

# DUO-THERM "505"

HIGH DENSITY POLYETHYLENE JACKETED  
CLASS A STEEL CONDUIT SYSTEM



## DUO-THERM "505"

THERMACOR'S DUO-THERM "505" is a factory-fabricated, pre-insulated piping system that incorporates polyurethane foam and a rugged, noncorrosive, High Density Polyethylene (HDPE) jacket with a Class A Steel Conduit System. The system is engineered as a complete system, combining a drainable, dryable, air testable conduit system with the added insulating value of polyurethane foam and the corrosion protection of HDPE, thereby eliminating the need for cathodic protection. The system is built to withstand heavy traffic/ earth loads, high water tables, and the most corrosive of soils.

### Carrier Pipe

- $d \geq 2"$  - A53 ERW Grade B, Std. Wt. Black Steel
- $d < 2"$  - A106 SML, Std. Wt. Black Steel
- Seamless & Schedule 80 pipe are available for all sizes.
- Std. Wt. is the same as Schedule 40 through 10".
- XS is the same as Schedule 80 through 8".

### Conduit

- $6" \leq c \leq 26"$  - 10 Gauge
- $28" \leq c \leq 36"$  - 6 Gauge
- $38" \leq c \leq 42"$  - 4 Gauge

### Outer Jacket

- High Density Polyethylene (HDPE)

### Polyurethane Insulation

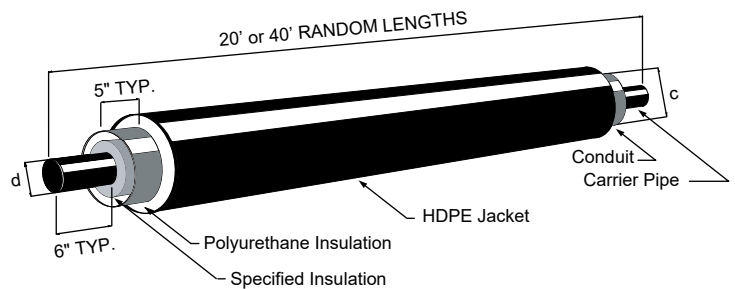
- Density  $> 2.0 \text{ lbs/ft}^3$
- "K" Factor  $\leq 0.17 @ 75^\circ\text{F}$
- Compressive Strength  $> 30 \text{ psi @ } 75^\circ\text{F}$
- Closed Cell Content  $\geq 90\%$

### Carrier Pipe Insulation

- Mineral Wool or as specified by engineer

### ERM Leak Detection

Duo-Therm systems can be provided with an Electric Resistance Monitoring (ERM) leak detection system in the outer layer of polyurethane insulation. This simple leak detection system is an economical, reliable, and easy to install leak detection monitoring system and should be used on all high temperature systems to ensure the longevity of the piping system. See Thermacor's ERM brochure for more information.



# SPECIFICATION GUIDE \*

## General

All underground heat distribution lines as shown on the contract drawings shall be Duo-Therm "505" HDPE pre-insulated steel conduit as manufactured by THERMACOR PROCESS INC.

All straight sections, fittings, anchors, and other accessories shall be factory prefabricated to job dimensions and designed to minimize the number of field welds. The design shall be computer analyzed by the piping system manufacturer to determine stresses and movements of the service pipe and to insure that the system design is in strict conformance with ASME B31.1 latest edition, and stamped by a registered professional engineer. Factory-trained field technical assistance shall be provided for the critical periods of the installation, i.e., unloading, field joint instruction, cold springing and testing.

## Service Pipe

The carrier or service pipe shall be A53, Grade B, ERW standard weight steel for pipe sizes 2" and larger and A106/A53, Grade B, seamless, standard weight for all pipe sizes 1.5" and smaller. Condensate piping materials shall be extra strong. All joints shall be butt welded for sizes 2 1/2" and larger and socket welded for 2" and smaller. Straight sections shall be supplied in 40' random length with 6" of piping exposed at each end for field joint fabrication where possible.

## Subassemblies

Gland seals, end seals, and anchors shall be designed and factory prefabricated to prevent the moisture ingress into the system. Subassemblies shall be designed to allow for complete draining, drying, and testing of the conduit system.

## Service Pipe Insulation

Insulation shall be mineral wool insulation manufactured to pass the boiling test. Insulation shall be fabricated in half or V-Groove insulation sections. The insulation shall be secured to the pipe by stainless steel bands. Insulation thickness shall be as shown on the drawings.

## Outer Conduit

The steel conduit casing shall be smooth wall or spiral, welded steel conduit ASTM A135 or ASTM 134, of the thickness specified below:

Conduit Size	Conduit Thickness
6" - 26"	10 Gauge
28" - 36"	6 Gauge
38" - 42"	4 Gauge

Oversized casing required for carrier pipe expansion shall be accomplished by eccentric and/or concentric fittings and shall provide for continuous drainage.

## Pipe Supports

All pipes within the outer casing shall be supported at not more than 9-foot intervals. Supports are designed to allow for continuous airflow and drainage of the conduit in place. Straight section supports are designed to occupy not more than 10% of the annular air space. Supports shall be of the type whereby insulation thermally isolates the carrier pipe from the outer conduit. The surface of the insulation shall be protected at the support by a sleeve not less than 12 inches long.

## Outer Conduit Insulation and Jacket

Conduit insulation shall be rigid polyurethane foam with a minimum 2.0 lbs/ft<sup>3</sup> density, 90% minimum closed cell content, and a "K" factor not higher than .17 at 75°F per ASTM C518. The polyurethane foam shall be CFC-free.

The outer jacket shall be High Density Polyethylene (HDPE) with a minimum wall thickness of 125 mils for jacket sizes less than or equal to 12", 150 mils for jacket sizes larger than 12" to 24", and 175 mils for jacket sizes greater than 24".

## ERM Leak Detection

The piping system can be made Leak Detection Ready by means of installing a bare copper wire between the outer conduit and the HDPE jacket. The piping system manufacturer shall install the wire in a manner that has the wire embedded in the foam insulation and incorporated into each piece of pre-insulated pipe and fittings. Connections of the ERM wire shall be made by the contractor prior to insulating joints.

## Installation

The installing contractor shall be responsible to excavate, string conduit, weld, test, place in trench, backfill, or otherwise treat and install the system as per directions furnished by the manufacturer and approved by the design engineer in accordance with the plans and specifications. The conduit shall be air tested at 15 psig for not less than two hours and the carrier pipe hydrostatically tested to 1.5 times the working pressure for not less than four hours, or as specified by the engineer. A qualified representative of THERMACOR PROCESS INC. shall be present at the jobsite during critical periods of installation and testing. Backfill shall not commence until approval of tests by the THERMACOR PROCESS INC. representative. Field modifications must be approved by the manufacturer. The installing contractor shall certify that he has complied with the manufacturer's directions.

## Backfill

A 6-inch layer of sand shall be placed and tamped in the trench to provide a uniform bedding for the system. The entire trench shall be evenly backfilled with a similar material as the bedding in 6-inch compacted layers to a minimum height of 6 inches above the top of the insulated piping sections. The remaining trench shall be backfilled in uniform layers with suitable excavated soil.

*\* For alternate specifications, please contact THERMACOR.*

**THERMACOR PROCESS INC.**

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# DUO-THERM "505"

## Specification Guide

DTSG  
3.101

STANDARD SPECIFICATION

11.02.2020

*Duo - Therm "505" Steel Piping Systems suitable for Steam, High Temperature Hot Water, Gravity and Pumped Condensate.*

### **Part 1 - General**

**1.1 Pre-insulated Piping** - Furnish a complete system of factory pre-insulated steel piping for the specified service. The system shall be a combination of a drainable, dryable, testable type conduit system, suitable for all ground water and soil conditions, site Classification "A" (Federal Construction Guide Spec. 02695), with an external covering of polyurethane insulation and an HDPE jacket. The system shall be provided as specified below and shown on the drawings.

**1.2 The pre-insulated pipe manufacturer shall make a complete layout of the system** showing anchors, expansion provisions, and building entrance details. Means for expansion must be made in pipe offsets or loops unless this is compensated for integrally in the system.

**1.3 The system shall be Duo-Therm "505"** as manufactured by **Thermacor Process Inc.** of Fort Worth, Texas.

### **Part 2 - Products**

**2.1 The conduit** shall be 10 gauge, welded, smooth-wall black steel conforming to ASTM A-139, A-134, and A-135. Conduit shall be tested at the factory to insure air and watertight welds prior to any fabrication or application of coating. No internal coating of conduit

**2.2 Conduit closures** shall be 10 gauge steel, furnished with the conduit at a ratio of one closure for each fabricated item or length. Closures shall be field welded over adjacent units after pipe insulation.

**2.3 Piping in the conduit** shall be standard weight (Std. Wt. is the same as Sch. 40 through 10"), steel, ASTM A-53, Grade B, ERW 2" and larger and A-106 Smls for 1- 1/2" and smaller. Steam lines shall be standard weight, and condensate lines shall be extra strong (XS is the same as Sch. 80 through 8"). Pipe joints shall be welded in accordance with the Pressure Piping Code, ASME/ANSI B 31.1.

**2.4 The Class "A" pipe insulation** shall be mineral wool applied to the thickness shown on drawing DTSG 3.105.

**2.5 Pre-fabricated ells, loops, and tees** shall be furnished and installed where shown on plans and shall consist of pipe, insulation, and conduit conforming to the same specification as hereinbefore stated for straight runs. Expansion loops shall be designed in accordance with the stress limits as dictated by the Power Piping Code, ASME/ANSI B31.1. Loop piping shall be installed in conduit suitably sized to handle indicated pipe movement. Elbows, loops, offsets, or any other direction changes shall conform to the standards set by ASME B31.1, Code for Power Piping.

**2.6 Terminal ends of conduits** inside manholes, pits, or building walls shall be equipped with end seals consisting of a 1/2" steel plate welded to the pipe and conduit, followed by the 16" steel sleeve, and with a 2" overlap of the heat shrink sleeve. End seals shall be equipped with drain and vent openings. Terminate all conduits 2" beyond the inside face of manhole or building walls.

**2.7 Pre-fabricated anchors** shall be furnished and installed where shown on plans and shall consist of a steel plate, welded to pipe and conduit. The steel anchor plate shall be 1/2" thick and shall be 1-1/2" larger horizontally and 1-1/2" larger vertically than the HDPE jacket outer diameter. Heat shrink wrap shall be used seal the overlap of anchor water shed over the HDPE jacket.

**2.8 A concrete thrust block** shall be cast over the anchor plate and conduit, large enough for firm anchorage into undisturbed trench sidewalls and/ or bottom. The concrete block shall be at least 36" in length and extend a minimum of 12" beyond the top and bottom of the anchor plate. Anchor blocks shall be sized by the engineer of record.

**2.9 Wall sleeves with leak plates** shall be provided at all building and manhole entries to provide an effective moisture barrier. The space between the conduit and wall sleeve shall be made watertight by use of pipe penetration modular seals or equal assemblies, which will also provide electrical isolation.

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# DUO-THERM "505"

## Specification Guide

DTSG  
3.102

STANDARD SPECIFICATION

11.02.2020

**2.10 The steel conduit for the steam and condensate** shall be insulated with polyurethane foam insulation to a nominal thickness of 1". Insulation shall be rigid, minimum 90% closed cell polyurethane with a minimum 2.0 lbs per cubic foot density, compressive strength of 30 psi @ 75°F, and a coefficient of thermal conductivity (K factor) not higher than .17 @ 75°F per ASTM C518. Maximum conduit interface temperature shall not exceed 200°F.

**2.11 Jacketing material** shall be extruded, black, high density polyethylene (HDPE), having a minimum wall thickness of 125 mils for jacket sizes less than or equal to 12", 150 mils for jacket sizes larger than 12" to 20", and 175 mils for jacket sizes greater than 20". The inner surface of the HDPE jacket shall be oxidized by means of corona treatment, flame treatment (patent pending), or other approved methods. This will ensure a secure bond between the jacket and foam insulation preventing any ingress of water at the jacket/ foam interface.

**2.12 Straight run joints** are insulated using a wrap around HDPE jacket placed over the field joint and insulated with polyurethane foam. The HDPE jacket is sealed with a heat shrink sleeve, as recommended by the manufacturer.

**2.13 Conduit fittings** are factory pre-fabricated and pre-insulated with urethane to the thickness specified and jacketed with a molded, extrusion welded, or butt fusion welded PE jacket. **NO TAPING OR HOT AIR WELDING SHALL BE ALLOWED.**

### **Part 3 - Execution**

**3.1 The installing contractor** shall be responsible to excavate, string conduit, weld test, place in trench, backfill, or otherwise treat and install the system as per the specifications and the directions furnished by the manufacturer and approved by the design engineer in accordance with plans and specifications.

**3.2 The conduit shall be air tested** at 15 psi. Test pressure shall be held for two hours. Repair any conduit leaks and retest prior to making joint closures.

**3.3 Pre-engineered systems** shall be provided with all straight pipe and fittings factory pre-insulated and pre-fabricated to job dimensions.

**3.4 Underground systems** shall be buried in a trench not less than two feet deeper than the top of the pipe and not less than eighteen inches wider than the combined O.D. of all piping systems. A minimum thickness of 24 inches of compacted backfill placed over the top of the pipe will meet H-20 highway loading.

**3.5 Trench bottom** shall have a minimum of 6" of sand as a cushion for the piping. All field cutting of the pipe shall be performed in accordance with the manufacturer's installation instructions.

**3.6 A hydrostatic pressure test** of the carrier pipe shall be performed per the engineer's specification with a factory recommendation of one and one-half times the normal system operating pressure for not less than two hours. Care shall be taken to insure all trapped air is removed from the system prior to the test. *Appropriate safety precautions shall be taken to guard against possible injury to personnel in the event of a failure.*



# DUO-THERM "505"

## Specification Guide

DTSG  
3.103

PRESSURE TESTABLE SPECIFICATION WITH ERM

11.02.2020

*Duo - Therm "505" Steel Piping Systems suitable for Steam, High Temperature Hot Water, and Gravity or Pumped Condensate.*

### Part 1 - General

**1.1 Pre-insulated Piping** - Furnish a complete system of factory pre-insulated steel piping for the specified service. The system shall be a combination of a drainable, dryable, testable type conduit system, suitable for all ground water and soil conditions, site Classification "A" (Federal Construction Guide Spec. 02695), with an external covering of polyurethane insulation and an HDPE jacket. The jacket throughout the entire system shall incorporate electric fusion, butt fusion, or extrusion welding at all fittings, joint closures, or other points of connection. This shall create a jacket that is seamless throughout the entire system with the exception of anchors, whose water shed rings are sealed with a heat shrink wrap prohibiting the ingress of water. All pre-insulated pipe, fittings, insulating materials, and technical support shall be provided by the Pre-insulated Piping System manufacturer. The system shall be provided as specified below and shown on the drawings.

**1.2 The pre-insulated pipe manufacturer shall make a complete layout of the system** showing anchors, expansion provisions, and building entrance details. Means for expansion must be made in pipe offsets or loops unless this is compensated for integrally in the system.

**1.3 The system shall be Duo-Therm "505" as manufactured by Thermacor Process Inc.** of Fort Worth, Texas.

### Part 2 - Products

**2.1 The conduit** shall be 10 gauge, welded, smooth-wall black steel conforming to ASTM A-139, A-134, and A-135. Conduit shall be tested at the factory to insure air and watertight welds prior to any fabrication or application of coating. No internal coating of conduit.

**2.2 Conduit closures** shall be 10 gauge steel, furnished with the conduit at a ratio of one closure for each fabricated item or length. Closures shall be field welded over adjacent units after pipe insulation.

**2.3 Piping in the conduit** shall be standard weight (Std. Wt. is the same as Sch. 40 through 10"), steel, ASTM A-53, Grade B, ERW 2" and larger and A-106 Smls for 1- 1/2" and smaller. Steam lines shall be standard weight, and condensate lines shall be extra strong (XS is the same as Sch. 80 through 8"). Pipe joints shall be welded in accordance with the Pressure Piping Code, ASME/ANSI B 31.1.

**2.4 The Class "A" pipe insulation** shall be mineral wool applied to the thickness shown on drawing DTSG 3.105.

**2.5 Pre-fabricated ells, loops, and tees** shall be furnished and installed where shown on plans and shall consist of pipe, insulation, and conduit conforming to the same specification as hereinbefore stated for straight runs. Expansion loops shall be designed in accordance with the stress limits as dictated by the Power Piping Code, ASME/ANSI B31.1. Loop piping shall be installed in conduit suitably sized to handle indicated pipe movement.

**2.6 Terminal ends of conduits** inside manholes, pits, or building walls shall be equipped with end seals consisting of a 1/2" steel plate welded to the pipe and conduit, followed by the 16" steel sleeve, and with a 2" overlap of the heat shrink sleeve. End seals shall be equipped with drain and vent openings. Terminate all conduits 2" beyond the inside face of manhole or building walls.

**2.7 Pre-fabricated anchors** shall be furnished and installed where shown on plans and shall consist of a steel plate, welded to pipe and conduit. The steel anchor plate shall be 1/2" thick and shall be 1-1/2" larger horizontally and 1-1/2" larger vertically than the HDPE jacket outer diameter. Heat shrink wrap shall be used to seal the overlap of the anchor water shed ring over the HDPE jacket.

**2.8 A concrete thrust block** shall be cast over the anchor plate and conduit, large enough for firm anchorage into undisturbed trench sidewalls and/ or bottom. The concrete block shall be at least 36" in length and extend a minimum of 12" beyond the top and bottom of the anchor plate. Anchor blocks shall be sized by the engineer of record.

**2.9 Wall sleeves with leak plates** shall be provided at all building and manhole entries to provide an effective moisture barrier. The wall sleeve and leak plate shall be electrically isolated from building rebar. The space between the conduit and wall sleeve shall be made watertight by use of pipe penetration modular seals or equal assemblies, which will also provide electrical isolation.

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# DUO-THERM "505"

## Specification Guide

DTSG  
3.104

PRESSURE TESTABLE SPECIFICATION WITH ERM

11.02.2020

**2.10 The steel conduit for the steam and condensate** shall be insulated with polyurethane foam insulation to a nominal thickness of 1". Insulation shall be rigid, minimum 90% closed cell polyurethane with a minimum 2.0 lbs per cubic foot density, compressive strength of 30 psi @ 75°F, and a coefficient of thermal conductivity (K factor) not higher than .17 @ 75°F per ASTM C518. Maximum conduit interface temperature shall not exceed 200°F.

**2.11 Jacketing material** shall be extruded, black, high density polyethylene (HDPE), having a minimum wall thickness of 200 mils for all jacket sizes. The jacket throughout the entire system shall incorporate electric fusion, butt fusion, or extrusion welding at all fittings, joint closures, or other points of connection. This shall create a jacket that is seamless throughout the entire system with the exception of anchors, whose water shed rings are sealed with a heat shrink wrap prohibiting the ingress of water. The inner surface of the HDPE jacket shall be oxidized by means of corona treatment, flame treatment (patent pending), or other approved methods. This will ensure a secure bond between the jacket and foam insulation preventing any ingress of water at the jacket/ foam interface.

**2.12 Straight run joints** are jacketed with a pressure testable joint closure, either an electro-fusion welded split sleeve HDPE joint closure or Canusa Supercase. The joint shall be pressure tested at 5 psi for 5 minutes while simultaneously soap tested at the joint closure's seams for possible leaks. After passing the pressure test, joints are insulated using polyurethane foam and a closure patch is welded (as per specified joint closure instructions) over the foam holes. All joint closures and insulation shall occur at straight sections of pipe.

**2.13 Conduit fittings** are factory pre-fabricated and pre-insulated with urethane to the thickness specified and jacketed with a molded, extrusion welded, or butt fusion welded PE jacket. **NO TAPING OR HOT AIR WELDING SHALL BE ALLOWED.** All fitting jackets/covers shall be connected to the straight lengths of pipe by electro fusion, butt fusion, or extrusion welding.

**2.14 The system shall be leak detection ready** by means of manufacturing into the system a copper wire through each piece of pre-insulated pipe and fittings. The piping system manufacturer shall install the wire in a manner that has the wire embedded in the outer polyurethane foam insulation and not touching the steel conduit. The contractor shall connect the wire together at each field joint with a recommended crimping tool. After crimping the wire at the joint, the contractor shall check the joined pieces for continuity of the wire and electrical isolation from the conduit by use of a standard analog ohmmeter. This check shall be repeated after each crimp, until the entire system is connected. After the piping system is installed, the owner at any time may check the system for a conduit leak by using a standard volt ohmmeter. If a leak is detected (a leak is signaled by a drastic drop in the electrical resistance of the circuit) the owner should contact the system manufacturer for a TDR instrument to determine the location of the leak. (At owner's option, an ohmmeter panel may be purchased which will provide continuous leak detection monitoring.)

### **Part 3 - Execution**

**3.1 The installing contractor** shall be responsible to excavate, string conduit, weld test, place in trench, backfill, or otherwise treat and install the system as per the specifications and the directions furnished by the manufacturer and approved by the design engineer in accordance with plans and specifications.

**3.2 The conduit shall be air tested** at 15 psi. Test pressure shall be held for two hours. Repair any conduit leaks and retest prior to making joint closures.

**3.3 Pre-engineered systems** shall be provided with all straight pipe and fittings factory pre-insulated and pre-fabricated to job dimensions.

**3.4 Underground systems** shall be buried in a trench not less than two feet deeper than the top of the pipe and not less than eighteen inches wider than the combined O.D. of all piping systems. A minimum thickness of 24 inches of compacted backfill placed over the top of the pipe will meet H-20 highway loading.

**3.5 Trench bottom** shall have a minimum of 6" of sand as a cushion for the piping. All field cutting of the pipe shall be performed in accordance with the manufacturer's installation instructions.

**3.6 A hydrostatic pressure test** of the carrier pipe shall be performed per the engineer's specification with a factory recommendation of one and one-half times the normal system operating pressure for not less than two hours. Care shall be taken to insure all trapped air is removed from the system prior to the test. *Appropriate safety precautions shall be taken to guard against possible injury to personnel in the event of a failure.*

**Carrier Pipe:**

- $d \geq 2"$  - A53 ERW Grade B, Std. Wt. Black Steel
- Seamless and Schedule 80 pipe available for all sizes
- Std. Wt. is the same as Schedule 40 for all sizes thru 10"
- XS is the same as Schedule 80 for all sizes thru 8"

**Conduit:**

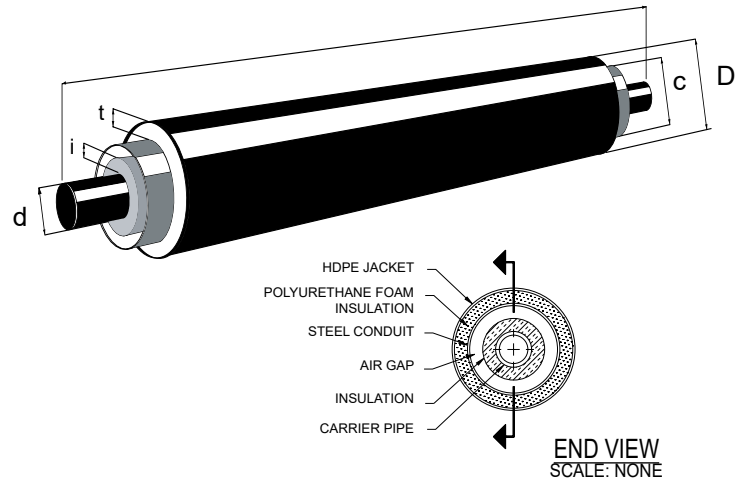
- $6" \leq c \leq 26"$  - 10 Gauge
- $28" \leq c \leq 36"$  - 6 Gauge
- $38" \leq c \leq 42"$  - 4 Gauge

**Jacketing Material:**

High Density Polyethylene (HDPE)

**Insulation:**

- Mineral Wool
- Polyurethane Foam

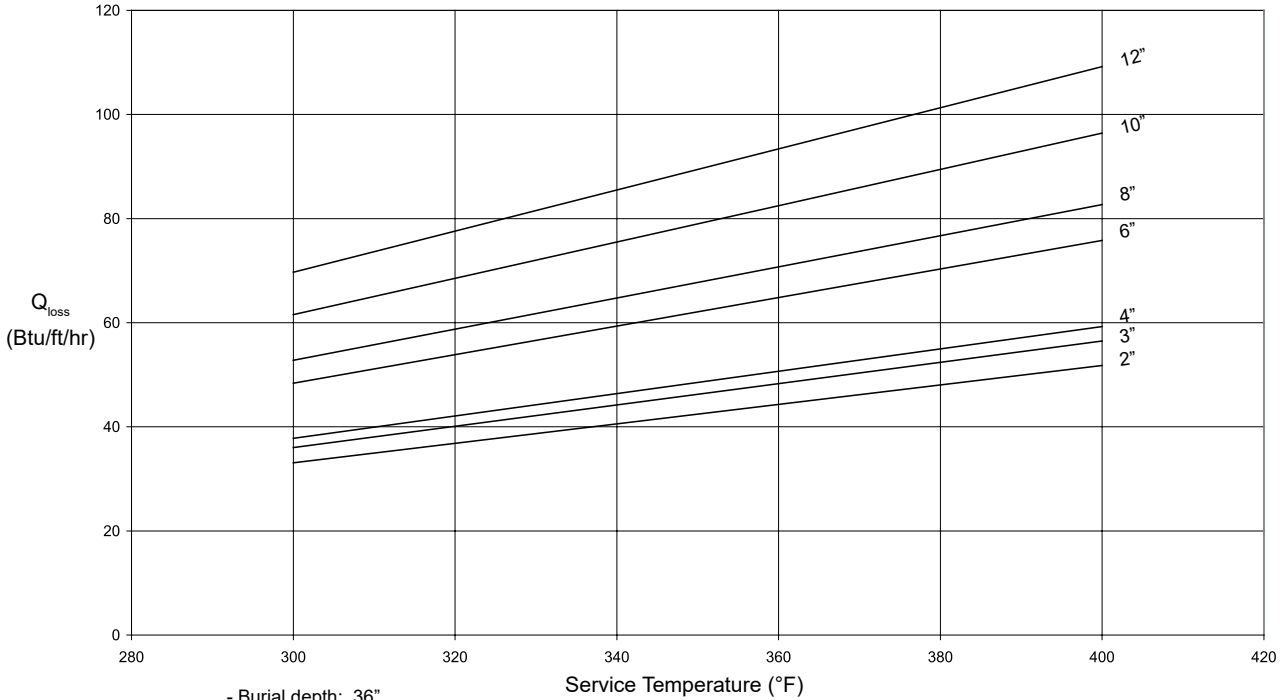


Pipe Size	Mineral Wool Thickness i	Conduit O.D. c	Min. Insulation Thickness t	External Diameter D
2"	1-1/2"	8-5/8"	1.0"	10.9"
3"	1-1/2"	8-5/8"	1.0"	10.9"
4"	1-1/2"	10-3/4"	1.0"	13.1"
6"	2"	12-3/4"	1.0"	15.1"
8"	2"	16"	1.0"	18.3"
10"	2"	18"	1.0"	20.3"
12"	2-1/2"	20"	1.0"	22.3"
14"	2-1/2"	22"	1.0"	24.4"
16"	3"	24"	1.0"	26.4"
18"	3"	26"	1.0"	28.4"
20"	3"	28"	1.0"	30.4"
24"	3-1/2"	34"	1.0"	36.4"

\* Other pipe sizes and pipe, insulation thickness, and conduit size combinations are available.

\*\* Insulation thickness is calculated using minimum wall thickness. Actual wall thickness may be greater than stated, thereby minimally increasing actual external diameter.

### HEAT LOSS FOR STANDARD SIZES OF MINERAL WOOL AND 1" POLYURETHANE FOAM\*



- Burial depth: 36"
- Soil conductivity: 12 (Btu/h.ft<sup>2</sup>.°F/ft)
- Soil temperature: 50°F

Pipe Size	Mineral Wool Thickness	Conduit O.D.	Polyurethane Thickness
2"	1-1/2"	8-5/8"	1.0"
3"	1-1/2"	8-5/8"	1.0"
4"	1-1/2"	10-3/4"	1.0"
6"	2"	12-3/4"	1.0"
8"	2"	16"	1.0"
10"	2"	18"	1.0"
12"	2-1/2"	20"	1.0"
14"	2-1/2"	22"	1.0"
16"	3"	24"	1.0"
18"	3"	26"	1.0"
20"	3"	28"	1.0"
24"	3-1/2"	34"	1.0"

\* Other pipe sizes and pipe, insulation thickness, and conduit size combinations are available.





# DUO-THERM "505"

## Installation Manual

DTIM  
3.201

GENERAL INSTALLATION INSTRUCTIONS

3.31.2022

## INSTALLATION INSTRUCTIONS

### UNLOADING & HANDLING

Lift joints from trucks. DO NOT DROP SHARP OR HEAVY OBJECTS ON INSULATED UNITS. DO NOT use chains or other devices which might puncture insulation jacket.

### STORAGE

Pipe is stockpiled off the ground. Do not exceed a stacking height of 6'. Prevent dirt and debris from entering pipe. Fittings, joining materials, etc. must be stored indoors to protect them from freezing, overheating, moisture, or loss.

### LAYING OF PIPE UNITS – TRENCHING

All sharp rocks, roots, and other abrasive material must be removed from the trench. The trench bed should be 6" of sand, providing a smooth and uniform stabilizing surface (sandbags may be used as a means to keep pipe off the ground until backfilling is started). The trench width should provide a minimum of 6" from trench wall to jacket O.D. and a minimum of 6" between pipe units. Trench depths will be indicated on the contract drawing and in line with good construction practices. Trench depth should allow for a minimum cover of 24" on top of the insulated unit. Pipe is to be sloped per the construction documents, or at a minimum 1" per 40' towards the drains. Pieces that are marked top should have "top" up.

### FIELD JOINING METHODS

Piping shall be joined in the field using approved methods of welding for appropriate pipe. Installation drawings will be provided to indicate location of each individual piece of pre-insulated pipe. Pre-insulated pipe will be marked with Job and Piece Number correlating to those on the installation drawings. Installation of pipe must follow the installation drawings. Shipping bars should be removed prior to welding, but only after carrier pipe has been tack welded. Care should be taken in removing shipping bars so as not to damage carrier pipe. ONLY grinders shall be used to remove shipping bars - torch cutting of shipping bars is NOT permitted unless allowed for by the construction documents. **Field changes to fabricated units must be authorized in writing by the factory.**

### ANCHORS AND COLD SPRINGING

All carrier pipe welds, with the exception of the cold spring welds, should be made and anchors poured prior to the cold springing. Anchors should be sized by the engineer of record. Cold springing is to be performed per the Engineer's instructions and as shown on the installation drawings. Bridging the conduit may be used when circumstance does not allow traditional methods.

### HYDROSTATIC TESTING

The hydrostatic pressure test shall be performed per the engineer's specification with a factory recommendation of one and one-half times the normal operating pressure for not less than two hours. Inspect all welds at this time. *Appropriate safety precautions shall be taken to guard against possible injury to personnel in the event of a failure.*

### INSULATION

Joints should be insulated after the hydro-test to the thickness and material specified, making sure that the insulation is cut to length and secured with two stainless steel bands, as provided. **The insulation and/ or the inside of the conduit must be kept dry during the entire insulation process.**

### CASING SLEEVES

Casing sleeves are welded and air tested at 15 psi for two hours or per construction documents, whichever is more stringent. After testing, sleeves are to be cleaned of any weld splatter and either coated, heat shrink is applied, or both.

### JOINT CLOSURES

An HDPE split sleeve is put in place and foam is poured and heat shrink sleeve applied. If a pressure testable sleeve has been specified, then follow the instructions provided.

### BACKFILL FINAL

Before backfilling is started, the trench should be cleaned of any trench wall cave-ins and general trash, especially metal. Backfilling should be done with sand 6" below the casing to 6" above. Engineer-approved backfill may be used to fill the rest of the trench. This material should be free of rocks, roots, large clods, or anything that could cause damage to the casing or casing coating. Casing should have a minimum of 2' cover.

**WHEELED OR TRACKED VEHICLES SHALL NOT BE USED FOR TAMPING!**

## SHIPPING & HANDLING INSTRUCTIONS

**HANDLE COATED PIPE WITH EXTRA CARE! THIS PIPE CAN DAMAGE WHEN HANDLED, MOVED, OR STORED IMPROPERLY!**

### UPON RECEIPT OF MATERIALS

Make an overall inspection of the load, checking all bands and braces to see if they are intact. Also, check the load for shifting. If the load has shifted, or if the braces and bands are broken, examine each pipe for damage. **HAVE THE TRUCK DRIVER MAKE AN ITEMIZED NOTATION OF ANY DAMAGE ON THE DELIVERY RECEIPT AND HAVE IT SIGNED BY THE DRIVER.**

### CHECK PACKING LIST

Compare materials received with those listed on the packing list. Count all pipe and boxes. **NOTE ANY SHORTAGES ON DRIVER'S DELIVERY RECEIPT.**

### CHECK BOXES

Open all boxes and inspect for damages, shortages, and correct size. **REPORT ANY DISCREPANCIES WITHIN 30 DAYS AFTER RECEIPT.**

### CLAIMS FOR DAMAGES

Claims for damages in transit or lost goods must be made within 30 days. The filing of any claim is the Purchaser's Responsibility. Thermacor will file any claim on Purchaser's behalf upon receipt of the following:

1. Written authority to file such a claim.
2. Written notice of loss or damage (signed and noted Bill of Lading) by truck driver or carrier freight agent.

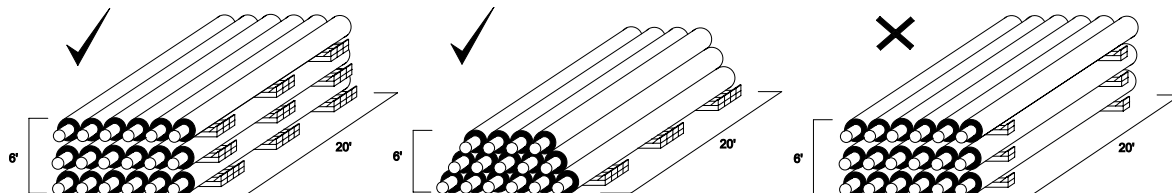
### UNLOADING PIPE

Pipe may be unloaded by hand or with fork lifts\*, cherry pickers, or cranes. **DO NOT HOOK** pipe ends. Minimum 4" wide straps or slings should be used.

\*Fork Lift – When using Fork Lift, wide tines or a large surface covering the fork tines must be used to prevent coating damage. Fork Lift must be able to handle the weight of the insulated pipe length.

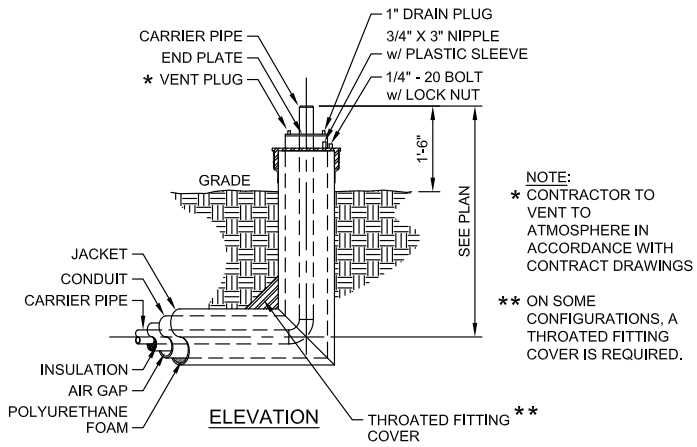
### PIPE STOCKPILING

Pipe should be stored on level ground, elevated to be as dry as possible, and in such a way that the pipe ends do not lie in water or on the ground. To prevent deformation of the jacket and insulation due to the weight of the pipe, place a series of supports (3 for 20' or 5 for 40') of ample size generally constructed from 2" x 4"s under the pipe as shown below. Supports should increase in width as weight load increases so that the top supports of a fully loaded stockpile should be approximately 10" wide, gradually increasing to the bottom level, approximately 18" wide. Pipe can be pyramided (within reasonable and safe limits) approximately 6' high after a properly braced or chocked base is formed. Pipe stored outside for long periods of time can be covered with blue mesh tarpaulin (plywood can also be used). **Do not prevent airflow as jacket can be deformed from heat buildup.**

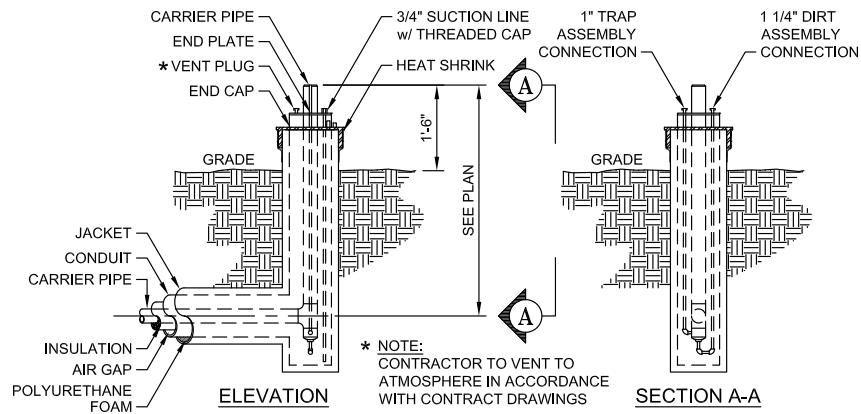


### BE VERY CAREFUL NOT TO DROP THE PIPE!

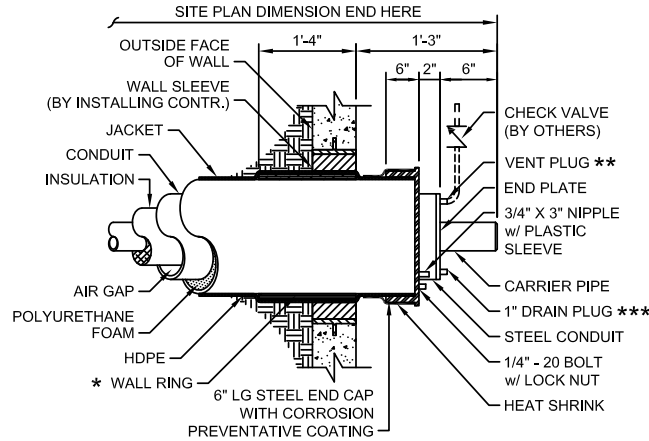
**NOTE: Thermacor does not approve of the practice of installing pipe and fittings, and backfilling the pipe before testing. Thermacor will not allow or pay claims for charges which arise in locating and digging up leaks regardless of cause.**


**RISER DETAIL**

SCALE: NONE


**RISER DETAIL**

SCALE: NONE

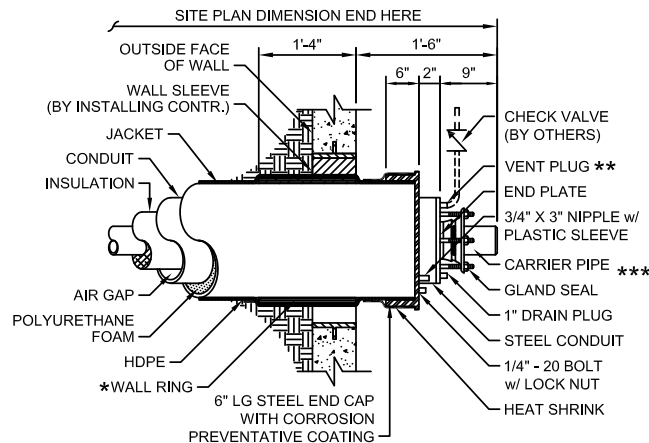


**NOTES:**

- \* WALL RING INCREASE OUTSIDE DIAMETER OF HDPE JACKET BY 1/2".
- \*\* CONTRACTOR TO VENT TO ATMOSPHERE TO PREVENT CONDUIT FLOODING IN ACCORDANCE WITH CONTRACT DRAWINGS IN THE EVENT THE VAULT FLOODS. VENT MUST BE OPEN AND INSTALLED PRIOR TO STARTING SYSTEM. INSTALL CHECK VALVE TO PREVENT WATER INTRUSION.
- \*\*\* DRAIN SHOULD BE OPENED DURING START-UP TO ALLOW CONDUIT TO DRAIN.

### WALL PENETRATION DETAIL (END PLATE)

SCALE: NONE

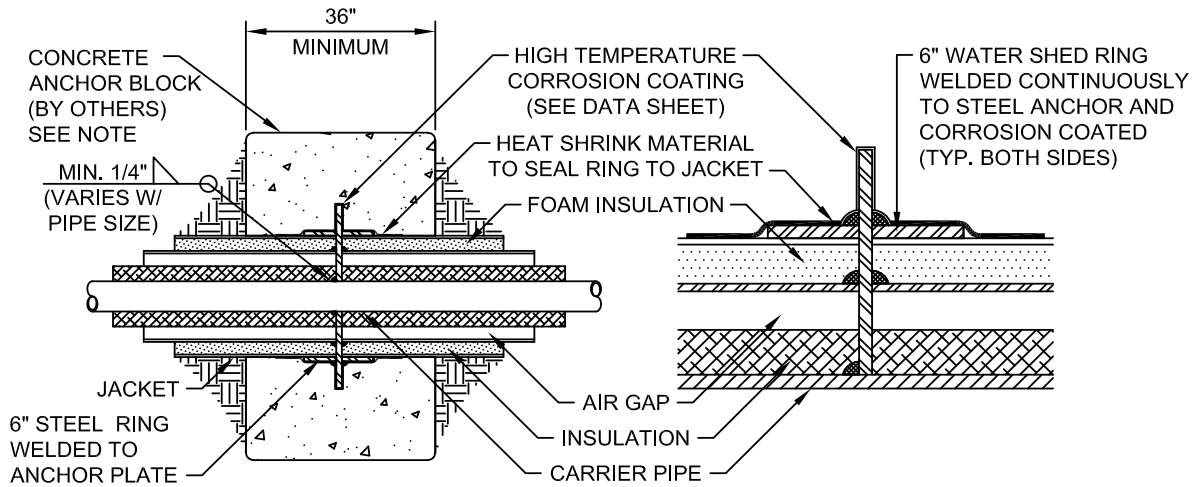


**NOTES:**

- \* WALL RING INCREASE OUTSIDE DIAMETER OF HDPE JACKET BY 1/2".
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- \*\*\* DRAIN SHOULD BE OPENED DURING START-UP TO ALLOW CONDUIT TO DRAIN.

### WALL PENETRATION DETAIL (GLAND SEAL)

SCALE: NONE

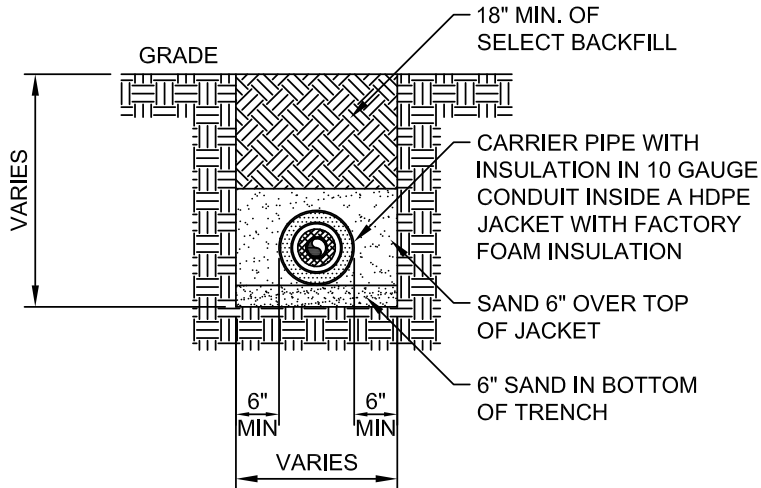


### STEEL PIPE ANCHOR SPECIFICATIONS

ANCHOR PLATES ARE 1/2" STEEL CENTERED ON CONDUIT WITH DIMENSIONS 1 1/2" LARGER HORIZONTALLY AND 1 1/2" LARGER VERTICALLY THAN NOMINAL HDPE JACKET DIAMETER. THE CONCRETE ANCHOR BLOCK SHOULD EXTEND A MINIMUM OF 12" INTO THE TRENCH WALL, UNDISTURBED EARTH OR COMPACTED BACK FILL (MINIMUM 95 PROCTOR) IN ALL DIRECTIONS, WITH A MINIMUM OF 18" IN LENGTH ON BOTH SIDES OF THE ANCHOR PLATE. THE ANCHOR BLOCK SIZE IS BASED ON THE SOIL CONDITIONS AND THE FORCES EXERTED ON THE ANCHOR. SIZING OF THE ANCHOR BLOCK IS BY OTHERS. ANCHOR BLOCK SIZING IS THE RESPONSIBILITY OF THE ENGINEER OF RECORD.

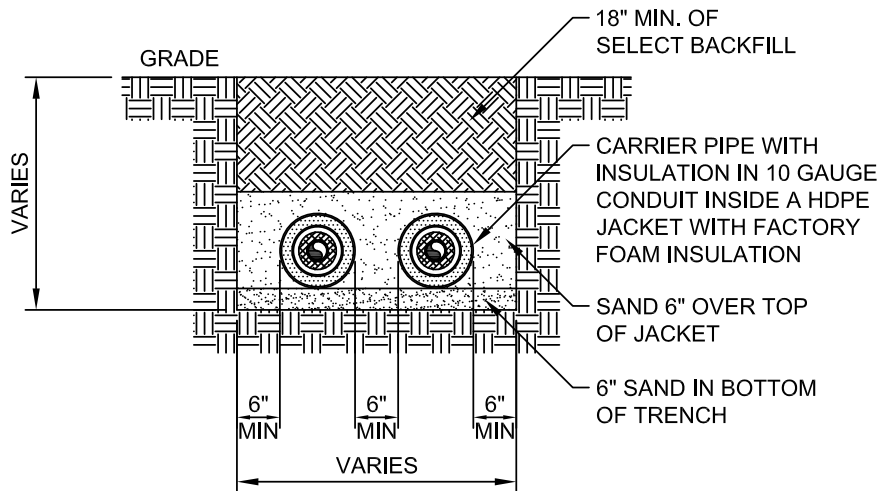
## ANCHOR DETAIL

SCALE: NONE



### TRENCH DETAIL

SCALE: NONE



### TRENCH DETAIL

SCALE: NONE