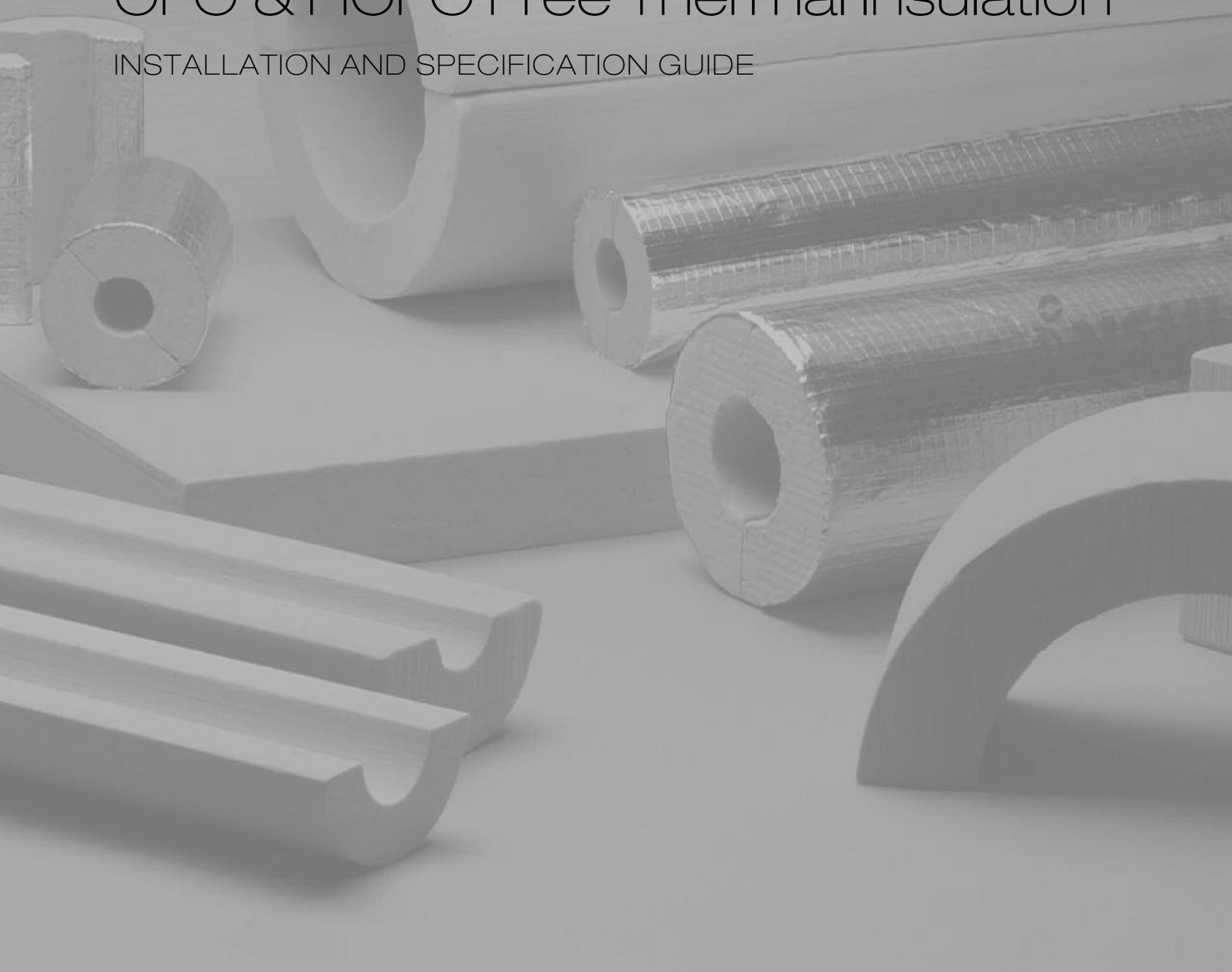




Resolco Insul-Phen

CFC & HCFC Free Thermal Insulation

INSTALLATION AND SPECIFICATION GUIDE



RESOLCO INC.

Specification: Insul-Phen closed cell CFC & HCFC free phenolic foam
Pipe & Equipment Insulation – Below Ambient

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1.0 SCOPE

1.1 This guide covers Resolco's recommended insulation materials, fabrication, installation and application of rigid, Insul-Phen CFC & HCFC free thermal insulation for above ground piping and equipment to be used in Cold Service.

2.0 INSTALLATION SUBCONTRACTOR RESPONSIBILITY

2.1 Any conflict between the requirements of this specification and related codes, standards, data sheets, drawings, attached commercial contract, etc., shall be referred to Owner for clarification/resolution.

2.2 Subcontractor shall not make assumptions to replace information not furnished by owner. Subcontractor is required to obtain necessary information from Owner or other reliable sources. Any and all claims arising from lack of knowledge of required information will be rejected by Owner.

2.3 Subcontractor shall list and fully describe all deviations from this specification and the related codes.

2.4 Subcontractor shall field verify all (existing) dimensions and conditions shown on Owner drawings. The lines and equipment to be insulated are identified on insulation line list and equipment insulation list. This document identifies insulation type and thickness required for each item.

2.5 Subcontractor shall follow manufacturer's recommendation in safe handling of insulation materials and use of required safety equipment.

3.0 DESIGN

3.1 Definitions

3.1.1 The term "Cold Service" shall normally apply to below ambient operating temperatures. It does not relate to cryogenic applications.

3.1.1.1 It includes anti-sweat which applies to operating temperatures below the ambient temperatures that can cause condensation.

3.1.2 The term "cylindrical surfaces" applies to equipment such as vessel shells, heat exchangers, etc., as well as to piping.

3.1.3 The abbreviation OD when used without a description applies to outside diameter of the insulation and/or finish covering.

3.1.4 The term "Vapor Barrier" refers to a material which retards the passage of water vapor.

3.1.5 The other terms used in the specification shall be in accordance with ASTM C168 "Standard Terminology Relating to Thermal Insulating Materials."

3.2 Specific Requirements.

3.2.1 Insulation application shall not proceed until after the following have been completed: All required hydrostatic and pneumatic pressure testing. Application of required substrate protective coating systems, including touch-up of previously applied coatings. Installation of tracing systems.

3.2.1.1 In cases where it is necessary to insulate before completing the above work, prior written approval of the Owner or his designated representative must be obtained.

3.2.2 Only proven stress-corrosion safe insulation material meeting the requirements of ASTM 795 "Wicking-Type Thermal Insulation for Use Over Austenitic Stainless Steel" shall not be applied over stainless steel.

3.2.2.1 Insulation materials containing greater than 150 ppm leachable chlorides per ASTM C871 shall not be used on austenitic stainless steel.

3.2.3 Asbestos containing materials shall not be used.

3.2.4 All insulation and finish shall be applied using the best modern practice and finished work shall display a neat appearance.

3.3 Extent of Insulation

3.3.1 General

3.3.1.1 The Owner's Equipment Insulation Schedule lists equipment, i.e., vessels, heat exchangers, machinery, etc., and the Owner's Piping Line List lists lines which are to be insulated in accordance with the specification.

3.3.1.2 The normal operating temperature, required thickness of insulation and insulation requirement code are all pertinent information contained in the above documents.

3.3.1.3 If insulation is unavailable in thickness shown, the next larger thickness commercially available shall be applied.

3.3.1.4 All valves, fittings, vessel drains, and flanges on cold equipment and piping shall be fully insulated.

3.3.1.5 Attachment to cold service vessels such as instrument bridges, gauge glass etc. shall be insulated.

3.3.1.6 Skid mounted piping and equipment shall be insulated per this specification and unless otherwise specified, in applicable purchase documents, shall be insulated by the insulation subcontractor.

3.3.2 Insulation Thickness

3.3.2.1 The insulation thickness tables are designed to minimize condensation on the outer surface at various ambient conditions as shown on each table. The insulation thickness shall be in accordance with the applicable thickness tables in Attachment I.

3.3.2.2 The maximum thickness of single layer insulation shall be 2.5 inches.

3.3.2.3 Insulation thickness shall be based on normal operating temperatures and shall not be based on design temperatures.

4.0 ADDITIONAL REQUIREMENTS

4.1 Welding

4.1.1 Field welding, such as welding of studs or nuts for insulation, on any piece of equipment or pipeline is prohibited without prior written approval of the Owner or his designated representative.

4.2 Surface Preparation and Painting.

4.2.1 Before application of insulation, all surfaces shall be cleaned to remove loose rust and paint, dirt, grease or other foreign matter.

4.2.2 Stainless Steel items shall be used with stainless steel brushes only.

4.2.3 All carbon steel piping operating below 25°F and stainless steel piping operating between 25°F and 250°F shall be painted with two coats of poly-amine cured epoxy or epoxy phenolic. Manufacturer's recommendation shall be followed for surface preparation of the steel.

4.2.4 Insulation shall not be installed until after field welds and other surfaces which require painting but have not been leak tested and painted.

5.0 MATERIAL

5.1 General

5.1.1 All materials shall be new; materials such as insulation blocks, molded pipe covering, mastics, adhesives and weatherproofing shall be delivered to jobsite in factory sealed cartons, containers, and/or packages.

5.1.2 Items specified by their properties represent minimum quality requirements. Alternates or deviations must be submitted to the Owner for approval.

5.1.3 The operating temperature must be within the temperature limits for the selected insulation material and/or accessories, as recommended by the Manufacturer.

5.1.3.1 Unless otherwise specified, Manufacturer's recommendation shall be adhered to in application and handling including all safety requirements for the materials.

5.2 Storage and Handling

5.2.1 Storage of insulation and accessory materials must provide adequate protection from damage due to moisture and temperature. All flammable materials must be stored away from ignition sources, such as welding operations.

5.2.2 Storage temperature for mastics, adhesives and sealers shall be within temperature ranges required by the material manufacturer. All materials which are improperly stored and exposed to temperatures outside the recommended temperature ranges should be removed from the site and replaced with new material.

5.2.3 All insulation material shall be kept dry and should be kept off the ground and provided with adequate protection against moisture and inadequate drainage. Wet or damaged material should be replaced with new material.

5.3 Acceptable Materials

5.3.1 Insulation

5.3.1.1 All insulation material for cold service shall be Resolco Insul-Phen CFC & HCFC free phenolic foam insulation as manufactured by Resolco Inc. in accordance with ASTM C-1126-00 Phenolic Foam Thermal Insulation or approved equal. Insulation shall be fabricated in required shapes from bun stock by Resolco Inc. approved fabricators in accordance with ASTM C 450 "Prefabrication and Field Fabrication of Thermal Insulating Fitting Covers for NPS Piping, Vessel Lagging, and Dished Head Segments" and C 585 "Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System)".

5.3.1.2 Insul-Phen insulation shall have the following minimum properties.

100% CFC and HCFC free

Density	2.5lb/ft ³
Temperature range	-290°F to +250°F
Closed cell content	92%
Compressive Strength	29lb/in ²
Thermal Conductivity (75°Mean)	0.18 BTU-in/hft ² °F, max
Fire Rating	ASTM E84 25/50 on plain and faced product up to 3 inches thick

5.3.1.3 Pipe covering and curved shapes shall be fabricated in accordance with ASTM C 450 and C 585 by an approved Resolco fabricator with minimum number of through joints.

5.3.1.3.1 Where multilayer pipe covering is required, each layer shall be minimum 1 inch thick.

5.3.1.4 The fittings such as valves, flanges, 900 and 450 elbows, and tees shall be two piece prefabricated flycut or routed for 9 5/8 inches outside diameter and smaller and shall be two piece mitered for 10 3/4 inches outside diameter and/or 4 inches IPS or larger fabricated by approved Resolco Inc. fabricator in accordance with ASTM C-450 and C-585. Larger OD valves and flanges may be fabricated as oversized and cavities may be filled with tightly packed loose Fiberglass.

5.3.1.5 Flat boards shall be fabricated by approved Resolco fabricators in accordance with ASTM C450.

5.3.1.6 Vessel heads segments shall be curved or flat insert type fabricated by an approved Resolco fabricator per ASTM C450.

5.3.1.7 Curved segments shall be fabricated per ASTM C450 by approved Resolco fabricator to fit the contour of surface in equal pieces to go around vessel with minimum number of through joints. Cutting in the field shall be minimized.

5.3.2 Joint Sealer

5.3.2.1 Joint sealer for sealing all joints of insulation and PVC Slip Joints shall be vapor barrier type, moisture and water resistant, 97% solids by weight, non hardening, flexible with the service temperature range from -5°F to +200°F, Daxcel 161D, Fosters 30-45, Childers CP-76 or approved equal.

5.3.3 Vapor Barrier Mastic

5.3.3.1 The vapor barrier used to seal all fittings, valves, heads and equipment insulation prior to application of outer covering shall be water-based, compatible with the insulation material and remain flexible at the environmental temperature. Vimasco Vapor-Block, Fosters 30-80, #749 or Childers' Chil-Perm #CP-35, or approved equal. The material shall have the following minimum requirements:

Wet Flammability:	No flash to boiling
Water Vapor Permeance:	Maximum 0.08 US perms
Average Non Volatile:	58% by volume
Service Temperature Range:	-20°F to +190°F
Application:	Two Coats

5.3.4 Reinforcing Fabric for Vapor Barrier Mastic

5.3.4.1 The membrane for reinforcement of vapor retardant mastic shall be 6 X 6 or 10 X 10 glass fiber reinforcing mesh, Chil Glas #5 made by Childers or PC-79 Fabric, 5 X 6 mesh, by Pittsburgh Corning, or approved equal.

5.3.5 ASJ Jacketing Vapor Barrier (Indoor Service)

5.3.5.1 Vapor barrier for indoor service shall be ASJ All Service Jacket as manufactured by Compac Corp or Lamtec Corp as per the Resolco ASTM E84 test reports, constructed from 0.00035 inch thick aluminum foil laminated to 30lb Kraft paper by flame retardant adhesive. The complete laminated product shall be reinforced with tri directional product and shall be reinforced with tri directional fiberglass yarn with yarn spacing of 5 per inch.

5.3.5.2 Venture 1555U factory applied zero perm jacket system should be considered in areas of high humidity or where there is a risk of mould/mildew growth.

5.3.5.3 An acceptable alternative for ASJ Jacket as a Vapor Barrier - Indoor Service - is Insulrap 30 Vapor Barrier (Paragraph 5.3.6). I-30 should be considered in heavy mechanical abuse or high pressure wash down areas.

5.3.6 Insulrap 30 Vapor Barrier, Alumaguard 60, VentureClad or Equivalent (Outdoor Service)

5.3.6.1 The vapor barrier used to seal any plain pipe insulation for outdoor service prior to application of cladding shall be Polyguard Insulrap 30, a rubberized bitumen adhesive laminated to a 4 mil polyethylene film. Total thickness shall be 30 mils (0.76mm), permeance: 0.015 max, or approved equal.

5.3.6.2 Polyguard 650 LT Liquid Adhesive is required at application temperatures below 50°F or with dusty insulation surfaces. As an alternative to the use of Liquid Adhesive, a light pass may be made with a heat gun over the face of the adhesive mass, just prior to application.

5.3.6.3 Insulrap 30 is an acceptable alternative for equipment/vessels from tangent to tangent to reinforced vapor barrier mastic stated in paragraphs 5.3.3.1 and 5.3.6.1 above. Heads must be sealed with the mastic and fabric. VentureClad 1577CW self adhesive zero perm vapor barrier/weatherproof jacket may also be used.

5.3.6.4 Peel & Seal, self-stick, aluminum embossed finish; by Polyguard Products may be considered as an alternative, outdoors. It eliminates the need for metal cladding, however, it is recommended for installation above +60°F and in no case, below +40°F.

5.3.6.5 All outdoor jacket systems shall be banded using 1/2 inch .020 aluminum banding with wing seals at 12 inch centers.

5.3.7 Fabrication Adhesive

5.3.7.1 Fabrication adhesive for fabrication of Resolco Insul-Phen shall be H.B. Fuller's SC-1454, a contact adhesive or H.B. Fuller's HL-2278, hot melt adhesive, or approved equal.

5.3.8 Pipe and Hanger Supports

5.3.8.1 Pipe support load bearing insulation shall be fabricated by a Resolco approved fabricator from Resolco CFC & HCFC free heavy density Insul-Phen in 3.75lb/ft³, 5lb/ft³ or 7.5lb/ft³ density in accordance with the table in attachment I. The upper 1800 section of the support can be fabricated from standard 2.5lb/ft³ density Insul-Phen and 2.5lb/ft³ can be used at the support point up to certain pipe diameters (contact your local Resolco fabricator or technical rep) with a 12 inch long saddle.

5.3.8.2 The pipe support insulation shall be supported by a saddle. Stainless steel saddles shall be used where edible food or open product is exposed. For all other applications it is acceptable to use painted, galvanized or carbon steel.

5.3.9 PVC Cladding (for Indoor Use Only)

5.3.9.1 The jacketing to provide protection to insulation and vapor barrier shall be 0.030 inch thick Ceel-Co 300 Series UVR PVC Jacketing or Proto LoSmoke 25/50 UVR PVC. Jacketing shall be tough all purpose, UV resistant capable of enduring frequent washing with hot water or other cleaning agents. All joints of PVC jacket shall be solvent welded with Ceeltite or Proto PVC Adhesive. As an alternative a higher density (3.75lb) phenolic along with 0.020 PVC jacket can be used.

5.3.9.1.1 Ceel-Co 300 Series or Proto LoSmoke UVR PVC Jacket .040 inch, or a double wrap of .030 inch thick shall be used where protection from mechanical abuse or high pressure washing is required.

5.3.9.1.2 NOTE: A stainless steel diamond-mesh expanded metal lath cage shall be installed with spacers a minimum of 1 inch away from and over top of the pipe and insulation sealed with PVC Jacket in areas where it is possible for knives, etc. to damage jacket system.

5.3.9.1.3 In food preparation/hygenic areas cladding must withstand scalding water washdowns; (standard PVC is rated for service temperature of +140°F to +160°F) and in general wherever a higher temperature material is required: Proto EXOD (R), a CPVC material, light grey and is rated to +225°F may be considered. EXOD (R) has increased impact and chemical resistance. NOTE: EXOD (R) shall be ordered "cut and recurled" for pipe insulation jacket.

5.3.9.2 Aluminum Cladding (for Outdoor Use Only).

The metal cladding weather barrier to provide protection from weather, mechanical wear or other damage shall be aluminum alloys 3003, 1100 or 3105 meeting ASTM B209 with H-14 temper, 0.016 inch thick with Polysurlyn moisture barrier on the back side. The metal jacketing shall be RPR Insul-mate, Childers Products or approved equal.

5.3.9.2.1 .016 inch thick aluminum is acceptable for all piping except where excessive abuse is anticipated; use .024 inch thick. .024 inch thick shall be used on all equipment as minimum, however .032 inch thick is preferred.

5.3.9.2.2 The metal cladding where frequent washing is anticipated, shall be smooth for all piping and horizontal equipment and 1 1/4 inches corrugated for all vertical equipment above 30 inch insulation OD. Stucco embossed finish may be used for other areas.

5.3.9.2.3 Rolls of pipe jacketing: Childers Corrolon or RPR Rib-Cor, 3/16 inch corrugated in the circumferential direction where foot traffic is likely and increased strength of jacket is desired, may be considered.

5.3.10 Fastening Accessories (Tape, Strapping etc.)

5.3.10.1 Tape for fastening plain pipe covering insulation shall be 3/4 inch Fiberglass reinforced strapping tape made by National Tape Co. or approved equal.

5.3.10.2 Stainless steel type T304/T316 or .020 aluminum strapping for fastening aluminum jacketing outdoors and outer layer of vessel and/or large diameter (above 16 inches O.D.) pipe insulation shall be 1/2 inch X .020 inch thick with stainless steel or aluminum wing seals made by RPR Products, Childers Products or approved equal. RPR no. 7 or breather spring 4 inches long made from stainless steel type T304 shall be used for securing large diameter vessels metal jacketing.

5.3.10.3 Polypropylene 1/2 inch wide, 0.50 inch thick banding and clips, Q-Band/Q-Clip made by Band-It Inc. shall be used for securing PVC jacketing indoors. The banding shall not be used in food processing areas where bacterial growth is anticipated. Banding may be used for temporary securement until PVC joint adhesive cures. The PVC Jacketing must be completely sealed at all joints to prevent entry of water or moisture. In non food processing areas PVC jacketing should be glued using manufacturers adhesive.

5.3.11 Inspection Plugs

5.3.11.1 When specified, NDT Inspection plugs made from EPDM and aluminum metal cap as manufactured by Parker Special Products shall be installed on pipe and equipment requiring frequent inspections. Use 1 1/2 inch NDT plug for pipe and equipment insulation jacket OD of less than 9 inches. Use 2 1/2 inches and 3 inches NDT plug for pipe and equipment between 9 inches and 24 inches insulation jacket OD. Use 5 inches NDT plug for pipe and equipment insulation jacket OD above 24 inches.

5.3.12 Expansion/Contraction Joints

5.3.12.1 Expansion/contraction joint material shall be 1lb/ft³ density fiberglass blanket.

6.0 INSTALLATION

6.1 Application of Insulation (All Services)

6.1.1 General

6.1.1.1 The design requirements of this specification are general and where it is not specific, pipe insulation, pipe fitting, flange and valve insulation and curved segments shall be fabricated by an approved Resolco fabricator in compliance with ASTM C450 and ASTM C585.

6.1.1.2 Prior to installation of insulating material, its thickness shall be verified in accordance with the operating temperature and diameter of pipe and equipment. If thickness or material do not verify, Subcontractor shall contact Owner to resolve the conflict. The Subcontractor shall not in any case establish a new thickness or select different material without written approval.

6.1.1.3 The insulation shall be protected from moisture and weather before and during application. 6.1.1.4 All insulation and surfaces to be insulated shall be dry and free from moisture prior to application of insulation and vapor barrier.

6.1.1.5 Piping with 16 inch outside diameter and less shall be insulated with 2-piece "sectional" pipe insulation (Para.5.3.1.). Above 16 inch O.D., sectional pipe covering or prefabricated curved sidewall segments (Para. 5.3.1.7) may be used.

6.1.1.6 All insulation sections shall be trimmed and tightly butted to eliminate voids, gaps or open joints. Joint sealer shall not be used to fill these imperfections. The insulation shall be fitted to achieve tight fit.

6.1.1.7 Insulation ends shall be rubbed against each other to achieve tight fit prior to application of joint sealer if required.

6.1.1.8 Application of Joint Sealer

6.1.1.8.1 A vapor sealing joint sealer (Paragraph 5.3.2.1) 1/16 inch thick shall be applied to all circumferential and longitudinal joints of outer layer in multilayer installation and to all circumferential and longitudinal joints of single layer insulation. Joint sealer shall completely fill full thickness of these joints.

6.1.1.8.2 In areas of high humidity consideration should be given to the use of joint sealer at all longitudinal and circumferential joints, indoor and outdoor.

6.1.1.8.3 Layers of insulation shall not be bonded to each other. Excessive sealer in the joints should be avoided during application. Do not feather edge.

6.1.1.9 Application of Tape and Banding

6.1.1.9.1 Insulation shall be fastened circumferentially with 3/4 inch wide tape (Paragraph 5.3.10.1) 2 inches from each end and one in the middle of pipe section and a minimum of two tapes per each section of equipment insulation. The tapes shall be pulled tight to seal all joints. Bands shall be used above 16 inches O.D. and on all curved wall segments where tapes do not close insulation joints tightly.

6.1.1.9.2 All tapes shall be taped at least 50% on itself or overlapped by 2 inches.

6.1.1.9.3 Tightening of tapes or bands shall not crush or crack the insulation. Cracked or broken insulation shall be replaced. 6.1.1.9.4 The outer layer or single layer of equipment insulation shall be fastened with the use of T-304 stainless steel 1/2 inch wide bands at 12 inch centers.

6.1.1.10 Application of Multiple Layers

6.1.1.10.1 Multiple layers shall be installed so the butt and longitudinal joints of one layer do not coincide with those of any other layer. The outer layer joints shall stagger inner layer joints by half sections. Minimum overlap shall be 18 inches.

6.1.1.10.2 Openings through the insulation shall be sealed vapor tight by applying joint sealer (Paragraph 5.3.2.1) between protrusion and insulation.

6.1.1.11 Application of Contraction Joint

6.1.1.11.1 Contraction joint for vertical piping and equipment shall be provided immediately below each insulation support ring.

6.1.1.11.2 Insulation support ring design for vertical piping. The support rings shall be installed for vertical runs over 21ft. (6.4m). The support ring shall be furnished and installed by the insulation contractor.

6.1.1.11.3 1 inch (25mm) space in each contraction joint shall be filled with 1lb/ft³ (16 kg/m³) density fiberglass blanket. Uncompacted 3 inch (75mm) thick fiberglass shall be compacted to 1 inch (25mm) thick.

6.1.1.11.4 Single layer and multilayer applications shall have an additional layer of equivalent thickness insulation installed as an outer cover over the contraction joint. Length of additional layer shall be 12 inches minimum.

6.1.1.11.5 Contraction joint in horizontal piping shall be installed in each layer of insulation. Joints shall be located midway between pipe supports and other protrusions through the insulation systems. Single layer contraction joints in horizontal piping shall have an additional layer of 12 inch long insulation collar.

6.1.1.11.6 Contraction joint spacing for horizontal and vertical lines shall be as shown in the following table:

Operating Temperature °F	Contraction Joint Spacing/LF
50 to 0	13
-1 to -50	7
-51 to -100	6

6.1.1.11.7 Vapor barriers must be maintained continuously over contraction joints by stepping up and then back down to the pipe insulation.

6.1.1.12 Application of Vapor Stops

6.1.1.12.1 The vapor stops shall be installed at all pipe supports and all changes in configuration such as elbows, flanges, valves, manways, nozzles and insulation terminations and all locations on piping and equipment requiring maintenance including instrumentation connections. Vapor stops are also required where straight pipe runs exceed 24ft between pipe supports.

6.1.1.12.2 Vapor stops shall be constructed using reinforced vapor barrier mastic (Paragraph 5.3.3.1). When the vapor stop is dry, the adjacent layer of insulation shall be installed using joint sealer (Paragraph 5.3.2.1).

6.1.1.13 Application of Insulation for Elbows, Valves and Fittings

6.1.1.13.1 Insulation material for bends and elbows shall be two piece prefabricated cover made from same insulation material and same thickness as for straight piping.

6.1.1.13.2 Insulation for fittings, valves and flanges shall be shop routed or fabricated by approved Resolco fabricator from pipe insulation in conformance with ASTM C450 and C585 (Paragraph 5.3.1.4).

6.1.1.13.3 The terminations of piping insulation at each side of flanged joint or valve shall allow sufficient clearance space for bolt removal and shall incorporate reinforced vapor stop. Voids between flange or valve body and the insulation cover shall be filled with 1lb/ft³ resilient glass fiber.

6.1.1.13.4 Insulation shall be cut back below packing glands, leaving packing glands exposed and joint between insulation and valve body at the packing gland shall be filled with the joint sealer and termination sealed with vapor barrier mastic.

6.2 Cold Insulation Pipe Support

6.2.1 Pre-insulated pipe supports (paragraph 5.3.8) for cold service shall be used for supporting pipes. Pipe support spacing shall be calculated per each system allowing for pipe weight, insulation weight, pipe content weight and appropriate safety factor. The spacing shall be calculated by a qualified piping engineer or follow the project pipe support specification.

6.2.2 High compressive strength insulation such as Resolco Insul-Phen 3.75lb/ft³, 5lb/ft³ or 7.5lb/ft³ phenolic foam (Paragraph 5.3.8.1) shall be used at the saddle supports. The bearing surface shall be calculated to withstand stresses on pipe support system. Refer to attachment I.

6.2.3 Insulation protection saddles made from stainless steel, painted or galvanized carbon steel (Paragraph 5.3.8.1) with 1800 arc shall be provided and installed at all pipe hangers and supports. The curvature of saddle shall fit the outside diameter of insulation.

6.2.4 Pipe insulation shall be fitted tight against cold shoe. Circumferential and longitudinal joints of cold shoe insulation shall be sealed with 1/16 inch thick joint sealer (paragraph 5.3.2.1).

6.2.5 Prefabricated shoe vapor barrier longitudinal lap shall be sealed using vapor barrier mastic (Paragraph 5.3.3.1). The circumferential lap shall be overlapped with vapor barrier mastic and reinforcing.

6.2.6 Insulation Subcontractor shall also maintain staggered joint construction on multilayer shoes. 6.2.7 The vapor sealed high density Insul-Phen shall be covered with vapor barrier and protective cladding of flat metal sheeting and the cold shoes shall be properly fastened upon completion of insulation work.

6.3 Vapor Barrier and Cladding (Indoor Service)

6.3.1 Application of ASJ Jacket

6.3.1.1 Fabricated insulation shall have factory applied integral All Service Jacket (ASJ) vapor barrier (paragraph 5.3.5.1). 6.3.1.2 In areas of high humidity or where mould/mildew is a risk, use Venture 1555U factory applied zero perm jacket.

6.3.1.3 Vapor barrier jacket must be sealed longitudinally by integral self sealing lap (SSL) and a 3 inch wide ASJ/Venture 1555U sealing tape. Butt joints shall be sealed with 3 inch ASJ/Venture 1555U sealing tape. Reinforced vapor barrier mastic may be applied over the longitudinal joints of ASJ/Venture 1555U in lieu of ASJ/Venture 1555U tape provided the mastic width is minimum 4 inches.

Butt joints shall also use reinforcing fabric in this application. Laps shall be placed at 10 o'clock or 2 o'clock. Use of staples for securing ASJ/Venture 1555U laps is prohibited.

6.3.1.4 ASJ/Venture 1555U jacket shall be wrinkle free and shall cover all outer surfaces of insulation.

6.3.1.5 NOTE: If Insulrap 30 or equal is chosen as alternate vapor barrier in heavy mechanical abuse areas (paragraph 5.3.5.2) SEE Paragraph 6.4.2 for application.

6.3.1.6 Irregular surfaces, contraction joints and fittings shall be vapor sealed with reinforced vapor barrier mastic (paragraph 5.3.3.1. and 5.3.4.1). Mastic shall be allowed to dry prior to application of PVC Jacketing.

6.3.2 Application of PVC Cladding

6.3.2.1 All indoor insulation after installation and/or sealing of ASJ/Venture 1555U jacket and mastic, shall be finished with PVC jacketing. See Paragraphs 5.3.9.1 - 5.3.9.1.3.

6.3.2.2 All flanges, valves and fittings shall be covered with Ceel-co Series 300 PVC heavy gauge fitting covers or equal. Minimum .028 inch thick.

6.3.2.3 All longitudinal and circumferential laps shall be seal welded with PVC solvent welding adhesive. Follow manufacturer's recommendation in handling and application of the adhesive. It is acceptable to use 1 1/2 inch SSL, self-sealing lap tape on longitudinal joints of jacket in addition to adhesive.

6.3.2.4 Laps shall have a minimum overlap of 2 inches on both the circumferential and longitudinal laps. Laps shall be located at 10 or 2 o'clock positions.

6.3.2.5 PVC sliding lap expansion-contraction joint shall be constructed by using 3 circumferential beads of CP-76 (Paragraph 5.3.2.1) in the middle of 6 inch wide lap. The beads shall be 1 inch apart. The circumferential bead shall be at least 1 1/2 inches away from the ends of overlap. The sliding joints shall be located near each end point and intermediate joints located no more than 20 feet apart. The plastic jacketing shall be held tight until cementing of longitudinal joints is completed. Expansion and contraction of pipe shall not bind, twist or crack PVC jacketing. At least one sliding joint shall be installed directly above contraction joint.

6.3.2.6 NOTE: For heavy mechanical abuse areas, install stainless steel metal lath (paragraph 5.3.9.1.2) cage a minimum of 1 inch spacer around sealed/finished insulation, vapor barrier and cladding.

6.4 Vapor Barrier and Cladding (Outdoor Service)

6.4.1 General

6.4.1.1 All insulated surfaces shall be covered with a vapor barrier. The vapor barrier and metal weatherproofing shall be installed as soon as practical after the insulation work has been completed. The Vapor barrier shall be continuous on all surfaces including contraction joints, valves, flanges, etc.

6.4.1.2 All materials applied in one day shall have the vapor barrier applied the same day. Any exposed insulation shall be temporarily protected with a combination moisture and/or UV barrier such as black polyethylene film to keep rain water out. The film shall be sealed to pipe or equipment.

6.4.1.3 Mastics shall not be applied when ambient air temperature is below 40°F (4.4°C) or it is expected to be below 40°F (4.4°C) within 24 hours, unless manufacturer will specifically approve it's material for each individual application.

6.4.2 Insulrap 30, Alumaguard 60, VentureClad 1577CW or Equivalent Vapor Barrier (Outdoor Service)

6.4.2.1 Straight runs of piping and flat surfaces of equipment shall be vapor sealed with Insulrap 30 or equal/approved laminated vapor barrier jacket (paragraph 5.3.6.1 and 5.3.6.2) utilizing maximum width commercially available.

6.4.2.2 The Insulrap 30 or equal/approved jacket shall have a minimum of two inch overlap on all joints. Installed vapor barrier shall be smooth and wrinkle free. Liquid adhesive (Paragraph 5.3.6.2) shall be used to join laps of Insulrap or equal when application temperature is below 50°F or on dusty insulation and overlaps.

6.4.2.3 Butt strips: Cut a length of butt strip at least 2.5 inches longer than the outer circumference of the jacketed pipe cover. Apply a bead of CP-76 (Paragraph 5.3.2.1) sealant along the edge of the longitudinal joint the width of the butt strip. Remove release paper from end and embed the end in the sealant. Smooth the butt strip into place working down and under the cover, then up and over, finally overlapping the embedded end. Press and roll the overlap to provide a seal.

6.4.2.4 All protrusions through insulation shall be wrapped with Insulrap or equal/approved tape in spirals to provide continuous vapor barrier or mastic and reinforcing fabric is an acceptable alternate (Paragraph 5.3.3.1 and 5.3.4.1).

6.4.2.5 Apply Peel & Seal as Insulrap or equal/approved (6.4.2.1-6.4.2.4); exception: no adhesive on laps, ambient temperature must be above +60°F, use hand roller for laps.

6.4.3 Application of Vapor Barrier Mastic

6.4.3.1 A vapor barrier coating of mastic (Paragraph 5.3.3.1) reinforced with glass cloth (paragraph 5.3.4.1) shall be applied to all outer surfaces of irregular surfaces and fittings such as elbows, valves, valve packing glands, vessel heads etc.

6.4.3.2 Vapor barrier mastic shall be applied to a minimum total dry (cured) film thickness of 0.038 inch. or as recommend by the mastic manufacture.

6.4.3.3 The first layer of mastic shall be applied evenly by suitable means as a tack coat over insulation or vapor barrier with an approximate 0.032 inch wet film thickness, or per Manufacturer's requirements.

6.4.3.4 Reinforcing cloth shall then be stretched tight, embedded into the still tacky first layer of mastic with minimum three inch overlap.

6.4.3.5 Apply second layer of mastic with 0.032 inch thick wet film thickness or as recommended by the mastic manufacturer.

6.4.3.6 Vapor barrier mastic shall be carried from outer surface of insulation to the uninsulated metal parts of the vessel or piping to provide continuous vapor seal at all terminations, projections, nozzles, and caps.

6.4.3.7 Vapor barrier on attachments shall be extended an additional 6 inches over uninsulated surface.

6.4.3.8 The glass cloth shall be completely covered with mastic and there shall be absolutely no cracks, holes, thin spots or open joints in the vapor barrier.

6.4.3.9 The vapor barrier mastic shall be allowed to dry per Manufacturer's recommendation before application of metal jacketing.

6.4.3.10 Final dry thickness of vapor barrier shall be checked. The vapor barrier shall be continuous and shall be checked for cracks, thin spots and pinholes, etc. Unsatisfactory areas shall be repaired.

6.4.4 Application of Metal Cladding for Piping

6.4.4.1 Metal jacketing shall be applied over all outer surfaces of vapor sealed insulation work located outdoors. See Paragraphs 5.3.9.2 - 5.3.9.2.3.

6.4.4.2 All openings in the jacket for nozzles, brackets, protrusions, etc. shall be cut as close as possible to achieve a tight fit. Silicone or butyl based caulking compound shall be used to seal all the projections and penetrations.

6.4.4.3 A minimum of two inch overlap shall be provided on all circumferential and longitudinal joints.

6.4.4.4 The longitudinal lap on horizontal piping and equipment shall be located alternatively at either 10 o'clock or 2 o'clock positions to shed rain water.

6.4.4.5 Circumferential lap shall have one band and intermediate bands shall be installed at 12 inch centers.

6.4.4.6 Jacketing on vertical pipes shall be supported by "S" clips made from stainless steel metal bands.

6.4.5 Application of Metal Cladding for Fittings

6.4.5.1 Preformed RPR Insul-Mate metal elbows or Childers Ell-Jac or Univers-Ells shall be used for diameter up to 12 inches. Metal gore elbows shall be used above 12 inches (Paragraph 5.3.9.2).

6.4.5.2 Smooth metal jacketing shall be used over flanges and flanged fittings.

6.4.5.3 Stainless Steel bands (Paragraph 5.3.10.2) shall be used for securing metal jacketing on gored and preformed elbow covers. Metal jacket shall have raised bead for proper closing of gores. No screws, pop rivets, etc.

6.4.5.4 Where pop rivets are used to secure irregular shapes, all holes shall be drilled before metal is put in place over the insulation. A 3 inch wide by 0.020 inch thick aluminum strip shall be taped to the vapor barrier under the seam to prevent puncture of the vapor barrier.

6.4.6 Application of Metal Cladding for Equipment

6.4.6.1 Aluminum, SEE Paragraphs 5.3.9.2 - 5.3.9.2.3, shall be used for all horizontal equipment, vessel heads, manways, nozzles and flashing.

6.4.6.2 Jacketing for horizontal and vertical cylindrical surfaces shall be applied with 3 inch circumferential and longitudinal laps, except 1 1/2 inches. corrugated jacketing shall be lapped a minimum of two corrugations.

6.4.6.3 Metal jacketing for vessel heads shall be one piece dish, or conical sections fitted to the insulation, or a single flat sheet bent at the edges for small diameter vessels. Head covers shall overlap the shell jackets by 4 inches. Head jacketing shall be fastened by means of 1/2 inch. X 0.020 inch stainless steel band, one for every gore. An additional metal band, minimum 4 inch wide shall be installed over the overlap and secured with stainless steel bands.

6.4.6.4 Metal jacketing on horizontal and vertical vessels shall be secured with 1/2 inch wide by 0.020 inch thick stainless steel T-304 bands spaced at 12 inch centers.

6.4.6.5 Metal screws, pop rivets, etc. shall not be used to secure metal jacketing. 6.4.6.6 Metal jacketing on vertical equipment shall be supported by "S" clips at 12 inch centers.

6.4.6.7 Circumferential lap shall have one band on overlap and intermediate bands shall be installed at 12 inch centers.

6.4.6.8 When metal band exceeds 25ft. between securement points, one breather (expansion) spring (paragraph 5.3.10.2) should be used for every 25ft. of band length.

6.4.6.9 Intermediate bands on vertical jacketing shall be held in place by "U" clips on 48 inch centers. The "U" Clips shall be secured with pop rivets secured to the ridge of corrugations.

6.4.6.10 Weatherproofing shall be inspected for specified metal thickness, bank spacing, overlaps, caulking, U and S clips.

7.0 INSPECTION

7.1 Inspection Plugs

7.1.1 Inspection plugs (paragraph 5.3.11.1) shall be installed per the owner's inspection and maintenance guideline criteria. As a minimum they shall be located where ultrasonic testing is planned by the owner.



Vapor Barrier Jacket / Tape / Self Seal Lap Detail

Figure 1

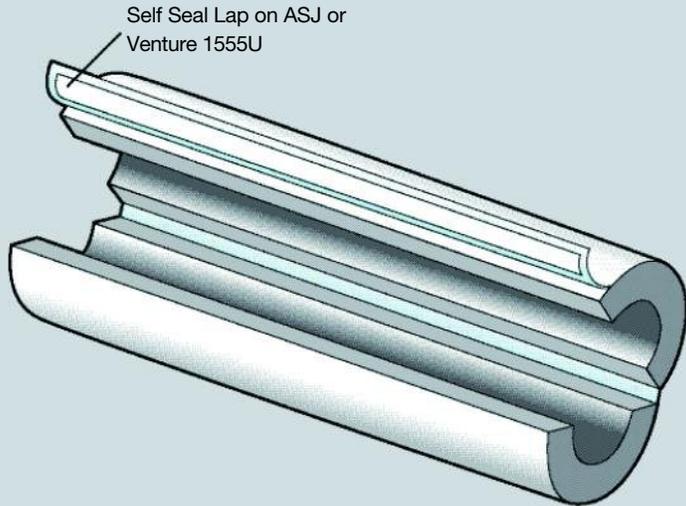
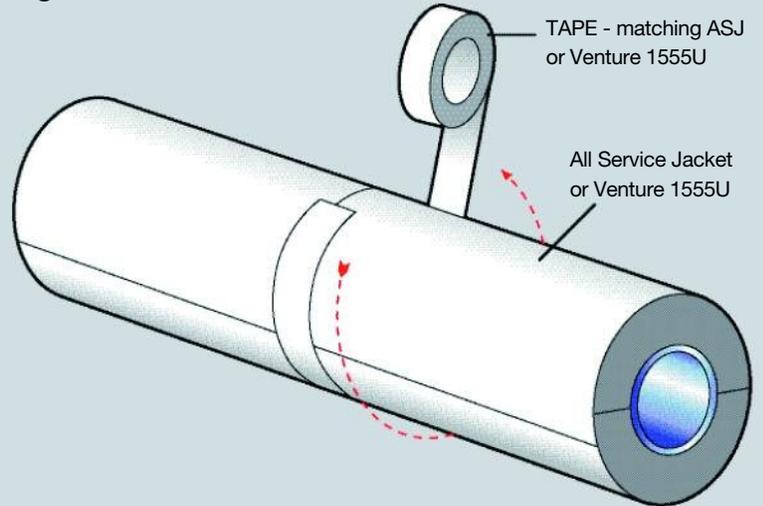
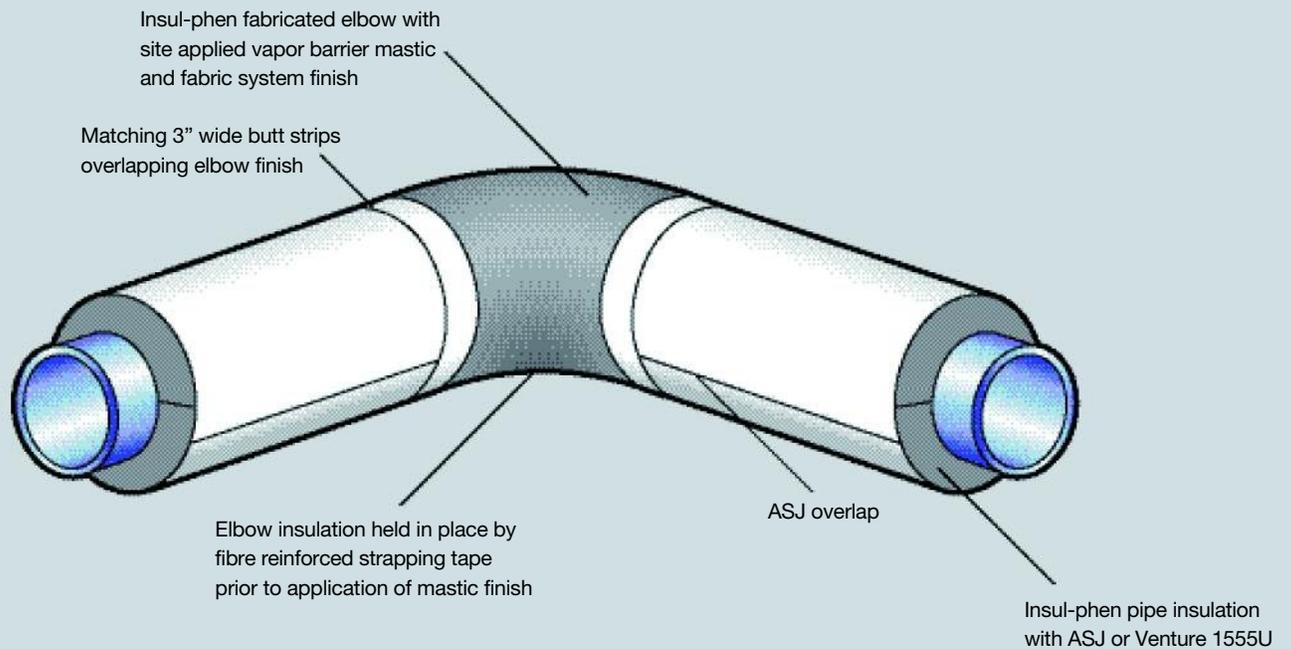


Figure 2



Pipe Elbow

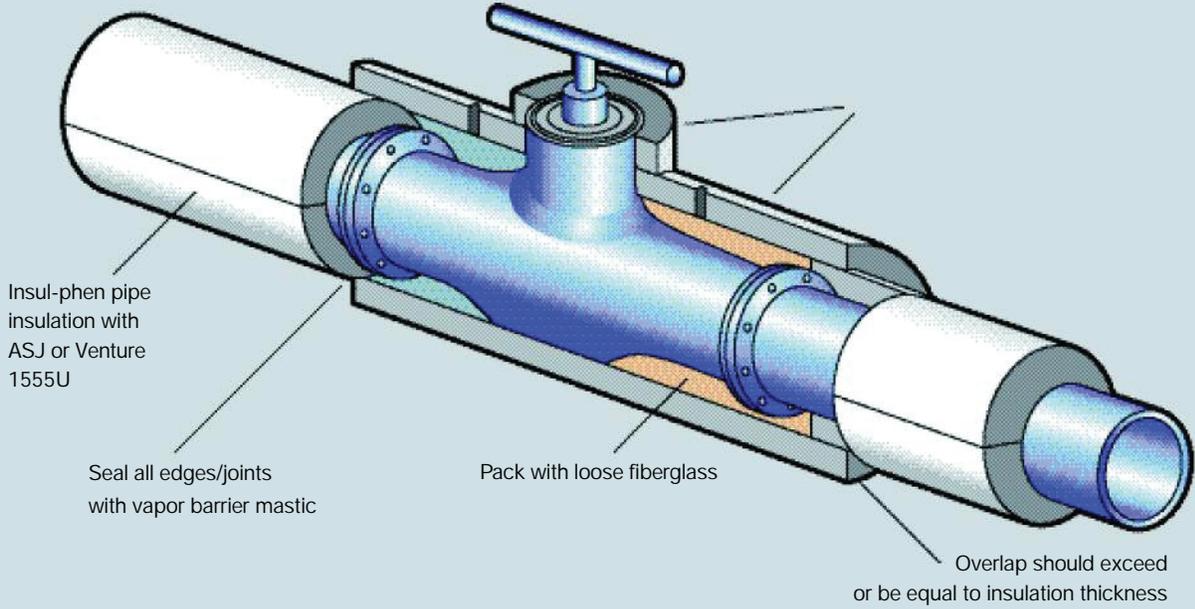
Figure 3





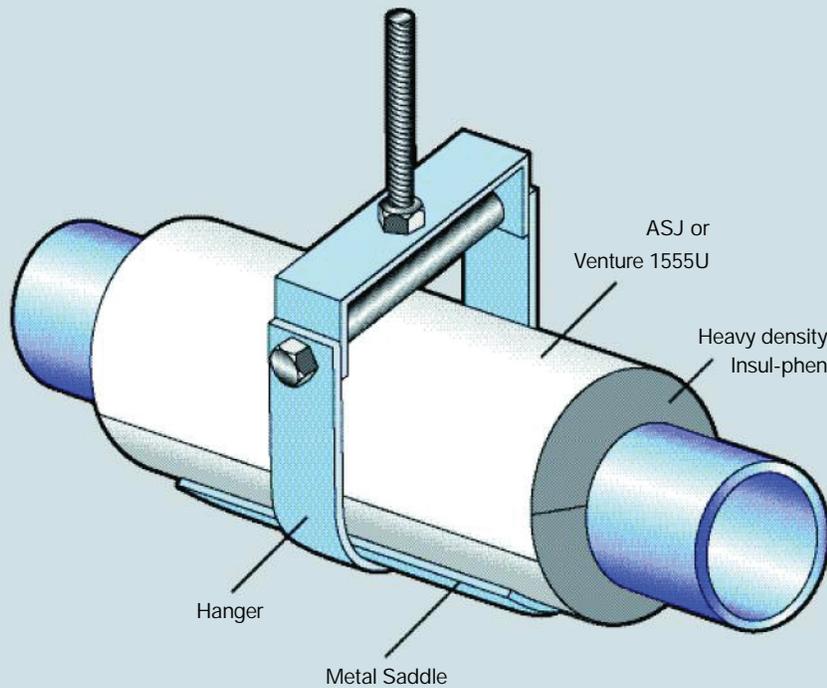
Valve / Fitting Insulation Detail

Figure 4



Pipe Hanger Support Detail

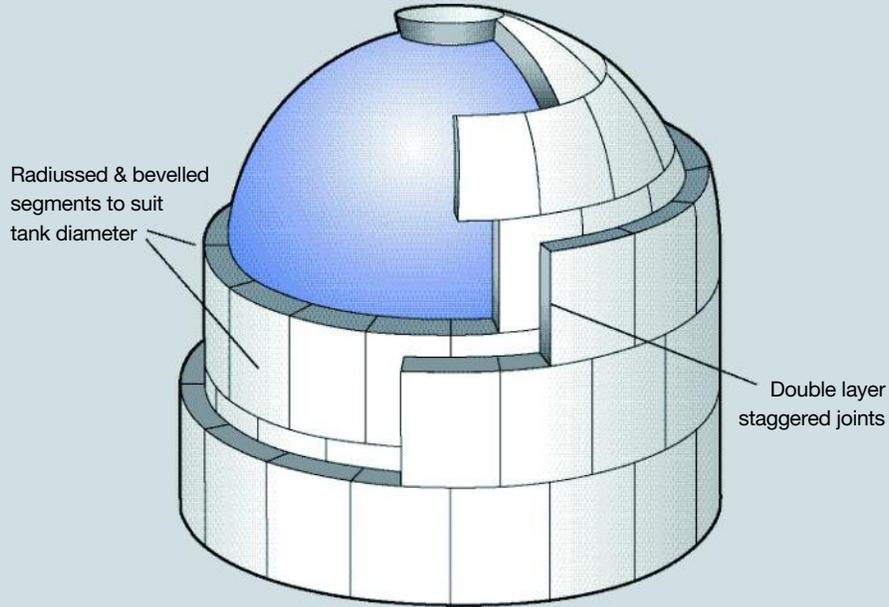
Figure 5





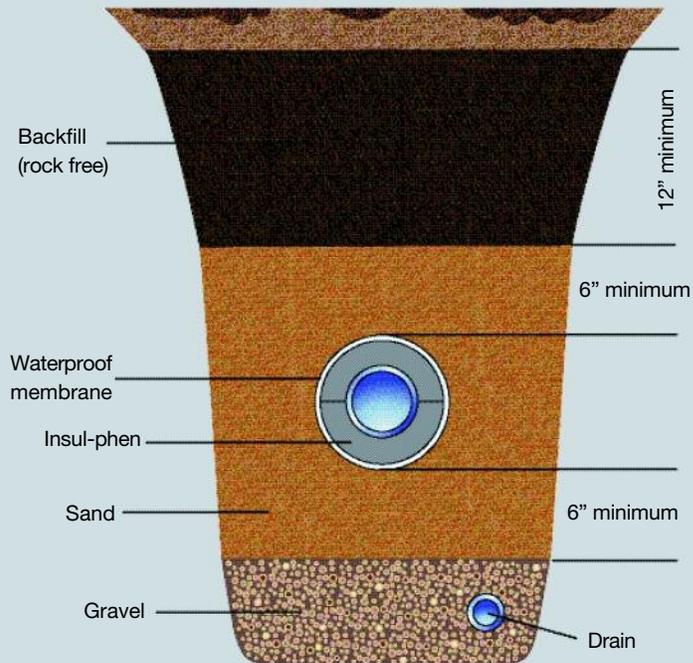
Valve / Fitting Insulation Detail

Figure 6



Buried Pipe Detail

Figure 7



Resolco Insul-phen Rigid Phenolic Insulation

INSUL-PHEN INSULATION THICKNESS TABLE FOR CHILLED WATER INDOORS

Insulation Thickness In inches Necessary to Prevent Condensation

Relative Humidity = 70%				
Nom pipe size (in)	Service Temp (°F)			
	35	40	45	50
0.5	1	1	1	1
0.75	1	1	1	1
1	1	1	1	1
1.25	1	1	1	1
1.5	1	1	1	1
2	1	1	1	1
2.5	1	1	1	1
3	1	1	1	1
4	1	1	1	1
5	1	1	1	1
6	1	1	1	1
8	1	1	1	1
10	1	1	1	1
12	1	1	1	1
14	1	1	1	1
16	1	1	1	1
18	1	1	1	1
20	1	1	1	1
24	1	1	1	1
30	1	1	1	1
36	1	1	1	1
48	1	1	1	1

ambient temp. = 75°F
 Outer surface = ASJ (e = 0.9)
 ambient relative humidity = 70%
 wind velocity = 0 mph
 dewpoint = 65°F
 geometry = horizontal pipe

The actual calculated thickness against conditions may be lower than shown in the table. However for practical application purposes we have increased the minimum thickness to 1 inch.

Data in the table above is based on ASTM C 680-95 heat transfer algorithms. The insulation thickness values shown assume correct system design and installation. They do not include a safety factor and only apply to the scenario specified. Users of Insul-phen should consult a professionally qualified design engineer competent in this field for system design and specification.

Resolco Insul-phen Rigid Phenolic Insulation

INSUL-PHEN INSULATION THICKNESS TABLE FOR CHILLED WATER INDOORS

Insulation Thickness In inches Necessary to Prevent Condensation

Relative Humidity = 80%				
Nom pipe size (in)	Service Temp (°F)			
	35	40	45	50
0.5	1	1	1	1
0.75	1	1	1	1
1	1	1	1	1
1.25	1	1	1	1
1.5	1	1	1	1
2	1	1	1	1
2.5	1	1	1	1
3	1	1	1	1
4	1	1	1	1
5	1	1	1	1
6	1	1	1	1
8	1	1	1	1
10	1	1	1	1
12	1	1	1	1
14	1	1	1	1
16	1	1	1	1
18	1	1	1	1
20	1	1	1	1
24	1	1	1	1
30	1	1	1	1
36	1	1	1	1
48	1	1	1	1

ambient temp. = 75°F
 Outer surface = ASJ (e = 0.9)
 ambient relative humidity = 80%
 wind velocity = 0 mph
 dewpoint = 68°F
 geometry = horizontal pipe

The actual calculated thickness against conditions may be lower than shown in the table. However for practical application purposes we have increased the minimum thickness to 1 inch.

Data in the table above is based on ASTM C 680-95 heat transfer algorithms. The insulation thickness values shown assume correct system design and installation. They do not include a safety factor and only apply to the scenario specified. Users of Insul-phen should consult a professionally qualified design engineer competent in this field for system design and specification.

Resolco Insul-phen Rigid Phenolic Insulation

INSUL-PHEN INSULATION THICKNESS TABLE FOR CHILLED WATER INDOORS

Insulation Thickness In inches Necessary to Prevent Condensation

Relative Humidity = 90%				
Nom pipe size (in)	Service Temp (°F)			
	35	40	45	50
0.5	1	1	1	1
0.75	1.5	1	1	1
1	1.5	1	1	1
1.25	1.5	1.5	1	1
1.5	1.5	1.5	1	1
2	1.5	1.5	1	1
2.5	1.5	1.5	1	1
3	1.5	1.5	1	1
4	1.5	1.5	1.5	1
5	1.5	1.5	1.5	1
6	2	1.5	1.5	1
8	2	1.5	1.5	1
10	2	1.5	1.5	1
12	2	1.5	1.5	1.5
14	2	1.5	1.5	1.5
16	2	1.5	1.5	1.5
18	2	2	1.5	1.5
20	2	2	1.5	1.5
24	2	2	1.5	1.5
30	2	2	1.5	1.5
36	2	2	1.5	1.5
48	2	2	1.5	1.5

ambient temp. = 75°F

Outer surface = ASJ (e = 0.9)

ambient relative humidity = 90%

wind velocity = 0 mph

dewpoint = 72°F

geometry = horizontal pipe

Data in the table above is based on ASTM C 680-95 heat transfer algorithms. The insulation thickness values shown assume correct system design and installation. They do not include a safety factor and only apply to the scenario specified. Users of Insul-phen should consult a professionally qualified design engineer competent in this field for system design and specification.

Resolco Insul-phen Rigid Phenolic Insulation

INSUL-PHEN INSULATION THICKNESS TABLE FOR CHILLED WATER INDOORS

Insulation Thickness In inches Necessary to Prevent Condensation

Relative Humidity = 60%				
Nom pipe size (in)	Service Temp (°F)			
	35	40	45	50
0.5	1	1	1	1
0.75	1	1	1	1
1	1	1	1	1
1.25	1	1	1	1
1.5	1	1	1	1
2	1	1	1	1
2.5	1	1	1	1
3	1	1	1	1
4	1	1	1	1
5	1	1	1	1
6	1	1	1	1
8	1	1	1	1
10	1	1	1	1
12	1	1	1	1
14	1	1	1	1
16	1	1	1	1
18	1	1	1	1
20	1	1	1	1
24	1	1	1	1
30	1	1	1	1
36	1	1	1	1
48	1	1	1	1

ambient temp. = 90°F
 Outer surface = ASJ (e = 0.9)
 ambient relative humidity = 60%
 wind velocity = 0 mph
 dewpoint = 74°F
 geometry = horizontal pipe

The actual calculated thickness against conditions may be lower than shown in the table. However for practical application purposes we have increased the minimum thickness to 1 inch.

Data in the table above is based on ASTM C 680-95 heat transfer algorithms. The insulation thickness values shown assume correct system design and installation. They do not include a safety factor and only apply to the scenario specified. Users of Insul-phen should consult a professionally qualified design engineer competent in this field for system design and specification.

Resolco Insul-phen Rigid Phenolic Insulation

INSUL-PHEN INSULATION THICKNESS TABLE FOR CHILLED WATER INDOORS

Insulation Thickness In inches Necessary to Prevent Condensation

Relative Humidity = 70%				
Nom pipe size (in)	Service Temp (°F)			
	35	40	45	50
0.5	1	1	1	1
0.75	1	1	1	1
1	1	1	1	1
1.25	1	1	1	1
1.5	1	1	1	1
2	1	1	1	1
2.5	1	1	1	1
3	1	1	1	1
4	1	1	1	1
5	1	1	1	1
6	1	1	1	1
8	1	1	1	1
10	1	1	1	1
12	1	1	1	1
14	1	1	1	1
16	1	1	1	1
18	1	1	1	1
20	1	1	1	1
24	1	1	1	1
30	1	1	1	1
36	1	1	1	1
48	1	1	1	1

ambient temp. = 90°F
 Outer surface = ASJ (e = 0.9)
 ambient relative humidity = 70%
 wind velocity = 0 mph
 dewpoint = 79°F
 geometry = horizontal pipe

The actual calculated thickness against conditions may be lower than shown in the table. However for practical application purposes we have increased the minimum thickness to 1 inch.

Data in the table above is based on ASTM C 680-95 heat transfer algorithms. The insulation thickness values shown assume correct system design and installation. They do not include a safety factor and only apply to the scenario specified. Users of Insul-phen should consult a professionally qualified design engineer competent in this field for system design and specification.

Resolco Insul-phen Rigid Phenolic Insulation

INSUL-PHEN INSULATION THICKNESS TABLE FOR CHILLED WATER INDOORS

Insulation Thickness In inches Necessary to Prevent Condensation

Relative Humidity = 80%				
Nom pipe size (in)	Service Temp (°F)			
	35	40	45	50
0.5	1	1	1	1
0.75	1	1	1	1
1	1	1	1	1
1.25	1	1	1	1
1.5	1	1	1	1
2	1	1	1	1
2.5	1	1	1	1
3	1	1	1	1
4	1	1	1	1
5	1	1	1	1
6	1	1	1	1
8	1	1	1	1
10	1	1	1	1
12	1	1	1	1
14	1	1	1	1
16	1	1	1	1
18	1	1	1	1
20	1	1	1	1
24	1	1	1	1
30	1	1	1	1
36	1	1	1	1
48	1	1	1	1

ambient temp. = 90°F
 Outer surface = ASJ (e = 0.9)
 ambient relative humidity = 80%
 wind velocity = 0 mph
 dewpoint = 83°F
 geometry = horizontal pipe

The actual calculated thickness against conditions may be lower than shown in the table. However for practical application purposes we have increased the minimum thickness to 1 inch.

Data in the table above is based on ASTM C 680-95 heat transfer algorithms. The insulation thickness values shown assume correct system design and installation. They do not include a safety factor and only apply to the scenario specified. Users of Insul-phen should consult a professionally qualified design engineer competent in this field for system design and specification.

Resolco Insul-phen Rigid Phenolic Insulation

INSUL-PHEN INSULATION THICKNESS TABLE FOR GENERAL USE OUTDOORS

Insulation Thickness In inches Necessary to Prevent Condensation

Relative Humidity = 90%				
Nom pipe size (in)	Service Temp (°F)			
	0	20	40	60
0.5	1.5	1.5	1	1
0.75	2	1.5	1	1
1	2	1.5	1	1
1.25	2	1.5	1.5	1
1.5	2	2	1.5	1
2	2	2	1.5	1
2.5	2	2	1.5	1
3	2.5	2	1.5	1
4	2.5	2	1.5	1
5	2.5	2.5	2	1
6	3	2.5	2	1.5
8	3	2.5	2	1.5
10	3	2.5	2	1.5
12	3.5	2.5	2	1.5
14	3.5	3	2	1.5
16	3.5	3	2	1.5
18	3.5	3	2	1.5
20	3.5	3	2	1.5
24	3.5	3	2.5	1.5
30	4	3	2.5	1.5
36	4	3	2.5	1.5
48	4	3	2.5	1.5

ambient temp. = 90°F

Outer surface = metal (e = 0.4)

ambient relative humidity = 90%

wind velocity = 7 mph

dewpoint = 87°F

geometry = horizontal pipe

Data in the table above is based on ASTM C 680-95 heat transfer algorithms. The insulation thickness values shown assume correct system design and installation. They do not include a safety factor and only apply to the scenario specified. Users of Insul-phen should consult a professionally qualified design engineer competent in this field for system design and specification.

Resolco Insul-phen Rigid Phenolic Insulation

INSUL-PHEN INSULATION THICKNESS TABLE FOR REFRIGERATION OUTDOORS

**Insulation Thickness In inches Necessary to Prevent Condensation
Or limit Heat Gain to 8 btu/hr-ft², whichever is greater**

Relative Humidity = 90%			
Nom pipe size (in)	Service Temp (°F)		
	0	20	40
0.5	1.5	1.5	1
0.75	2	1.5	1.5
1	2	1.5	1.5
1.25	2	1.5	1.5
1.5	2	1.5	1.5
2	2	2	1.5
2.5	2	2	1.5
3	2.5	2	1.5
4	2.5	2	1.5
5	2.5	2	2
6	3	2.5	2
8	3	2.5	2
10	3	2.5	2
12	3	2.5	2
14	3.5	2.5	2
16	3.5	3	2
18	3.5	3	2.5
20	3.5	3	2.5
Tank Side	3.5	2.5	2
Tank Top	3	2.5	2
Tank Bottom	4.5	3.5	3

ambient temp. = 100°F
 Outer surface = metal (e = 0.4)
 ambient relative humidity = 90%
 wind velocity = 7.5 mph
 dewpoint = 97°F
 geometry = horizontal pipe

Data in the table above is based on ASTM C 680-95 heat transfer algorithms. The insulation thickness values shown assume correct system design and installation. They do not include a safety factor and only apply to the scenario specified. Users of Insul-phen should consult a professionally qualified design engineer competent in this field for system design and specification.

Resolco Insul-phen Rigid Phenolic Insulation

INSUL-PHEN INSULATION PIPE AND HANGER SUPPORTS TABLE

- Pipe Supports can be fabricated from 2.2lb/ft³ (contact Resolco for detail), 3.75lb/ft³ or 5lb/ft³ density. Insul-Phen Phenolic Supports are faced with factory applied All Service Jacket.
- Supports can be manufactured with the galvanised steel saddle factory adhered to the underside of the Support.
- Contact Resolco or your local fabricator for load bearing calculation or after design data.

FOAM DENSITY	PIPE SIZE	SADDLE	FOAM & SADDLE LENGTH	CENTERS
2.5#	4" and smaller	18 Gauge	12"	10'
3.75#	5" to 10"	16 Gauge	12"	10'
5.0#	12" to 16"	14 Gauge	12"	10'
5.0#	18" to 20"	10 Gauge	18"	10'
7.5#	24" and larger	8 Gauge	24"	10'S

All information on Insul-phen rigid phenolic foam insulation in this literature is given in good faith and believed to be correct at the time of printing. However, Resolco makes no representation or warranties, express or implied, as to its completeness or accuracy.

Information is given subject to the condition that persons acting on it will perform all relevant tests and take full responsibility for their own final determination as to its suitability for their purposes prior to use in any specific intended application. Under no circumstances will Resolco be responsible for any damages incurred as a result of the use of or reliance upon any information relating to Insul-phen given in this literature.

Insul-phen is sold for commercial and/or industrial use only and should be used in accordance with the design of the complete insulation system specified by professionally competent engineers and consultants.

Insul-phen should be applied following the manufacturer's installation instructions and to meet the standards set out in the National Commercial and Insulation Standards (1999 Fifth Edition) as published by MICA and endorsed by NIA.

Any recommendations made by Resolco or its representatives are based on what is believed to be reliable test data, experiments and experience; without any guarantee of accuracy. It should be noted that surface burning characteristics derived from ASTM E 84 are not intended to reflect hazards presented by Insul-phen under actual fire conditions.

Conditions of sale are available on request.

