substances List or exempt from notification requirements.

Canadian WHMIS Classification: Class D, Division 2, Subdivision A (Very Toxic Material causing other Toxic Effects)

This MSDS has been prepared according to the criteria of the Controlled Products Regulation (CPR) and the MSDS contains all of the information required by the CPR.

Japan METI: All of the components of this product are existing chemical substances as defined in the Chemical Substance Control Law.

Australian Inventory of Chemical Substances: All of the components of this product are listed on the AICS inventory or exempt from notification requirements.

Australian National Occupational Health & Safety Commission Status: Hazardous according to the criteria of Australian National Occupational Health & Safety Commission -Harmful (Xn) R48/20 Harmful: Danger of serious damage to health by prolonged exposure by inhalation.

Korea: All of the components of this product are listed on the ECL inventory or exempt from notification requirements.

Philippines: All of the components of this product are listed on the PICCS inventory or exempt from notification requirements.

16: OTHER INFORMATION

EU Classes and Risk Phrases for Reference (See Sections 2 and 3)
Xn Harmful
R48/20 Harmful: Danger of serious damage to health by prolonged exposure by inhalation.
S22 Do not breathe dust
S38 In case of insufficient ventilation, wear suitable respiratory equipment.

NFPA Hazard Rating:	Health: 1	Fire: 0	Reactivity: 0
HMIS Hazard Rating:	Health: *	Fire: 0	Reactivity: 0

* Warning - Chronic health effect possible - inhalation of silica dust may cause lung injury/disease (silicosis). Take appropriate measures to avoid breathing dust. See Section 3.

References:

Registry for Toxic Effects of Chemical Substances (RTECS), 2006
Patty's Industrial Hygiene and Toxicology
NIOSH Hazard Review – Health Effects of Occupational Exposure to Respirable Crystalline Silica, April 2002
NTP Eleventh Report on Carcinogens, 2005
IARC Monograph Volume 68, Silica, Some Silicates and Organic Fibres, 1997
Hazardous Substances Data Bank (HSDB), 2006
Documentation of the TLV – Silica, Crystalline: α-Quartz and Cristobalite, American Conference of Governmental Industrial Hygienists, 2006

Revision Summary: Switched Sections 2 and 3. Updated websites in Section 7.

GeoPro, Inc.

PRODUCT HANDLING GUIDE

www.geoproinc.com

THERMAL ENHANCEMENT COMPOUNDS

Specific thermal conductivities and handling characteristics of GeoPro's thermal grouts are achieved through the proper blending of thermal enhancement compounds. The selection of thermal enhancement compound will depend on a variety of factors including target conductivity, installation type and project cost.

PowerTEC \ PowerTEC^{x}

PowerTEC and PowerTECx are specially formulated, graphite based thermal enhancement compounds designed to be field mixed with GeoPro thermal grouts to achieve thermal conductivities ranging from 0.79-1.60 Btu/hr·ft·°F. Use PowerTEC and PowerTECx with, or as a replacement for traditional silica sand to lower mixed viscosity, reduce formation losses, decrease grout weight, and to minimize the amount of material required at the job site.

CONSIDER FOR USE IN

- All Horizontal and Vertical boring applications especially where silica sand is difficult to source or expensive to ship.
- Horizontally Bored GHEX installations to lower viscosity and improve pumpability.
- Loopfield installations where space is limited and the reduction of total material on-site is beneficial.
- Commercial ground heat exchange designs that require thermal conductivities above 1.20 Btu/hr·ft·°F.

BENEFITS

- Capable of delivering the widest range of thermal conductivities in the industry. Mix conductivities range from 0.79 all the way up to 1.60 Btu/hr·ft·°F.
- Reduces or eliminates the need for silica sand on the jobsite.
- Lower viscosity and self-lubricating nature decreases wear on grouting equipment.
- Decreases formation losses in fractured and porous formations as compared to traditional thermal grout mixes.
- Reduces total freight cost for a project by decreasing the required amount of dry material.
- NSF/ANSI Standard 60 Certified to not contribute contaminants to drinking water that could cause adverse health effects.

Mixes using PowerTECx are extremely sensitive to mix water volume. It is strongly recommended that a water meter assembly like GeoPro's Water Meter Kit be used with every PowerTECx installation.

PowerTECx is designed exclusively for use with GeoPro's thermal grout products. Use with unapproved bentonite products may result in damage to equipment and unknown performance/handling characteristics.

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QUIK-BORE™

High Yield Boring Fluid System

Description

QUIK-BORE high-yield boring fluid system is specially formulated for use in horizontal directional drilling (HDD), primarily tunneling and micro-tunneling applications. QUIK-BORE high-yield boring fluid system is a proprietary blended product using Wyoming sodium bentonite.

Applications/ Functions

The use of QUIK-BORE high-yield boring fluid system assists or promotes the following:

- Provides functional gel strength for cuttings suspension
- Improves borehole stability
- Reduces filtration by forming a thin filter cake with low permeability
- Lubricates pipe in micro-tunneling operations

Advantages

- High-yielding and easy to mix
- Helps provide lubrication for pulling product line
- Can be used in unconsolidated formations
- Can provide gel strength to compensate for low annular velocity
- Can minimize the number of boring fluid products required
- Disperses readily in water
- Efficiently improves filtration control
- NSF/ANSI Standard 60 certified

Typical Properties

Appearance	Variable colored powder (tan to gray)
Bulk Density, lb/ft^3	68 to 72 (compacted)

Recommended Treatment

Add slowly and uniformly through a high-shear, jet-type mixer, or into the vortex of a high speed stirrer over one or more cycles of the volume of slurry. Continue to circulate and agitate the slurry until all un-yielded bentonite is dispersed.

Recommended Treatment (continued)

Approximate Amounts of QUIK-BORE bentonite Added to Fresh Water		
lb/bbl	**lb/100 gallons**	**kg/m^3**
8 – 15	20 – 35	24 – 42

- Ideal make-up water has a total hardness (as calcium) less than 100 ppm (mg/L), chloride content less than 1500 ppm, chlorine content less than 50 ppm, and pH between 8.5 – 9.5.
- Pre-treat mixing water with Soda Ash (sodium carbonate), typically 0.5 – 1 pound per 100 gallons (0.6 – 1.2 kg/m^3), to reduce total hardness to less than 100 mg/l and raise pH to 8.5-9.5.

Packaging

QUIK-BORE high-yield boring fluid system is packaged in 50-lb (22.7 kg) multi-wall paper bags.

Availability

QUIK-BORE high-yield boring fluid system can be purchased through any Baroid Industrial Drilling Products Retailer. To locate the Baroid IDP retailer nearest you contact the Customer Service Department in Houston or your area IDP Sales Representative.

Baroid Industrial Drilling Products
Product Service Line, Halliburton
3000 N. Sam Houston Pkwy. E.
Houston, TX 77032

Customer Service	**(800) 735-6075 Toll Free**	**(281) 871-4612**
Technical Service	**(877) 379-7412 Toll Free**	**(281) 871-4613**