COPPER-THERM is a factory-fabricated, pre-insulated piping system for below ground distribution of heating water, domestic hot water, chilled water, condensate return, process fluids, and cryogenic services. The system is designed with Copper Tubing (type to be specified), closed cell polyurethane foam insulation, and a Type 1, Class 1 PVC or High Density Polyethylene (HDPE) jacket. O-ring couplings are also available for joining straight lengths of pipe to compensate for thermal expansion.

**Carrier Pipe**
- Type “K” Copper
- Type “L” Copper
- Type “M” Copper

**Polyurethane Insulation**
- Density: > 2.0 lbs/ft³
- “K” Factor: ≤ 0.16 @ 75°F
- Compressive Strength: > 30 psi
- Closed Cell Content: ≥ 90% @ 75°F

**Jacket**
- Type 1, Class 1, PVC
- High Density Polyethylene (HDPE)
SPECIFICATION GUIDE *

GENERAL
All underground and above ground piping materials transporting heating water, domestic hot water, chilled water, condensate return, process fluids, and cryogenic services shall be COPPER-THERM as manufactured by THERMACOR PROCESS INC. All straight pipe, fittings, anchors, insulating materials, and technical support shall be provided by the manufacturer.

SERVICE PIPE
The carrier or service pipe shall be Type K Copper tube, conforming to ASTM B-88. (At the Engineer’s option, Type L or Type M is acceptable.) Cleaned and capped Type K, and ACR Type L copper tube may be used for cryogenic and refrigeration applications. All copper tubing shall have ends cut square for socket brazing. Straight sections shall be supplied in 20 foot lengths with cutbacks to allow for brazing at the field joints. Field joining of piping shall utilize approved methods of silver soldering or brazing with alloys melting at or above 1100°F; 50-50 tin-lead solder is not acceptable. (O-ring couplings may be used to join straight pipe lengths.)

INSULATION
Insulation of the service pipe shall be rigid polyurethane foam with a minimum 2.0 lbs/ft³ density, 90% minimum closed cell content, and a “K” factor not higher than .16 @ 75°F per ASTM C518. The polyurethane foam shall be CFC-free. The polyurethane foam shall completely fill the annular space between the service pipe and jacket, and shall be bonded to both. Insulation shall be provided to the minimum insulation thickness specified.

JACKET
The outer protective jacket shall be either extruded white polyvinyl chloride, consisting of clean, virgin NSF approved Class 12454-B PVC compound, conforming to ASTM D-1784, Type 1, Grade 1 or high density polyethylene (HDPE). No FRP, HDUP, or tape jacket allowed. PVC jacket shall have a wall thickness in mils equal to ten times the nominal jacket diameter and shall not be less than 60 mils.

FITTINGS
All straight sections, fittings, anchors, and other components shall be factory-fabricated and pre-insulated. Fittings shall be jacketed with a molded fitting cover or with a PVC fitting cover and wrapped with polyethylene backed, pressure sensitive rubberized bitumen adhesive tape, 30 mils thick. Carrier pipe fittings shall be silver soldered or brazed with alloys melting at or above 1100°F; 50-50 tin-lead solder is not acceptable. Fittings include expansion loops, elbows, tees, reducers, and anchors. (At the Engineer’s option, fittings may be field insulated with liquid urethane foam insulation, jacketed with a PVC fitting cover and then wrapped with polyethylene backed, pressure sensitive rubberized bitumen adhesive tape, 30 mils thick.) Above ground installations shall use white, pressure sensitive PVC tape. (In systems utilizing O-ring couplings, fittings are not insulated and are thrust blocked at all changes in direction. Expansion compensation occurs at couplings between straight lengths of pipe, therefore expansion loops and elbows are not required.)

FIELD JOINTS
Service pipe shall be hydrostatically tested as per the Engineer’s specification with a factory recommendation of 1.5 times the specified pressure of the system. Straight joint sections shall be insulated using urethane foam to the thickness specified, jacketed with an HDPE or PVC sleeve and sealed with pressure sensitive, polyethylene backed, rubberized bitumen adhesive tape, 30 mils thick, or a heat shrink sleeve or tape. Above ground installations shall use white, pressure sensitive PVC tape. All insulation and jacketing materials shall be furnished by THERMACOR. (In systems utilizing O-ring couplings, straight run joints are not insulated to allow for expansion and contraction of the gasketed joint. At the Engineer’s option, straight joint sections may be jacketed as above to prevent the ingress of moisture or debris.)

INSTALLATION
Installation of the piping system shall be in accordance with the manufacturer’s instructions. Factory trained field technicians shall be provided for critical periods of installation, unloading, field joint instruction, and testing.

* For alternate specifications, please contact THERMACOR.

VHM Solutions Pty Ltd.
13 Chullora Bend, Jandakot,
Western Australia 6164 Australia
Tel No. +61 08 9414 9111

The information contained in this document is subject to change without notice. THERMACOR PROCESS INC. believes the information contained herein to be reliable, but makes no representations as to its accuracy or completeness.

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.
Pre-insulated Copper Piping Systems suitable for Heating Water, Domestic Hot Water, Chilled Water, Condensate Return, Process Fluids, and Cryogenic services.

Part 1 – General

1.1 Pre-insulated Piping - Furnish a complete system of factory pre-insulated copper piping for the specified service. All pre-insulated pipe, fittings, insulating materials, and technical support shall be provided by the Pre-insulated Piping System manufacturer.

1.2 The system shall be COPPER-THERM manufactured by Thermacor Process Inc. of Fort Worth, Texas.

Part 2 – Products

2.1 Carrier pipe shall be Type K Copper tube, conforming to ASTM B-88. (At the Engineer’s option, Type L or Type M is acceptable.) Cleaned and Capped Type K, and ACR Type L copper tube may be used for cryogenic and refrigeration applications. All copper piping shall have ends cut square for socket brazing. Straight sections of factory insulated pipe shall be 20-foot in length and shall have 6” of exposed pipe at each end for field joint fabrication. Field joining of piping shall utilize approved methods of silver soldering or brazing with alloys melting at or above 1100°F; 50-50 tin-lead solder is not acceptable.

2.2 Insulation shall be polyurethane foam either spray applied or injected with one shot into the annular space between carrier pipe and jacket. Insulation shall be rigid, 90% minimum closed cell polyurethane with a minimum 2.0 lbs per cubic foot density, compressive strength of 30 psi @ 75°F, and coefficient of thermal conductivity (K-Factor) of not higher than 0.16 @ 75°F per ASTM C-518. Maximum operating temperature shall not exceed 250°F. Insulation thickness shall be specified by calling out appropriate carrier pipe and jacket size combinations as listed on drawing CUSG 6.103 or 6.104.

2.3 Jacketing material shall be either extruded white polyvinyl chloride, consisting of clean, virgin NSF approved Class 12454-B PVC compound, conforming to ASTM D-1784, Type 1, Grade 1 or high density polyethylene (HDPE). PVC jacket shall have a wall thickness in mils equal to ten times the nominal jacket diameter and shall not be less than 60 mils. HDPE shall have a minimum wall thickness of 100 mils for jacket sizes less than or equal to 12”, 125 mils for jacket sizes larger than 12” to 24”, and 150 mils for jacket sizes larger than 24”. No FRP, HDUP, or tape jacket allowed.

2.4 Straight run joints are insulated using urethane foam to the thickness specified, jacketed with either an HDPE or PVC sleeve and sealed with pressure sensitive, polyethylene backed, rubberized bitumen adhesive tape, 30 mils thick, or a heat shrink sleeve. Above ground installations shall use white, pressure sensitive PVC tape.

2.5 Fittings are Thermacor SC (standard components) factory pre-fabricated and pre-insulated with urethane to the thickness specified, jacketed with a molded fitting cover or a PVC fitting cover wrapped with polyethylene backed, pressure sensitive rubberized bitumen adhesive tape, 30 mils thick. Carrier pipe fittings shall be silver soldered or brazed with alloys melting at or above 1100°F; 50-50 tin-lead solder is not acceptable. Fittings include expansion loops, elbows, tees, reducers, and anchors. (At the Engineer’s option, system may be pre-engineered.)

2.6 Expansion/contraction compensation will be accomplished utilizing factory pre-fabricated and pre-insulated expansion elbows, Z-bends, expansion loops, and anchors specifically designed for the intended application. External expansion compensation utilizing flexible expansion pads minimum one inch thick extending on either side, both inside and outside the radius of the fittings, is used with all fittings having expansion in excess of 1/2".

(Continued)
Part 3 – Execution

3.1 Pre-fabricated systems shall be provided as SC (standard components) fittings and factory insulated straight pipe sections for field engineering per the contract drawings. (At the Engineer’s option, system may be pre-engineered with spool piece numbers marked for installation per manufacturer’s drawings.)

3.2 Underground systems shall be buried in a trench of 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 over the top of the pipe will meet H-20 highway loading.

3.3 Trench bottom shall have a minimum of 6” of sand, pea gravel, or specified backfill material, as approved by the engineer, as a cushion for the piping. All field cutting of the pipe shall be performed in accordance with the manufacturer’s installation instructions.

3.4 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.

3.5 Field service, if required by project specifications, will be provided by a certified manufacturer’s representative or company field service technician. The technician will be available at the job to check unloading, storing, and handling of pipe, joint installation, pressure testing, and backfilling techniques. This service will be added into the cost as part of the project technical services required by the pre-insulated pipe manufacturer.
Carrier Pipe:
- Type K, L, or M Hard Copper (ASTM B-88)
  \[d \geq 3" - 9" \text{ Cut Back}\]
  \[d \leq 2" - 6" \text{ Cut Back}\]

Jacketing Material:
Polyvinyl Chloride (PVC)

Insulation:
Polyurethane Foam

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<th>Pipe Size</th>
<th>Jacket Size</th>
<th>Standard Length</th>
<th>Insulation Thickness</th>
<th>External Diameter</th>
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* Other sizes are available
Carrier Pipe:
- Type K, L, or M Hard Copper (ASTM B-88)
  - $d > 3\,\text{"} - 9\,\text{"}$ Cut Back
  - $d \leq 2\,\text{"} - 6\,\text{"}$ Cut Back

Jacketing Material:
High Density Polyethylene (HDPE)

Insulation:
Polyurethane Foam

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* Other pipe and jacket combinations are available.
** Insulation thickness is calculated using minimum wall thickness. Actual wall thickness may be greater than stated, thereby minimally decreasing actual foam thickness.
HEAT LOSS FOR 1” OF POLYURETHANE FOAM*

- Burial depth: 36”
- Soil conductivity: 12 (Btu/h.ft.°F/ft)
- Soil temperature: 50°F

HEAT LOSS FOR 2” OF POLYURETHANE FOAM*

- Burial depth: 36”
- Soil conductivity: 12 (Btu/h.ft.°F/ft)
- Soil temperature: 50°F

* Values are calculated using 3E Plus in accordance with ASTM C680 and are subject to the terms and limitations stated in the software. Actual heat loss may vary.
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 the 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.

FIELD JOINING METHODS
K, L, or M copper piping and fittings shall be joined in the field using approved methods of silver soldering or brazing alloys melting at or above 1100°F; 50-50 tin-lead solder is not acceptable.

FIELD ALTERATIONS
Pipe will be cut in the field, based on the appropriate field measurements for fabrication of loops, fittings, and/or making manhole or wall entries unless the system is pre-engineered with piece mark sections and/or with pre-fabricated/pre-insulated fittings. If special short pieces are required, measure distance needed for field alteration and cut through unit with saw. Using factory insulated pipe as guide, cut back insulation and bevel pipe (simultaneously removing burrs, cuts, nicks, and scratches). Apply end seal to the clean, dry, exposed insulation surface, if required.

HYDROSTATIC TESTING
Anchor blocks shall be poured and cured, prior to testing. Bleed all air from lines to eliminate possible incorrect readings. 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 fittings, valves, and couplings at this time. Appropriate safety precautions shall be taken to guard against possible injury to personnel in the event of a failure.

FIELD JOINT & FITTING INSULATION
See Drawings furnished with job material.

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 jacket. Jacket 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 pyramidied (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.
Pre-insulated Copper O-Ring Piping Systems suitable for Heating Water, Domestic Hot Water, Chilled Water, Condensate Return, Process Fluids, and Cryogenic services.

Part 1 – General

1.1 Pre-insulated Piping - Furnish a complete system of factory pre-insulated copper piping for the specified service. All pre-insulated pipe, fittings, insulating materials, and technical support shall be provided by the Pre-insulated Piping System manufacturer.

1.2 The system shall be COPPER-THERM O-Ring manufactured by Thermacor Process Inc. of Fort Worth, Texas.

Part 2 – Products

2.1 Carrier pipe shall be Type K Copper tube, conforming to ASTM B-88. (At the Engineer’s option, Type L or Type M is acceptable). All copper piping shall have ends cut square for socket brazing. Straight sections of factory insulated pipe shall be 20-foot in length and shall have 2” of exposed pipe at each end for field joint assembly, or 6” for brazed connection.

2.2 Insulation shall be polyurethane foam either spray applied or injected with one shot into the annular space between carrier pipe and jacket. Insulation shall be rigid, 90% minimum closed cell polyurethane with a minimum 2.0 lbs per cubic foot density, compressive strength of 30 psi @ 75°F, and coefficient of thermal conductivity (K-Factor) of not higher than 0.16 @ 75°F per ASTM C-518. Maximum operating temperature shall not exceed 250°F. Insulation thickness shall be specified by calling out appropriate carrier pipe and jacket size combinations as listed on drawing COSG 6.303 or 6.304.

2.3 Jacketing material shall be either extruded white polyvinyl chloride, consisting of clean, virgin NSF approved Class 12454-B PVC compound, conforming to ASTM D-1784, Type 1, Grade 1 or high density polyethylene (HDPE). PVC jacket shall have a wall thickness in mils equal to ten times the nominal jacket diameter and shall not be less than 60 mils. HDPE shall have a minimum wall thickness of 100 mils for jacket sizes less than or equal to 12”, 125 mils for jacket sizes larger than 12” to 20”, and 150 mils for jacket sizes larger than 24”. No FRP, HDUP, or tape jacket allowed.

2.4 Straight run joints are not insulated to allow for expansion and contraction of the gasketed joint. At the Engineer’s option, straight field joints may be jacketed with either an HDPE or PVC sleeve and sealed with pressure sensitive, polyethylene backed, rubberized bitumen adhesive tape, 30 mils thick or heat shrink wrap to prevent the ingestion of moisture or debris.

2.5 Fittings shall be cast bronze or wrought copper. Carrier pipe fittings shall be silver soldered or brazed with alloys melting at or above 1100°F; 50-50 tin-lead solder is not acceptable. Fittings are not insulated and are poured in concrete thrust blocks at all changes on direction. Thrust block design and sizing is the responsibility of the design engineer.

2.6 Expansion/contraction compensation will be accomplished utilizing O-ring couplings to join straight pipe sections. The couplings shall consist of a machined coupling housing two EPDM sealing rings, and at the Engineer’s option, jacketed with either an HDPE or PVC sleeve and sealed with polyethylene backed, pressure sensitive bituminous rubber tape, 30 mils thick. Couplings are required for distances between fittings of five feet or greater.

(Continued)
Part 3 – Execution

3.1 Underground systems shall be buried in a trench of 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 over the top of the pipe will meet H-20 highway loading.

3.2 Trench bottom shall have a minimum of 6” of sand, pea gravel, or specified backfill material, as approved by the engineer, as a cushion for the piping. All field cutting of the pipe shall be performed in accordance with the manufacturer’s installation instructions.

3.3 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.

3.4 Field service, if required by project specifications, will be provided by a certified manufacturer’s representative or company field service technician. The technician will be available at the job to check unloading, storing, and handling of pipe, joint installation, pressure testing, and backfilling techniques. This service will be added into the cost as part of the project technical services required by the pre-insulated pipe manufacturer.
**Carrier Pipe:**
- Type K, L, or M Hard Copper (ASTM B-88)
  - $d \geq 3\" - 9\"$ Cut Back
  - $d \leq 2\" - 6\"$ Cut Back

**Jacketing Material:**
Polyvinyl Chloride (PVC)

**Insulation:**
Polyurethane Foam

### Pipe and Jacket Specifications

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>Jacket Size</th>
<th>Standard Length $L$</th>
<th>Insulation Thickness $t$</th>
<th>External Diameter $D$</th>
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* Other sizes are available
Carrier Pipe:
- Type K, L, or M Hard Copper (ASTM B-88)
  \( d \geq 3" \) - 9" Cut Back
  \( d \leq 2" \) - 6" Cut Back

Jacketing Material:
High Density Polyethylene (HDPE)

Insulation:
Polyurethane Foam

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<th>Insulation Thickness</th>
<th>External Diameter</th>
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<td>20'</td>
<td>1.18&quot;</td>
<td>6.68&quot;</td>
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</table>

* Other pipe and jacket combinations are available.
** Insulation thickness is calculated using minimum wall thickness. Actual wall thickness may be greater than stated, thereby minimally decreasing actual foam thickness.
GENERAL 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 the 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.

FIELD JOINING METHODS
Pipe should be laid straight and level. Installation that results in cocking of coupling or pinching of “o-ring” is unacceptable. Distance without a coupling between thrust blocked fittings SHALL NOT exceed 5’.

1. Inspect carrier pipe ends for proper bevel. Any burrs or scratches should be touched up with up with emery cloth (180 grit or finer) or fine tooth file. Slide sleeve cover over one end of jacket.

2. Rub a thin layer of lubricant over carrier pipe end and “o-ring”. Use silicone-based lubricant supplied by Thermacor. Do NOT use petroleum-based lubricant.

3. Insert pipe ends into brass coupling.** Take care not to damage pipe ends during installation. Partially backfill (see TESTING) and pressure test as per specifications.

4. Insulate brass coupling and slide sleeve over coupling so that there is equal overlap.

5. Wrap tape around each end of sleeve with overlap at the top. Rub out any tape wrinkles with knife hilt.

**Coupling must be cleaned before assembly. Be sure “o-ring” groove is clean and that the “o-ring” is seated properly. Lubricate smooth pipe spigot with Thermacor provided lubricant. Insert pipe spigot carefully to prevent cutting or rolling of “o-ring”. Coupling should fit tightly against factory insulation.
FIELD ALTERATIONS
Pipe will be cut in the field, based on the appropriate field measurements for fittings and/or making manhole or wall entries unless the system is pre-engineered with piece mark sections. If special short pieces are required, measure distance needed for field alteration and cut through unit with saw. Using factory insulated pipe as guide, cut back insulation and bevel pipe (simultaneously removing burrs, cuts, nicks, and scratches). Apply end seals to the clean, dry, exposed insulation surface. Where fittings are required, they must be brazed, using approved brazing methods with appropriate copper or brass fittings.

BACKFILL INITIAL
After pipe is installed, specified backfill shall be tamped around the conduit in 6” layers to insure proper compaction. One foot on either side of each joint and fitting shall be left bare for visual inspection during testing.

TESTING
Sufficient backfill must be placed on pipe, and anchor blocks poured and cured, prior to testing. Bleed all air from lines to eliminate possible incorrect readings. 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 fittings, valves, and couplings at this time. Appropriate safety precautions shall be taken to guard against possible injury to personnel in the event of a failure.

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 jacket. Jacket should have a minimum of 2’ cover.

WHEELED OR TRACKED VEHICLES SHALL NOT BE USED FOR TAMPPING!

THRUST BLOCK INSTALLATION
The engineer who designs the system has the responsibility for designing and sizing the thrust blocks. A knowledge of site soil conditions is essential for proper design. Thermacor will not accept or assume responsibility for thrust blocks, and intends to provide basic data only.

WHY THRUST BLOCKS?
A Copper-Therm system must include thrust blocks to prevent the O-ring joints from separating under pressure. To prevent separation, thrust blocks must be located at:
1. All major changes in direction; i.e., tees and elbows (both horizontal and vertical).
2. All changes in size.
3. All terminal ends.
4. All Valves, so as to support the body weight and prevent excessive torque on pipe connections.
5. IMPORTANT: Any connecting brazed copper tube must be anchored at the point of connection to the Copper-Therm tube to prevent excessive stresses from being transferred to the brass couplings.

NOTE: Thrust blocks are required with gasket pipe and solvent weld fittings.
INSTALLATION
As thrust blocks are an essential part of the system, they should be poured before hydrostatic testing. Temporary thrust blocking may be used with extreme caution if absolutely necessary. The system must be retested after the permanent thrust blocks are poured and cured to verify that the thrust blocks will resist the thrust.

DESIGN
The design of the thrust blocks depend on test pressure, size, number of pipes, soil conditions, and types of fittings involved. Three conditions must be met for the thrust blocks to function properly.

1. The bearing area must be adequate to resist the pressure force.
2. The bearing surface must rest directly against undisturbed soil.
3. The face of the block bearing surface in the soil must be perpendicular to the resultant direction of thrust.

If the thrust blocks have not been designed by the engineer, they must be sized by the following procedure:

**Example:** Design a thrust block to resist the horizontal thrust of two 4" chilled water lines (supply and return) at a 90° elbow. The test pressure is 150 psi and the soil is soft clay.

**TABLE 1**

<table>
<thead>
<tr>
<th>PIPE SIZE</th>
<th>TEE</th>
<th>90°</th>
<th>45°</th>
</tr>
</thead>
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<tr>
<td>½&quot;</td>
<td>40</td>
<td>50</td>
<td>30</td>
</tr>
<tr>
<td>¾&quot;</td>
<td>70</td>
<td>90</td>
<td>50</td>
</tr>
<tr>
<td>1&quot;</td>
<td>100</td>
<td>150</td>
<td>80</td>
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<td>120</td>
</tr>
<tr>
<td>1½&quot;</td>
<td>210</td>
<td>300</td>
<td>160</td>
</tr>
<tr>
<td>2&quot;</td>
<td>360</td>
<td>510</td>
<td>280</td>
</tr>
<tr>
<td>2½&quot;</td>
<td>550</td>
<td>770</td>
<td>420</td>
</tr>
<tr>
<td>3&quot;</td>
<td>770</td>
<td>1,090</td>
<td>590</td>
</tr>
<tr>
<td>4&quot;</td>
<td>1,340</td>
<td>1,890</td>
<td>1,030</td>
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**TABLE 2**

<table>
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<tr>
<th>SOIL</th>
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<tr>
<td>Muck, Peat</td>
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<tr>
<td>Soft Clay</td>
<td>1,000</td>
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<tr>
<td>Sand</td>
<td>2,000</td>
</tr>
<tr>
<td>Sand &amp; Gravel</td>
<td>3,000</td>
</tr>
<tr>
<td>Sand &amp; Gravel cemented with clay</td>
<td>4,000</td>
</tr>
<tr>
<td>Hard Shale</td>
<td>10,000</td>
</tr>
</tbody>
</table>

**STEP 1**

**FINDING THRUST:**
From Table 1, the resultant thrust of a 4" x 90° elbow is 1890 lbs. at 100 psi.

At 150 psi, the thrust is:

\[
\text{1890 lbs. x } \frac{150 \text{ psi}}{100 \text{ psi}} = 2835 \text{ lbs. elbow}
\]

2835 lbs. x 2 = 5670 lbs. thrust for two elbows.

**STEP 2**

**FINDING BEARING AREA OF BLOCK:**
From Table 2, soft clay has a bearing strength of 1000 lbs./sq. ft. therefore:

\[
\frac{5670 \text{ lbs.}}{1000 \text{ lbs./sq. ft.}} = 5.67 \text{ sq. ft. bearing area required}
\]

or a block face of 3’ x 2’ (6 sq. ft.) is adequate.
**THRUST BLOCK TYPES**

Examples of thrust blocks for normal fittings are illustrated. For vertical risers the trench bottom must be undercut and the entire trench bottom should be covered with concrete. The thrust blocks must bear against firm, stable soil.

![Figure I](image1)

**CONSTRUCTION**

Thrust blocks are made of concrete.

An acceptable concrete is 1 part Portland cement, 2 parts washed sand, and 3 parts washed gravel with enough water for a relatively dry mix. The dry mix is easier to shape and offers higher strength.

The concrete should be worked thoroughly around the elbows for maximum surface contact. Make sure the entire area between the fittings and the trench wall is filled with concrete and free of voids.

The blocks should be shaped with the designed bearing area against the trench wall. Smaller blocks should be shaped by hand. Larger blocks require simple forms.

The trench should be undercut under the pipes at least six inches to give added thrust resistance and to provide adequate concrete around the fittings. Six inches of concrete should be over the top of the pipe.

The center of the thrust blocks bearing surface should coincide with the horizontal center line of the pipes. (See figures I and II).

![Figure II](image2)

**UNSTABLE SOIL**

If the soil is unstable in the area of a thrust block, it will be necessary for the engineer to make special provisions. This is considered a civil engineering matter and a project civil engineer should be consulted for professional advice.

**VALVE BLOCKS**

Blocks must be poured beneath valves with sufficient steel for valve connections. This supports the valve weight and prevents any torque or twisting action caused by opening and closing the valve.
**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.
PIPING RISER DETAIL

ELEVATION

CARRIER PIPE

PIPE SLEEVE & SEAL
(BY INSTALLING CONTR.)

ANCHOR PLATE

HDPE JACKET

CONCRETE ANCHOR BLOCK (BY OTHERS)

SCALE: NONE

BUILDING RISER DETAIL

ELEVATION

CARRIER PIPE

FLOOR SLEEVE AND SEAL
(BY INSTALLING CONTR.)

ANCHOR PLATE

HDPE JACKET

CONCRETE ANCHOR BLOCK (BY OTHERS)

FOUNDATION

SCALE: NONE

ANCHOR BLOCK SHALL BE LOCATED MINIMUM OF 3'-0" FROM WALL

FIN. FLR.

CARRIER PIPE

INSULATION

HDPE JACKET

OUTSIDE FACE OF WALL

GRADE

FIN. FLR.

CARRIER PIPE

FLOOR SLEEVE AND SEAL
(BY INSTALLING CONTRACTOR)

OUTSIDE FACE OF WALL

GRADE

FIN. FLR.

CARRIER PIPE

FLOOR SLEEVE AND SEAL
(BY INSTALLING CONTRACTOR)

OUTSIDE FACE OF WALL

GRADE

FIN. FLR.
OUTSIDE FACE OF WALL
WALL SLEEVE AND SEAL (BY INSTALLING CONTR.)
CARRIER PIPE
INSULATION
HDPE JACKET

WALL PENETRATION DETAIL
SCALE: NONE
INSTALLATION INSTRUCTIONS: EXPANSION BOLSTERS (HDPE JACKET)

PROCEDURE

1. EXPANSION BOLSTER MATERIAL IS SUPPLIED IN PRECUT PADS: 41" WIDE x 1" THICK x PRECUT LENGTH.

2. USE APPROPRIATE PADS FOR EACH ELBOW OR EXPANSION LOOP AS PER THE INSTALLATION INSTRUCTIONS.

3. WRAP BOLSTER AROUND JACKET HOLDING IT IN PLACE WITH BEDDING SAND. BE CERTAIN THAT THE BOLSTER FITS SNUG AROUND JACKET.

4. BUILD THE PADS TO THE REQUIRED LENGTH AND NUMBER OF LAYERS BY BUTTING PADS IN LONG SEGMENTS AND LAYERING AS REQUIRED BY THE DRAWING.

EXPANSION BOLSTER DETAIL
SCALE: NONE

INSTALLATION INSTRUCTIONS: EXPANSION BOLSTERS (PVC JACKET)

PROCEDURE

1. EXPANSION BOLSTER MATERIAL IS SUPPLIED IN PRECUT PADS: 41" WIDE x 1" THICK x PRECUT LENGTH.

2. USE APPROPRIATE PADS FOR EACH ELBOW OR EXPANSION LOOP AS PER THE INSTALLATION INSTRUCTIONS.

3. WRAP BOLSTER AROUND JACKET HOLDING IT IN PLACE WITH BEDDING SAND. BE CERTAIN THAT THE BOLSTER FITS SNUG AROUND JACKET.

4. BUILD THE PADS TO THE REQUIRED LENGTH AND NUMBER OF LAYERS BY BUTTING PADS IN LONG SEGMENTS AND LAYERING AS REQUIRED BY THE DRAWING.

EXPANSION BOLSTER DETAIL
SCALE: NONE
EXPANSION LOOP DETAIL

Scale: None

BOLSTER PAD
(TYP/ WHERE REQUIRED)

NOTE:
FOR 2 OR 3 LAYERS
EXTEND PADS ONLY
HALF WAY UP "H"
AS SHOWN.

NOTE:
FOR 1 PAD LAYER
EXTEND PADS OVER
ENTIRE LOOP LENGTH

2 PAD SECTION VIEW

1 PAD SECTION VIEW
COPPER-ANCHOR SPECIFICATIONS

1. BRASS ANCHOR PLATE AND WELDED RINGS FURNISHED BY THERMACOR. ANCHOR PLATE SHALL ON ALL SIZES SHALL BE 1/4" THICK. ANCHOR PLATE SHALL EXTEND 2-1/2" BEYOND THE CASING DIAMETER ON ALL SIDES. ANCHOR PLATE SHALL BE CORROSION COATED WITH A HIGH TEMPERATURE MASTIC MATERIAL AFTER WATERSHED RINGS HAVE BEEN SEALED TO CASING BY HEAT SHRINK TAPE.

2. ANCHOR ASSEMBLY SHALL BE POURED IN A CONCRETE BLOCK BY THE CONTRACTOR IN THE FIELD. GENERALLY, THE ANCHOR BLOCK EXTENDS 12" IN ALL DIRECTIONS FROM THE ANCHOR AND RESTS ON UNDISTURBED EARTH. THE JOB SITE CONDITIONS SHALL BE THE FINAL DETERMINING FACTOR FOR ANCHOR BLOCK SIZING.

PIPING ANCHOR DETAIL

SCALE: NONE
4-PIPE TRENCH SECTION

SCALE: NONE