

CON II

CONTAINMENT PIPING SYSTEM



CON II

THERMACOR'S CON II Hazardous Fluids Containment System is a pre-engineered, factory-fabricated, containment piping system for above or below ground transportation of hazardous fluids. The system is designed with a steel carrier pipe (type and grade specified, as required) and a secondary steel outer pipe to contain and/or drain carrier pipe leaks.

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"
- Stainless Steel

Containment Pipe

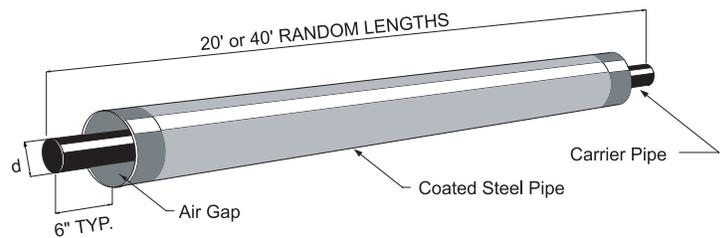
- 10 Gauge, smooth wall black steel conduit.
- A53 ERW Grade B, Std. Wt. Black Steel.

Containment Coating

- Novacoat - 30 mils
- Fusion Bonded Epoxy - 20 mils
- Primer Coating for Above Ground
- 100 mil HDPE

Optional Systems

- Leak Detection
 - Access Ports for manual checking.
 - Electronic Leak Detection for precise location of leaks.
- Heat Tracing and Skin Effect Heating



SPECIFICATION GUIDE *

GENERAL

All above ground, below ground, and tunnel piping materials transporting hazardous fluids shall be **CON II**, pre-engineered Hazardous Fluid Containment Piping System, as manufactured by **THERMACOR PROCESS INC.** All straight pipe, fittings, and technical support shall be provided by the manufacturer.

SERVICE PIPE

The carrier or service pipe shall be A-53, Grade B, ERW, Standard Weight for pipe sizes 2" and larger and A106/ A53, Grade B, seamless, standard weight for pipe sizes 1.5" and smaller. Pipe shall be butt-welded for sizes 2" and larger and socket-welded for 1.5" and smaller. Straight sections shall be supplied in 20 or 40 foot random lengths with cutbacks to allow for welding at the field joints.

CONTAINMENT PIPE

Containment pipe shall be 10 gauge, smooth-walled black steel conduit manufactured in accordance with ASTM A-135. The containment casing shall be sized to accommodate any expansion or contraction of the pipe due to temperature changes. All conduit shall be cylindrical and straight with the ends cut square. Containment pipe shall be factory coated with 30 mil Novacoat or 20 mil FBE and Holiday tested to 125 volts/mil. Conduit straight lengths shall be normally fabricated in 40 foot nominal lengths with five pipe supports per length. Shorter lengths will be fabricated as required and provided with pipe supports not more than nine feet apart and with a pipe support not more than two feet from each end. Centering devices are to be constructed to allow drainage of the system, air flow, and unrestricted installation of leak trace cable (when required). Tees, elbows, and other fittings will be coated and pre-fabricated to straight sections whenever shipping requirements permit.

FITTINGS

Carrier pipe fittings shall be minimum 2D bends 2" thru 4" or butt-weld fittings conforming to ASTM A-234 and ANSI B16.9 for sizes over 2", or shall be socket weld steel fittings conforming to ANSI B16.11 for sizes 2" and below. Where pipe

is to be joined to other materials or fittings, suitable socketed adapters or flanges shall be used. Dielectric couplings or flanges with isolation gasket sets shall be used when connecting to dissimilar metals, and at all termination points to provide electrical isolation as needed for proper operation of cathodic protection system.

Containment pipe fittings shall be fabricated from the containment pipe material. All pre-fabricated fittings, end plates, and accessories shall be fully welded, liquid tight, and Holiday tested.

CATHODIC PROTECTION

Containment pipe shall be protected against corrosion using a sacrificial anode cathodic protection system designed by a qualified NACE Corrosion Engineer. System components shall include, but not be limited to, sacrificial anodes (either pre-packed ingots or ribbon anode as appropriate), test stations, shunts, isolation couplings, and gasket sets.

FIELD JOINTS

Field Joints shall be applied by the installation contractor utilizing the manufacturer's furnished kits and instructions. Field joints shall not be applied until after the carrier pipe has been hydrostatically tested and approved.

INSTALLATION

Installation of the piping system shall be in accordance with the manufacturer's instructions. The services of a Factory Representative are to be obtained for the purpose of field instructions in the installation of, and observation during the construction of the Hazardous Fluid Containment Piping System. The Factory Representative is to instruct the installation contractor in the prescribed method of system assembly, joint assembly, containment casing joint closure and coating, Holiday testing, and the installation of the leak detection sensors and alarm module. A final report shall state that the installation is in accordance with the manufacturer's recommendations, and that the installation is in accordance with the plans and specifications.

** For alternate specifications, please contact THERMACOR.*

THERMACOR PROCESS INC. Your Authorized THERMACOR Representative Is:

1670 Hicks Field Road East
Fort Worth, Texas 76179-5248
P.O. Box 79670

Phone (817) 847-7300
Fax (817) 847-7222
www.thermacor.com

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THERMACOR PROCESS INC. sole and exclusive warranty is as stated in the Standard Terms and Conditions of Sale for these products. In no event will THERMACOR PROCESS INC. be liable for any direct, indirect, or consequential damage.



CON II

Specification Guide

C2SG
13.101

STANDARD SPECIFICATION

7.01.08

Containment Piping Systems suitable for Fuel Oil, Gasoline, Solvents, and other Hazardous Fluids.

Part 1 - General

1.1 Containment Piping - Furnish a complete system of factory fabricated, pre-engineered steel piping for the specified service. The system shall be provided as specified below and shown on the drawings.

1.2 The system shall be **CON II** as manufactured by **Thermacor Process Inc.** of Fort Worth, Texas.

Part 2 – Products

2.1 Carrier pipe shall be steel ASTM A-53, Grade B., ERW (Type E) or seamless (Type S), standard weight for sizes 2" and larger, and shall be ASTM A-106, Grade B, standard weight for sizes 1-1/2" and smaller (Std. Wt is the same as Sch. 40 through 10"). When practical, piping shall be provided in 40-foot double-random lengths. All carbon steel pipe shall have ends cut square and beveled for butt-welding. Straight sections of factory insulated pipe shall have 6" of exposed pipe at each end for field joint fabrication.

2.2 Carrier pipe fittings shall be minimum 2D bends 2" thru 4", butt-weld fittings conforming to ASTM A-234 and ANSI B16.9 for sizes over 2", or shall be socket weld steel fittings conforming to ANSI B16.11 for sizes 2" and below. Where pipe is to be joined to other materials or fittings, suitable socketed adapters or flanges shall be used. Dielectric couplings or flanges with isolation gasket sets shall be used when connecting to dissimilar metals, and at all termination points to provide electrical isolation as needed for proper operation of cathodic protection system.

2.3 Containment pipe shall be 10 gauge, smooth-walled black steel conduit manufactured in accordance with ASTM A-134, A-135, or A-139. The containment casing shall be sized to accommodate any expansion or contraction of the pipe due to temperature changes. All conduit shall be cylindrical and straight with the ends cut square. Containment pipe conduit shall be shot blasted to clean bright metal and factory coated with 30 mil Novacoat or 20 mil FBE. All coated surfaces shall be Holiday tested to 125 volts/ mil and any detected holidays shall be recoated and retested.

2.4 Containment pipe fittings shall be fabricated from the containment pipe material. All pre-fabricated fittings, end plates, and accessories shall be fully welded, liquid tight, and Holiday tested in accordance with 2.3 above. Tees, elbows, and other fittings will be coated and pre-fabricated to straight sections whenever shipping requirements permit.

2.5 Corrosion protection shall be provided using a sacrificial anode cathodic protection system designed by a qualified NACE Corrosion Engineer. The design Engineer shall furnish the soil resistivity for CP design purposes. The Cathodic protection system, complete with test stations, shall be designed for the particular site conditions. System components shall include, but not be limited to, sacrificial anodes (either pre-packed ingots or ribbon anode as appropriate), test stations, shunts, isolation couplings, and gasket sets.

2.6 Pipe supports shall be designed to maintain orientation of the pipes throughout the system and shall permit axial or lateral movement, as required, to accommodate expansion. Conduit straight lengths shall be normally fabricated in 40 foot nominal lengths with five pipe supports per length. Shorter lengths will be fabricated as required and provided with pipe supports not more than nine feet apart and with a pipe support not more than two feet from each end. Centering devices are to be constructed to allow drainage of the system, air flow, and unrestricted installation of leak trace cable (when required).

2.7 Terminal ends of conduits shall be equipped with fully welded end seals consisting of a 1/2" steel bulk head plate welded to the pipe and conduit. If there is no anchor within five feet of a terminal end, conduits shall be equipped with gland seals consisting of a packed stuffing box and gland follower mounted on a steel plate welded to the end of the conduit. End seals or gland seals shall be equipped with 1" drain and vent fittings, as well as feed-through fittings to accommodate the passage of jumper cables to the leak detection sensors (where required). Terminate all conduits 2" beyond the inside face of manhole or building walls.

2.8 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 Link-Seal® pipe penetration seals or equal assemblies, which will also provide electrical isolation.

(Continued)



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STANDARD SPECIFICATION

3.14.07

2.9 Field joints shall be made at straight sections of pipe. Carrier pipe shall be welded in accordance with ANSI B31.1. Conduit pipe shall be joined using a one piece, 10 gauge split sleeve welded to the adjacent casing sections. After pressure testing, the 10 gauge sleeve is covered with a heat shrink sleeve.

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 directions furnished by the manufacturer and approved by the engineer in accordance with the 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, pea gravel, or specified backfill 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.*

3.7 Field Service is required and will be provided by a certified manufacturer's representative or company field service technician. The manufacturer's representative is to instruct the installation contractor in the prescribed method of system assembly, joint assembly, containment casing joint closure and coating, Holiday testing, and the installation of the leak detection sensors and alarm module. A final report shall state that the installation is in accordance with the manufacturer's recommendations, and that the installation is in accordance with the plans and specifications.

3.8 All valves and equipment shall be supported independently from the pipe. Valves shall be anchored to prevent the turning movement resulting from their operation from being transmitted to the pipe.

3.9 All piping shall be installed to slope for drainage of the system in case of leakage in the carrier pipe.



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LEAK DETECTION SPECIFICATION

7.01.08

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2.4 Containment pipe fittings shall be fabricated from the containment pipe material. All pre-fabricated fittings, end plates, and accessories shall be fully welded, liquid tight, and Holiday tested in accordance with 2.3 above. Tees, elbows, and other fittings will be coated and pre-fabricated to straight sections whenever shipping requirements permit.

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2.8 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 Link-Seal® pipe penetration seals or equal assemblies, which will also provide electrical isolation.

(Continued)



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LEAK DETECTION SPECIFICATION

3.14.07

2.9 Field joints shall be made at straight sections of pipe. Carrier pipe shall be welded in accordance with ANSI B31.1. Conduit pipe shall be joined using a one piece, 10 gauge split sleeve welded to the adjacent casing sections. After pressure testing, the 10 gauge sleeve is covered with a heat shrink sleeve.

2.10 Electronic leak detection is to be installed with a TraceTek Probe system as manufactured by Raychem Corporation for continuous detection of leaks. (Select TraceTek 1000 for Aqueous chemicals, TraceTek 5000 for solvents and fuels. If TraceTek 5000 is selected and the engineer desires to monitor also for ground water leakage through the containment pipe, a TraceTek 1000 system can be supplied in tandem.)

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 directions furnished by the manufacturer and approved by the engineer in accordance with the 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.

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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.*

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3.8 All valves and equipment shall be supported independently from the pipe. Valves shall be anchored to prevent the turning movement resulting from their operation from being transmitted to the pipe.



CON II Installation Manual

C2IM
13.201

GENERAL INSTALLATION INSTRUCTIONS

3.14.07

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 or backfill as specified by the engineer, 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 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. One end, and one end only, of conduit must have conduit sleeve. Shipping bars should be removed prior to welding. Care should be taken in removing shipping bars so as not to damage carrier pipe. Thermacor strongly recommends the use of a grinder when removing the bars from the carrier pipe. **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 1' above, 1' below, and 3' in length, extending into the undisturbed dirt of the trench wall. 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 do not allow traditional methods.

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.*

LEAK DETECTION

If leak detection has been specified by the Engineer, each spool piece will have a pull wire provided that is to be replaced with a continuous pull wire, cable, or rope by the contractor.

CASING SLEEVES

Sleeves are welded and air tested at 15 psi for two hours. After testing, sleeves are to be cleaned of any weld splatter and either coated, heat shrink is applied, or both.

HOLIDAY TESTING

Conduit should be holiday tested right before backfill or earlier if pipe is handled with care. Pipe should be holiday tested at the required voltage for the particular coating. Make any repairs with the patch sticks provided. (Larger repairs can be made with liquid coating from Thermacor.)

CATHODIC PROTECTION

Cathodic protection should be installed right before backfill, per the instructions of the corrosion engineer.

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 or other engineer-approved material 6" below the casing to 1' 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.

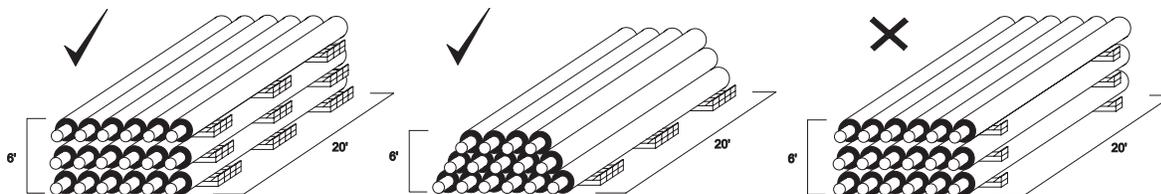
UNLOADING PIPE

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.

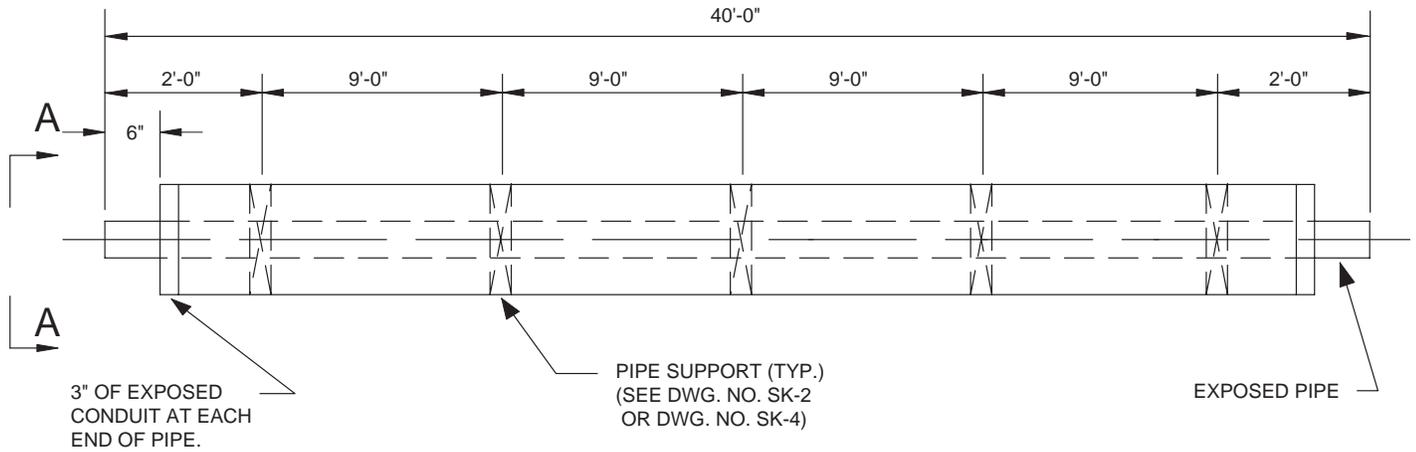
PIPE STOCKPILING

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.**



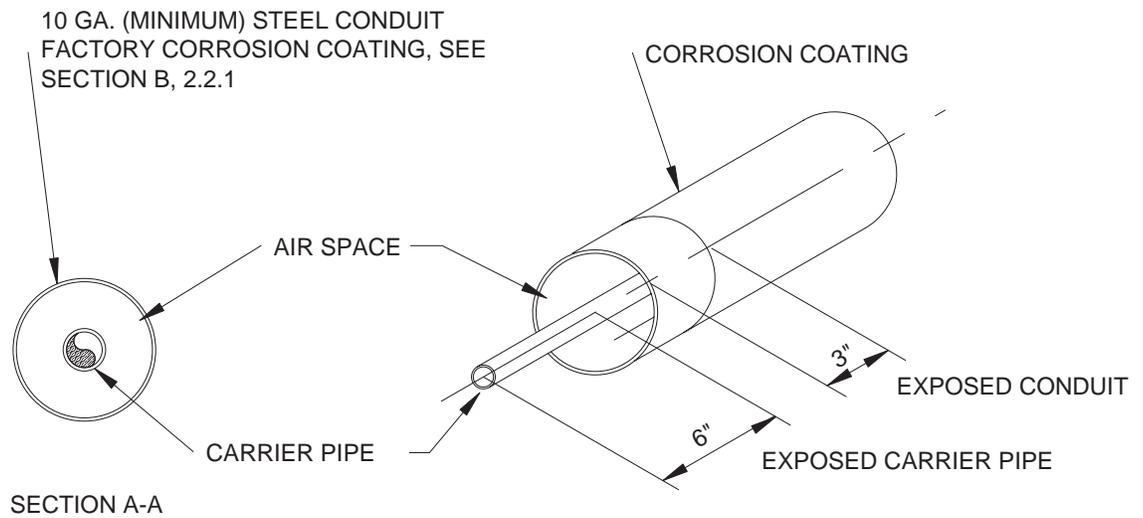
BE VERY CAREFUL NOT TO DROP THE PIPE!

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.



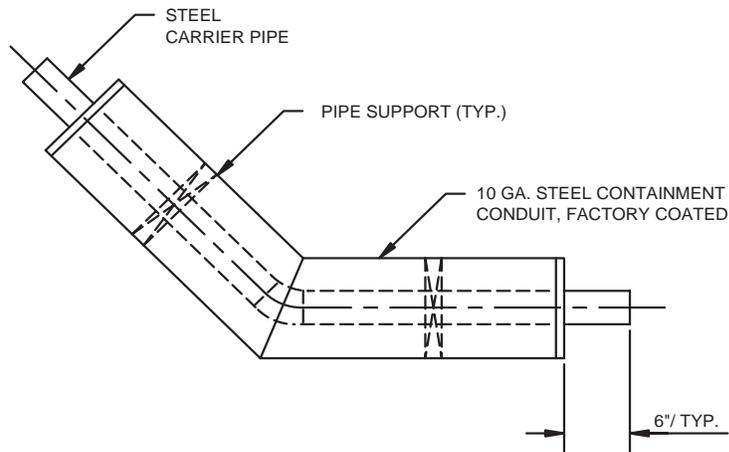
MINIMUM GAUGE AND THICKNESS FOR STEEL CASING CONDUIT SYSTEMS		
CASING TYPE	CASING DIAMETER	MIN. WALL THICKNESS
BLACK STEEL	UP THROUGH 26"	0.1345" (10 GAUGE)
SMOOTH WALL	27" THROUGH 36"	0.1943" (6 GAUGE)
	37" THROUGH 42"	0.2242" (4 GAUGE)

The above thicknesses will support a highway loading H-20, or equivalent, with a minimum of 2' burial and 95% of maximum density compacted backfill in cohesive soils or 70% of relative density compacted backfill for cohesive soils. For special loadings and soil conditions, conduit thickness may change.

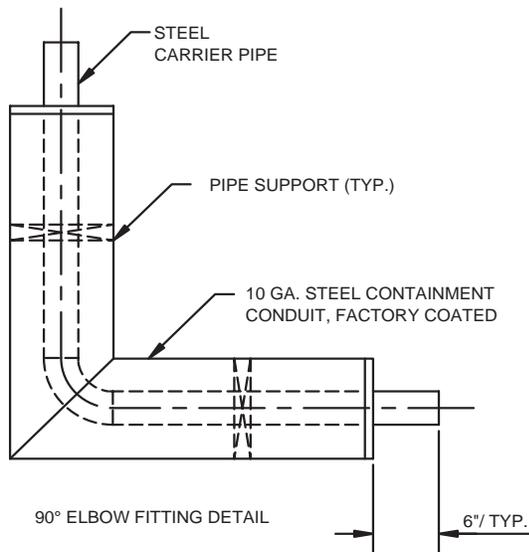


NOTE:

This detail shows a single pipe in a conduit. The support spacing dimensions and casing thickness are applicable for a dual pipe system in a single conduit.

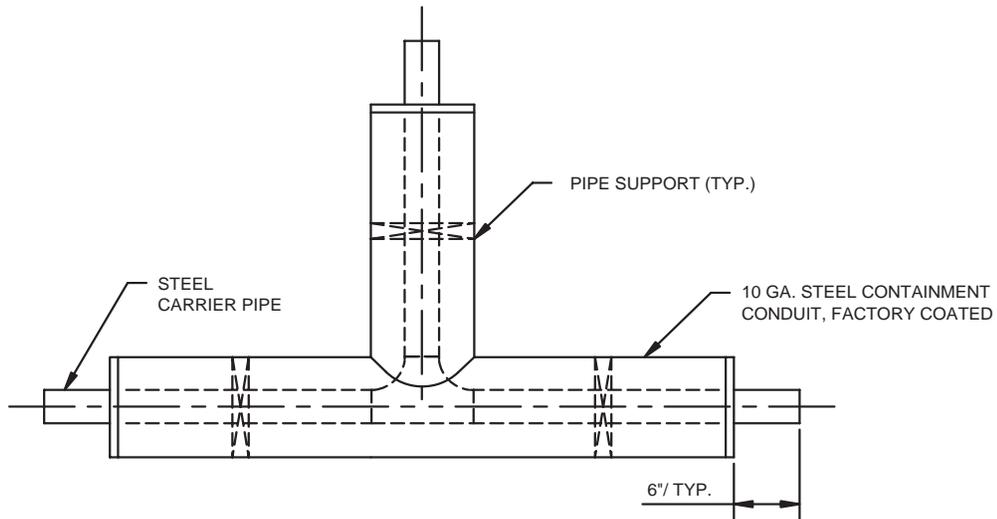


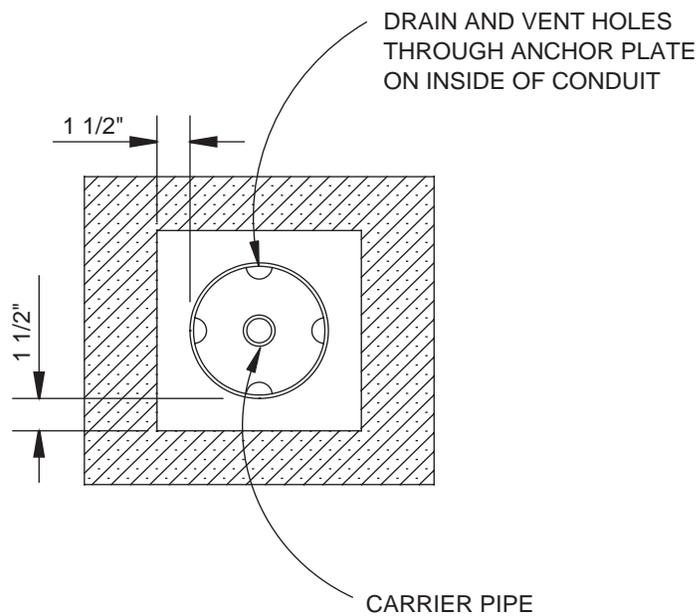
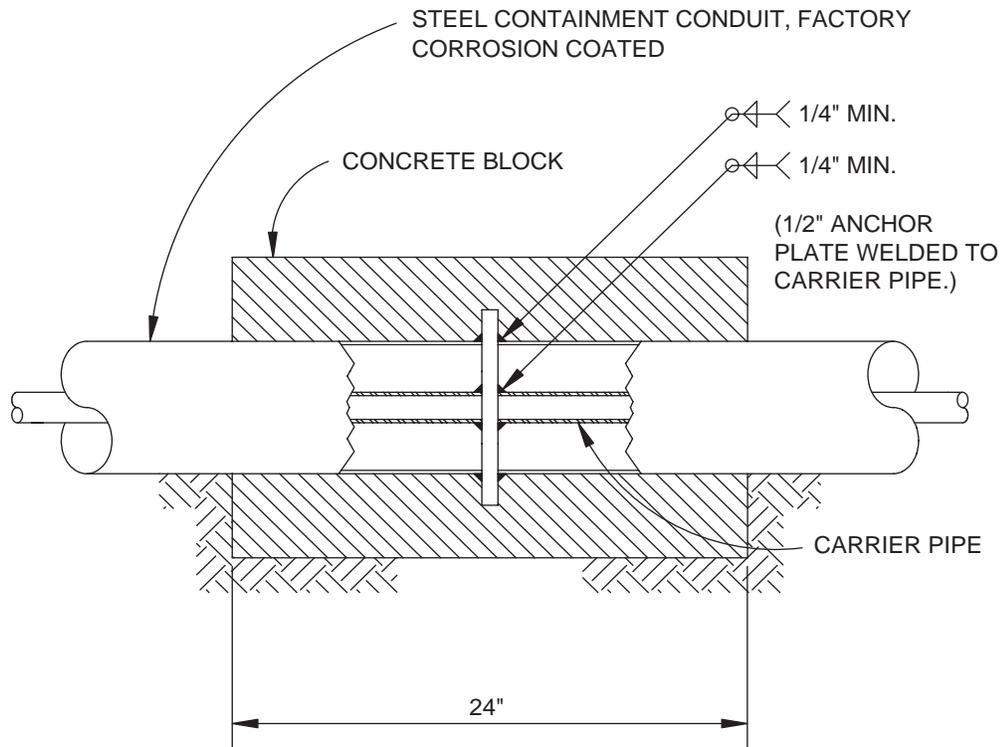
45° ELBOW FITTING DETAIL



90° ELBOW FITTING DETAIL

PIPE SIZE	CONTAINMENT CONDUIT SIZE
3"	6"
4"	8"
6"	10"
8"	12"
10"	14"





ANCHOR PLATES ARE 1/2" STEEL CENTERED ON CONDUIT WITH DIMENSIONS 1 1/2" LARGER HORIZONTALLY AND 1 1/2" LARGER VERTICALLY THAN NOMINAL CONDUIT DIAMETER. CONCRETE ANCHOR BLOCK EXTENDS MINIMUM OF 12" OUTSIDE ANCHOR PLATE AND IS MINIMUM OF 24" IN LENGTH.

OPTIONAL VENT LOCATION

1" HALF COUPLING (VENT)

DRESSER GASKETS FOR GLAND SEAL

OPTIONAL DRAIN LOCATION

1" HALF COUPLING (DRAIN)

STUD AND NUT TABLE FOR VARYING PIPE SIZES

CARRIER PIPE SIZE	NO. OF STUDS AND NUTS
1/2" TO 2"	2
2-1/2" TO 4"	3
5" TO 6"	4
8"	5
10" TO 12"	6
14"	8
16"	10

1" HALF COUPLING (VENT)

GLAND

GLAND FOLLOWER

STAINLESS STEEL STUDS W/ STAINLESS STEEL NUTS

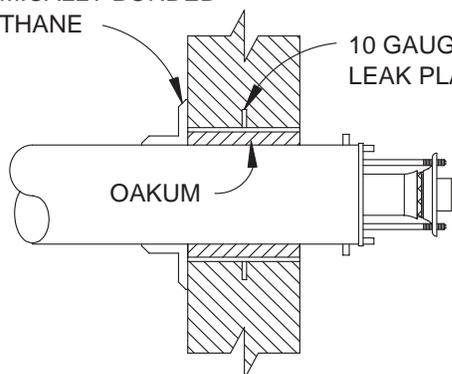
DRESSER GASKETS FOR GLAND SEAL

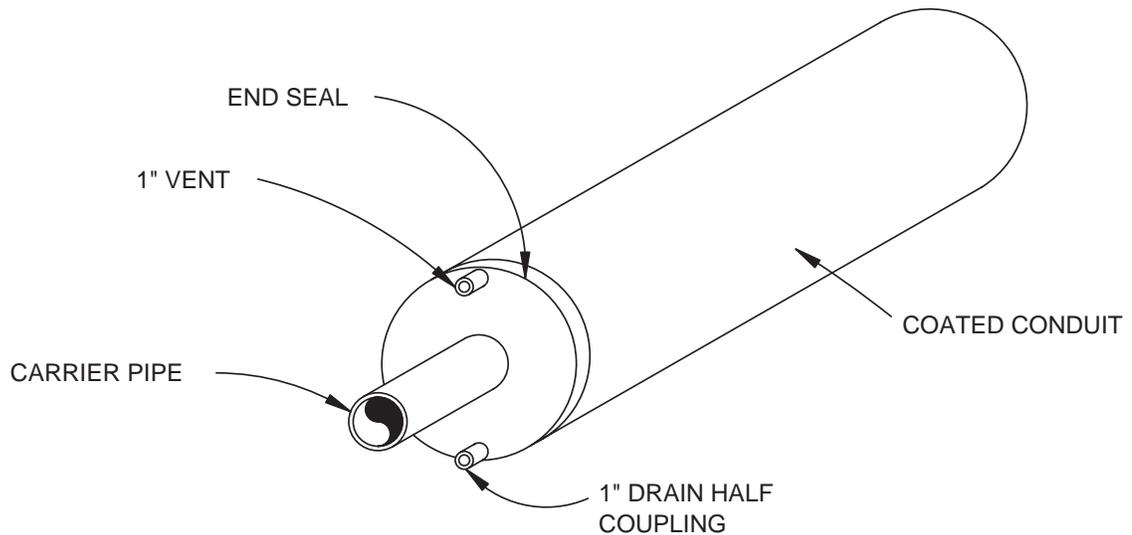
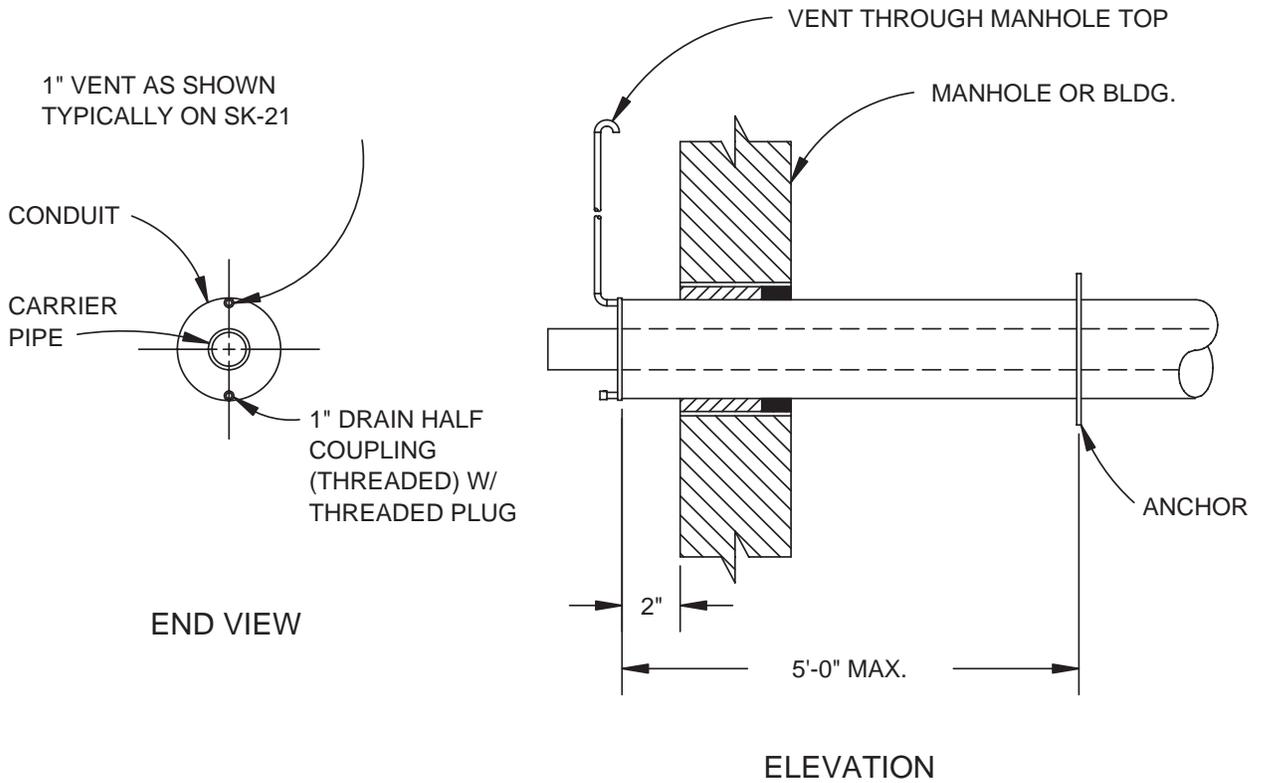
SEAL WALL PENETRATION W/ 3 COATS OF BITUMUS MASTIC OR ONE COAT OF CHEMICALLY BONDED URETHANE

10 GAUGE LEAK PLATE

1" HALF COUPLING (DRAIN)

OAKUM





**NOTE: USED WHEN ANCHOR
IS WITHIN 5' OF A MANHOLE
OR BUILDING WALL.**