DRITHERM
INTERNATIONAL INC.

Underground Pipe Insulation
Corrosion Protection

MANUAL REGISTRATION

IN ORDER TO RECEIVE FUTURE LITERATURE, NEW ENGINEERING MANUAL INSERTS, AND CAD DRAWING FILES, AS THEY BECOME AVAILABLE, PLEASE FILL IN THE FOLLOWING INFORMATION AND SEND / FAX THIS FORM BACK TO THE ADDRESS / FAX NUMBER SHOWN BELOW.

COMPANY NAME ADDRESS & CONTACT			
	PHONE		FAX

SALESPERSON _____ **DATE** _____ **E-MAIL** _____

GROUP *(CHECK BOX)*

	COLLEGE / UNIVERSITY		COMMERCIAL
	ENERGY COMPANY		INDUSTRIAL
	ENGINEERING FIRM		MECHANICAL CONTRACTOR
	FEDERAL AGENCY		INSULATION CONTRACTOR
	MILITARY BASE		INSULATION DISTRIBUTOR
	STATE AGENCY		OTHER (FILL IN)

DRITHERM INTERNATIONAL INC.

2500 Plaza 5.• Harborside Plaza • Jersey City, NJ 07331
Phone: (973) 808-2255 • (800) 343-4188
www.dritherm.com

DRITHERM INTERNATIONAL INC.

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Revised March 28, 2012. This addition supersedes all previous versions.

DRITHERM
INTERNATIONAL INC.

Introduction

General Information

Dritherm International, Inc. manufactures DriTherm®, waterproof underground pipe insulation and corrosion protection, for District Energy projects. District Energy is de ned as steam, condensate, hot water, chill water, and compressed air, owing between a central source (powerplant) and end users (buildings/equipment). The DriTherm ® formula has been continuously manufactured since 1967, with over 4.5 million cubic feet (equivalent of over 300 miles of piping) of product satisfactorily installed throughout North America, South America, the Caribbean, North Africa, and Japan. DriTherm ® is manufactured at facilities that are ISO 9002 certi ed.

DriTherm ® is manufactured and stock maintained at (6) facilities in the United States, located in California, Georgia, Illinois, Massachusetts, and Texas. In Canada, DriTherm® is warehoused and distributed in Montreal, Ottawa, and Winnipeg. Su cient DriTherm ® to insulate and protect several hundred feet of underground piping can be shipped to arrive anywhere in the continental United States within (24) hours.

Company Information

Dritherm International, Inc.
2500 Plaza 5
Harborside Plaza
Jersey City, NJ 07331

(800) 343-4188 / (973) 808-2255
(973) 808-2815 FAX
www.dritherm.com (web site)
info@dritherm.com (e-mail)

DRITHERM INTERNATIONAL INC.

Introduction

Product Information

DriTherm ® provides both pipe insulation and corrosion protection to underground pipes/tanks as a field applied system. DriTherm ® is installed directly from its packaging around underground piping to form a dense, closed cell, barrier between the pipes and the surrounding soil. Once installed to specified dimensions, the product self compacts with the weight of backfill to form a strong (12,000 psf) block of cohesively bonded particles that retard air, water, moisture passage to the carrier piping.

DriTherm ® is manufactured using only 100% Calcium Carbonate particles, which have been chemically modified to completely repel water / moisture. Each particle contains a cohesive surface, which allows for a complete and enduring bond once installed and backfilled. All DriTherm ® particles are less than 5 micron in size.

One product insulates both hot and cold pipes. A free flowing self-compacting material – pour from bag / sack and backfill. Completely inert – will not affect piping materials. Cathodic protection is not required to prevent pipe corrosion when piping is installed in DriTherm®. No maintenance is required after a DriTherm® system is installed.

DriTherm® meets United Facilities Guide Specifications (UFGS) for new construction on military bases and federal institutions, which include the following agencies:

- Corps of Engineers
- Naval Facilities Engineering
- Department of the Air Force
- Veterans Administration

DRITHERM INTERNATIONAL INC.

Introduction

Technical Services

Complete engineering services are available including system layout, component design, CAD drawings, computer generated heat load calculations and start up training of installation crew.

The information contained in this manual is believed to be accurate and reliable, and is being offered to assist system design engineers. Ultimate responsibility for system and insulation design is the responsibility of the system design engineer.

Product Warranty

Dritherm International, Inc. warrants for a period of one year after the date of delivery that the products sold by Dritherm International, Inc. shall be of like grade and quality to and in accordance with Dritherm International, Inc.'s published data sheet for such products. Dritherm International, Inc. makes no other warranties express or implied, makes no warranties or representations of any kind with regard to installation or length of service life and SPECIFICALLY EXCLUDES WITHOUT LIMITATION ANY AND ALL WARRANTIES OF MERCHANTABILITY AND OF FITNESS FOR A PARTICULAR PURPOSE and makes no warranties beyond those contained herein. If any of the products in any shipment does not conform to the warranty contained herein, purchaser's sole remedy will be to notify Dritherm International, Inc. of such nonconformity within fourteen (14) days of the receipt of such product or within fourteen (14) days after such nonconformity reasonably should have been discovered within the one-year warranty period. Dritherm International, Inc. will at its option either promptly replace the nonconforming product with a product which conforms to the warranty or refund the purchase price of the nonconforming product. Dritherm International, Inc. shall not be liable for damages of any kind arising from the presence or use of the products delivered, whether used singularly or in combination with other substances. Dritherm International, Inc. shall incur no liability for the design, method or manner of installation and purchaser specifically waives all claims therefor and agrees to indemnify and hold Dritherm International, Inc. harmless from any and all liability, costs and expenses (including reasonable attorney's fees) arising from the design, method or manner of installation. No claim of any kind arising hereunder shall be greater than, nor shall Dritherm International, Inc. in any event be liable for, an amount in excess of the amount of the purchase price of the products in respect of which such claim is made.

DRITHERM INTERNATIONAL INC.

Packaging (50 lb.Bags)

PALLETS	CUBIC FEET	BAGS	WEIGHT (lb.)
1	**37.5**	45	2,250
2	**75.0**	90	4,500
3	**112.5**	135	6,750
4	**150.0**	180	9,000
5	**187.5**	225	11,250
6	**225.0**	270	13,500
7	**262.5**	315	15,750
8	**300.0**	360	18,000
9	**337.5**	405	20,250
10	**375.0**	450	22,500
11	**412.5**	495	24,750
12	**450.0**	540	27,000
13	**487.5**	585	29,250
14	**525.0**	630	31,500
15	**562.5**	675	33,750
16	**600.0**	720	36,000
17	**637.5**	765	38,250
18	**675.0**	810	40,500
19	**712.5**	855	42,750
20	**750.0**	900	45,000

Full truckload equals 750 cubic feet; 900 bags

MANUFACTURING FACILITIES / STOCK LOCATIONS

Adams, MA 0122
Lucerne Valley, CA 92356
Quincy, IL 62301
Ottawa, Ontario K1T 3T7
Marble Falls, TX 78654
Marblehill, GA 30145
Montreal, Canada H4S 1V8
Winnipeg, Manitoba R2L 1J3

DRITHERM INTERNATIONAL INC.

Packaging (40 cubic feet sacks)

PALLETS	CUBIC FEET	SAC S	WEIGHT (lb.)
1	**40**	1	2,400
2	**80**	2	4,800
3	**120**	3	7,200
4	**160**	4	9,600
5	**200**	5	12,000
6	**240**	6	14,400
7	**280**	7	16,800
8	**320**	8	19,200
9	**360**	9	21,600
10	**400**	10	24,000
11	**440**	11	26,400
12	**480**	12	28,800
13	**520**	13	31,200
14	**560**	14	33,600
15	**600**	15	36,000
16	**640**	16	38,400
17	**680**	17	40,800
18	**720**	18	43,200
19	**760**	19	45,600
20	**800**	20	48,000

Full truckload equals 760 CF (19 sacks) or 800 CF (20 sacks)
Super sacks come with a discharge chute and pick-up slings

MANUFACTURING FACILITIES / STOCK LOCATIONS

Adams, MA 0122
Lucerne Valley, CA 92356
Quincy, IL 62301
Ottawa, Ontario K1T 3T7
Marble Falls, TX 78654
Marblehill, GA 30145
Montreal, Canada H4S 1V8
Winnipeg, Manitoba R2L 1J3

DRITHERM INTERNATIONAL INC.

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DRITHERM INTERNATIONAL INC.

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SECTI 7 P E E TATI E EASU ES

SECTI 8 FI ST AI EASU ES

SECTI P EPA ATI ATE F S S

30, 2011

DRITHERM INTERNATIONAL INC.

Specification

hysical roperties

Thermal Conductivity: (ASTM C177): K = 0.58 BTU/hrft2°F/in. (100°F), and 0.68 @ 300°F

Temperature Range: -273 to +480°F (250ºC). Higher temperatures to 1000°F possible – consult manufacturer

Bulk Density: 60 lbs. per cubic foot (approx.)

Load Bearing: up to 12,000 lbs. per sq. ft

Electrical Resistivity: R = 10^{14} OHMS-CM

Dielectric Constant: 2.7

Moisture Resistance: withstands 10ft. Hydrostatic head of water for minimum of 14 days with no moisture penetration.

Friction Coe cient: 0.35 ± 0.04

Material Speci cation

Underground pipe insulation / corrosion protection product consisting of 100 percent chemically modi ed calcium carbonate particles, all less than 10 microns, which is manufacturer certi ed to be waterproof. The particles shall cohesively bond with each other to form a closed-cell compacted mass that will e ectively isolate pipe surfaces from air, water, moisture, and chemicals.

Material shall be inert, compatible with metals and plastics, and shall not be a ected by normal soil constituents. Material shall be non- ammable, non-toxic, and meet OSHA safety standards. Insulation manufacturer must provide documentation of completion of 10-ft. head of water test (14 days - less than 1-% moisture gain). Insulation must be free owing and self-compacting.

DRITHERM
INTERNATIONAL INC.

Specification

Material Speci cation roduct Limitation

riTherm may be used for Class C and soil conditions as de ned by the Corps of ngineers. riTherm should not be used where the permanent water table is expected to be above the base of the trench, or where rapidly owing water is expected to be in direct contact, unless these conditions can be satisfactorily eliminated by use of pumps, sub-drainage or other means. Sub-drainage, if necessary, should be installed running parallel to the length of the piping system. esign of drainage systems and materials used will depend on the severity of the water conditions.

System esign Speci cation

Install a Class C Heat istribution system consisting mechanical piping which meets current A SI speci cations and is encapsulated within 100 percent chemically modi ed calcium carbonate particles. xcept for pipes within manholes / vaults / buildings, all underground piping shall be enclosed within riTherm . All underground piping, including penetrations through building walls and manholes, shall be properly supported, anchored and guided in accordance with the speci cations prepared by the system design engineer. Install mechanical components in accordance with manufacturer s recommendations. Cathodic rotection devices or systems are not required when installing pipes/tan s in riTherm hydrophobic insulation. erify piping system has been tested and accepted.

erify trenching dimension, including clearances under the piping are as required to receive the riTherm . erify the base of the trench contains un-disturbed earth. If ll dirt is required it must be compacted to resemble original trench base conditions. Sand / crushed stone / pea gravel is not allowed as trench base material or bac ll. Concrete shall be used under installations in areas where soil conditions are so unstable as to warrant such use.

Specification

System Design Specification (continued)

Where expansion loops or changes in pipe direction are provided to allow for pipe expansion, the piping shall first be wrapped at the point of movement with a mineral fiber cushion material. This will allow free movement of the pipes within the cushion once the DriTherm® is in place and the system is in operation. The fiber cushion shall be placed in accordance with dimensions shown in the specifications and must not come in contact with earth, pipe supports, anchors, guides or any other surface that makes direct contact with the surrounding soil.

Pipe sleeves shall be used at wall entries and to guide pipe movement parallel to the system. Sleeves must be of steel and can be fabricated from the next larger pipe size than the carrier pipe to allow for packing rings. Packing rings shall be installed where carrier pipes pass through steel pipe sleeves. This will support the pipe within the sleeve, to prevent abrasive wear of the pipe surface, and to form a seal at wall entries. Mechanical Link Belt type seals may be substituted for packing rings.

Supports, manholes, concrete, metal, etc., in contact with the piping system and extending through and beyond the DriTherm®, shall be coated with a Bitumastic adhesive to prevent entrance of water by capillary action. Bitumastic shall also be applied to concrete surfaces used in conjunction with pipe supports, anchors and guides in direct contact with the DriTherm®. This coating shall be applied just prior to installation of the DriTherm® and must be sufficiently tacky to allow the DriTherm® to bond to it.

Specification

System Design Specification (continued)

Suitable side-forms shall be erected using drywall (sheetrock) or plywood. Side-forms are not necessary where trenches can be dug to specified dimensions. The DriTherm® is poured within the forms. Make certain no voids exist beneath closely spaced pipes as the DriTherm® is being installed. In order to provide additional support and rigidity to the forms, earth backfill shall be placed on the outside of the forms alternately with the pouring of the DriTherm®.

Once the DriTherm® has been installed to specified dimensions, polyfilm is placed over the top of the material. Temporary spacers must be removed before the polyfilm is installed. Temporary pipe supports, which support the pipe from grade level using threaded rod or wire, must not be removed prior to 8 – 10 inches of backfill placed over the DriTherm®. Empty DriTherm® bags or sacks are then placed over the polyfilm to protect the material during the backfilling operation. Forms must be left in place.

Clean, soil backfill, free of large stones and debris, shall be placed over the top of the empty bags. Sand / crushed stone / pea gravel is not allowed as trench base material or backfill. The first 4 to 6 inches of earth cover shall be installed manually and/or gently, from as close to pipe elevation as possible, to prevent displacement of the forms. The total backfill requirement over the DriTherm® shall be a minimum of 18 inches to insure proper compaction. Where minimum soil backfill depths cannot be met, a layer of earth followed by roadbed material and covered with asphalt or concrete may be used, as long as a total weight of approximately 100 lbs. per sq. ft. (psf) is achieved.

The contractor shall advise Dritherm International, Inc. of the time and work schedule for installation sufficiently in advance to allow Dritherm International, Inc., at its option, to observe the installation.

Consult product manufacturer for additional details and specifications.

Specification

Terms / Explanations

Insulation Envelope – The DriTherm® insulation surrounding the pipeline or tank.

Forms – Drywall (sheetrock) forms which are left in place.

Polyfilm – 4 to 6 mil common plastic sheeting.

Formwork Spacers – Temporary spacers consisting of dimensional lumber, plywood, or steel which are used to achieve side (x) dimension, and which must be removed after installation of DriTherm® and before backfilling.

Temporary Pipe Supports – used to support the pipe system before and during installation of DriTherm®, and which must be removed prior to backfilling.

Bitumastic – a coal-tar product used to bond DriTherm® to concrete / steel surfaces. Must be rated for temperature of pipe system.

Silicone Grease – a silicone product used instead of Bitumastic. Must be rated for temperature of pipe system.

Mineral Fiber Cushion – a flexible, 4 – 6 lb. density, mineral wool or inorganic glass product. Sold in batt form or in pre-formed sizes (pre-formed is recommended).

Packing Rope / Rings – are fabricated from suitable material such as silicone impregnated braided packing rope, or Teflon, able to withstand the maximum operating temperatures of the system.

Dual Piping Systems – where hot and cold pipes exist in a common insulation envelope. Hot and cold pipes immediately adjacent to each other are separated by insulation dimension (y) sufficient to provide minimal energy transfer.

SAMPLE SPECIFICATION

SECTION 15261

UNDERGROUND PIPE INSULATION

Part-1 GENERAL

1.01 SECTION INCLUDES

A. Mineral powder pipe insulation

B. Accessories

1.02 SUBMITTALS

A. Product Data: Submit data on Hydrophobic underground pipe insulation.

B. Manufacturer's Installation Instructions.

1.03 QUALITY ASSURANCE

A. Advise insulation manufacturer of time and work schedule sufficiently in advance to allow for observation.

B. Consult insulation manufacturer's technical manual for additional information.

1.04 QUALIFICATIONS

A. Installer: Company specializing in the work of this section with minimum three years experience.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and protect products.

PART-2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURER:
DriTherm International Inc.
2500 Plaza 5
Jersey City, NJ 07311
(800)343-4188 / (973)808-2255 / www.dritherm.com.

2.02 INSULATION

A. Provide a Class C Heat Distribution system consisting of 100 percent chemically modified calcium carbonate particles, all less than 10 microns, which is manufacturer certified to be Hydrophobic. The particles shall cohesively bond with each other to form a closed-cell compacted mass that will effectively isolate pipe surfaces from air, water, moisture, and chemicals.

B. Material shall be inert, compatible with metals and plastics, and shall not be affected by normal soil constituents.

C. Material shall be non-flammable, non-toxic, and meet OSHA safety standards.

D. Insulation manufacturer must provide documentation of completion of 10 ft. head of water test (14 days - less than 1 moisture gain).

E. Insulation must be free flowing and self-compacting.

. Physical Properties:

1.	Thermal Conductivity:	0.58 Btu/hr.ft^2 ° /in. 100 ° 0.68 Btu/hr.ft^2 ° /in. 300 °
2.	Temperature Range:	Cryogenic (-273 °) to 480 ° (250 °C)
3.	Bulk Density:	60 - 62 lbs. /cu. ft.
4.	Load Bearing:	Up to 12,000 lbs. / s . ft.
5.	Electrical Resistivity:	R 10^{14} Ohms/cm/cm
6.	Dielectric Constant:	2.7
7.	riction Coefficient:	0.35 plus or minus 0.04
8.	aterproof:	Certified 100 Hydrophobic
9.	apor Barrier:	Closed cell insulation - vapor proof to -273 °

2.03 ACCESSORIES

A. Mineral iber Cushion: lexible type, 4 6 lb. density mineral wool or inorganic glass. Thickness as recommended by insulation manufacturer.

B. Polyethylene Sheet: 4 - 6 mil thick

C. Coatings:

1. or pipe temperature up to 400 degrees : op-Coat Super Service Black Bitumastic coal tar.

2. or pipe temperatures 400 degrees and higher: Silicone Grease.

PART-3 E ECUTION

3.01 E AMINATION

A. erify trenching dimension including clearances under the piping are as re uired to receive the work.

B. erify the base of the trench contains un-disturbed earth. If fill dirt is re uired it must be compacted to resemble original trench base conditions. Sand / crushed stone / pea gravel is not allowed as trench base material or backfill.

C. erify piping is supported, anchored and guided as specified

D. erify piping systems have been tested and accepted.

3.02 INSTALLATION - GENERAL

A. Install products in accordance with manufacturer's recommendations.

3.04 MINERAL FIBER CUSHION

A. here expansion loops or changes in pipe direction are provided to allow for pipe expansion, wrap the piping at the point of movement with 4 to 6 lb. density mineral fiber cushion to allow free movement of the pipes within the cushion. Place the fiber cushion so as to not come in contact with earth, pipe supports, anchors, guides, or any other surface that makes direct contact with the surrounding soil. Tape / tie mineral fiber cushion in place.

B. ollow the insulation manufacturer's recommendations as to extent and thickness of coverage.

C. Insulation dimensions are increased in mineral fiber cushion areas except for the dimension between multiple pipes. Consult manufacturer for details.

3.05 COATINGS

A. Apply coatings to supports, manhole face, concrete, metal and other materials in contact with the piping system that extend through and beyond the insulation, to prevent entrance of water by capillary action. Apply coating to concrete surfaces used in con unction with pipe supports, anchors and guides in direct contact with the insulation. Apply coating ust prior to placing the insulation. Coating must be sufficiently tacky to allow the insulation to bond to it.

3.06 INSULATION

A. Except for pipes within manholes and valve pits, encase all underground piping with specified insulation.

B. Pour the insulation within the drywall forms. Make certain no voids exist beneath closely spaced pipes knife if necessary. Provide additional support and rigidity to the forms by placing earth backfill on the outside of the forms alternately with the placing of the insulation.

C. Once the insulation has been installed to specified dimensions, place polyethylene sheet over the top of the material. Place empty insulation bags or sacks over the polyfilm to protect the material during the backfilling operation. Leave forms in place.

END O SECTION

Mechanical Design

Introduction

Mechanical pipeline design encompasses many issues involved with the transportation of fluids. Of significant importance is the arrangement of components in a system such that the dynamic forces occurring when heated fluids pass though piping will be kept in equilibrium.

Thermal expansion is a function of the temperature of a piping system - the hotter the pipe the more it will expand. Thermal expansion in piping systems are resolved in one of three (3) ways - expansion loops, z bends, expansion joints, or through a combination of these. Expansion loops are the most common means of controlling thermal expansion and basically consist of four (4) 90° elbows connected by straight lengths of pipe to form a "U". As the pipe expands and contracts the "legs" of the expansion loop flex to take up or release the pipe growth. Z bends operate in a similar fashion and are considered to be a half of an expansion loop. Expansion joints allow thermal expansion to be absorbed in a mechanical component.

Pipe anchors are designed to withstand the force of thermal expansion so that pipe growth is directed into expansion loop, z bend, or expansion joint. Through a combination of steel and concrete, the resistant force of thermal expansion is directed against un-disturbed earth, thus creating a pipe anchor. Typically pipe anchors are placed at building / manhole entries to limit movement into those structures. When expansion devices are used, anchors are typically placed in the middle of long pipe runs so that the pipe expansion is directed into the expansion device, which must be housed in a manhole/vault.

Pipe guides are designed to allow pipes to slide through them with minimal resistance while they are expanding / contracting, while maintaining them in their intended plane. Typically pipe guides are placed at 90° elbows or every 50-ft. apart.

The following pages offer the system Design Engineer information intended to aid in the design of an underground piping system. This information is not intended to be used for construction unless approved the Design Engineer of record.

THERMAL EXPANSION AND PIPE SUPPORT SPACING TABLES

THERMAL EXPANSION OF PIPE IN INCHES PER 100 FEET

TEMPERATURE = (OPERATING TEMPERATURE - INSTALLED TEMPERATURE)

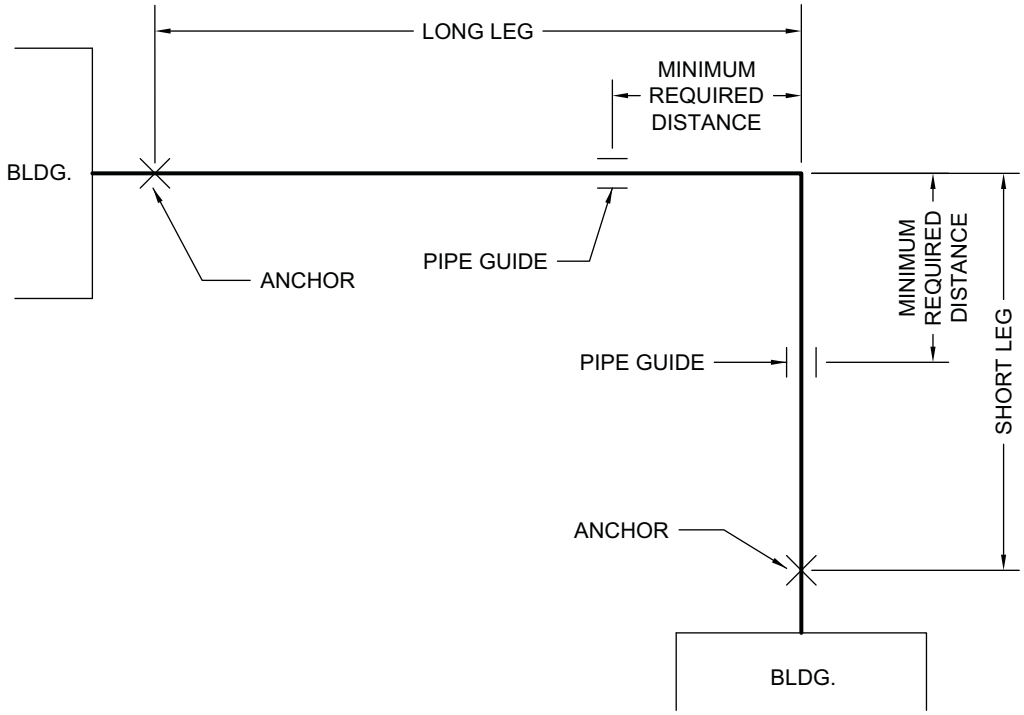
SATURATED STEAM VACUUM IN HG BELOW 212°F, PRESSURE PSI GAUGE ABOVE 212°F.	TEMPERATURE DEGREES FAHRENHEIT	CAST IRON	CARBON & CARBON MOLYB-DENUM	WROUGHT IRON	4-6% Cr ALLOY STEEL	12% Cr STAINLESS STEEL	18 Cr-8 Ni STAINLESS STEEL	COPPER	BRASS	ALUMINUM 2-S	MONEL
	-200	-1.058	-1.282	-1.289	-1.250	-1.170	-2.030	-1.955	-2.065	-2.69	-1.53
	-180	-0.982	-1.176	-1.183	-1.150	-1.070	-1.850	-1.782	-1.890	-2.44	-1.40
	-160	-0.891	-1.066	-1.073	-1.030	-0.970	-1.670	-1.612	-1.705	-2.18	-1.27
	-140	-0.797	-0.948	-0.955	-0.970	-0.870	-1.480	-1.428	-1.508	-1.93	-1.12
	-120	-0.697	-0.826	-0.833	-0.800	-0.750	-1.300	-1.235	-1.308	-1.67	-0.98
	-100	-0.593	-0.698	-0.705	-0.700	-0.630	-1.090	-1.040	-1.098	-1.40	-0.82
	-80	-0.481	-0.563	-0.570	-0.550	-0.520	-0.880	-0.835	-0.888	-1.12	-0.68
	-60	-0.368	-0.428	-0.435	-0.430	-0.400	-0.670	-0.630	-0.673	-0.85	-0.51
	-40	-0.248	-0.288	-0.295	-0.290	-0.270	-0.450	-0.421	-0.452	-0.58	-0.35
	-20	-0.127	-0.145	-0.152	-0.145	-0.130	-0.225	-0.210	-0.227	-0.28	-0.18
	0	0	0	0	0	0	0	0	0	0	0
	20	0.128	0.148	0.188	0.140	0.140	0.223	0.238	0.233	0.32	0.20
	32	0.209	0.230	0.280	0.234	0.234	0.356	0.366	0.373	0.50	0.30
29.39	40	0.270	0.300	0.350	0.280	0.280	0.446	0.451	0.466	0.63	0.37
	60	0.410	0.448	0.540	0.430	0.430	0.669	0.684	0.690	0.93	0.55
28.89	80	0.550	0.580	0.710	0.500	0.550	0.892	0.896	0.920	1.24	0.74
27.99	100	0.680	0.753	0.887	0.650	0.690	1.115	1.134	1.150	1.53	0.92
26.48	120	0.830	0.910	1.058	0.800	0.820	1.338	1.366	1.390	1.84	1.11
24.04	140	0.970	1.064	1.240	0.950	0.960	1.545	1.590	1.625	2.15	1.30
20.27	160	1.110	1.200	1.420	1.100	1.090	1.784	1.804	1.865	2.46	1.50
14.63	180	1.240	1.360	1.580	1.250	1.230	2.000	2.051	2.100	2.77	1.70
6.45	200	1.390	1.520	1.750	1.400	1.380	2.230	2.296	2.340	3.08	1.88
0	212	1.480	1.610	1.870	1.500	1.460	2.361	2.428	2.467	3.28	2.00
2.5	220	1.530	1.680	1.940	1.550	1.510	2.460	2.516	2.580	3.41	2.07
10.3	240	1.670	1.840	2.120	1.720	1.650	2.680	2.756	2.830	3.73	2.27
20.7	260	1.820	2.020	2.300	1.880	1.790	2.920	2.985	3.070	4.07	2.47
34.5	280	1.970	2.180	2.470	2.050	1.930	3.150	3.218	3.315	4.40	2.66
52.3	300	2.130	2.350	2.670	2.200	2.080	3.390	3.461	3.565	4.74	2.87
74.9	320	2.268	2.530	2.850	2.370	2.220	3.615	3.696	3.820	5.10	3.07
103.3	340	2.430	2.700	3.040	2.530	2.360	3.840	3.941	4.065	5.43	3.27
138.3	360	2.590	2.880	3.230	2.700	2.510	4.100	4.176	4.350	5.78	3.48
180.9	380	2.750	3.060	3.425	2.860	2.670	4.346	4.424	4.610	6.13	3.70
232.4	400	2.910	3.230	3.620	3.010	2.820	4.580	4.666	4.870	6.47	3.91
293.7	420	3.090	3.421	3.820	3.180	2.980	4.800	4.914	5.150	6.84	4.12
366.1	440	3.250	3.595	4.020	3.350	3.130	5.050	5.154	5.400	7.19	4.34
451.3	460	3.410	3.784	4.200	3.530	3.290	5.300	5.408	5.680	7.55	4.56
550.3	480	3.570	3.955	4.400	3.700	3.450	5.540	5.651	5.950	7.90	4.78
664.3	500	3.730	4.151	4.600	3.860	3.600	5.800	5.906	6.220	8.25	4.99
795.3	520	3.900	4.342	4.810	4.040	3.760	6.050	6.148	6.500	8.61	5.23
945.3	540	4.080	4.525	5.020	4.200	3.930	6.280	6.410	6.780	8.98	5.45

RECOMMENDED MAXIMUM PIPE SUPPORT SPACING

(MAX. 1,500 PSI STRESS,1/8-IN DEFLECTION, WATER FILLED PIPE)

NOMINAL PIPE SIZE	1"	1 1/2"	2"	2 1/2"	3"	3 1/2"	4"	5"	6"	8"	10"	12"	14"	16"	18"	20"	24"
STEEL PIPE	7'	9'	10'	11'	12'	13'	14'	16'	17'	19'	22'	23'	25'	27'	28'	30'	32'
COPPER TUBE	6'	8'	8'	9'	10'	11'	12'	13'	14'	16'	18'	19'	-	-	-	-	-

PIPE FLEXIBILITY CHART (90° ELBOW)



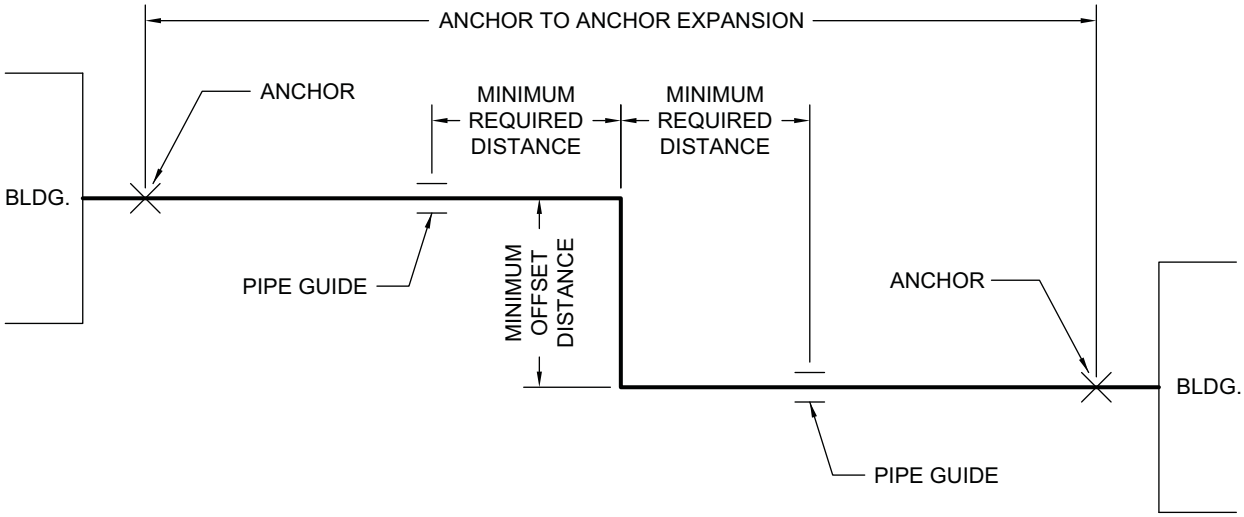
MINIMUM REQUIRED DISTANCE FOR PIPE GUIDES

PIPE SIZE	EXPANSION OF LONGEST LEG								
	1"	1 1/2"	2"	2 1/2"	3"	3 1/2"	4"	4 1/2"	5"
1"	7'	8'	10'	10'	11'	12'	13'	14'	14'
1 1/2"	8'	10'	11'	12'	13'	14'	15'	16'	17'
2"	8'	11'	13'	15'	16'	17'	18'	19'	20'
2 1/2"	9'	12'	14'	16'	17'	18'	19'	21'	22'
3"	10'	13'	15'	17'	18'	20'	21'	22'	23'
3 1/2"	11'	14'	16'	18'	19'	21'	21'	23'	24'
4"	11'	14'	16'	18'	19'	22'	22'	24'	25'
5"	12'	15'	17'	19'	21'	23'	25'	27'	28'
6"	13'	16'	19'	21'	23'	25'	27'	29'	31'
8"	18'	20'	22'	25'	27'	29'	31'	33'	35'
10"	20'	23'	26'	28'	30'	33'	35'	38'	40'
12"	22'	26'	29'	32'	34'	37'	40'	43'	45'
14"	22'	26'	30'	33'	36'	39'	41'	43'	45'
16"	23'	28'	32'	35'	39'	41'	44'	46'	48'
18"	25'	30'	34'	38'	41'	44'	46'	49'	51'
20"	26'	31'	36'	40'	43'	46'	49'	51'	54'
24"	28'	34'	39'	43'	47'	50'	53'	56'	59'

NOTES:

1. CALCULATE EXPANSION OF LONGEST LEG.
2. FIND MINIMUM REQUIRED DISTANCE FOR THIS AMOUNT OF EXPANSION FROM THE CHART. THIS REPRESENTS THE MINIMUM REQUIRED DISTANCE FOR PIPE GUIDES ON EACH SIDE OF ELBOW.
3. DIMENSIONS SHOWN ARE FOR ASTM A53 Gr. B, STD. WT., SEAMLESS PIPE. THESE ARE THE MINIMUM FOOTAGE'S REQUIRED TO MEET THE MAXIMUM ALLOWABLE STRESS. FOR LOWER STRESS LEVELS, ADD MORE FOOTAGE. ADJUST DIMENSIONS FOR OTHER PIPE MATERIALS AND/OR GREATER WALL THICKNESS.

PIPE FLEXIBILITY CHART ("Z" BEND)



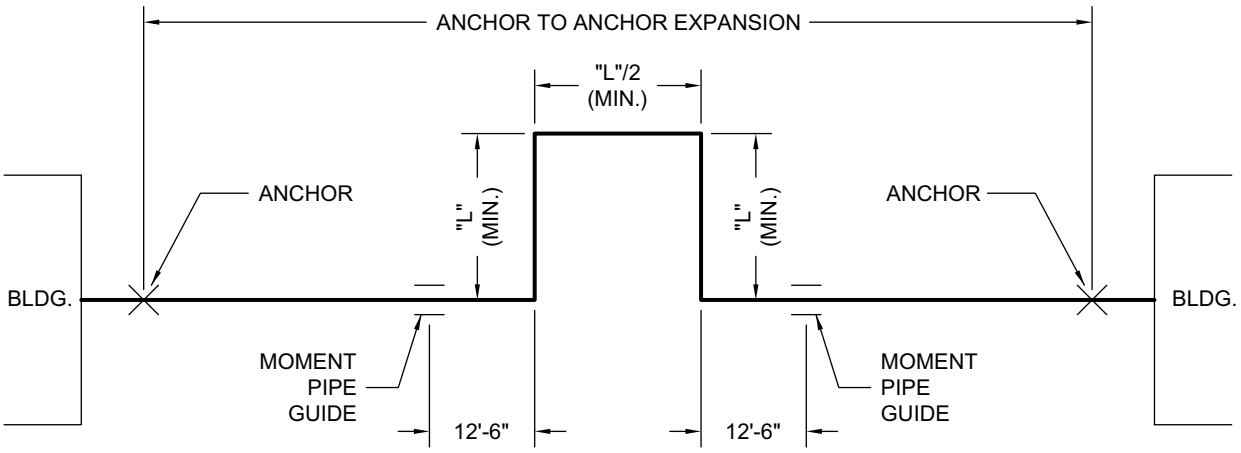
NOTES:

1. CALCULATE TOTAL EXPANSION ANCHOR TO ANCHOR.
2. FIND MINIMUM REQUIRED DISTANCE FOR THIS AMOUNT OF EXPANSION FROM THE CHART. THIS REPRESENTS THE MINIMUM REQUIRED DISTANCE FOR PIPE GUIDES ON EACH SIDE OF THE "Z" BEND AND ALSO THE MINIMUM OFFSET DISTANCE.
3. THE MINIMUM REQUIRED DISTANCE CHART ALSO REPRESENTS THE MINIMUM DISTANCE FROM ANCHORS TO OFFSET.
4. DIMENSIONS SHOWN ARE FOR ASTM A53 Gr. B, STD. WT., SEAMLESS PIPE. THESE ARE THE MINIMUM FOOTAGE'S REQUIRED TO MEET THE MAXIMUM ALLOWABLE STRESS. FOR LOWER STRESS LEVELS, ADD MORE FOOTAGE. ADJUST DIMENSIONS FOR OTHER PIPE MATERIALS AND/OR GREATER WALL THICKNESS.

MINIMUM REQUIRED DISTANCE FOR PIPE GUIDES AND OFFSET

PIPE SIZE	EXPANSION ANCHOR TO ANCHOR								
	1"	1 1/2"	2"	2 1/2"	3"	3 1/2"	4"	4 1/2"	5"
1"	4'	5'	6'	6'	7'	7'	8'	8'	9'
1 1/2"	5'	6'	7'	8'	9'	10'	10'	11'	11'
2"	6'	7'	9'	10'	11'	12'	12'	13'	14'
2 1/2"	6'	8'	9'	10'	11'	12'	13'	14'	15'
3"	7'	9'	10'	12'	13'	14'	15'	16'	17'
3 1/2"	7'	9'	11'	12'	13'	15'	16'	17'	18'
4"	8'	10'	11'	13'	14'	16'	17'	18'	19'
5"	8'	10'	12'	14'	16'	17'	19'	20'	21'
6"	9'	11'	13'	15'	17'	19'	20'	22'	23'
8"	9'	12'	14'	17'	19'	20'	22'	24'	25'
10"	10'	13'	16'	18'	20'	23'	25'	27'	28'
12"	11'	14'	17'	20'	22'	24'	26'	28'	30'
14"	15'	18'	21'	23'	25'	27'	29'	30'	32'
16"	16'	19'	22'	24'	27'	29'	31'	32'	34'
18"	17'	20'	23'	26'	28'	30'	32'	34'	36'
20"	18'	21'	24'	27'	30'	32'	34'	36'	38'
24"	19'	23'	26'	30'	32'	35'	37'	40'	42'

PIPE FLEXIBILITY CHART (EXPANSION LOOP)



NOTES:

1. CALCULATE TOTAL EXPANSION ANCHOR TO ANCHOR.

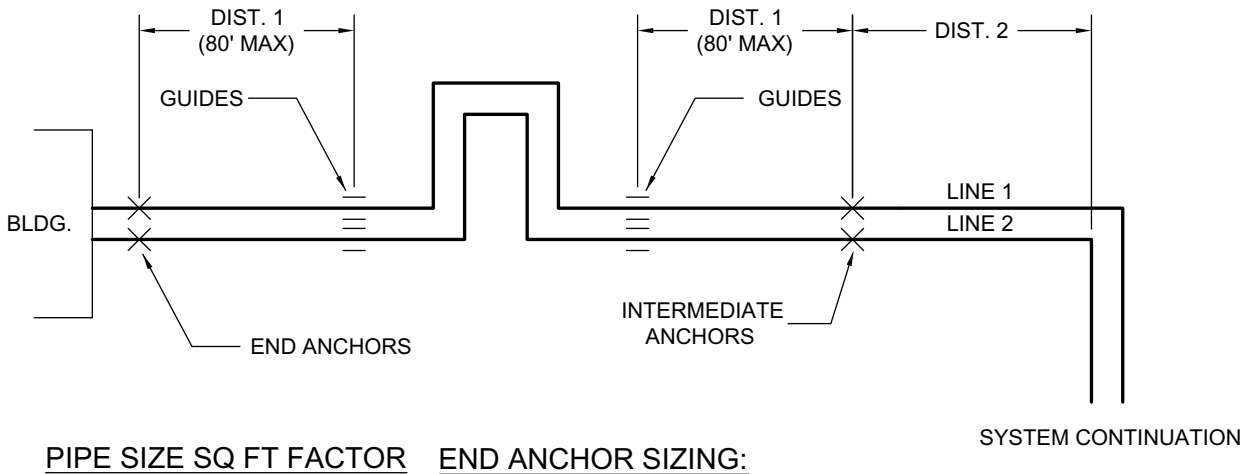
2. FIND MINIMUM REQUIRED "L" FOR THIS AMOUNT OF EXPANSION FROM THE CHART. THIS REPRESENTS THE MINIMUM REQUIRED EXPANSION LOOP SIZE.

3. DIMENSIONS SHOWN ARE FOR ASTM A53 Gr. B, STD. WT., SEAMLESS PIPE. THESE ARE THE MINIMUM FOOTAGE'S REQUIRED TO MEET THE MAXIMUM ALLOWABLE STRESS. FOR LOWER STRESS LEVELS, ADD MORE FOOTAGE. ADJUST DIMENSIONS FOR OTHER PIPE MATERIALS AND/OR GREATER WALL THICKNESS.

MINIMUM EXPANSION LOOP "L"

PIPE SIZE	EXPANSION ANCHOR TO ANCHOR									
	1"	2"	3"	4"	5"	6"	7"	8"	9"	10"
1"	3'	4'	5'	5'	6'	7'	7'	8'	8'	9'
1 1/2"	3'	5'	6'	7'	8'	9'	9'	10'	11'	12'
2"	4'	5'	7'	8'	9'	10'	11'	12'	13'	14'
2 1/2"	4'	6'	7'	8'	9'	10'	11'	12'	13'	14'
3"	4'	6'	8'	9'	11'	12'	13'	14'	15'	16'
3 1/2"	4'	6'	8'	10'	11'	12'	14'	15'	16'	17'
4"	5'	7'	9'	11'	12'	14'	15'	16'	18'	19'
5"	5'	8'	10'	12'	14'	16'	17'	19'	20'	22'
6"	5'	9'	11'	13'	15'	17'	19'	21'	22'	24'
8"	6'	9'	12'	15'	17'	19'	21'	23'	25'	27'
10"	6'	9'	13'	16'	19'	21'	23'	25'	27'	29'
12"	6'	10'	13'	17'	20'	22'	25'	27'	29'	31'
14"	7'	11'	14'	18'	21'	23'	26'	28'	30'	32'
16"	8'	12'	15'	19'	22'	24'	27'	29'	31'	33'
18"	9'	13'	16'	20'	23'	25'	28'	30'	32'	33'
20"	10'	14'	17'	21'	24'	26'	29'	31'	33'	35'
24"	12'	15'	18'	22'	25'	27'	30'	32'	34'	36'

ANCHOR SELECTION CHART



PIPE SIZE SQ FT FACTOR

PIPE SIZE	SQ. FT. FACTOR
1"	0.3
1 1/2"	0.5
2"	0.6
2 1/2"	0.7
3"	0.9
3 1/2"	1.1
4"	1.2
5"	1.5
6"	1.7
8"	2.3
10"	2.8
12"	3.3
14"	3.7
16"	4.2
18"	4.7
20"	5.2
24"	6.3

END ANCHOR SIZING:

1. CALCULATE UNBALANCED SURFACE AREA:
   (DIST. 1) x (LINE 1 PIPE SIZE SQ FT FACTOR) = LINE 1 SQ FT REQ'D
   (DIST. 1) x (LINE 2 PIPE SIZE SQ FT FACTOR) = LINE 2 SQ FT REQ'D
   (DIST. 1) x (NEXT LINE) = NEXT SQ FT REQ'D

   MIN. SQ FT ANCHOR SIZE = TOTAL SQ FT REQ'D

2. SELECT CONCRETE ANCHOR BLOCK THAT EXCEEDS TOTAL SQ FT REQ'D.

INTERMEDIATE ANCHOR SIZING:

1. CALCULATE DIST. 1 REQ'D SURFACE AREA:
   (DIST. 1) x (LINE 1 PIPE SIZE SQ FT FACTOR) = LINE 1 SQ FT REQ'D
   (DIST. 1) x (LINE 2 PIPE SIZE SQ FT FACTOR) = LINE 2 SQ FT REQ'D
   (DIST. 1) x (NEXT LINE) = NEXT SQ FT REQ'D

   DIST. 1 SQ FT REQ'D = TOTAL SQ FT REQ'D

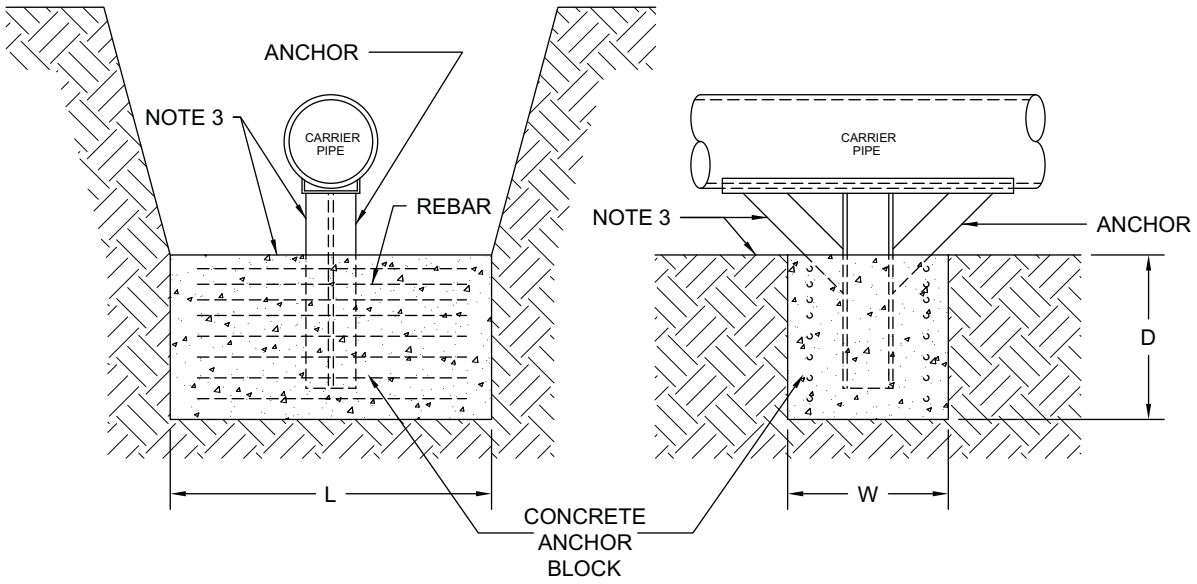
2. CALCULATE DIST. 2 REQ'D SURFACE AREA:
   (DIST. 2) x (LINE 1 PIPE SIZE SQ FT FACTOR) = LINE 1 SQ FT REQ'D
   (DIST. 2) x (LINE 2 PIPE SIZE SQ FT FACTOR) = LINE 2 SQ FT REQ'D
   (DIST. 2) x (NEXT LINE) = NEXT SQ FT REQ'D

   DIST. 2 SQ FT REQ'D = TOTAL SQ FT REQ'D

3. MIN. SQ FT REQ'D IS THE LARGER OF:
   (TOTAL DIST. 1 SQ FT REQ'D) - (TOTAL DIST. 2 SQ FT REQ'D)
   OR (0.33) * (LARGER OF DIST. 1 OR DIST. 2 TOTAL SQ FT REQ'D)

4. SELECT CONCRETE ANCHOR BLOCK THAT EXCEEDS TOTAL SQ FT REQ'D.

CONCRETE ANCHOR BLOCK DETAIL



CONCRETE ANCHOR BLOCK SCHEDULE

ANCHOR SIZE	SQ. FT AREA	L	W	D	REBAR NO. / SIDE	REBAR SIZE
1	60	28"	15"	16"	4	3
2	100	36"	15"	20"	6	3
3	160	44"	18"	24"	8	3
4	220	52"	21"	28"	10	3
5	300	60"	24"	32"	8	4
6	400	68"	27"	36"	10	4
7	500	76"	30"	40"	12	4
8	600	84"	33"	44"	16	4
9	750	92"	36"	48"	12	5
10	900	100"	39"	52"	14	5
11	1050	108"	42"	56"	16	5
12	1250	116"	45"	60"	20	5

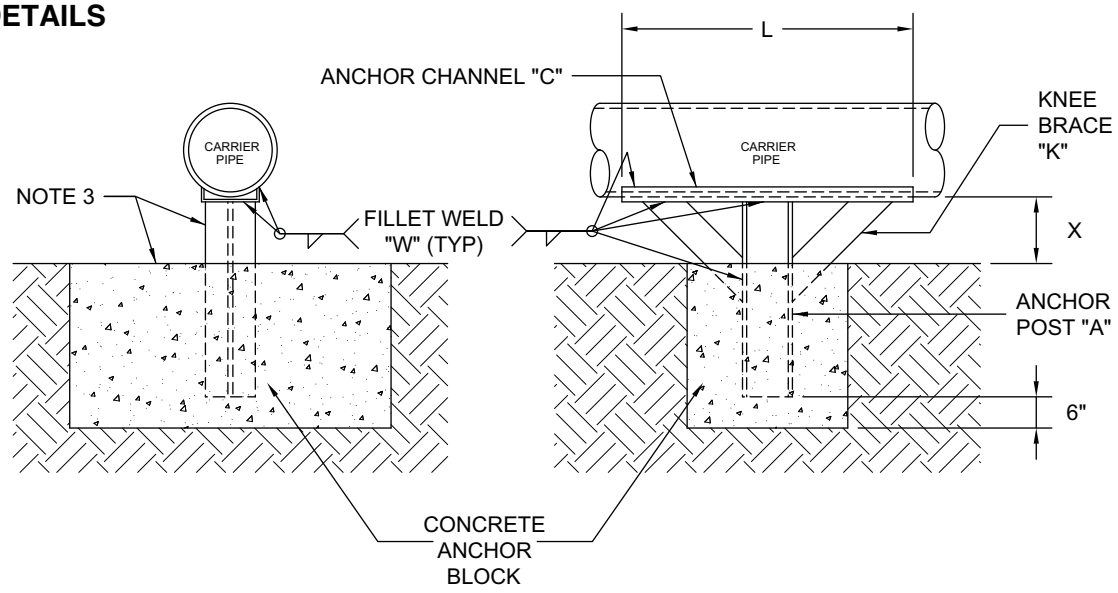
NOTES:

1.) CONCRETE BLOCK DIMENSIONS BASED ON SOIL BEARING CAPACITY OF 2500 PSF.

2.) PLACE HALF OF REBAR IN TOP 1/3 OF CONCRETE BLOCK.

3.) COAT WITH BITUMASTIC OR SILICONE GREASE IMMEDIATELY PRIOR TO DRITHERM INSTALLATION.

PIPE ANCHOR DETAILS



END ANCHOR DATA

NOMINAL PIPE SIZE	CHANNEL "C"	L	POST "A"	BRACE "K"	WELD "W"
1"	NR	-	S3x5.7	NR	1/4"
1 1/2"	NR	-	S3x5.7	NR	1/4"
2"	NR	-	S5x10	NR	1/4"
2 1/2"	NR	-	S5x10	NR	1/4"
3"	NR	-	S6x12.5	NR	1/4"
3 1/2"	NR	-	S6x12.5	NR	1/4"
4"	C4x5.4	26"	S5x12.5	2 1/2" OD	1/4"
5"	C5x6.7	28"	S6x17.5	2 1/2" OD	5/16"
6"	C5x6.7	30"	S6x17.5	3" OD	5/16"
8"	C7x9.8	34"	S8x23	4" OD	5/16"
10"	C8x11.5	38"	S10x35	5" OD	5/16"
12"	C10x15.3	40"	S10x35	6" OD	5/16"
14"	C10x15.3	44"	S12x31.8	W5x19	3/8"
16"	C12x20.7	52"	S12x40.8	W6x25	3/8"
18"	C12x20.7	62"	S15x42.9	W6x25	3/8"
20"	C12x20.7	72"	S15x42.9	W6x25	3/8"
24"	NOTE 1	NOTE 1	NOTE 1	NOTE 1	NOTE 1

INTERMEDIATE ANCHOR DATA

NOMINAL PIPE SIZE	CHANNEL "C"	L	POST "A"	BRACE "K"	WELD "W"
1"	NR	-	S3x5.7	NR	1/4"
1 1/2"	NR	-	S3x5.7	NR	1/4"
2"	NR	-	S4x7.7	NR	1/4"
2 1/2"	NR	-	S5x10	NR	1/4"
3"	NR	-	S5x10	NR	1/4"
3 1/2"	NR	-	S6x12.5	NR	1/4"
4"	NR	-	S6x12.5	NR	1/4"
5"	NR	-	S7x15.3	NR	1/4"
6"	NR	-	S8x18.4	NR	1/4"
8"	C7x9.8	26"	S5x10	2 1/2" OD	1/4"
10"	C8x11.5	30"	S6x12.5	3" OD	5/16"
12"	C10x15.3	34"	S7x15.3	4" OD	5/16"
14"	C10x15.3	38"	S7x15.3	4" OD	5/16"
16"	C12x20.7	42"	W8x18	5" OD	5/16"
18"	C12x20.7	46"	W8x21	5" OD	5/16"
20"	C12x20.7	50"	W8x21	6" OD	5/16"
24"	NOTE 1	NOTE 1	NOTE 1	NOTE 1	NOTE 1

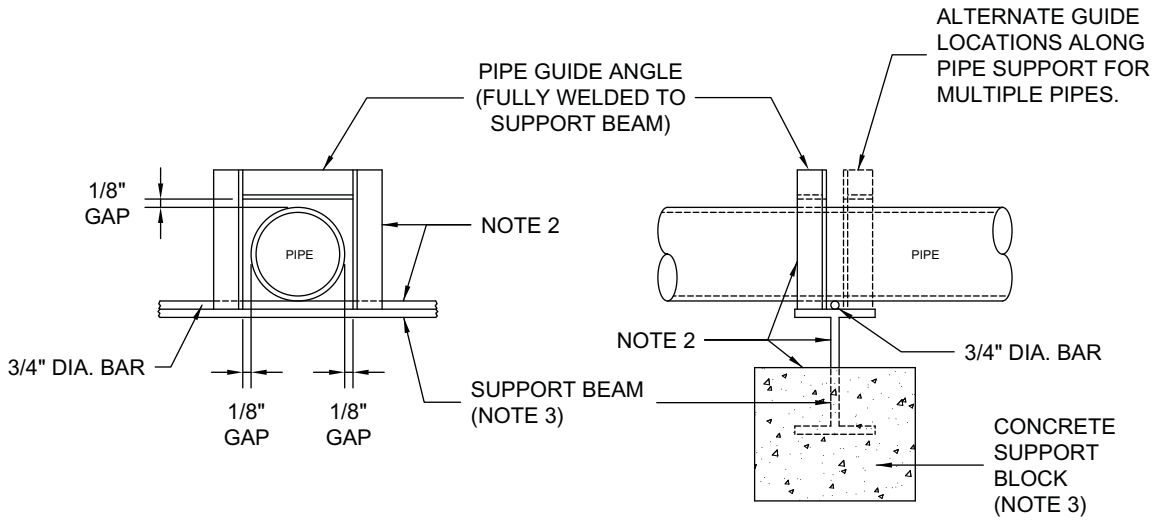
NOTES:

1.) CONTACT DRITHERM FOR INFORMATION

2.) X - DIMENSION FROM DRITHERM ENVELOPE DIMENSIONS.

3.) COAT WITH BITUMASTIC OR SILICONE GREASE IMMEDIATELY PRIOR TO DRITHERM INSTALLATION.

PIPE GUIDE DETAIL



PIPE GUIDE SCHEDULE

PIPE SIZE	ANGLE SIZE
1"	1" x 1" x 1/4"
1.5"	1" x 1" x 1/4"
2"	1" x 1" x 1/4"
2.5"	1" x 1" x 1/4"
3"	1 1/2" x 1 1/2" X 1/4"
3.5"	1 1/2" x 1 1/2" X 1/4"
4"	1 1/2" x 1 1/2" X 1/4"
5"	2 1/2" x 2 1/2" x 1/4"
6"	2 1/2" x 2 1/2" x 1/4"
8"	2 1/2" x 2 1/2" x 1/4"
10"	2 1/2" x 2 1/2" x 1/4"
12"	2 1/2" x 2 1/2" x 1/4"
14"	3" x 3" x 5/16"
16"	3" x 3" x 5/16"
18"	3" x 3" x 5/16"
20"	3" x 3" x 5/16"
24"	3" x 3" x 5/16"

NOTES:

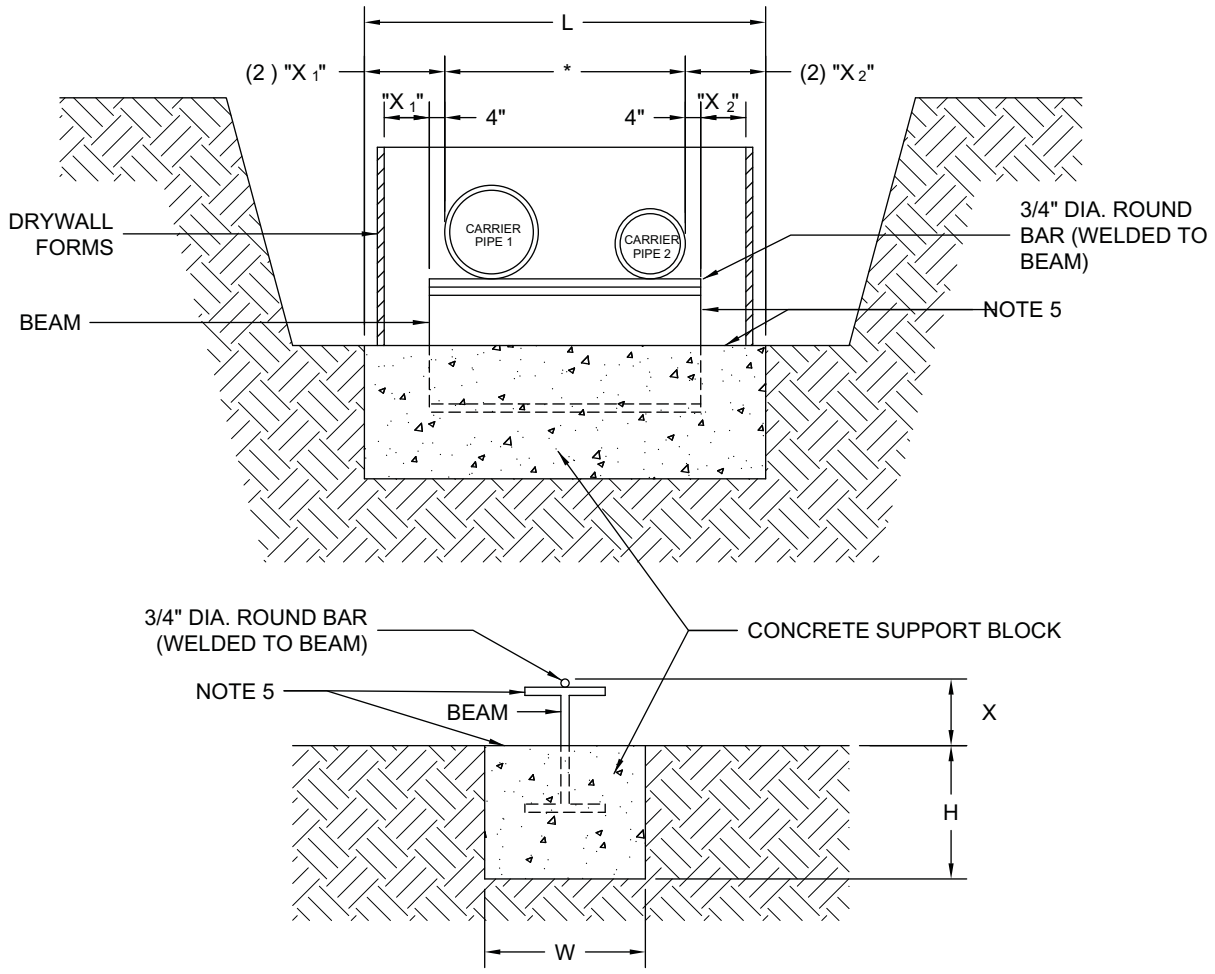
1.) GUIDE GAPS ARE TO PIPE O.D., NOT INSULATION O.D..

2.) COAT WITH BITUMASTIC OR SILICONE GREASE IMMEDIATELY PRIOR TO DRITHERM INSTALLATION.

3.) SEE PIPE SUPPORT DETAIL DRAWING FOR SUPPORT BEAM AND CONCRETE BLOCK SIZING.

PERMANANT PIPE SUPPORT DETAIL

Recommended for size 14" pipe and above



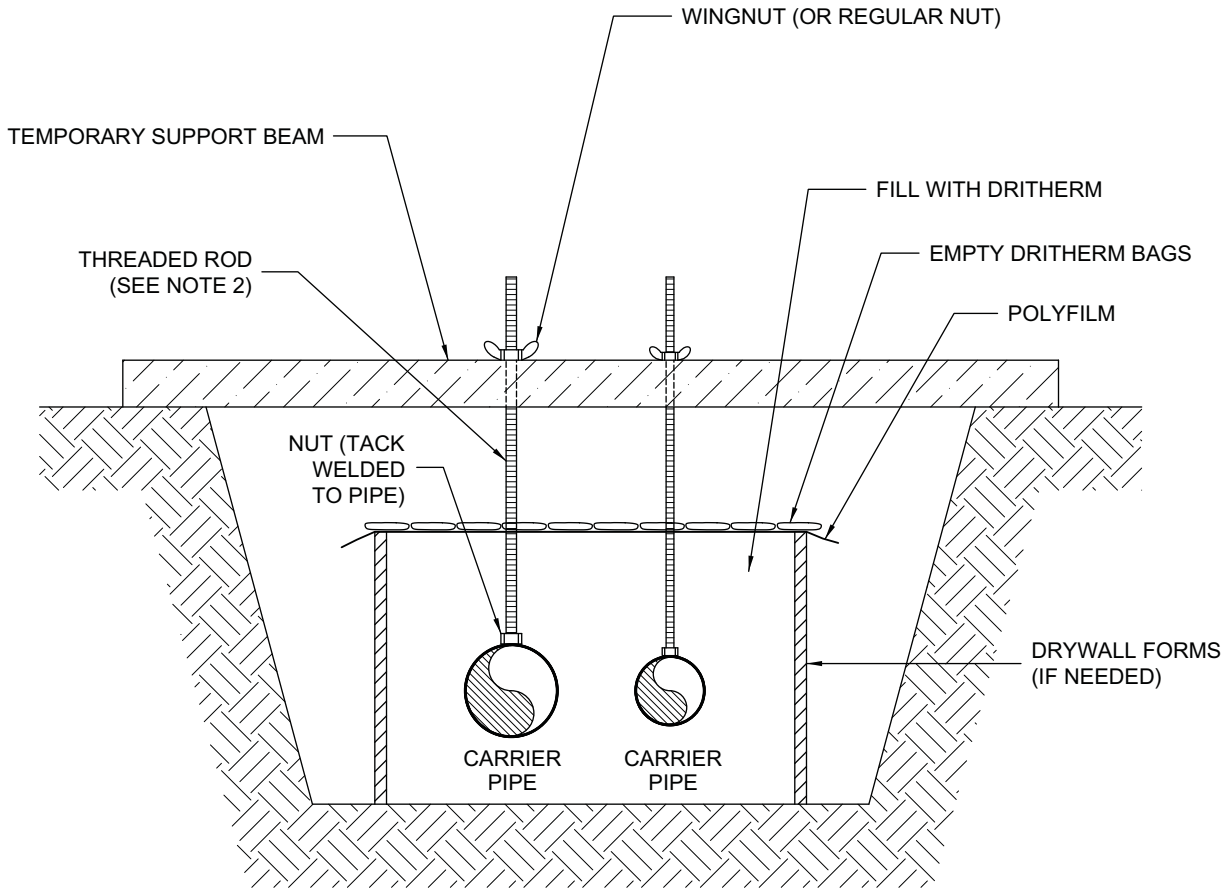
PIPE SUPPORT SCHEDULE

DRITHERM ENVELOPE "X" DIM.	BEAM SIZE	L	W	H
3"	W6x15.5	*	12"	6"
4"	W8x28	*	15"	8"
5"	W10x39	*	18"	10"
6"	W12x27	*	18"	12"
7"	W14x34	*	18"	14"
8"	W16x40	*	18"	16"
9"	W18x50	*	18"	18"
10"	W21x62	*	18"	21"

NOTES:

1.) DRITHERM ENVELOPE "X" DIM. DETERMINED BY PIPE SIZE (SEE CHART)
2.) * = LENGTH TO BE CALCULATED BASED ON PIPE SIZE AND SPACING.
3.) SUPPORT DESIGN BASED ON 2500 PSF SOIL BEARING CAPACITY.
4.) CONCRETE SHALL BE 3000 PSI MINIMUM.
5.) COAT WITH BITUMASTIC OR SILICONE GREASE IMMEDIATELY PRIOR TO DRITHERM INSTALLATION.

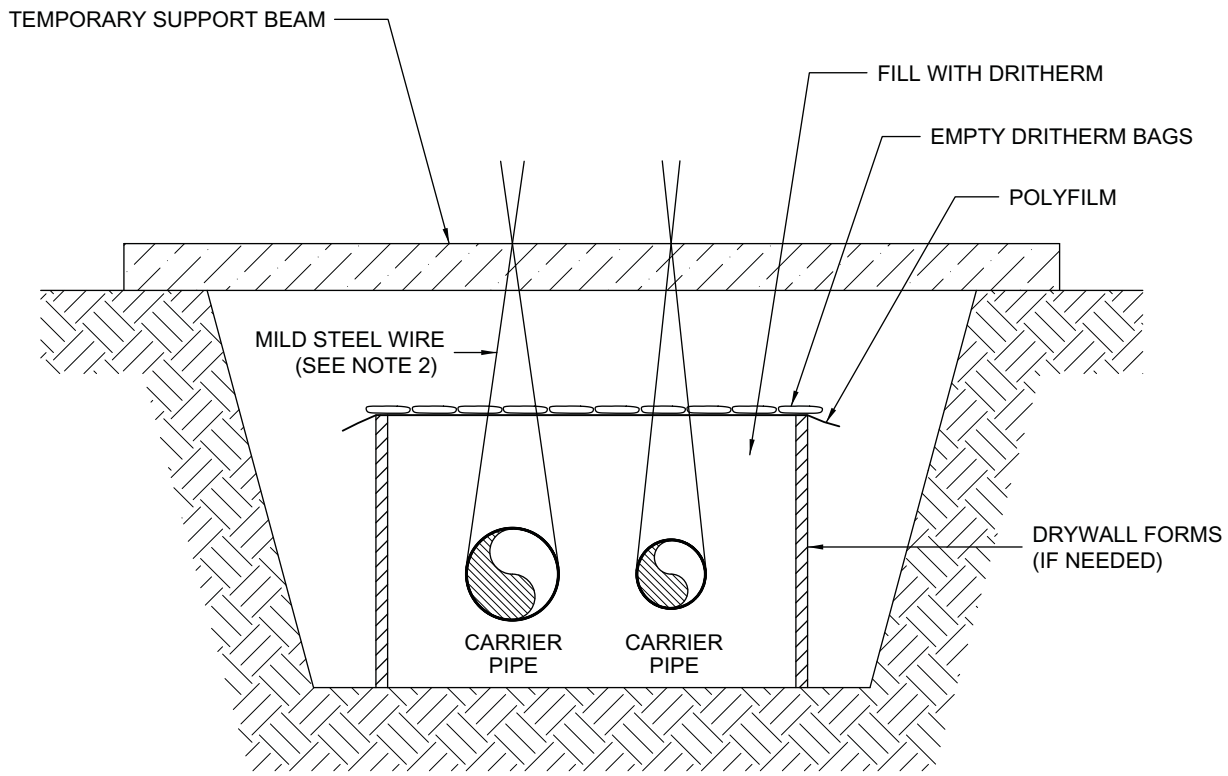
TEMPORARY SUPPORT DETAIL (THREADED ROD)
Recommended for size 12" pipe and below



NOTES:

1.) SELECT SUITABLE SIZED TEMPORARY SUPPORT BEAM ACROSS TRENCH.
2.) TACK WELD SUITABLE SIZE NUT TO TOP OF PIPE.
3.) RUN SUITABLE SIZE THREADED ROD INTO NUT AND THRU SUPPORT.
4.) ALLOW THREADED ROD TO PASS BEYOND SUPPORT BEAM AND FASTEN WITH WINGNUT. RAISE AND LOWER PIPE TO DESIRED ELEVATION.
5.) INSTALL DRYWALL FORMS, DRITHERM, POLYFILM, AND LAYER OF EMPTY DRITHERM BAGS / SACKS.
6.) BACKFILL AT LEAST 10 INCHES BEFORE REMOVING THREADED ROD. THREADED ROD MUST BE REMOVED.
7.) RE-USE THREADED ROD ON NEXT SECTION OF TRENCH.

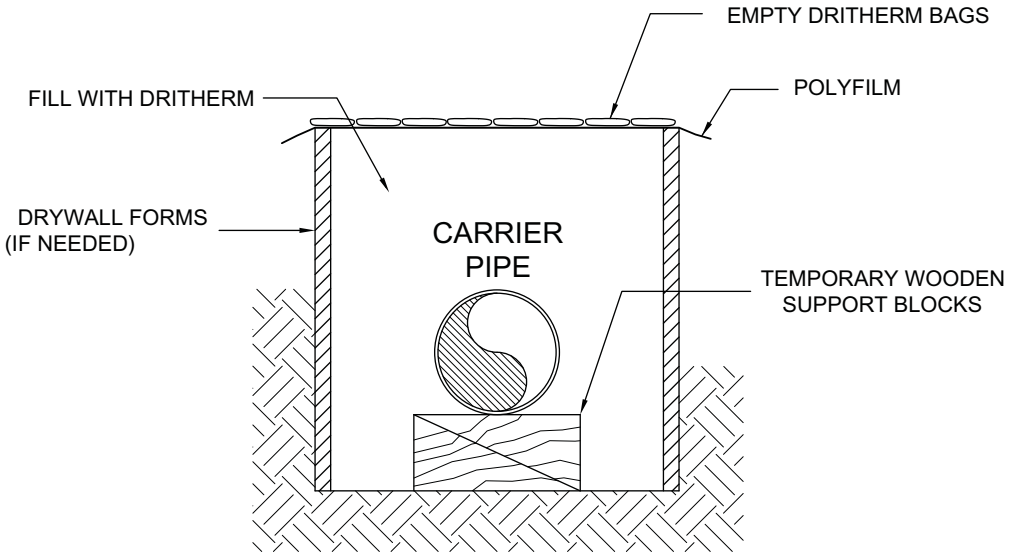
TEMPORARY SUPPORT DETAIL (WIRE LOOPS)
Recommended for size 12" pipe and below

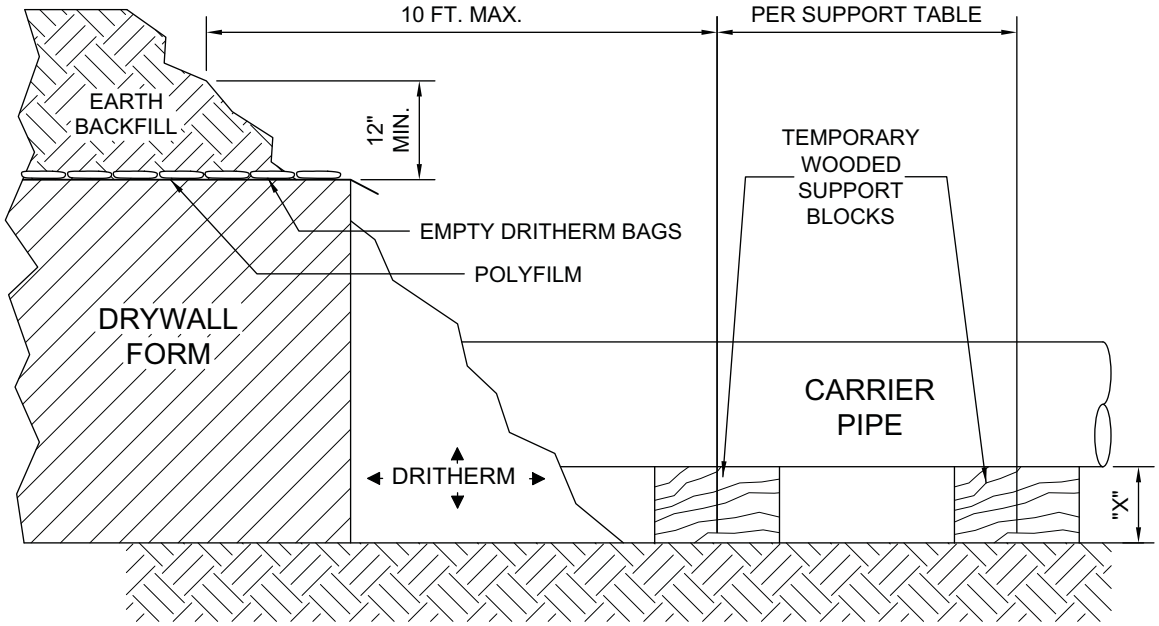


NOTES:

1.) SELECT SUITABLE SIZED TEMPORARY SUPPORT BEAM ACROSS TRENCH.
2.) PLACE SUITABLE SIZED MILD STEEL WIRE AROUND PIPE.
3.) TWIST WIRE ABOVE WOOD/STEEL SUPPORT BEAM TO RAISE/LOWER PIPE.
4.) INSTALL DRYWALL FORMS, DRITHERM, POLYFILM, AND LAYER OF EMPTY DRITHERM BAGS / SACKS.
5.) BACKFILL AT LEAST 10 INCHES BEFORE CUTTING AND REMOVING WIRE SUPPORT. WIRE MUST BE REMOVED.

TEMPORARY SUPPORT DETAIL (WOOD BLOCKS)

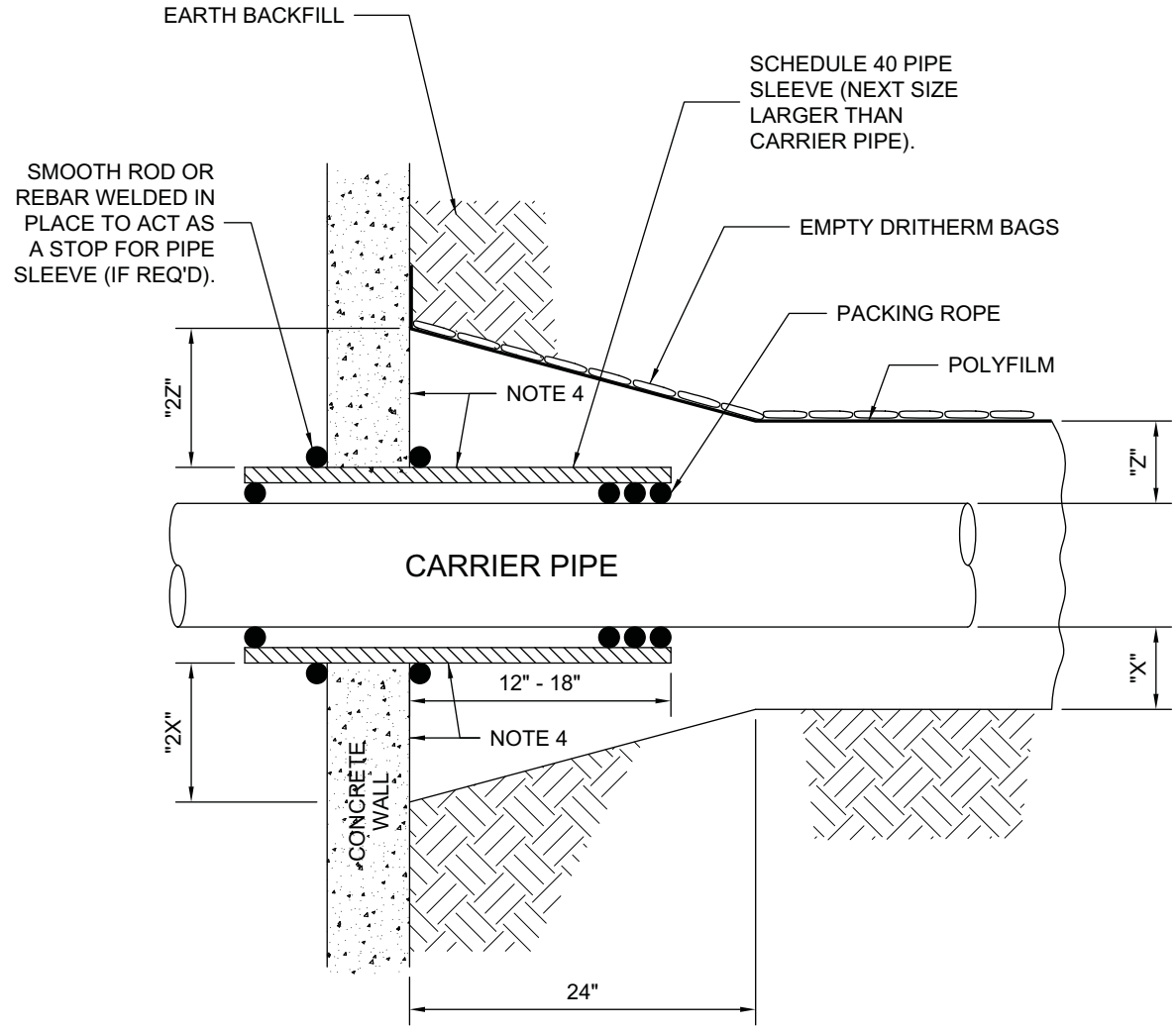




NOTES:

1.) INSTALL TEMPORARY WOODEN BLOCKS TO HEIGHT REQUIRED FOR MINIMUM DRITHERM "X" DIMENSION.
2.) INSTALL DRYWALL FORMS, DRITHERM, POLYFILM, AND LAYER OF EMPTY DRITHERM BAGS / SACKS.
3.) BACKFILL AT LEAST 12" DEEP AND TO WITHIN 10 FT OF WOODEN BLOCK BEFORE REMOVING WOODEN BLOCK.
4.) WOODEN BLOCKS MUST BE REMOVED FOR PIPE TEMPERATURES ABOVE 75°F WITHOUT DISTURBING PIPE. DO NOT LIFT PIPE TO REMOVE BLOCK.
5.) AT DISCRETION OF SYSTEM DESIGN ENGINEER, WOODEN SUPPORT BLOCKS MAY BE LEFT IN TRENCH FOR NONMETALLIC PIPES BELOW 75°. USE WOLMANIZED LUMBER.

WALL ENTRY DETAIL



NOTES:

1.) CORE HOLE THROUGH CONCRETE WALL SHOULD BE SIZED FOR SLEEVE PIPE OUTSIDE DIAMETER +1/16".

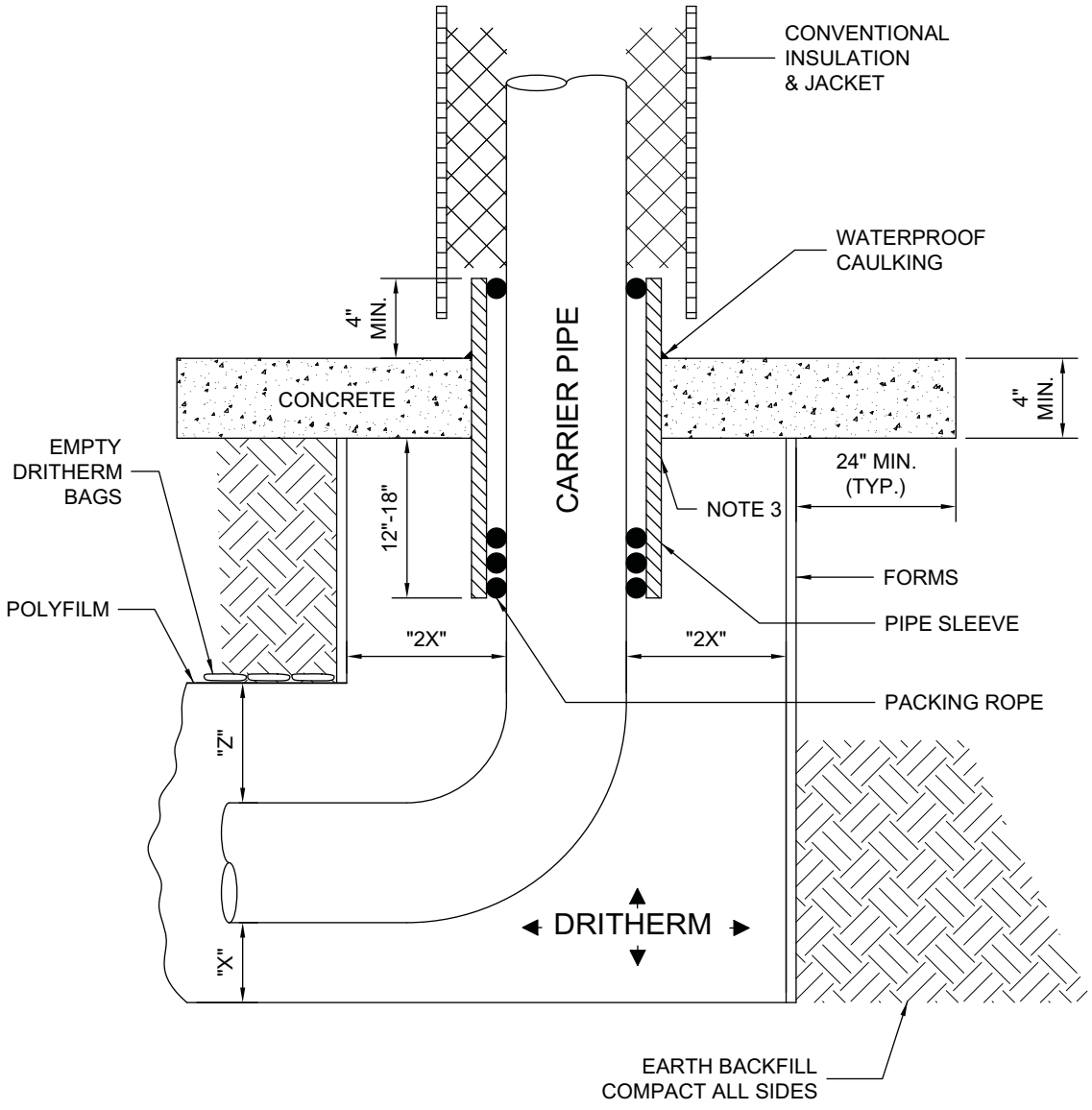
2.) FOR WALLS WHERE THE EXISTING ENTRY HOLE IS SIGNIFICANTLY LARGER THAN THE SLEEVE PIPE, INSERT THE SLEEVE PIPE OVER THE CARRIER PIPE, FORM UP THE WALL WITH PLYWOOD ON EITHER SIDE, AND FILL AROUND THE SLEEVE PIPE WITH SUITABLE CONCRETE OR HYDRAULIC CEMENT TO REESTABLISH WALL.

3.) SLEEVE PIPE CAN BE SPLIT IN HALF, INSERTED OVER THE CARRIER PIPE, AND WELDED BACK TOGETHER TO AVOID HAVING TO REMOVE THE CARRIER PIPE.

4.) COAT WITH BITUMASTIC OR SILICONE GREASE IMMEDIATELY PRIOR TO DRITHERM INSTALLATION.

5.) REFER TO ADDITIONAL INFORMATION FOR PACKING ROPE.

VERTICAL PIPE RISER DETAIL



NOTES:

1.) PIPE SLEEVE SHOULD BE NEXT LARGER DIAMETER PIPE SIZE FROM CARRIER PIPE - SCHEDULE 40 MIN.

2.) ELASTOMERIC MECHANICAL SEAL CAN BE SUBSTITUTED FOR PACKING ROPE.

3.) COAT WITH BITUMASTIC OR SILICONE GREASE IMMEDIATELY PRIOR TO DRITHERM INSTALLATION.

4.) REFER TO ADDITIONAL INFORMATION FOR PACKING ROPE.

DRITHERM INTERNATIONAL INC.

Insulation Design

Introduction

The purpose of DriTherm® is to provide a dry, stable, environment, around underground piping so that maximum thermal efficiency is attained while negligible moisture passage is allowed, similar to a pipe within a pipe system. Closed cell bonds between individual particles with air entrapment within is how DriTherm® achieves this.

Once dimensions are chosen for the correct pipe diameter and temperature the insulation envelope size will be determined. Sideforms are used only to contain the minimum envelope size and do not affect DriTherm® insulation performance. Sideforms are best held in place with temporary spacers, which are removed after the DriTherm® has been installed. In areas where mineral fiber cushion is used, the insulation envelope is wider and deeper to accommodate the cushion. Bitumastic or silicone grease, which is applied to all steel and concrete in direct contact with the carrier pipe, should be installed immediately prior to the installation of DriTherm® so that it is tacky.

In order to minimize dusting it is advisable to open the DriTherm® bags or sacks as close to the carrier pipe as possible while pouring. DriTherm® will readily flow from it's packaging and begin to seek it's own level in the confines of the insulation envelope.

Mechanical design components and devices are extremely critical to system performance and will affect the performance of a DriTherm® system if not designed and installed correctly. Items such as pipe sleeves protruding into the DriTherm® at wall entries are necessary to prevent capillary action water from reaching the carrier piping.

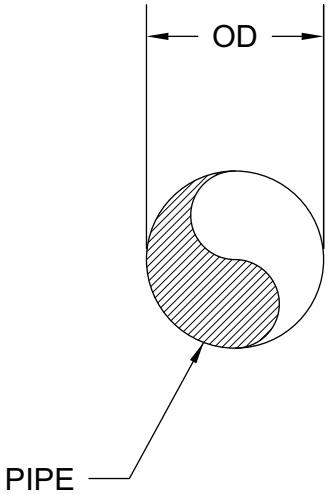
The information contained in this section is intended to aid the system Design Engineer in the correct dimensions for the insulation envelope as well as provide volume calculations for estimating purposes.

PIPE DATA (DIAMETERS & CROSS SECTIONAL AREAS)

PIPE WITH NO INSULATION CUSHION:

CROSS SECTIONAL AREA (SQ. IN.) = 0.785398 x $(OD)^2$

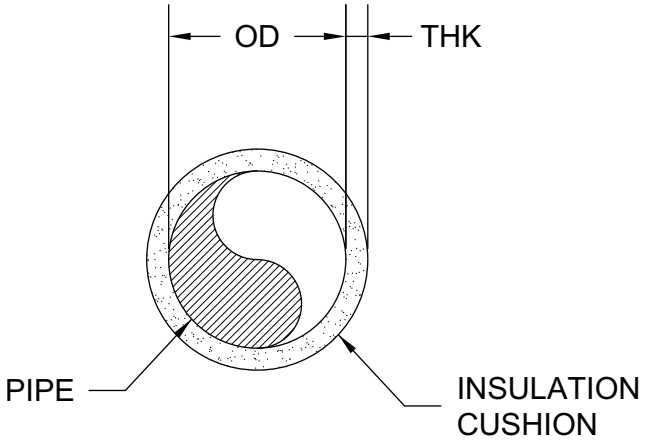
NOMINAL PIPE SIZE	OUTSIDE DIAMETER "OD"	CROSS-SECTIONAL AREA
1"	1.315"	1.36 SQ. IN.
1 1/2"	1.9"	2.83 SQ. IN.
2"	2.375"	4.43 SQ. IN.
2 1/2"	2.875"	6.49 SQ. IN.
3"	3.5"	9.62 SQ. IN.
3 1/2"	4"	12.57 SQ. IN.
4"	4.5"	15.90 SQ. IN.
5"	5.563"	24.30 SQ. IN.
6"	6.625"	34.45 SQ. IN.
8"	8.625"	58.40 SQ. IN.
10"	10.75"	90.72 SQ. IN.
12"	12.75"	127.61 SQ. IN.
14"	14"	153.86 SQ. IN.
16"	16"	200.96 SQ. IN.
18"	18"	254.34 SQ. IN.
20"	20"	314.00 SQ. IN.
24"	24"	452.16 SQ. IN.



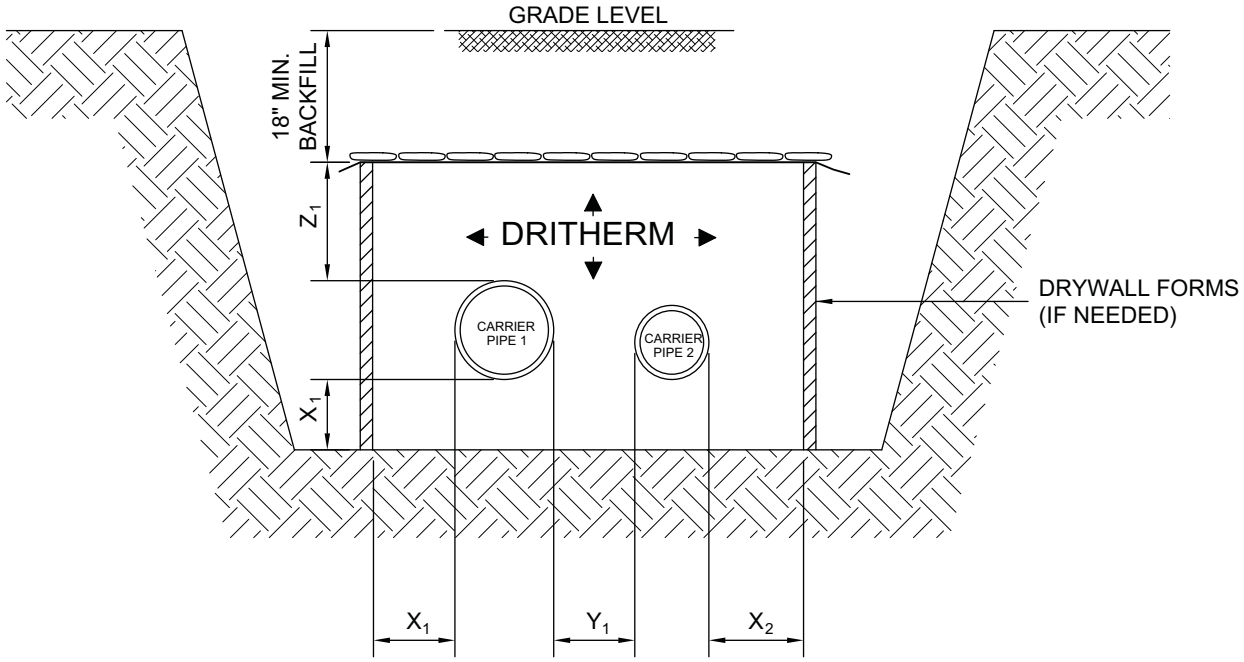
PIPE WITH MINERAL WOOL CUSHION:

CUSHION OUTSIDE DIAMETER (INCHES) = OD + (2 x THK)

CROSS SECTIONAL AREA (SQ. IN.) = 0.785398 x $(CUSHION\ OUTSIDE\ DIAMETER)^2$



DRITHERM ENVELOPE DIMENSIONS



DRITHERM ENVELOPE DIMENSIONS IN INCHES

NOM. PIPE DIA.	-100°F TO 100°F			101°F TO 230°F			231°F TO 305°F			306°F TO 400°F			401°F TO 480°F		
	X	Y	Z	X	Y	Z	X	Y	Z	X	Y	Z	X	Y	Z
1	3	2	4	3	2	4	3	2	4	3	2	4	4	2	5
2	3	2	4	3	2	4	3	2	4	4	2	5	4	2	5
3	3	2	5	3	2	5	4	2	5	4	2	5	4	2	5
4	4	2	5	4	2	5	4	2	5	5	2	6	5	2	6
5	4	3	5	4	3	5	4	3	6	5	3	6	5	3	7
6	4	3	5	4	3	6	4	3	6	5	3	6	6	3	7
8	4	3	5	5	3	6	5	3	7	6	3	8	6	4	8
10	4	3	6	5	3	7	6	3	7	6	3	8	6	4	8
12	4	3	6	6	4	8	6	4	8	7	4	9	7	4	10
14	5	4	6	6	4	8	7	4	8	7	4	9	7	4	10
16	5	4	6	6	4	8	7	4	9	8	4	10	8	5	10
18	5	4	6	7	4	9	7	4	9	8	4	10	8	5	10
20	5	4	7	7	4	9	8	4	10	9	4	10	9	5	10
24	5	4	7	7	4	9	8	4	10	10	4	12	10	5	12

NOTES:

1.) X = USE FOR EACH PIPE SIZE

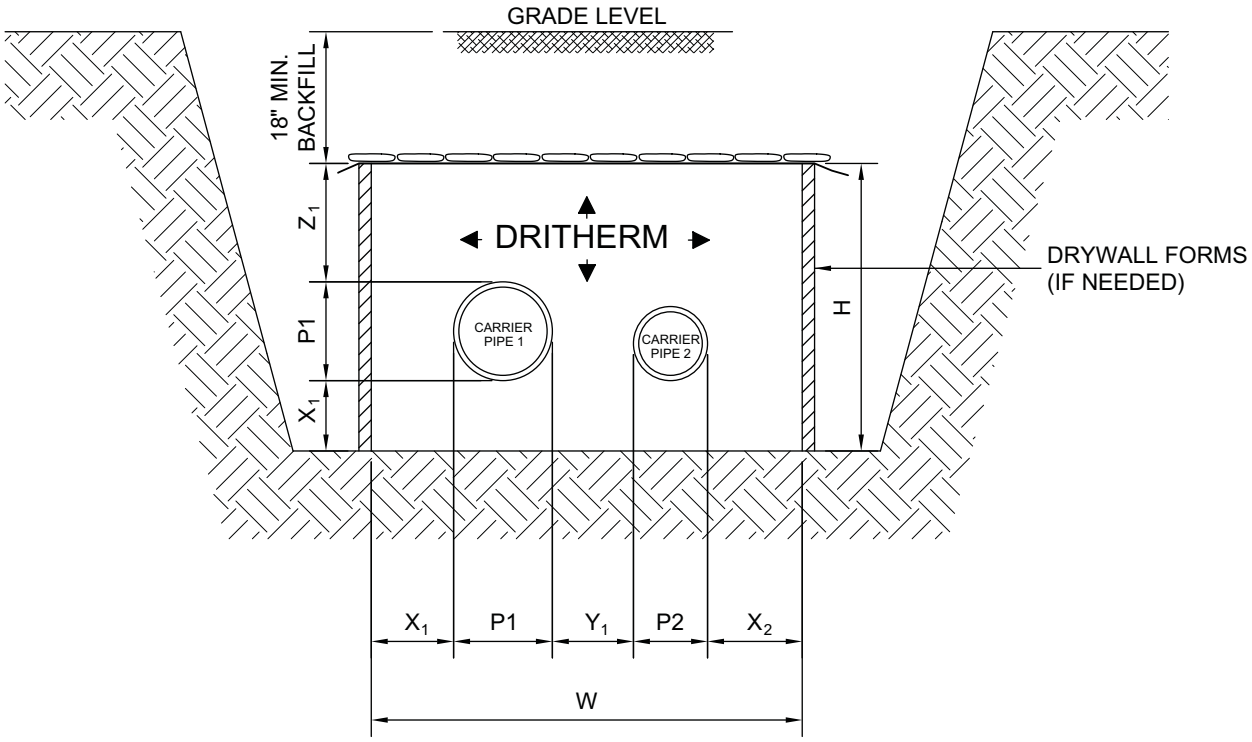
2.) Y = USE LARGER PIPE SIZE TO DETERMINE

3.) Z = USE LARGER PIPE SIZE TO DETERMINE

4.) ENVELOPE DIMENSIONS ARE FROM OUTSIDE DIAMETER OF PIPE OR MINERAL WOOL INSULATION.

5.) CONTACT DRITHERM FOR INCREASED SPACING REQUIREMENTS BETWEEN HOT & COLD PIPING IN COMMON ENVELOPE.

DRITHERM ENVELOPE VOLUME CALCULATIONS



VOLUME CALCULATION PROCEDURES:

1.) OBTAIN PIPE DIAMETERS / INSULATION DIAMETERS FROM PIPE DATA CHARTS.

2.) $W = X_1 + P1 + Y_1 + P2 + X_2$

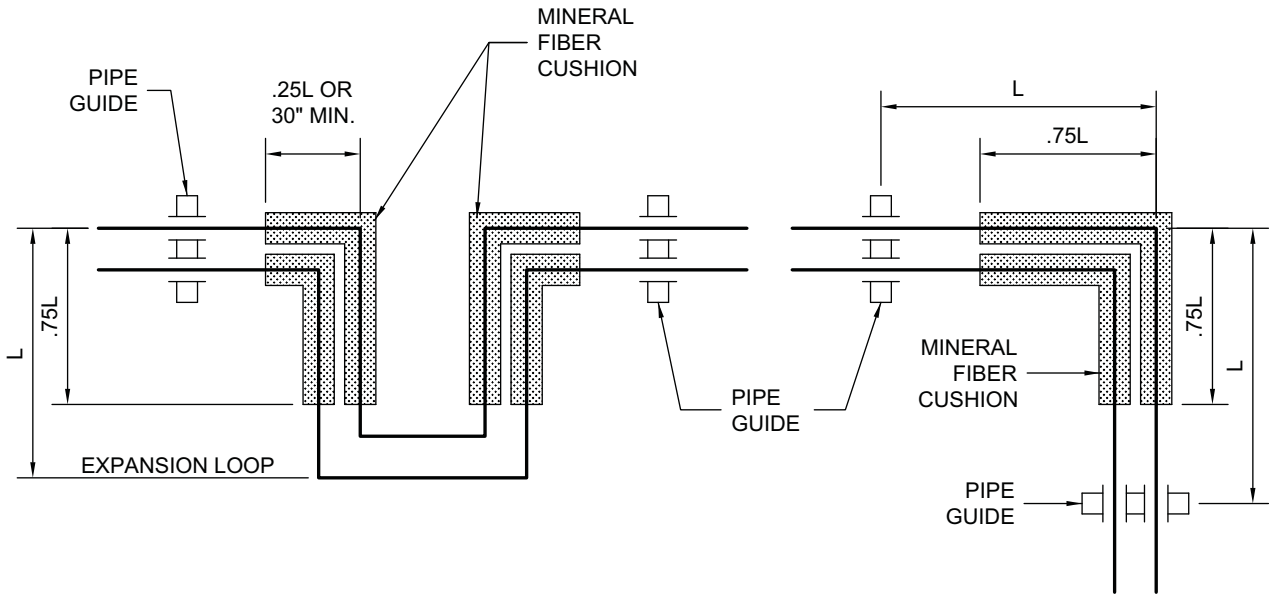
3.) $H = X_1 + P1 + Z_1$

4.) OBTAIN CROSS SECTIONAL AREAS OF PIPE / INSULATION FROM PIPE DATA CHARTS.

5. VOLUME AREA (SQ. FT) = $\frac{(W \times H) - (\text{CROSS SECTIONAL AREA OF P1 + P2})}{144}$

6.) TRENCH VOLUME (CUBIC FEET) = VOLUME AREA X LINEAR FEET OF TRENCH

MINERAL FIBER CUSHION REQUIREMENTS



MINERAL FIBER CUSHION THICKNESS

MINIMUM MINERAL FIBER CUSHION THICKNESS (INCHES) = CALCULATED PIPE EXPANSION (INCHES) X 1.25

NOTES:

1.) AN EXPANSION ABSORBING CUSHION IS REQUIRED IN ORDER TO PROVIDE GREATER FLEXIBILITY FOR EXPANSION MOVEMENT AND TO REDUCE PIPE STRESS TO A MINIMUM.

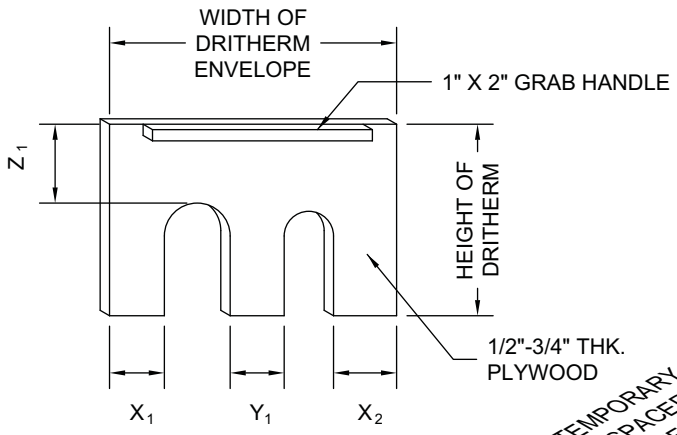
2.) ALL EXPECTED PIPE EXPANSION MOVEMENT SHALL BE ABSORBED WITHIN THE MINERAL FIBER CUSHION.

3.) DRITHERM ENVELOPE DIMENSIONS ARE TO BE MAINTAINED AROUND THE OUTSIDE OF THE MINERAL FIBER CUSHION.

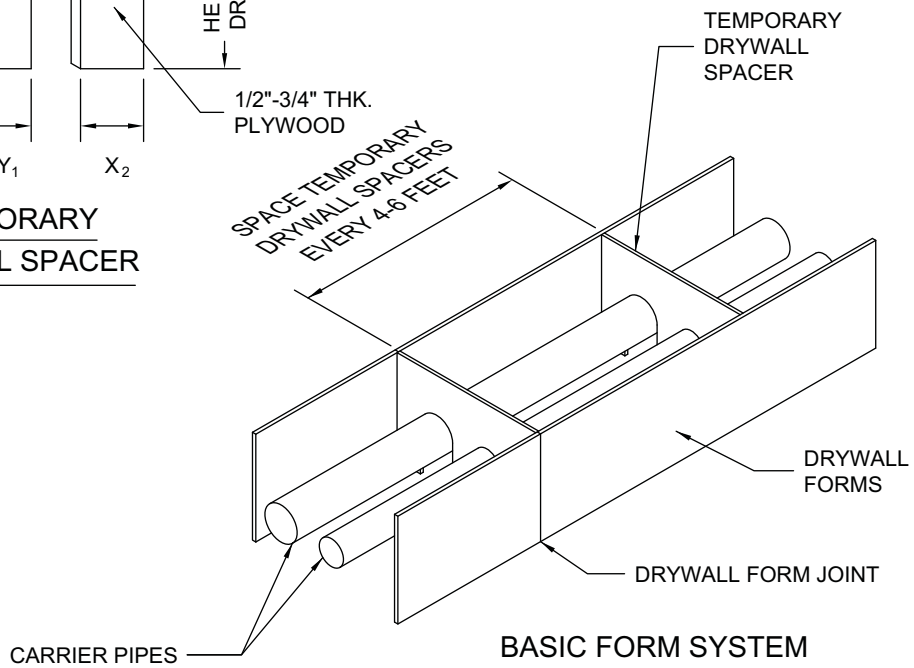
4.) REFER TO ADDITIONAL INFORMATION FOR MINERAL FIBER CUSHION.

Insulation Design

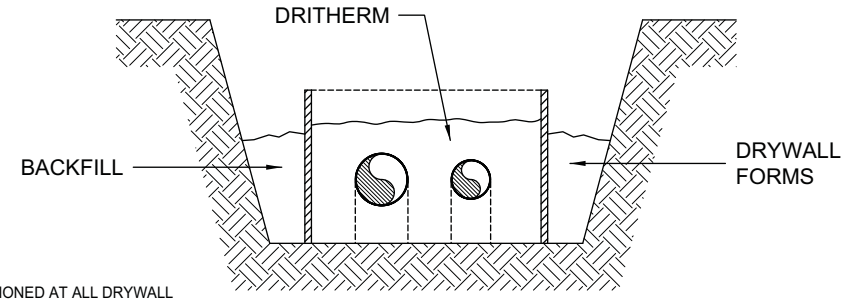
ALTERNATE FORMWORK DETAILS



TEMPORARY DRYWALL SPACER



BASIC FORM SYSTEM



TRENCH DETAIL

NOTES:

1.) DRYWALL FORMS SHALL REMAIN IN THE GROUND.

2.) DRYWALL FORMS SHALL BE 1/2" MIN. THICKNESS.

3.) TEMPORARY DRYWALL SPACERS SHALL BE POSITIONED AT ALL DRYWALL FORM JOINTS. ADDITIONAL TEMPORARY DRYWALL SPACERS SHALL BE SPACED TO LIMIT DRYWALL FORM DEFLECTION TO 1/2" MAXIMUM.

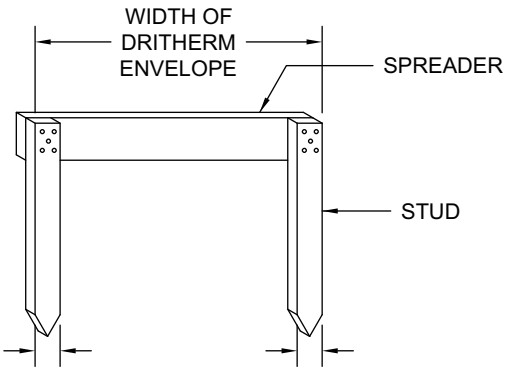
4.) TEMPORARY DRYWALL SPACERS SHALL BE REMOVED AFTER DRITHERM IS INSTALLED TO 1/2 THE HEIGHT OF THE FORMS. ADDITIONAL DRITHERM SHALL BE ADDED TO FILL VOIDS AFTER THE SPACERS ARE REMOVED.

5.) BEGIN BACKFILLING OUTSIDE OF DRYWALL FORMS AS DRITHERM IS POURED INSIDE FORMS.

6.) WHERE TRENCHES CAN BE DUG TO PRECISE DIMENSIONS, FORMS MAY BE ELIMINATED.

Insulation Design

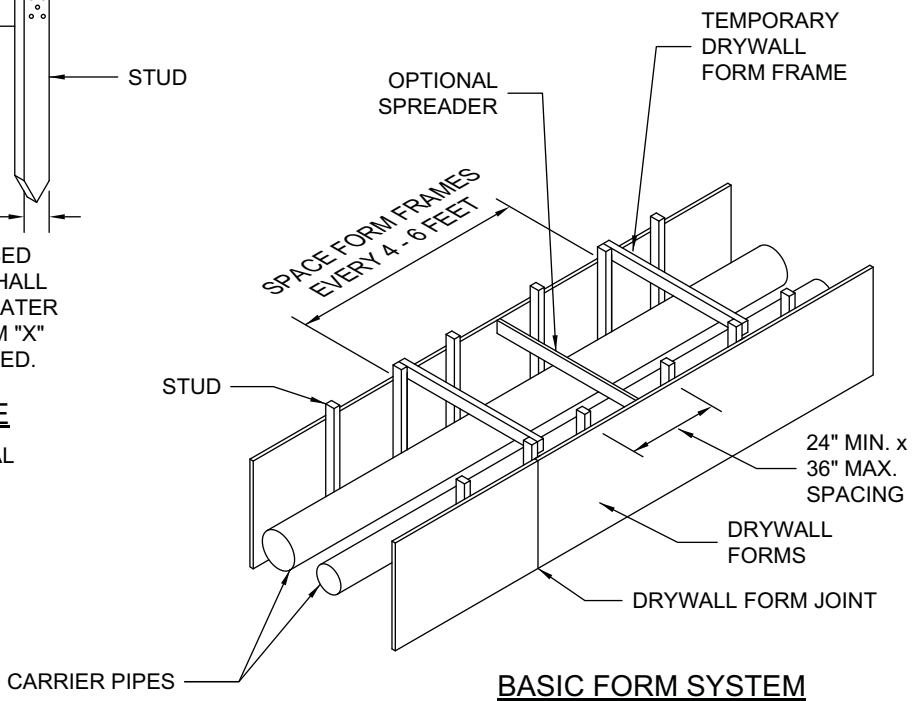
ALTERNATE FORMWORK DETAILS



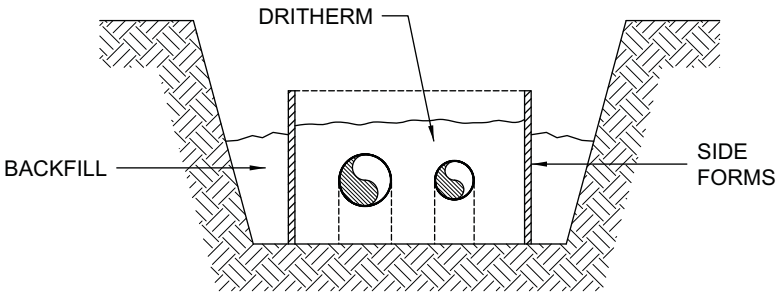
WIDTH OF STUD USED FOR FORM FRAME SHALL BE EQUAL TO OR GREATER THAN THE DRITHERM "X" DIMENSION REQUIRED.

FORM FRAME

USE DIMENSIONAL LUMBER



BASIC FORM SYSTEM

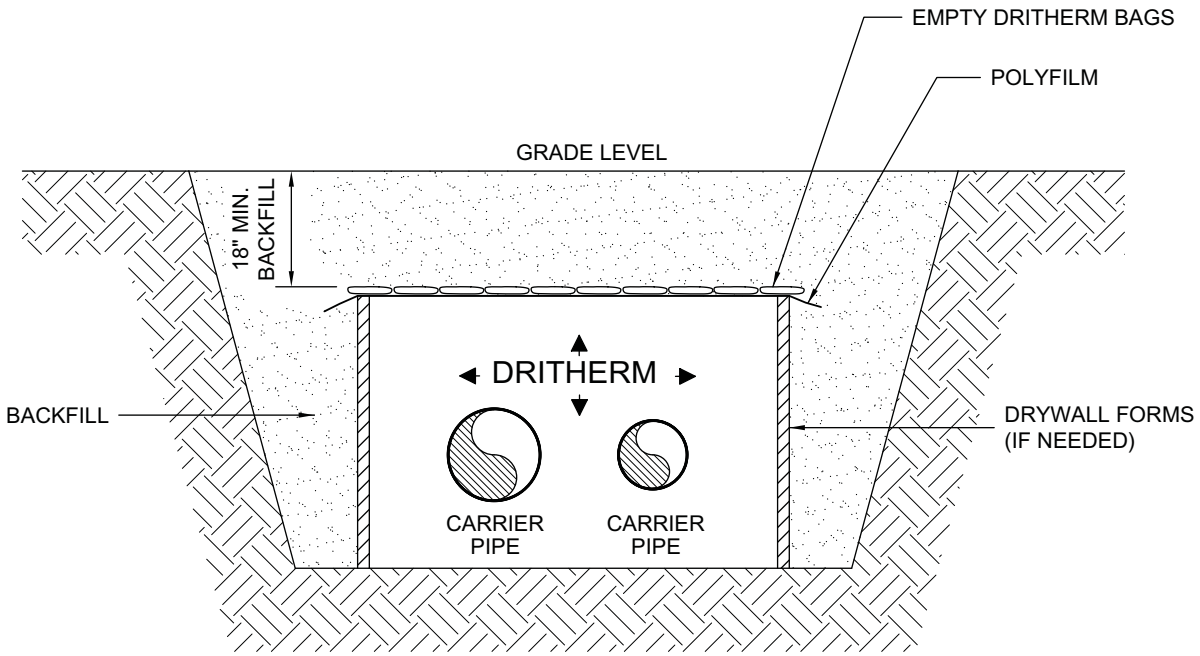


TRENCH DETAIL

NOTES:

1.) SIDE FORMS SHALL REMAIN IN THE GROUND.
2.) SIDE FORMS SHALL BE 1/2" MIN. THICKNESS. DRYWALL RECOMMENDED.
3.) FORM FRAMES SHALL BE POSITIONED AT ALL SIDE FORM JOINTS. ADDITIONAL FORM FRAMES SHALL BE SPACED TO LIMIT SIDE FORM DEFLECTION TO 1/2" MAXIMUM.
4.) FORM FRAMES SHALL BE REMOVED AFTER DRITHERM IS INSTALLED TO 1/2 THE HEIGHT OF THE SIDE FORMS. ADDITIONAL DRITHERM SHALL BE ADDED TO FILL VOIDS AFTER THE FORM FRAME REMOVAL.
5.) BEGIN BACKFILLING OUTSIDE OF SIDE FORMS AS DRITHERM IS POURED INSIDE FORMS.
6.) WHERE TRENCHES CAN BE DUG TO PRECISE DIMENSIONS, FORMS MAY BE ELIMINATED.

INSULATION ENVELOPE BACKFILL REQUIREMENTS



NOTES:

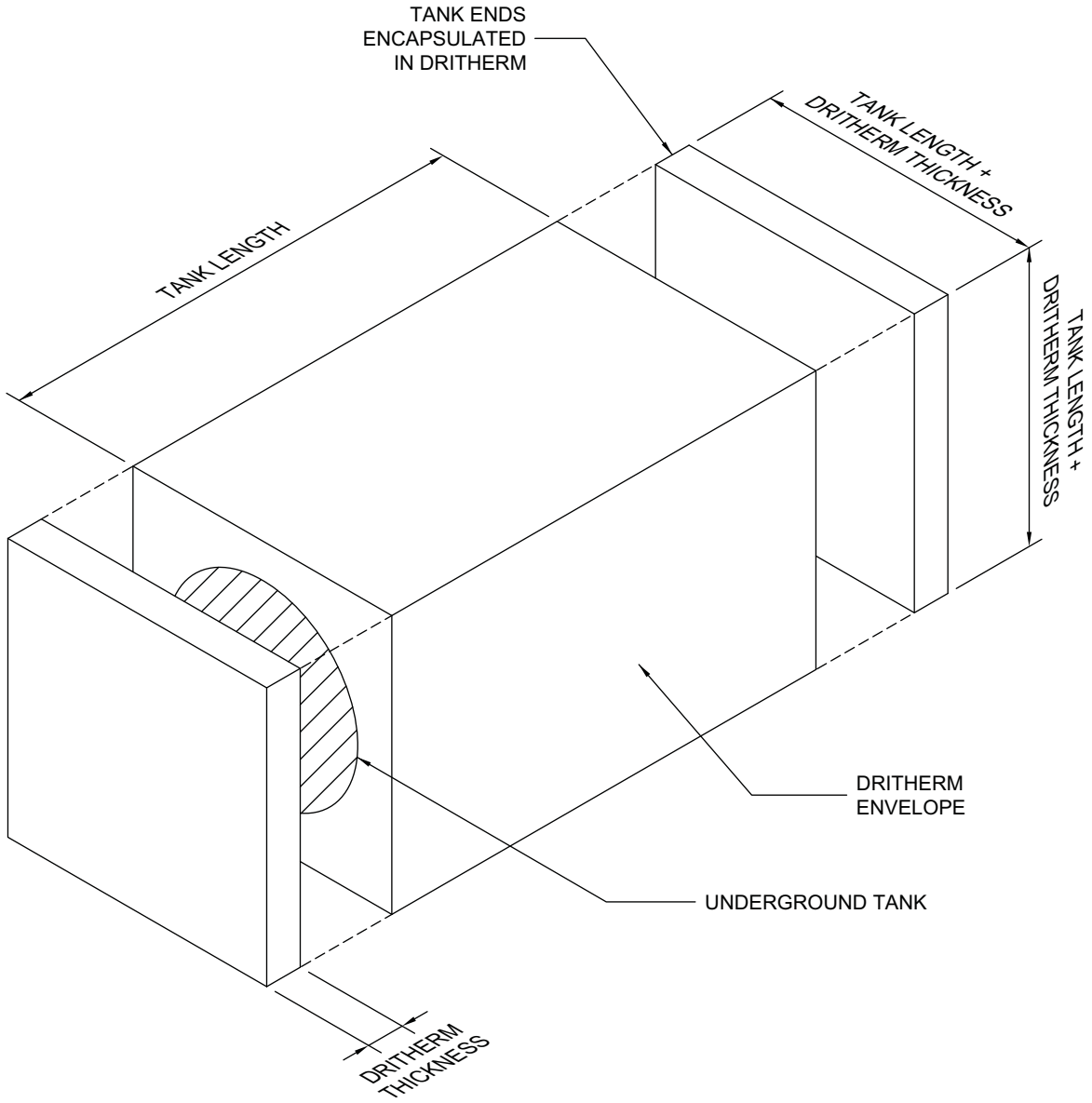
1.) INITIAL BACKFILL SHOULD BE PLACED MANUALLY / GENTLY AS CLOSE TO PIPE ELEVATION AS POSSIBLE.

2.) BACKFILL MUST BE CLEAN AND FREE OF LARGE ROCKS AND DEBRIS. SAND, PEA GRAVEL, CRUSHED STONE IS NOT ALLOWED AS TRENCH BASE MATERIAL OR BACKFILL.

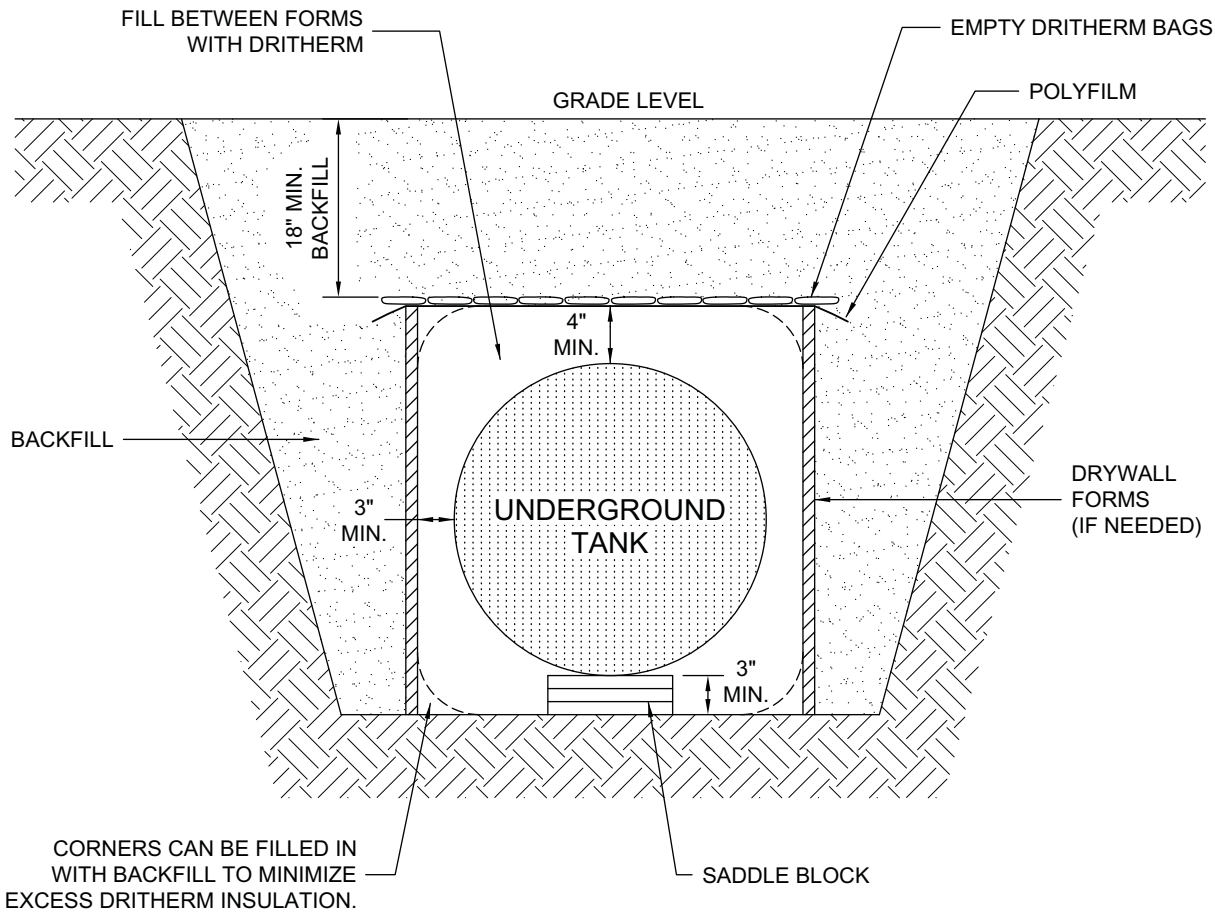
3.) IF COMPACTION OF BACKFILL IS REQUIRED, INSTALL A MINIMUM OF 12 INCHES OF CLEAN BACKFILL BEFORE USING MECHANICAL COMPACTION EQUIPMENT.

4.) MINIMUM BACKFILL OF 18 INCHES OF EARTH OR EQUIVALENT WEIGHT IS ALL THAT IS REQUIRED TO COMPACT THE DRITHERM.

TANK INSULATION ENVELOPE DETAIL
(ISOMETRIC VIEW)



TANK INSULATION ENVELOPE DETAIL (SECTION VIEW)

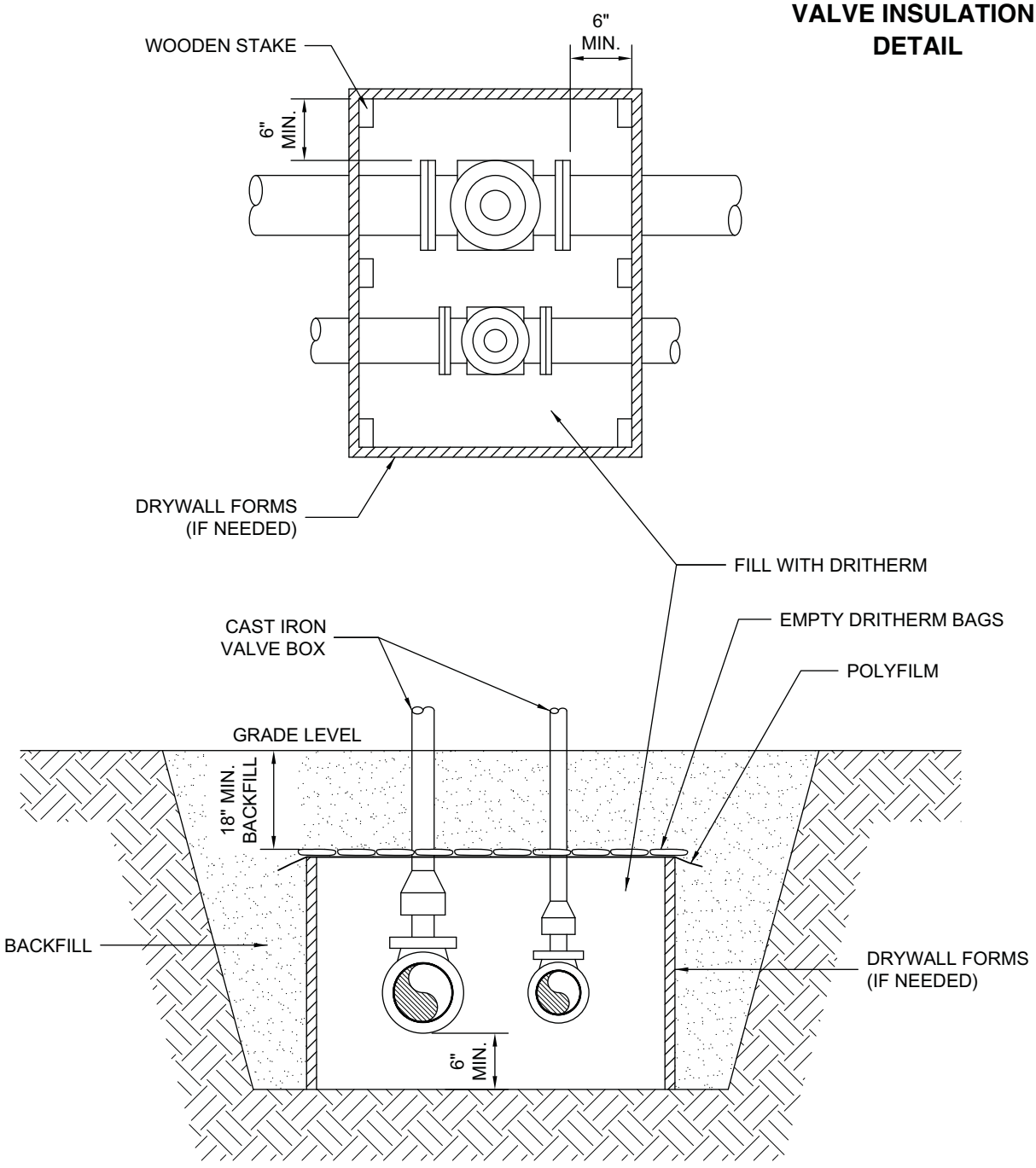


NOTES:

1.) WHERE TRENCHES CAN BE DUG TO PRECISE DIMENSIONS, FORMS MAY BE ELIMINATED.

Insulation Design

VALVE INSULATION DETAIL

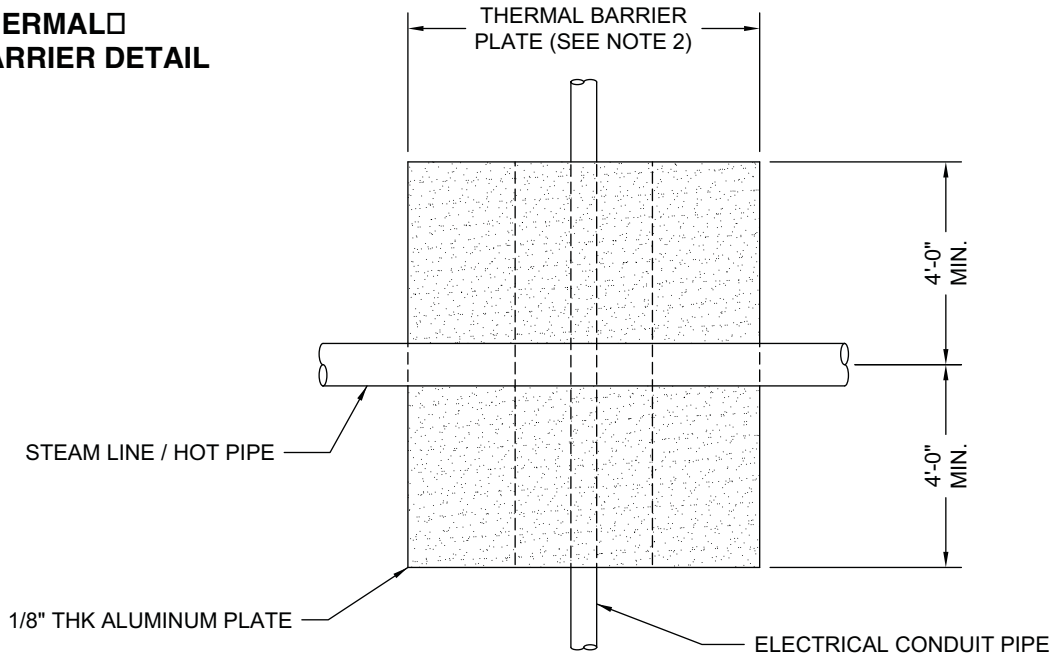


NOTES:

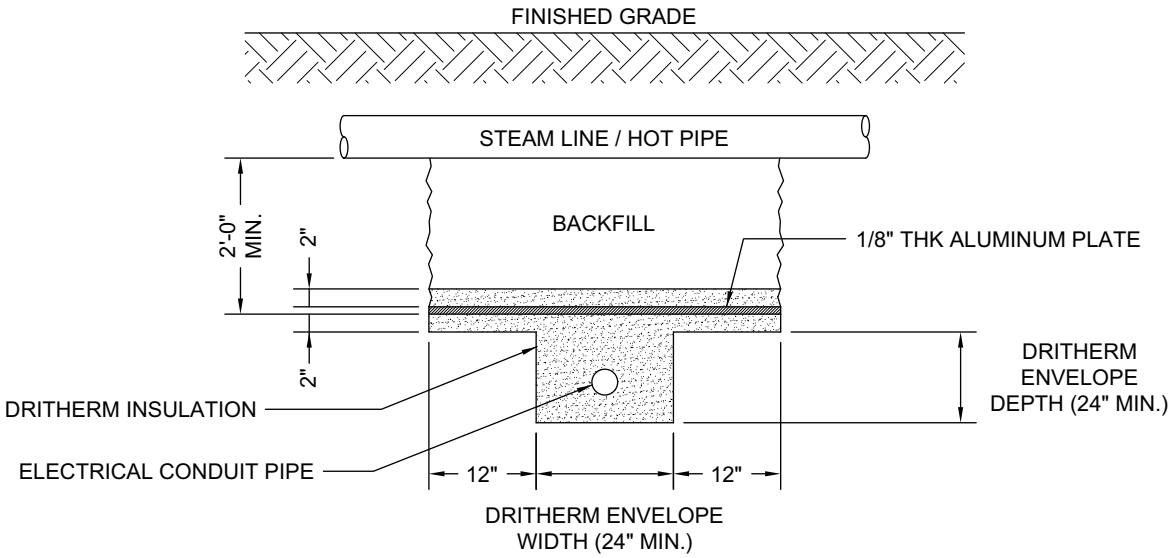
1.) WHERE TRENCHES CAN BE DUG TO PRECISE DIMENSIONS, FORMS MAYBE ELIMINATED.

Insulation Design

THERMAL BARRIER DETAIL



PLAN VIEW



ELEVATION VIEW

NOTES:

1.) MAINTAIN A 2 FT MINIMUM SEPARATION BETWEEN THE CONDUIT PIPING THERMAL BARRIER AND STEAM LINE. IF STEAM LINE IS LOCATED BELOW THE CONDUIT PIPING, REVERSE THE INSTALLATION.

2.) THERMAL BARRIER PLATE WIDTH IS 2 FT WIDER THAN CALCULATED DRITHERM ENVELOPE WIDTH.

INSULATION VOLUME CALCULATION WORKSHEET
SINGLE PIPE

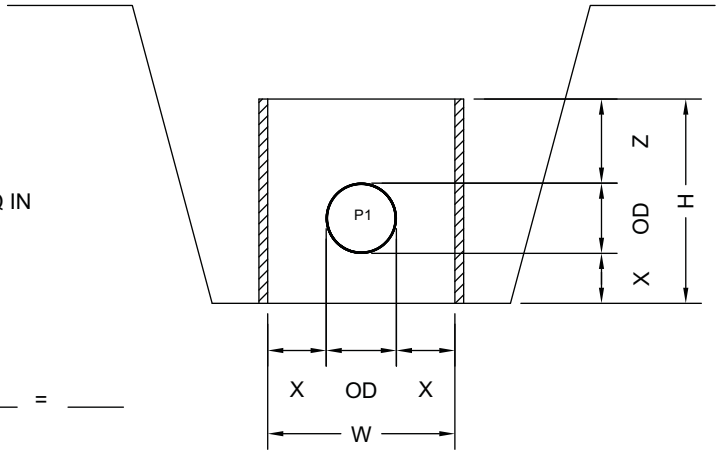
PROJECT NAME: _____

LOCATION: _____

ADDITIONAL INFO: _____

_____

_____



PIPE AREA

$A = .78 \times OD^2$

$P1_A$ = _____ SQ IN

FORMWORK AREA

W = (2 x X) + OD

W = (2 x _____) + _____ = _____

H = X + OD + Z

H = _____ + _____ + _____ = _____

PIPE OD

P1 = _____ INCHES

DRITERM INSULATION ENVELOPE LENGTH

LF = _____ FEET

VOLUME CALCULATION

VOLUME = [(H x W) - $P1_A$] / 144

VOLUME = [(_____ x _____) - _____] / 144 = _____ CUBIC FEET / LINEAL FOOT

TOTAL VOLUME = VOLUME x LF

TOTAL VOLUME = _____ x _____ = _____ CUBIC FEET

NOTES:

1.) SEE DRITHERM ENVELOPE DIMENSIONS FOR SPACING VALUES.

2.) SEE DIAMETERS AND CROSS SECTIONAL AREA CHART FOR PIPE AREA DATA.

3.) ALL DIMENSIONS ARE IN INCHES, UNLESS OTHERWISE NOTED.

INSULATION VOLUME CALCULATION WORKSHEET
SINGLE PIPE
(MINERAL WOOL CUSHION)

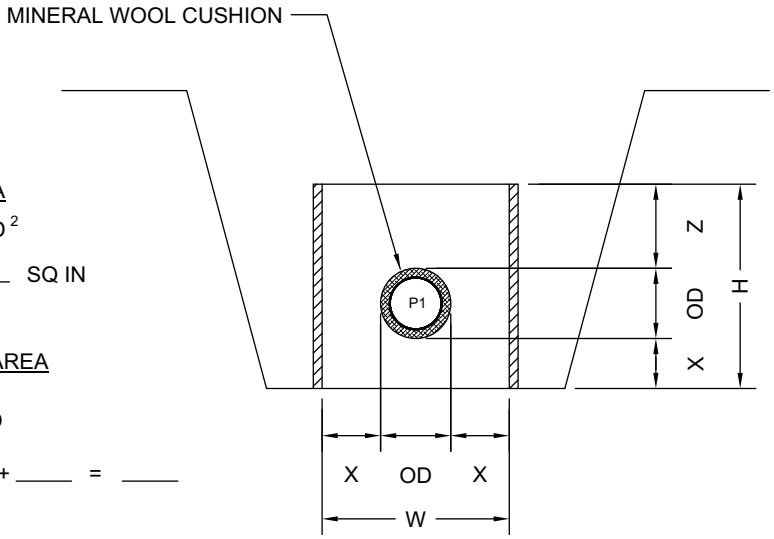
PROJECT NAME: _____

LOCATION: _____

ADDITIONAL INFO: _____

_____

_____



PIPE AREA

$A = .78 \times OD^2$

$P1_A$ = _____ SQ IN

FORMWORK AREA

W = (2 x X) + OD

W = (2 x _____) + _____ = _____

H = X + OD + Z

H = _____ + _____ + _____ = _____

MINERAL WOOL CUSHION OD

P1 = _____ INCHES

DRITERM INSULATION ENVELOPE LENGTH

LF = _____ FEET

VOLUME CALCULATION

VOLUME = [(H x W) - $P1_A$] / 144

VOLUME = [(_____ x _____) - _____] / 144 = _____ CUBIC FEET / LINEAL FOOT

TOTAL VOLUME = VOLUME x LF

TOTAL VOLUME = _____ x _____ = _____ CUBIC FEET

NOTES:

1.) SEE DRITHERM ENVELOPE DIMENSIONS FOR SPACING VALUES.
2.) SEE DIAMETERS AND CROSS SECTIONAL AREA CHART FOR PIPE AREA DATA.
3.) SEE MINERAL FIBER CUSHION REQUIREMENTS FOR MINIMUM INSULATION THICKNESSES AT EXPANSION LOOPS AND BENDS.
4.) ALL DIMENSIONS ARE IN INCHES, UNLESS OTHERWISE NOTED.

INSULATION OLUME CALCULATION OR SHEET
(2) PIPE - STEAM / CONDENSATE

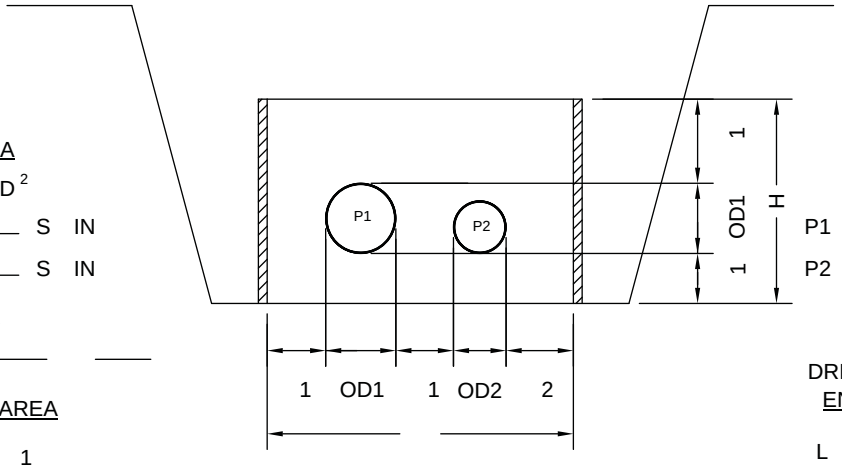
PROJECT NAME: _____

LOCATION: _____

ADDITIONAL IN O: _____

_____

_____



PIPE AREA

A .78 x OD ^{2}

$P1_A$ _____ S IN

$P2_A$ _____ S IN

A_T $P1_A$ $P2_A$

A_T _____ _____ _____

ORM OR AREA

H 1 OD1 1

H _____ _____ _____ _____

1 OD1 1 OD2 2

_____ _____ _____ _____ _____ _____

PIPE OD

P1 _____ INCHES

P2 _____ INCHES

DRITERM INSULATION
EN ELOPE LENGTH

L _____ EET

OLUME CALCULATION

OLUME (H x) - A_T / 144

OLUME (_____ x _____) - _____ / 144 _____ CUBIC EET / LINEAL OOT

TOTAL OLUME OLUME x L

TOTAL OLUME _____ x _____ _____ CUBIC EET

NOTES:

1.) SEE DRITHERM EN ELOPE DIMENSIONS OR SPACING ALUES.
2.) SEE DIAMETERS AND CROSS SECTIONAL AREA CHART OR PIPE AREA DATA.
3.) ALL DIMENSIONS ARE IN INCHES, UNLESS OTHER ISE NOTED.

INSULATION VOLUME CALCULATION WORKSHEET
(2) PIPE - STEAM / CONDENSATE
(MINERAL WOOL CUSHION)

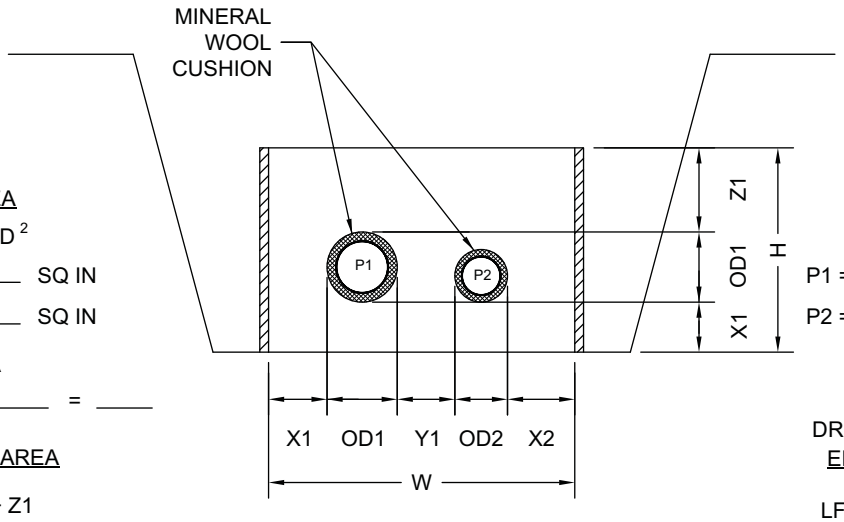
PROJECT NAME: _____

LOCATION: _____

ADDITIONAL INFO: _____

_____

_____



PIPE AREA

$A = .78 \times OD^2$

$P1_A$ = _____ SQ IN

$P2_A$ = _____ SQ IN

$A_T = P1_A + P2_A$

A_T = _____ + _____ = _____

MINERAL WOOL CUSHION OD

P1 = _____ INCHES

P2 = _____ INCHES

FORMWORK AREA

H = X1 + OD1 + Z1

H = _____ + _____ + _____ = _____

W = X1 + OD1 + Y1 + OD2 + X2

W = _____ + _____ + _____ + _____ + _____ = _____

DRITERM INSULATION ENVELOPE LENGTH

LF = _____ FEET

VOLUME CALCULATION

VOLUME = [(H x W) - A_T] / 144

VOLUME = [(_____ x _____) - _____] / 144 = _____ CUBIC FEET / LINEAL FOOT

TOTAL VOLUME = VOLUME x LF

TOTAL VOLUME = _____ x _____ = _____ CUBIC FEET

NOTES:

1.) SEE DRITHERM ENVELOPE DIMENSIONS FOR SPACING VALUES.
2.) SEE DIAMETERS AND CROSS SECTIONAL AREA CHART FOR PIPE AREA DATA.
3.) SEE MINERAL FIBER CUSHION REQUIREMENTS FOR MINIMUM INSULATION THICKNESSES AT EXPANSION LOOPS AND BENDS.
4.) ALL DIMENSIONS ARE IN INCHES, UNLESS OTHERWISE NOTED.

INSULATION VOLUME CALCULATION WORKSHEET
(2) PIPE - SAME SIZE - HWS / HWR

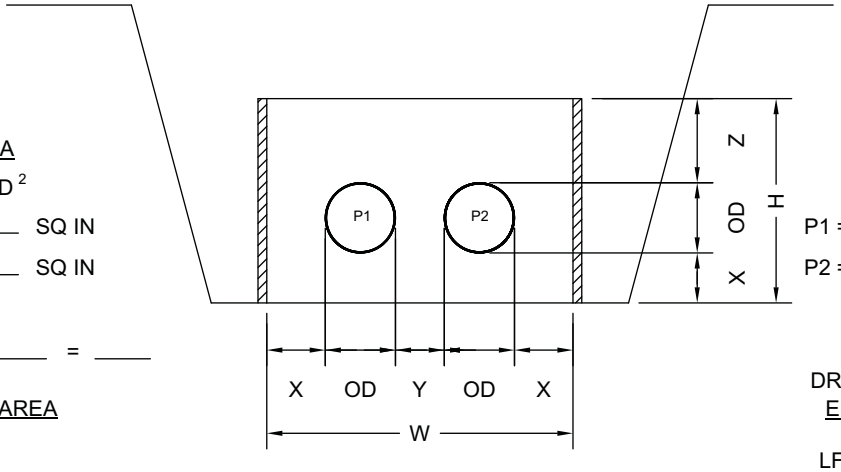
PROJECT NAME: _____

LOCATION: _____

ADDITIONAL INFO: _____

_____

_____



PIPE AREA

$A = .78 \times OD^2$

$P1_A$ = _____ SQ IN

$P2_A$ = _____ SQ IN

$A_T = P1_A + P2_A$

A_T = _____ + _____ = _____

PIPE OD

P1 = _____ INCHES

P2 = _____ INCHES

FORMWORK AREA

H = X + OD + Z

H = _____ + _____ + _____ = _____

W = X + OD + Y + OD + X

W = _____ + _____ + _____ + _____ + _____ = _____

DRITERM INSULATION ENVELOPE LENGTH

LF = _____ FEET

VOLUME CALCULATION

VOLUME = [(H x W) - A_T] / 144

VOLUME = [(_____ x _____) - _____] / 144 = _____ CUBIC FEET / LINEAL FOOT

TOTAL VOLUME = VOLUME x LF

TOTAL VOLUME = _____ x _____ = _____ CUBIC FEET

NOTES:

1.) SEE DRITHERM ENVELOPE DIMENSIONS FOR SPACING VALUES.

2.) SEE DIAMETERS AND CROSS SECTIONAL AREA CHART FOR PIPE AREA DATA.

3.) ALL DIMENSIONS ARE IN INCHES, UNLESS OTHERWISE NOTED.

INSULATION VOLUME CALCULATION WORKSHEET
(2) PIPE - SAME SIZE - HWS / HWR

(MINERAL WOOL CUSHION)

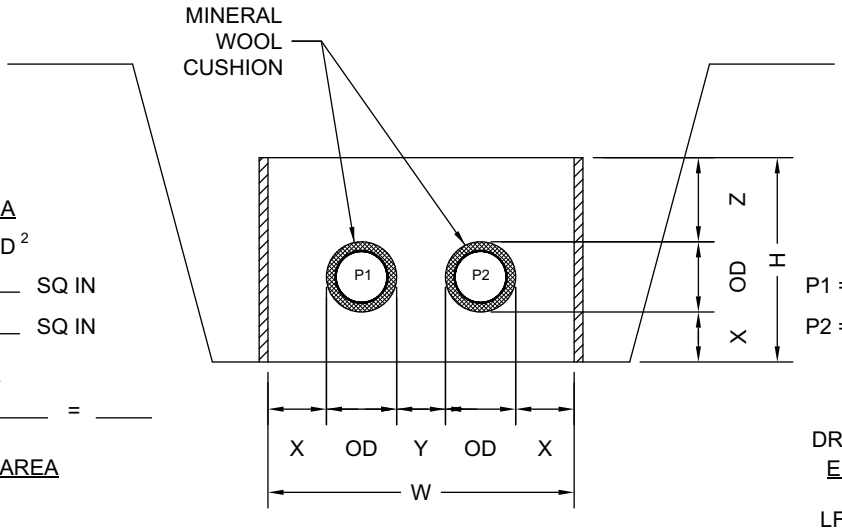
PROJECT NAME: _____

LOCATION: _____

ADDITIONAL INFO: _____

_____

_____



PIPE AREA

$A = .78 \times OD^2$

$P1_A$ = _____ SQ IN

$P2_A$ = _____ SQ IN

$A_T = P1_A + P2_A$

A_T = _____ + _____ = _____

FORMWORK AREA

H = X + OD + Z

H = _____ + _____ + _____ = _____

W = X + OD + Y + OD + X

W = _____ + _____ + _____ + _____ + _____ = _____

MINERAL WOOL CUSHION OD

P1 = _____ INCHES

P2 = _____ INCHES

DRITERM INSULATION ENVELOPE LENGTH

LF = _____ FEET

VOLUME CALCULATION

VOLUME = [(H x W) - A_T] / 144

VOLUME = [(_____ x _____) - _____] / 144 = _____ CUBIC FEET / LINEAL FOOT

TOTAL VOLUME = VOLUME x LF

TOTAL VOLUME = _____ x _____ = _____ CUBIC FEET

NOTES:

1.) SEE DRITHERM ENVELOPE DIMENSIONS FOR SPACING VALUES.
2.) SEE DIAMETERS AND CROSS SECTIONAL AREA CHART FOR PIPE AREA DATA.
3.) SEE MINERAL FIBER CUSHION REQUIREMENTS FOR MINIMUM INSULATION THICKNESSES AT EXPANSION LOOPS AND BENDS.
4.) ALL DIMENSIONS ARE IN INCHES, UNLESS OTHERWISE NOTED.

INSULATION VOLUME CALCULATION WORKSHEET
(4) PIPE - CWS / CWR / HWS / HWR

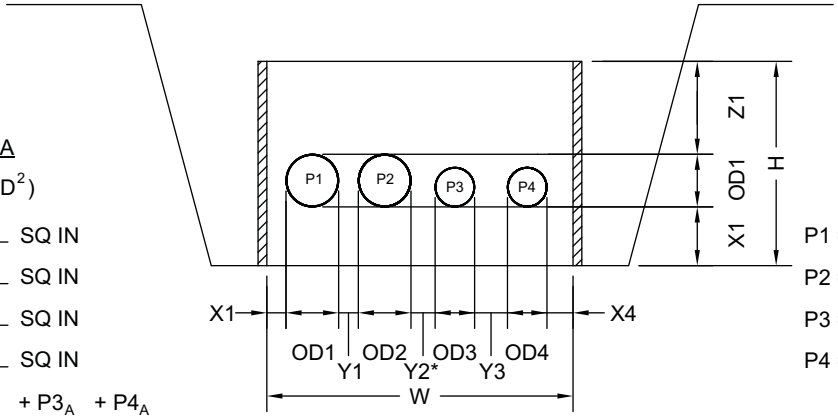
PROJECT NAME: _____

LOCATION: _____

ADDITIONAL INFO: _____

_____

_____



PIPE AREA

($A = .78 \times OD^2$)

$P1_A$ = _____ SQ IN

$P2_A$ = _____ SQ IN

$P3_A$ = _____ SQ IN

$P4_A$ = _____ SQ IN

$A_T = P1_A + P2_A + P3_A + P4_A$

A_T = _____ + _____ + _____ + _____ = _____

PIPE OD

P1 = _____ INCHES

P2 = _____ INCHES

P3 = _____ INCHES

P4 = _____ INCHES

DRITERM INSULATION ENVELOPE LENGTH

LF = _____ FEET

FORMWORK AREA

H = X1 + OD1 + Z1

H = _____ + _____ + _____ = _____

W = X1 + OD1 + Y1 + OD2 + Y2 + OD3 + Y3 + OD4 + X2

W = _____ + _____ + _____ + _____ + _____ + _____ + _____ + _____ + _____ = _____

VOLUME CALCULATION

VOLUME = [(H x W) - A_T] / 144

VOLUME = [(_____ x _____) - _____] / 144 = _____ CUBIC FEET / LINEAL FOOT

TOTAL VOLUME = VOLUME x LF

TOTAL VOLUME = _____ x _____ = _____ CUBIC FEET

NOTES:

1.) SEE DRITHERM ENVELOPE DIMENSIONS FOR SPACING VALUES.

2.) SEE DIAMETERS AND CROSS SECTIONAL AREA CHART FOR PIPE AREA DATA.

3.) ALL DIMENSIONS ARE IN INCHES, UNLESS OTHERWISE NOTED.

4.) * - CONTACT DRITHERM FOR PIPE SPACING REQUIREMENTS.

INSULATION VOLUME CALCULATION WORKSHEET
(4) PIPE - CWS / CWR / HWS / HWR

(MINERAL WOOL CUSHION)

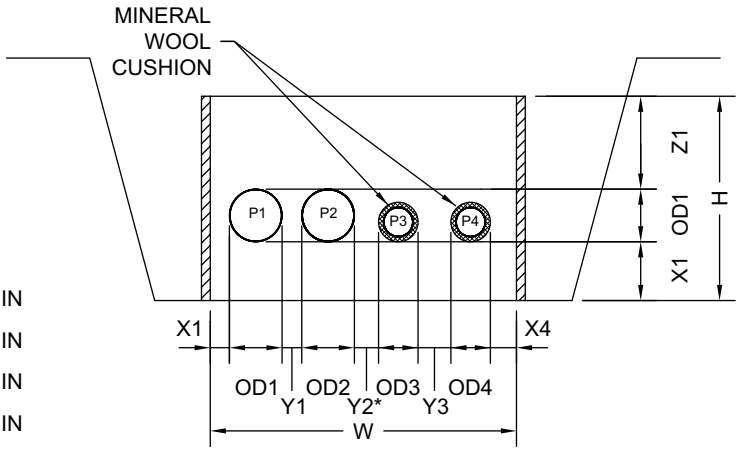
PROJECT NAME: _____

LOCATION: _____

ADDITIONAL INFO: _____

_____

_____



BARE PIPE OD

P1 = _____ INCHES

P2 = _____ INCHES

MINERAL WOOL CUSHION OD

P3 = _____ INCHES

P4 = _____ INCHES

PIPE AREA

(A = .78 x OD^2)

$P1_A$ = _____ SQ IN

$P2_A$ = _____ SQ IN

$P3_A$ = _____ SQ IN

$P4_A$ = _____ SQ IN

$A_T = P1_A + P2_A + P3_A + P4_A$

A_T = _____ + _____ + _____ + _____ = _____

FORMWORK AREA

H = X1 + OD1 + Z1

H = _____ + _____ + _____ = _____

W = X1 + OD1 + Y1 + OD2 + Y2 + OD3 + Y3 + OD4 + X2

W = _____ + _____ + _____ + _____ + _____ + _____ + _____ + _____ + _____ = _____

DRITERM INSULATION ENVELOPE LENGTH

LF = _____ FEET

VOLUME CALCULATION

VOLUME = [(H x W) - A_T] / 144

VOLUME = [(_____ x _____) - _____] / 144 = _____ CUBIC FEET / LINEAL FOOT

TOTAL VOLUME = VOLUME x LF

TOTAL VOLUME = _____ x _____ = _____ CUBIC FEET

NOTES:

1.) SEE DRITHERM ENVELOPE DIMENSIONS FOR SPACING VALUES.
2.) SEE DIAMETERS AND CROSS SECTIONAL AREA CHART FOR PIPE AREA DATA.
3.) SEE MINERAL FIBER CUSHION REQUIREMENTS FOR MINIMUM INSULATION THICKNESSES AT EXPANSION LOOPS AND BENDS.
4.) ALL DIMENSIONS ARE IN INCHES, UNLESS OTHERWISE NOTED.
5.) * - CONTACT DRITHERM FOR PIPE SPACING REQUIREMENTS.

INSULATION VOLUME CALCULATION WORKSHEET
(4) PIPE - HPS / CR / CWS / CWR

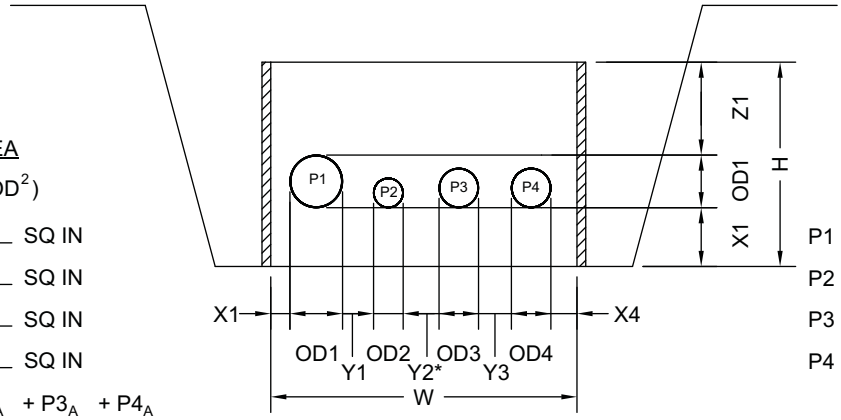
PROJECT NAME: _____

LOCATION: _____

ADDITIONAL INFO: _____

_____

_____



PIPE AREA

(A = .78 x OD^2)

$P1_A$ = _____ SQ IN

$P2_A$ = _____ SQ IN

$P3_A$ = _____ SQ IN

$P4_A$ = _____ SQ IN

$A_T = P1_A + P2_A + P3_A + P4_A$

A_T = _____ + _____ + _____ + _____ = _____

PIPE OD

P1 = _____ INCHES

P2 = _____ INCHES

P3 = _____ INCHES

P4 = _____ INCHES

DRITERM INSULATION ENVELOPE LENGTH

LF = _____ FEET

FORMWORK AREA

H = X1 + OD1 + Z1

H = _____ + _____ + _____ = _____

W = X1 + OD1 + Y1 + OD2 + Y2 + OD3 + Y3 + OD4 + X2

W = _____ + _____ + _____ + _____ + _____ + _____ + _____ + _____ + _____ = _____

VOLUME CALCULATION

VOLUME = [(H x W) - A_T] / 144

VOLUME = [(_____ x _____) - _____] / 144 = _____ CUBIC FEET / LINEAL FOOT

TOTAL VOLUME = VOLUME x LF

TOTAL VOLUME = _____ x _____ = _____ CUBIC FEET

NOTES:

1.) SEE DRITHERM ENVELOPE DIMENSIONS FOR SPACING VALUES.
2.) SEE DIAMETERS AND CROSS SECTIONAL AREA CHART FOR PIPE AREA DATA.
3.) ALL DIMENSIONS ARE IN INCHES, UNLESS OTHERWISE NOTED.
4.) * - CONTACT DRITHERM FOR PIPE SPACING REQUIREMENTS.

INSULATION VOLUME CALCULATION WORKSHEET
(4) PIPE - HPS / CR / CWS / CWR

(MINERAL WOOL CUSHION)

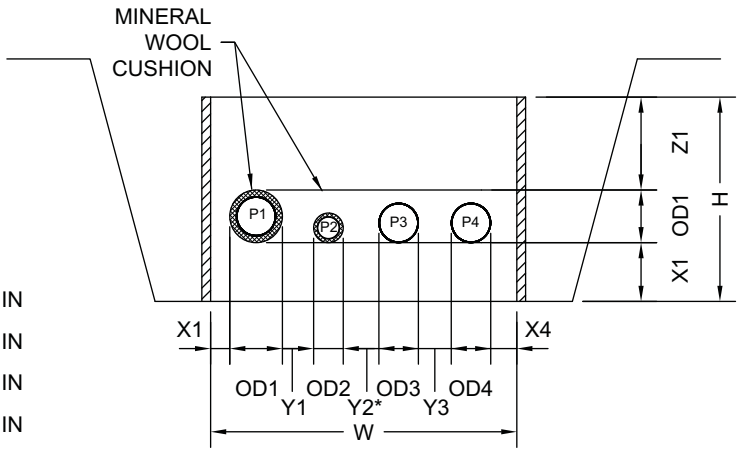
PROJECT NAME: _____

LOCATION: _____

ADDITIONAL INFO: _____

_____

_____



MINERAL WOOL CUSHION OD

P1 = _____ INCHES

P2 = _____ INCHES

BARE PIPE OD

P3 = _____ INCHES

P4 = _____ INCHES

PIPE AREA

($A = .78 \times OD^2$)

$P1_A$ = _____ SQ IN

$P2_A$ = _____ SQ IN

$P3_A$ = _____ SQ IN

$P4_A$ = _____ SQ IN

$A_T = P1_A + P2_A + P3_A + P4_A$

A_T = _____ + _____ + _____ + _____ = _____

DRITERM INSULATION ENVELOPE LENGTH

LF = _____ FEET

FORMWORK AREA

H = X1 + OD1 + Z1

H = _____ + _____ + _____ = _____

W = X1 + OD1 + Y1 + OD2 + Y2 + OD3 + Y3 + OD4 + X2

W = _____ + _____ + _____ + _____ + _____ + _____ + _____ + _____ + _____ = _____

VOLUME CALCULATION

VOLUME = [(H x W) - A_T] / 144

VOLUME = [(_____ x _____) - _____] / 144 = _____ CUBIC FEET / LINEAL FOOT

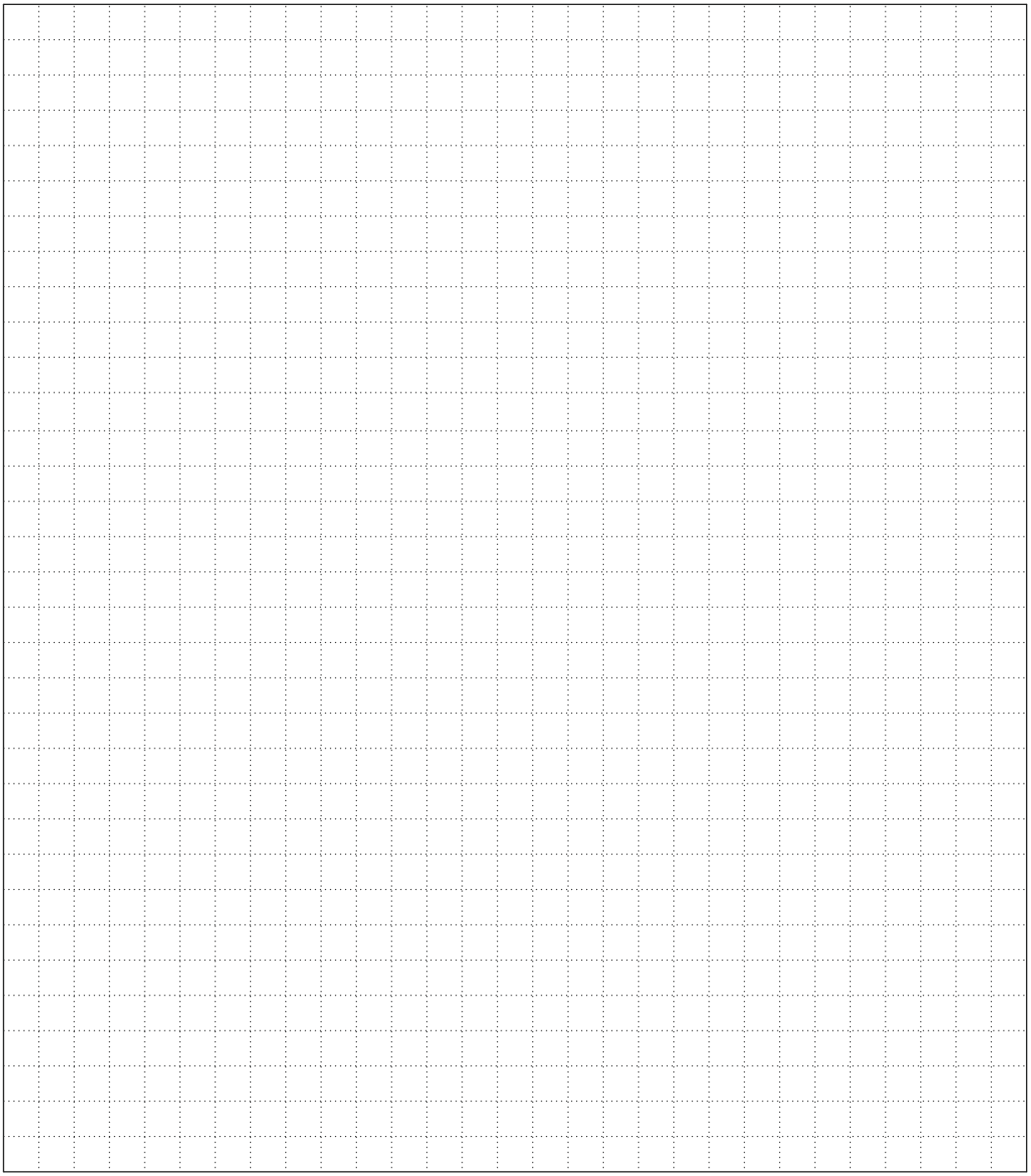
TOTAL VOLUME = VOLUME x LF

TOTAL VOLUME = _____ x _____ = _____ CUBIC FEET

NOTES:

1.) SEE DRITHERM ENVELOPE DIMENSIONS FOR SPACING VALUES.
2.) SEE DIAMETERS AND CROSS SECTIONAL AREA CHART FOR PIPE AREA DATA.
3.) SEE MINERAL FIBER CUSHION REQUIREMENTS FOR MINIMUM INSULATION THICKNESSES AT EXPANSION LOOPS AND BENDS.
4.) ALL DIMENSIONS ARE IN INCHES, UNLESS OTHERWISE NOTED.
5.) * - CONTACT DRITHERM FOR PIPE SPACING REQUIREMENTS.

BLANK WORKSHEET



DRITHERM INTERNATIONAL INC.

Suggested Installation Sequence

Preparation

1. Excavate trench to minimum dimensions.
2. Install sub-drainage if specified.
3. Install anchors, guides, and supports as required.
4. Install piping. Test system for leaks.
5. Compact and stabilize base of trench to assure support system.

Forming

1. Remove any temporary standing water in trench.
2. Prepare sideforms to vertical height requirement of specifications.
3. Install and secure forms rigidly to horizontal width requirement of specifications.

Installation

1. Apply Bitumastic and mineral wool where required.
2. Pour DriTherm, to appropriate dimension.
3. If necessary, knife DriTherm® to eliminate all voids beneath pipes.
4. Cover DriTherm® with polyfilm.
5. Carefully place empty bags / sacks over polyfilm.

Backfilling

1. Manually / gently install first four to six inches of clean backfill from as close to pipe elevation as possible.
2. Mechanically or manually complete backfilling to specifications.
3. If compaction of backfill is required, install a minimum of 8 - 12 inches of clean backfill before using mechanical compaction equipment.

DRITHERM® IS SELF-COMPACTING.
DO NOT MECHANICALLY COMPACT
THE DRITHERM® PRODUCT.

DRITHERM INTERNATIONAL INC.

Suggested Installation Sequence

Preparation

1. Excavated earth should be placed on one side of trench. Leave opposite side clear for the pallets of DriTherm®.
2. The base of the trench should be level and compacted to support the DriTherm®. Loose debris should be removed and proper clearances under the pipes rechecked.
3. All piping should be pressure tested before installing the DriTherm®.
4. Do not use wood or concrete supports on hot piping.
5. Concrete thrust blocks are not recommended and should not be used.
6. Where pipes are hung from temporary wire loops, proper spacing between the pipes can be maintained by use of temporary wooden wedges between the pipes. These wedges must be removed as the powder is being poured.
7. Pipes need not be coated but should be reasonably clean and dry.
8. Cathodic protection is not required.

Forming

1. Where trenches can be dug to exact width requirements, forms are not necessary.
2. On oversize trenches, pipes may be positioned off-center. This may permit use of one wall of the trench as a form, thus reducing forming material cost.
3. Sheetrock forms are normally sufficient if supported on the outside with earth during pouring of the DriTherm®. Plywood forms are acceptable but are more costly. If wooden stakes are used to support the forms, they must be placed on the outside of the sheetrock.
4. Forms must be opened outward at expansion elbows and clearance under the pipes increased to allow for the application of the mineral fiber cushion.
5. The trench need not be dry, but all standing water must be removed before pouring the DriTherm®.
6. Don't form the entire trench first. Inclement weather can damage forming. Form as you pour.

DRITHERM INTERNATIONAL INC.

Suggested Installation Sequence

Installation

1. Bags should be opened with a sheetrock knife, as close to the pipes as possible. Change blades often.
2. Bitumastic / Silicone Grease must be applied, where necessary, just prior to pouring the DriTherm®. This assures bonding of the DriTherm® to the coated surface.
3. Mineral fiber cushion is best applied and held in place with tape or wire.
4. The DriTherm® must be kept free of contamination while pouring.
5. Cover the DriTherm® with polyfilm sheet and empty bags as you proceed. Earth and debris falling into the trench must be removed. These measures will protect the insulation from contamination.
6. Proper dimensions are important. Don't guess. Check clearances before starting to pour. Use simple gauge to check depth of insulation above pipes. Follow specifications provided by system design engineer.
7. Do not walk on the DriTherm® at any time unless it has been backfilled.
8. Forms remain after pouring. However, no part of the forms that come in direct contact with the pipe (such as wooden spacers) can be left in the trench.

Backfilling

1. Initial backfill should be placed manually or gently by machine from as close to pipe elevation as possible.
2. Backfill must be clean and free of large rocks and debris. Sand / crushed stone / pea gravel is not allowed as trench base material or backfill.
3. If compaction of backfill is required, install a minimum of 10 –12 inches of clean backfill before using mechanical compaction equipment.
4. Minimum backfill of 18 inches of earth or equivalent weight is all that is required to compact the DriTherm®.