

AGC

Miscellaneous Mechanical Equipment

E12-2.1

**ENGINEERING
STANDARD**



**PACKING MATERIAL
GASKETS
And
THREAD LUBRICANTS**

CELANESE CORPORATION OF AMERICA

**Central Engineering
Charlotte Office**

000009

APPROVED NOVEMBER 2, 1961

Celanese Corporation of America MISCELLANEOUS MECHANICAL EQUIPMENT PACKING MATERIALS, GASKETS AND THREAD LUBRICANTS Sponsor - Belvidere	Engineering Standard E 12 - 2.1		
	Issued 11/2/61	Rev. No.	Date

PREFACE

Packing and gasket materials of numerous types and shapes are available from a large number of manufacturers. There are individual preferences in specific applications. Where several materials overlap in suitability it is not sensible to arbitrarily prescribe one only, since availability and cost may favor other materials in many localities.

Therefore this standard, as concerns packing and gaskets, is designed to assist the plants of the Corporation in solution of difficult problems rather than to attempt to tabulate many materials versus many applications.

The thread lubricant section catalogs available material with comment where facts are known.

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Celanese Corporation of America MISCELLANEOUS MECHANICAL EQUIPMENT PACKING MATERIALS, GASKETS AND THREAD LUBRICANTS Sponsor - Belvidere	Engineering Standard E 12 - 2.1		
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1. SCOPE

This standard is limited to problem applications within the corporation. Compilation is made of uses where difficulty has been or is experienced. Against the problem applications are shown a.) the material and form that solved the problem or b.) the best material known to date where problem is not considered to be solved.

This standard also tabulates applications where thread lubricants are used and opinions given.

2. GENERAL

Data submitted by several of the plants is contained in the accompanying tables.

Table 1 - Lists applications where original packing methods were not satisfactory. Against each entry is shown a treatment deemed satisfactory or the best found to date by individual plants.

Table 2 - Lists similar information about gasketing.

Table 3 - Is essentially a list of thread lubricants and sealants in general use at several plants. No attempt has been made to list all of the uses of all of the sealants.

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TABLE 1 - PACKING MATERIAL

PRODUCT	EQUIPMENT	PACKING MATERIAL USED	SATIS-FACTORY	NOT SATIS-FACTORY
"A" Mix Acetic Acid Acetic Anhydride Sulphuric Acid (Celriver)	Cooling & Mixing Vessel. Top driven agitator with bottom bearing to steady shaft.	For bottom gland: - After shaft was remachined glass filled Teflon bushings were installed in the stuffing box. A blind flange was installed over end of shaft. Seal was eliminated.	*	
"A" Mix Acetic Acid Acetic Anhydride Sulphuric Acid (Celco)	Cooling & Mixing Vessel. Top driven agitator with bottom bearing to steady shaft.	A trial is to be made with John Crane C-99 packing made with crocidolite blue asbestos yarn with each strand impregnated with Teflon suspensoid.		
Acetic Acid (Amcelle)	Centrifugal Transfer Pumps	Durametallic RO-TT mechanical seals composed of 316 SS and #9 carbon sealing surfaces and Teflon rings on shaft.	*	
Precipitating Acid 14 - 15% Acetic Acid with Solids (Celco)	Centrifugal Transfer Pumps	Durametallic mechanical seal - external rotary unit unbalanced type shaft packing - Teflon chevron	*	
Acetic Anhydride (Amcelle)	Centrifugal Transfer Pump	Durametallic RO-TT mechanical seals. Composed of 316 SS and #9 carbon sealing surfaces and Teflon rings on shaft.	*	

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Misc. Mechanical Equipment
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TABLE 1 - PACKING MATERIAL

PRODUCT	EQUIPMENT	PACKING MATERIAL USED	SATIS-FACTORY	NOT SATIS-FACTORY
39 - 60% Hot Acetic Anhydride with carbon particles. Temperature just below boiling point. (D.P. Pump Dept. Celco)	Centrifugal Pumps	Durametallic mechanical seal, duralip, external type RO-TT, balanced, Teflon Chevron shaft packing, with flushing by clean product from D.P. still runoff.	*	
Acetone (Belvidere)	Centrifugal Transfer Pump	Mechanical Seal - Crane Packing Company Type 9 - Pure carbon and ni-resist steel sealing faces.	*	
Acetone, Methanol & 1% Colloids in Suspension (Belvidere)	Centrifugal Transfer Pump	Mechanical Seal - Crane Packing Company Type 9 - Pure carbon and ni-resist steel sealing faces.	*	*
Benzene (Celco)	Centrifugal Transfer Pump	Mechanical Seal Durametallic - internal rotary unit, unbalanced type shaft packing - Teflon chevron.	*	
Butanol (Chemcel)	Reciprocating Rod Type Flush Fluid Pump	Graphited Asbestos - After installing solid tungsten carbide rod.	*	
Butanol (Chemcel)	Oil Well Type Pump	Lubricup Packing (non adjustable). After installation of solid ceramic rod.		*Still under test 9/1/61

TABLE 1 - PACKING MATERIAL

PRODUCT	EQUIPMENT	PACKING MATERIAL USED	SATIS-FACTORY	NOT SATIS-FACTORY
Brine - Riverwater & Calcium Chloride (Amcelle)	Centrifugal Pump Gland	1/2" Wood Fiber Packing (Rains Wood-Metal Packing Company - Spokane)	*	
Catalyst - Slurry of Rainey Catalyst and Aldehyde (Chemcel)	Feed Pumps - Rods: - Ceramic Chrome Tungsten Carbide 4140 Monel	Best to date: - Rod coated with tungsten carbide. Graphited asbestos packing.		
Caustic - 50% Sodium Hydroxide (Chemcel)	Centrifugal Transfer Pump	"Flexrock" Type #403 Square Teflon Packing	*	
Organic Slurry 40 - 60% Water 60 - 40% Methanol with 8 to 14% slightly abrasive solids (Clarkwood)	Centrifugal and reciprocating pumps slow speeds to 170° F maximum.	Pure asbestos with 35% impregnated Teflon - Raybestos Manhattan #840 SW.	*	
Dope - Acetate (Belvidere)	Rotary Gear Pump	Long Fiber Asbestos Castor oil - castor wax impregnated.	*	

TABLE 1 - PACKING MATERIAL

PRODUCT	EQUIPMENT	PACKING MATERIAL USED	SATIS-FACTORY	NOT SATIS-FACTORY
Dope - Acetate - Residue (Celco)	Horizontal Residue Mixer - Agitator end to end mounted	Alternate layers #234 Garlock & Lead Wool. Alternate 2 layers Garlock with one layer lead wool.	*	
Dope - Acetate - Residue (Ocotlan)	Low pressure mixer top driven agitator.	Chesterton Teflon Packing #322	*	
Dope - Acid (Amcelle)	Low Pressure Gear Pump Low & High Press Screw Pumps	Graphited Asbestos (Anchor No. 317)		Best to date
Dope - Acid (Celriver)	Screw Pumps External brg. four stuffing boxes per pump	1. Complete pump rebuilding program resulted in less run out, better shafts. (Shafts now being ceramic coated - trial incomplete.) 2. New low priced Teflon filled asbestos packing.	*	
Dope - Triacetate (Amcelle)	Low Pressure Mixer Top Driven Agitator	1. Shaft realigned to run concentrically. 2. Alternate rings of Teflon and Palmetta Graphite.	*	

TABLE 1 - PACKING MATERIAL

PRODUCT	EQUIPMENT	PACKING MATERIAL USED	SATIS-FACTORY	NOT SATIS-FACTORY
Dope - Triacetate (Celriver)	Low Pressure Mixer Top Driven Agitator	Mechanical seals removed. Lead wool used for packing until pitted areas of shafts become impregnated with lead and were smooth again. Graphited asbestos packing now used with a solvent resist and grease injected once per week by grease gun.	*	
Dope - Triacetate (Charlotte)	Low Pressure Mixer Top Driven Agitator	Alternate rings of Graphited Asbestos and Lead Wool.	*	
Dope - Triacetate	Low Pressure Mixer Top Driven Agitator	Using "Chesterton Teflon packing #322 without lubrication.	*	
Dope - Triacetate (Belvidere)	Rotary Gear Pump Worthington 2 GRS	Long Fiber Asbestos Castor Oil - Castor wax impregnated		*
Dope - Triacetate (Charlotte)	Rotary Gear Pump Zenith BC4748	Butyl Rubber "O" Ring installed after increasing dope circulation thru enlarged relief port.	*	

TABLE 1 - PACKING MATERIAL

PRODUCT	EQUIPMENT	PACKING MATERIAL USED	SATIS- FACTORY	NOT SATIS- FACTORY
Dope - Triacetate (Charlotte)	Rotary Gear Pump Worthington 2 GRS	Used Crane #9 Mechanical Seal. 1. Circulated high pressure dope thru seal. via 1/4" dia. hole drilled near seal end plate. 2. Used filtered free dope for gland circu- lation. 3. Cooled packing end plate with water through 2 turns of copper 1/2" dia. tubing sweated on the outside of end plate. 4. Installed soft copper gasket under end plate in place of Teflon to improve heat flow away from packing sealing faces.	*	
Dope - Triacetate & Acetate (Amcelle)	Rotary Gear Pump 6" & 1-1/2" Up to 300 PSIG	Installed plant fabricated water cooled mechanical seals composed of two stellite sealing surfaces and three style S16R5R chevron rings from Universal Packing Co., Houston, Texas.		Best to date
Ethyl - Acetate (Calco)	Centrifugal Transfer Pumps	Mechanical Seal (Durametallic) internal rotary unit unbalanced type shaft packing, Teflon chevron.	*	
Ethyl - Acetate Ethyl - Alcohol (Ocotlan)	Centrifugal Transfer Pumps	Mechanical Seals with carbon and hastelloy sealing surfaces.	*	

TABLE 1-1 PACKING MATERIAL

PRODUCT	EQUIPMENT	PACKING MATERIAL USED	SATIS-FACTORY	NOT SATIS-FACTORY
Gas - Oxygen (Chemcel)	Centrifugal Pump	Mechanical Seal	*	
Magnisite Solution Acid Solvents Solids Sand (Celriyer)	Centrifugal Transfer Pump	Packing to be tested when flushing filtered solution thru stuffing box at pressure higher than pump pressure.	To be tested	
Methanol (Belvidere)	Centrifugal Transfer Pumps	Mechanical Seal, Crane Packing Co. Type 9 carbon & niresist steel sealing faces.	*	
Methylene Chloride (Belvidere)	Centrifugal Transfer Pump	Mechanical Seal, Crane Packing Co. Type 9 carbon & niresist steel sealing faces.	*	
Methylene Chloride (Amcelle)	Centrifugal Transfer Pump	Installed durametallie RO-TT mechanical seals SS and #9 carbon sealing surfaces with Teflon rings on shaft.	*	
Methylene Chloride Methanol 90/10 (Belvidere)	Centrifugal Transfer Pumps	Mechanical Seal, Crane Packing Co. Type 9 carbon & niresist steel sealing faces.	*	

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TABLE 1 - PACKING MATERIAL

PRODUCT	EQUIPMENT	PACKING MATERIAL USED	SATIS-FACTORY	NOT SATIS-FACTORY
Methylene Chloride Methanol CA Fines Mineral Oil (Celriver)	Centrifugal Transfer Pumps	Die formed rings of lead foil packing plus continuous force feed mineral oil into stuffing box.	*	
Polyester Resin (Linden)	Low Pressure - high vacuum mixer, top driven agitator, 400° F temperature	Unsolved problem. Mechanical seal not applicable (space limitation). Packing lubricants have contamination problems.		
Slurry Liquors & Trioxane (Clarkwood)	Centrifugal Transfer Pumps	<u>1st Method</u> - Tolerance behind impeller was decreased, water make-up injected into seal chamber as a flushing liquid. <u>2nd Method</u> - Designed & installed double seal chamber. Seals are installed back to back using pressured seal coolant pot connected to the seal chamber by thermosyphon system. (Crane type 9 & 9B are used) Sealing Faces: carbon rotating on stellite or ceramic.	*	
Sodium Sulphate Solution (Ocotlan)	Lawrence Pumps	Marlo Redwater Semi-metallic packing alternated with Teflon packing.		Best to date

TABLE 2 - GASKETING MATERIAL

PRODUCT	EQUIPMENT	GASKET MATERIAL USED	SATIS-FACTORY	NOT SATIS-FACTORY
Acid Lines Acid Dope Lines (Amcelle)	Flange Gaskets Valve Packing	Teflon impregnated braided asbestos	*	
Dope Lines Acetate & Triacetate (Belvidere) (Amcelle)	Flange Gaskets Valve Packing	Polyethylene Teflon Compressed Asbestos (Garlock #950)	*	
Flake - Pulverized CA (Amcelle)	Flake Size Classifier	Silicone rubber gaskets.	*	
Cake Separators (Fortenese) (Amcelle)	In Saponification Tanks	1/4" polished, pressed Tygon.	*	
Hot & Cold Solvents & Acids (Clarkwood)	Flange & Pump Gaskets	John Crane #2150 navy type gasket	*	

TABLE 3 - THREAD LUBRICANT

	APPLICATION	SEALANT MATERIAL USED	
Several plants have had satisfactory service from use of the lubricants listed herewith:	Threads: In High Temperatures or Long Exposed in Air Refrigeration Piping Pipe Threads Stainless Steel and all Other Threads	Colloidal Copper "Jet-Lube" "Kopr-Kote" "Silver Goop" - 2000° F "Blue Goop" - 400° F "Copal Tite" "Dam-It" (Guigley) "Permatex #2" "Garlock Type A" "Sealrite #5" "W-K-M" Teflon Tape under tradenames of "Permacel Ribbon Dope" "Plastic Tape #547" Teflon Paste	

INSULATION SECTION

1977 Edition

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SECTION PREPARATION

The Insulation Section was prepared by Ray Hearon, Cl Weldon Wallace, Bay City; Jim Beasley, Bishop; and Ja Pampa.

DISTRIBUTION

Each plant will be supplied three copies of the Insul Section. Use one of these copies to reproduce your number of copies. The Clear Lake Plant will be responsible for distribution to Chemical Company Purchasing and other Divisions requesting copies.

PROCEDURE FOR REVISIONS AND UPDATING

To keep this section open for improvement and the dissemination of new Engineering know-how, it is important that method additions or revisions to the Standard be readily available. A change request form letter should be used whenever feasible. All changes should be reviewed by the Insulation Standards Committee and the Plant Engineering Superintendents at their meeting for acceptance. All holders of the Insulation-Standard will receive the revised material and new publications as they become available.

Name and Location

Ray Hearon - Clear Lake

DATE

Name and Location

REFERENCE NO

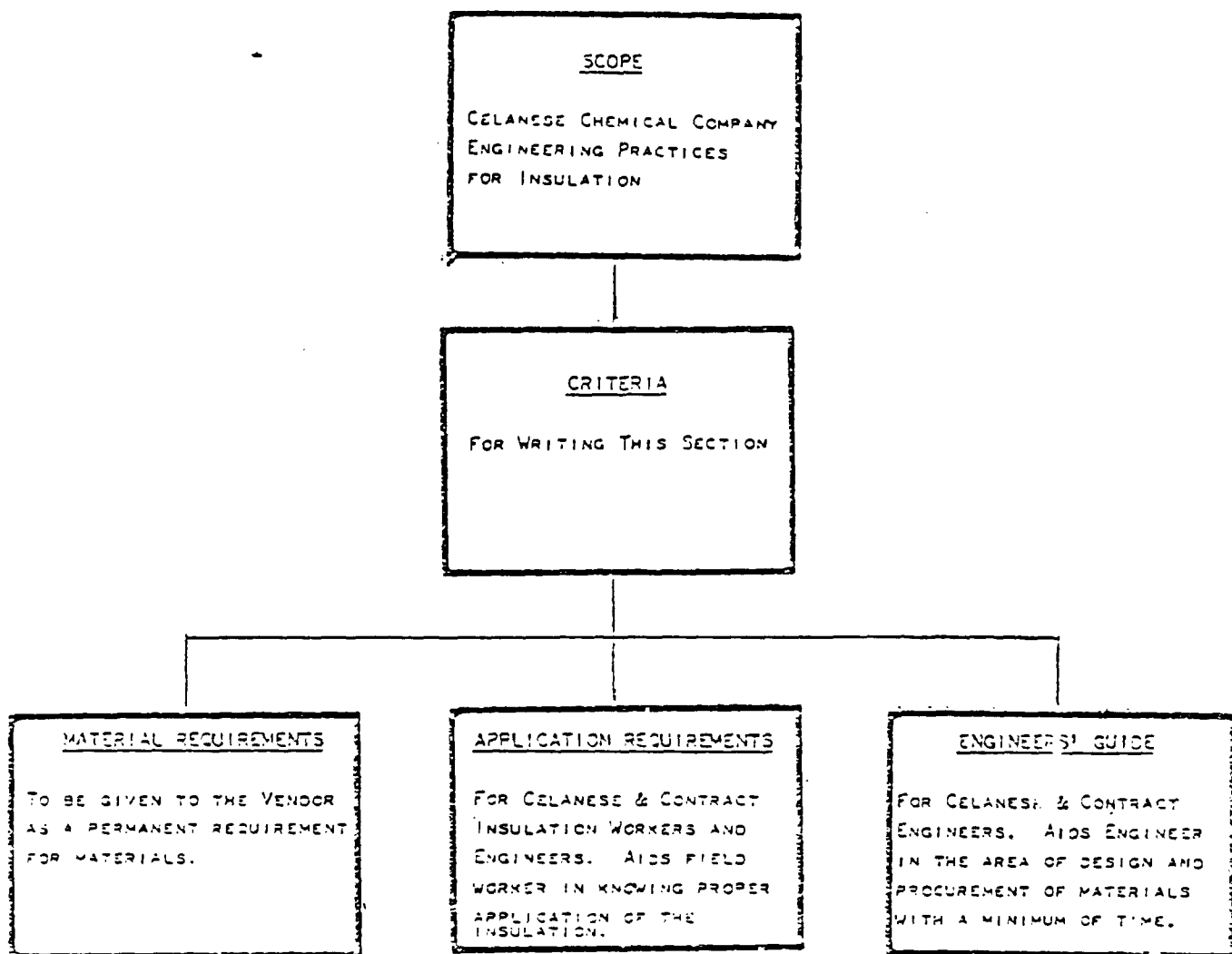
SUBJECT: Recommended Revisions to Insulation Section

- (1) State changes or additions you feel with improve or update this section.
- (2) State justification.

cc: Plant Engineering Superintendents
Bay City
Bishop
Clear Lake
Pampa

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CRITERIA FOR WRITING
INSULATION SECTION

1. Provide conformity of insulation between Chemical Company Plants to allow Chemical Company Purchasing to obtain the most economical agreement with the suppliers and applicators of insulation.
2. Provide a training manual for the Engineer becoming involved with insulation.
3. Establish guidelines for the application of insulation materials in the Chemical Company Plants.

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NOTES TO USERS

The Insulation Section consists of three basic information packages: requirements for vendors, guidelines for engineers, and requirements for application of the insulation.

The first two sections will be supplied to a potential vendor for his consideration and to aid in his supplying of materials and expertise for Chemical Company jobs.

The third section will be supplied to a contractor when bids are being obtained for job-site maintenance or construction.

The Section should be used strictly as a guideline and may be changed consistent with good Engineering Practices and the approval of the Project Engineer. This Section should not be construed to prohibit continual testing and evaluation of any insulation material.

The insulation thicknesses presented in Tables 1 through 4 were arrived at using T-2013, "Economic Insulation Thickness Computer Program." Table 5 lists the process and economic conditions used to determine the recommended thicknesses in those tables. These process conditions reflect agreed-to average conditions at the four Texas plants. It was found that plant-to-plant variations did not result in thickness differences to justify separate tables for each plant. The Computer Applications Group at CCCC in Corpus Christi has data sheets for T-2013 and can help the user determine thicknesses for special and/or high temperature (1000 to 2300°F) applications.

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M1 SCOPE

M2 INSULATING MATERIALS - HOT SERVICE

M2.1 CALCIUM SILICATE (KAYLO)

M2.1.1 DESCRIPTION

M2.1.2 SERVICE

M2.1.2.1 Temperature Range

M2.1.2.2 Components Insulated

M2.1.3 THICKNESS

M2.2 MINERAL WOOL

M2.2.1 DESCRIPTION

M2.2.2 SERVICE

M2.2.2.1 Temperature Range

M2.2.2.2 Components Insulated

M2.2.3 THICKNESS

M2.3 CELLULAR GLASS - (FOAMGLASS)

M2.3.1 DESCRIPTION

M2.3.2 SERVICE

M2.3.2.1 Temperature Range

M2.3.2.2 Components Insulated

M2.3.3 THICKNESS

M2.4 FIBERGLASS

M2.4.1 DESCRIPTION

M2.4.2 SERVICE

M2.4.2.1 Temperature Range

M2.4.2.2 Components Insulated

M2.4.3 THICKNESS

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M2.5 INSULATING CEMENT

M2.5.1 DESCRIPTION

M2.5.2 SERVICE

M2.5.2.1 Temperature Range

M2.5.2.2 Components Insulated

M2.5.3 THICKNESS

M2.6 ASBESTOS TAPE

M2.6.1 DESCRIPTION

M2.6.2 SERVICE

M2.6.2.1 Temperature Range

M2.6.2.2 Components Insulated

M2.6.3 THICKNESS

M2.7 FOAMED PLASTIC

M2.7.1 DESCRIPTION

M2.7.2 SERVICE

M2.7.2.1 Temperature Range

M2.7.2.2 Components Insulated

M2.7.3 THICKNESS

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M5.3 WIRE NETTING

M5.3.1 DESCRIPTION

M5.3.2 SERVICE

M5.4 BANDS

M5.4.1 DESCRIPTION

M5.4.2 SERVICE

M5.4.2.1 Aluminum Jacketing

M5.4.2.2 Pipe Insulation

M5.4.2.3 Vessel Insulation

M5.5 WIRE

M5.5.1 DESCRIPTION

M5.5.2 SERVICE

M5.6 SCREWS

M5.6.1 DESCRIPTION

M5.6.2 SERVICE

M5.7 WELD PINS

M5.7.1 DESCRIPTION

M5.7.2 SERVICE

M5.8 SPEED CLIPS

M5.8.1 DESCRIPTION

M5.8.2 SERVICE

M5.9 CHIL-SPRINGS

M5.9.1 DESCRIPTION

M5.9.2 SERVICE

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M1 SCOPE

This section describes the minimum requirements for the purchase of exterior thermal insulation materials for pipe, instruments and equipment. A summary of this section is attached in Table 7.

[REDACTED]

[REDACTED]

M2.1.1 DESCRIPTION

Insulation shall be a rigid hydrous calcium silicate pipe covering of sectional or segmental form. The insulation shall contain an inhibitor to reduce the possibility of stress corrosion cracking of stainless steel. CAUTION--calcium silicate containing asbestos will not be used.

M2.1.2 SERVICE

M2.1.2.1 Temperature Range - Calcium silicate is normally used for components operating in the temperature range of 451°F to 1000°F.

M2.1.2.2 Components Insulated - Calcium silicate is used for the insulation of carbon steel and alloy piping and equipment.

M2.1.3 THICKNESS

Table 1 gives the insulation thickness for operating temperatures between 450°F and 1000°F. When economic calculations dictate a multi-layer situation, it is recommended a Kaylo/fiberglass combination be used rather than two Kaylo layers, as long as the interface temperature is below 450°F. This allows a reduction in total thickness for equivalent heat recovery and a more favorable LTRCA. The two material zone is indicated in Table 1. When using the Kaylo/fiberglass combination, it should be specified that the Kaylo thickness be applied as two, 1-1/2" thick layers in accordance with A3.1.1.

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[REDACTED]

M2.2.1 DESCRIPTION

Insulation shall be a segmental, mat faced, felted refractory fiber pipe covering such as mineral fiber pipe insulation.

M2.2.2 SERVICE

M2.2.2.1 Temperature Range - Mineral fiber pipe insulation is normally used for components operating in the temperature range of 451°F to 1000°F. Mineral wool in special cases can be used to 1800°F.

M2.2.2.2 Components Insulated - Mineral fiber pipe insulation may be used on any cylindrical equipment 36" in diameter or less and it may be used on stainless steel items.

M2.2.3 THICKNESS

Table 2 gives the insulation thickness for components using mineral wool. For applications above 1000°F, thickness should be determined with vendor assistance and/or use of the T-2013 program at CCCTC.

[REDACTED]

M2.3.1 DESCRIPTION

Insulation shall be a rigid cellular glass material in flat block, beveled lags, or pipe covering of sectional or segmental form.

M2.3.2 SERVICE

M2.3.2.1 Temperature Range - Cellular glass is used for components operating in the range from 90°F to 300°F.

M2.3.2.2 Components Insulated - Cellular glass may be used for the insulation of piping or equipment of any material of construction operating in the 90 to 300°F range.

M2.3.3 THICKNESS

Thickness of cellular glass insulation used on piping and equipment should be determined from Table 3.

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M2.4.1 DESCRIPTION

The insulation shall be sectional pipe covering of 6# density or rigid sheets and blankets of 3# or 6# density fiberglass.

M2.4.2 SERVICE

M2.4.2.1 Temperature Range - Fiberglass is used for components operating in the temperature range of 90°F to 450°F.

M2.4.2.2 Components Insulated - Fiberglass may be used for piping, instruments, and equipment.

M2.4.3 THICKNESS

Table 4 gives the insulation thickness for components insulated with fiberglass.

M2.5.1 DESCRIPTION

Insulation shall be a high temperature mineral wool type insulating cement such as Ryder Thermokate #1-MWP or equal.

M2.5.2 SERVICE

M2.5.2.1 Temperature Range - Insulating cement is used for components operating at temperatures of 71°F and above with upper limits depending upon the material used.

M2.5.2.2 Components Insulated - Insulating cement is used for the insulating of irregular surfaces such as pumps, turbines, valves, flanges, etc. Insulating cement is also used to fill voids and smooth the surface of fabricated elbow covering.

M2.5.3 THICKNESS

The thickness of insulating cement shall be as shown for mineral wool in Table 2. For irregular surfaces use the thickness shown for 36" diameter.

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[REDACTED]

M2.6.1 DESCRIPTION

Insulation shall be a woven asbestos cloth tape 1" wide x 1/8" thick.

M2.6.2 SERVICE

M2.6.2.1 Temperature Range - Asbestos tape is used for components operating at temperatures of 180°F and above.

M2.6.2.2 Components Insulated - Asbestos tape is used on irregular surfaces such as bent pipe and tubing where the use of rigid insulation is considered impractical.

M2.6.3 THICKNESS

Tape shall be wrapped to a thickness of 1/2 inch. If thicknesses greater than 1/2 inch are required, consideration should be given to alternate materials.

[REDACTED]

M2.7.1 DESCRIPTION

Insulation shall be flexible foamed plastic tubular pipe insulation.

M2.7.2 SERVICE

M2.7.2.1 Temperature Range - Foamed plastic insulation is used for components operating at temperatures of 180°F and below.

M2.7.2.2 Components Insulated - Foamed plastic is used on bent pipe or tubing where the use of rigid insulation is considered impractical.

M2.7.3 THICKNESS

Insulation thickness shall be 3/4 inch minimum.

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M2.8 HIGH TEMPERATURE SERVICE

For services in the 1800 to 2300°F range, Babcox and Wilson "Kaowool" 8-lb density blankets or equal should be used. Insulation thickness should be determined with vendor assistance and/or use of the T-2013 program at CCCTC.



M3.1.1 DESCRIPTION

Insulation shall be a rigid cellular glass material in flat block, beveled lags, or pipe covering of sectional or segmental form.

M3.1.2 SERVICE

M3.1.2.1 Temperature Range - Cellular glass is used for components operating in the ambient to -350°F range.

M3.1.2.2 Components Insulated - Cellular glass shall be used for the following:

- a. Piping, instrument or equipment with a diameter of 36" or less.
- b. Equipment with diameters greater than 36".
- c. Irregular surfaces.

M3.1.3 THICKNESS

Table 6 gives the thickness of cellular glass insulation for piping and equipment operating from ambient to -350°F.



M4.1.1 DESCRIPTION

Aluminum jacketing material shall be 5005 or 3003 alloy with H-14 temper. Sheets or rolls shall be 0.016" thick with 3/16" corrugations or 0.020" thick smooth. Jacketing both with and without attached moisture barrier are used. Aluminum elbow covers shall be 0.020" thick.



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M4.1.2 SERVICE

M4.1.2.1 Moisture Barrier - Aluminum jacketing with attached moisture barrier shall be used over calcium silicate insulation when wet conditions are anticipated.

M4.1.2.2 Components Jacketed - All straight run piping insulation shall be jacketed with smooth or corrugated aluminum. The following components may be jacketed with aluminum if specified:

- a. Insulated elbows.
- b. Vertical vessel and exchanger shells with corrugated aluminum.
- c. Horizontal vessel and exchanger shells with smooth aluminum.



M4.2.1 DESCRIPTION

Mastic shall be a polyvinyl acetate emulsion such as Benjamin Foster Sealfast mastic with an aluminum color, or a solvent cutback type such as Lion Nokorode "Sealkote" or a vinyl acrylic such as Childers Vy-CRYL, or Pittcoat #300 for cold service.

M4.2.2 SERVICE

Mastic weather barrier shall be used over all insulated components such as pumps, turbines, instruments, valves, exchanger and vessel heads where aluminum jacketing is impractical. Mastic shall also be used for elbows and equipment for which aluminum jacketing is not specified.

M4.3 OTHER MATERIALS

Other weather barrier materials such as stainless steel may be used where service conditions will not permit usage of aluminum or mastic.

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M5.1.1 DESCRIPTION

Joint sealer shall be an aluminum gray vapor barrier sealer such as Benjamin Foster's No. 30-45 or an asphalt base sealer such as Lion Nokorode "Low Temp".

M5.1.2 SERVICE

Joint sealer shall be used on all butt edges of single layer insulation or outer layer of multi-layer applications.

M5.2.1 DESCRIPTION

Glass cloth shall be 10 x 10 thread count or 10 x 20 thread count asphalt impregnated glass cloth.

M5.2.2 SERVICE

The 10 x 10 glass cloth is used to reinforce mastic weather barriers. The 10 x 20 thread count cloth is used to reinforce mastic vapor barriers in cold service.

M5.3.1 DESCRIPTION

Wire netting shall be 1" HEX pattern, 20 gauge monel, 316 stainless steel, or galvanized poultry netting depending upon environmental conditions.

M5.3.2 SERVICE

Wire netting is used to reinforce insulating cement when thickness of 1-1/2" or greater is required or when used as reinforcing/hold-down for block or mat insulation on large flat surfaces.

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M5.4 BANDS

M5.4.1 DESCRIPTION

Bands shall be 3/8", 1/2", or 3/4" wide x .020" thick stainless steel with matching double prong seals.

M5.4.2 SERVICE

M5.4.2.1 Aluminum Jacketing - 3/8" wide bands on 9" centers are used to secure all aluminum jacketing.

M5.4.2.2 Pipe Insulation - Bands 1/2" wide are used on 9" centers to secure insulation on pipe greater than 12" in diameter and equipment with a diameter of 36" or less.

M5.4.2.3 Vessel Insulation - Bands 3/4" wide are used on 12" centers to secure insulation on equipment or pipe with a diameter greater than 36".

M5.5 WIRE

M5.5.1 DESCRIPTION

Wire shall be 16 gauge stainless steel or galvanized.

M5.5.2 SERVICE

Wire is used on 9" centers to secure pipe insulation on lines through 12" diameter. Stainless steel wire is used at high humidity locations and galvanized wire is used at low humidity locations.

M5.6 SCREWS

M5.6.1 DESCRIPTION

Screws shall be No. 3 x 1/2" long cadmium plated or aluminum slotted HEX head or pan head sheet metal screws.

M5.6.2 SERVICE

Sheet metal screws shall be used on 6" centers to secure aluminum pipe or equipment jacketing at low humidity locations. On vertical equipment surfaces at all locations, screws are used at the horizontal laps.

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M5.7 WELD PINS

M5.7.1 DESCRIPTION

Weld pins shall be 12 gauge minimum 304 or 316 stainless steel and of sufficient length to project through the insulation being secured for attachment of speed clip.

M5.7.2 SERVICE

Weld pin spacing is optional depending on service and type of insulation. Project engineer should specify. Generally, spacing should never exceed 2'0" c-c. At edges and projections such as nozzles, spacing should be closer.

M5.8 SPEED CLIPS

M5.8.1 DESCRIPTION

Speed clips shall be push-on type of 30 gauge sheet metal of either round or square type. They shall be a minimum of 1-1/2" diameter or 1-1/2" square.

M5.8.2 SERVICE

All weld pins shall be topped with speed clips. If weld pins and speed clips are used in conjunction with wire netting, the weld pin should protrude through the netting with the speed clip on the outside of the netting.

M5.9 CHIL-SPRINGS

M5.9.1 DESCRIPTION

Chil-springs shall be either 4" or 2" long, T-302 stainless steel material with a 600°F service temperature. As manufactured by Childers Products Co. or equal.

M5.9.2 SERVICE

Chil-springs are used in stainless steel securement bands on large diameter equipment to allow for expansion or contraction. One Chil-spring should be used about every 50 feet of strapping if excessive expansion/contraction is expected (i.e., >2" growth).

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