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E. I. DU PONT DE NEMOURS AND COMPANY, INC.

WILMINGTON, DEL.

ENGINEERING DEPARTMENT

THERMAL INSULATION SPECIFICATION

NO. 8544

FOR VICTORIA PLANT

SITE MAINTENANCE AND OR PROJECTS

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Approved:

Date:

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INSULATION ENGINEER

Date: 7/9/84

This specification supercedes all previously issued insulation specifications from the Engineering Department.

This specification is issued on Project 1908. However it shall be used for subsequent Projects with updating as required.

ISSUE DATE _____ REV. DATE 10/15/84

PLAINTIFF'S
EXHIBIT

DUP-540

DUP 0838653

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1.0 GUIDE FOR USING THIS SPECIFICATION

1.1 SPECIFICATION GUIDE

1. Review the drawings or models for the pipe or equipment to be insulated. They will be identified with a double diamond, <><>.
2. The letter/number in the right hand diamond indicates the proper "Insulation Thickness Table". The number in the left hand diamond is the "thickness index" which indicates the insulation thickness in the in the "Insulation Thickness Table". The exception is when a single thickness is indicated such as found on ducts. In this case a cross is shown in the right hand diamond.
3. See the "Table of Contents" in front of the Specification.
4. Note the numbered sections 2 thru 9.
5. Section 2 "Notes and Exceptions" provides data for Site areas or processes where special insulation systems may be required.
6. Section 3 "Category" will assist Engineering, Construction and Plant Personnel in verifying that all pipe and equipment which must be insulated is included in the Specification. This Section is also helpfull for maintenance.
7. Section 4 "Material Index" is a list of approved insulation materials. Substitutes are not acceptable.
8. Section 5 "Thickness Index Tables" indicates the insulation material and thickness as shown in the double diamond. Where the insulation thickness index must be determined in the field, take the operating temperature in deg. F and add the number 460, then drop the last digit. Example; $300 \text{ deg F} + 460 = 76$
9. Sections 6,7 and 8 are the "Application Specifications". Review the "Table of Contents" for the correct Specification.
10. Section 9, the "Appendix" includes all sketches for fabrication details and additional supplemental Specifications.

1.2 INSULATION SYMBOLS

<60> = Thickness Index (Example)

The letter between the diamonds signifies special

conditions (Example) ^A<60> <H1>

- A = Stainless Steel Pipe and Equipment
- S = Insulate For Personnel Safety
- D = Dual-Temperature (Double Layer) Defined as a system subject to temperatures above and below freezing.
- J = Duct- Antisweat -Insulation outside the duct.
- N = Noise Reduction
- Q = Fire Resistant
- R = Removable /Reusable Insulation
- F = Factory Pre-Insulated Pipe
- G = Where the insulation can get wet, heavier jacket and flashing is required for equipment.

2.0 -NOTES AND EXCEPTIONS

This Section provides information for areas or processes
where
special insulation materials or systems are required.

3.0 THERMAL INSULATION SYSTEM- CATEGORY

Du Pont Engineering is responsible to code drawings and models.

3.1 CATEGORY NO. 1- SERVICE TEMP. 36 TO 80 F.

A. General

This category covers requirements for installing thermal insulation systems on pipe and equipment.

B. Insulation, Thickness, Finish and Application Specifications

1. Service-

36 to 80 F -Freeze protection

Temp. F

36 to 80

Temp. C

2 to 27

Notation shown on drawings

<50><C2> to <54><C2>

2. Insulation materials

Insulation

Polyisocyanurate foam- rigid (Code 118.1)

3. Insulation Thickness

See Table C2

4. Insulation Jacket Materials

Aluminum

5. Application Specification

Pipe; see Sections 6.1, 6.3 and 6.6.

Equipment; see Sections 7.1, 7.3, 7.5, 7.7 and 7.8.

3.2 CATEGORY NO. 2- SERVICE TEMP. 80 TO 750 F.

A. General

This category covers requirements for installing thermal insulation systems on pipe and equipment.

B. Insulation, Thickness, Finish and Application Specifications

1. Service

For energy conservation and personnel protection.
80 to 750 F -Steam, process lines and equipment.

Temp. F

80 to 750

Temp. C

27 to 399

Notation shown on drawings

<54><H2> to <121><H2>

2. Insulation materials

Insulation

Calcium Silicate (Codes 102.1, 102.2, 102.3)

3. Insulation Thickness

See Table H2

4. Insulation Jacket Materials

Aluminum

5. Application Specification

Pipe; see Sections 6.1, 6.4, 6.6.

Equipment; see Sections 7.1, 7.2, 7.3

3.3 CATEGORY NO. 3- PERSONNEL SAFETY

A. General

This category covers requirements for installing thermal insulation systems on pipe and equipment.

B. Insulation, Thickness, Finish and Application Specifications

1. Service- For personnel protection/no energy conservation.
Condensate and drain lines.

Temp. F _C
See below.

2. Insulation materials

Insulation

Calcium Silicate (Codes 102, 102.1)
140 to 1200 F 60 to 649 C
Notation shown on drawings
S S
<60><H1> to <166><H1>

3. Insulation Thickness

See Table H1

4. Insulation Jacket Materials

Aluminum

5. Application Specification

Pipe; see Sections 6.1, 6.4, 6.6.

Equipment; see Sections 7.1, 7.2, 7.3.

C. 1. To prevent corrosion, guards are preferred instead of insulation for personnel protection where possible.

2. Where protective guards or insulation is required for personnel protection follow these guidelines:

3. Extend the insulation 8 feet above floors, stairs, and regular working or travel platforms.

4. Extend the insulation 3 feet beyond the restrictions of platforms, catwalks, stairs, fixed ladders, or designated travel paths.

3.4 CATEGORY NO. 4- SERVICE TEMP. -200 TO +35 F

A. General

This category covers requirements for installing thermal insulation systems on pipe and equipment.

B. Insulation, Thickness, Finish and Application Specifications

1. Service- Cold temperature
Brine piping and equipment.

Temp. F

-200 to + 35

Notation shown on drawings

<26><C2> to <49><C2>

Temp. C

-129 to +2

2. Insulation materials

Insulation

Polyisocyanurate (Code 118.1)

3. Insulation Thickness
See Table C2

4. Insulation Jacket Materials
Vapor Barrier + Aluminum

5. Application Specification
Pipe; see Sections 6.1, 6.2 and 6.6.
Equipment; see Sections 7.1, 7.2, 7.5
and 7.7.

3.5 CATEGORY NO. 5- DUCTS- IN WET AREAS

A. General

This category covers requirements for installing thermal insulation systems on ducts.

B. Insulation, Thickness, Finish and Application Specifications

1. Service

Outdoor and high abuse areas for heating and ventilating ducts.
For anti-sweat and warm service.

Temp. F	Temp. C
36 to 300	2 to 150

Notation shown on drawings

J J
<50><+> TO <76><+>

2. Insulation materials

Insulation

36 to 80 F.	2 to 27 C.
Polyisocyanurate (Code 118.1)	
81 to 300 F.	3 to 150 C.
Calcium silicate (Code 102, 102.1)	

3. Insulation Thickness

1" thick for operating temperatures to 80 deg. F.
1 1/2" thick above 80 deg. F or where flanges or stiffeners will not interrupt the finish.

4. Insulation Jacket Materials

Aluminum (Codes 716 series); Specify stucco embossed finish where a wrinkled appearance is undesirable.

5. Application Specifications

Ducts; see Sections 8.1, 8.2 and 8.5.

1.6 CATEGORY NO. 6- TRACED PIPE

A. General

This category covers requirements for installing thermal insulation systems on pipe.

B. Insulation, Thickness, Finish and Application Specifications

1. Service

Electric or Steam Traced Piping

Temp. F

81 to 500

Temp. C

27 to 260

Notation shown on drawings

<55><H1,H2> to <96><H1,H2>

2. Insulation materials

Perlite Silicate (Code 102.2)

3. Insulation Thickness

See Table H1, or H2

4. Insulation Jacket Materials

Aluminum

5. Application Specification

Pipe; see Sections 6.1, 6.5, 6.6.

3.7 CATEGORY NO. 7- DUCTS, PIPE- IN DRY AREAS

A. General

This category covers requirements for installing thermal insulation systems on pipe and ducts.

B. Insulation, Thickness, Finish and Application Specifications

1. Service

For anti-sweat and hot services; In low abuse areas where the insulation can not get wet.

Temp. F	Temp. C
36 to 375	2 to 190
Notation shown on drawings	
J	J
<50><+>	TO - <84><+>

2. Insulation materials

Glass-Fiber (Codes 112, 112.6)

3. Insulation Thickness

1" thick for operating temperatures to 150 F.
For temperatures above 150 F. see Table C4

4. Insulation Jacket Materials

Factory applied FSK finish for square ducts
Factory applied ASJ finish for round ducts and pipe

5. Application Specification

Pipe and ducts; see Sections 8.1 AND 8.4

3.8 CATEGORY NO. 9- NOISE - PERSONNEL SAFETY

A. General

This category covers requirements for installing thermal insulation systems on pipe and equipment.

B. Insulation, Thickness, Finish and Application Specifications

1. Service

Acoustic- No energy conservation

Temp. F	Temp. C
36 to 1200	2 to 649

Notation shown on drawings

N	N
<50><H5>	TO <166><H5>

2. Insulation materials

Glass-Fiber (Codes 112.1, A10.2) to 370 F (188 C)

N	N
<50><H5>	TO <83><H5>

Calcium silicate/glass-fiber composite (Codes 112.1, A10.2, 102, 102.1) above 370 F (188 C). Glass-Fiber to be the outside layer.

N	N
<84><H5>	TO <166><H5>

3. Insulation Thickness

See Table H5

4. Insulation Jacket Materials

Lead laminated Aluminum (Code A30.4)

Loaded Mastic (Code A60.5)

5. Application Specification

Pipe: see Sections 6.1, 6.2, 6.4

Equipment; see Sections 7.1, 7.2, 7.3

3.9 CATEGORY NO. 10- NOISE - ENERGY CONSERV.

A. General

This category covers requirements for installing thermal insulation systems on pipe and equipment.

B. Insulation, Thickness, Finish and Application Specifications

1. Service

Acoustic- For energy conservation

Temp. F	Temp. C
36 to 750	2 to 399
Notation shown on drawings	
N	N
<50><H6>	TO <121><H6>

2. Insulation materials

Glass-Fiber (Codes 112.1, A10.2) to 370 F (188 C)

N	N
<50><H6>	TO <83><H6>

Calcium Silicate/Glass-Fiber composite (Codes 112.1, A10.2, 102, 102.1) above 370 F (188 C). Glass-Fiber is to be the outside layer.

N	N
<84><H6>	TO <121><H6>

3. Insulation Thickness

See Table H6

4. Insulation Jacket Materials

Lead laminated aluminum (Code A30.4)
Loaded mastic (Code A60.5)

5. Application Specification

Pipe; see Sections 6.1, 6.2, 6.4

Equipment; see Sections 7.1, 7.2, 7.3

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3.10 CATEGORY NO. 12- FIRE PROTECTION

A. General

This category covers requirements for installing thermal insulation systems on pipe and equipment.

B. Insulation, Thickness, Finish and Application Specifications

1. Service- Insulation system for fire protection.

Temp. F	Temp. C
36 to 1200	2 to 649
Notation shown on drawings	
Q	Q
$<50> <H1 \text{ or } H2>$	$\text{to } <166> <H1 \text{ or } H2>$

2. Insulation materials

Insulation
Calcium Silicate (Codes 102, 102.1) or
Perlite Silicate (Code 102.2)

3. Insulation Thickness; See the H1 or H2 Tables.
Minimum total thickness 4" (double layer) required.
Where the insulation thickness tables indicate a thickness greater than 4", use the greater thickness.4. Insulation Jacket Materials
Stainless Steel (Code 753)5. Application Specification
Pipe; see Sections 7.1, 7.4 and 7.9.
Equipment; see Sections 8.1, 8.5 and 8.7.

3.11 CATEGORY NO. 14- FACTORY PRE-INSULATED PIPE

A. General

This category covers requirements for factory pre-insulated piping, above or below ground. This system may be more economical where lines are greater than 100 ft. long and have few branches.

B. Insulation, Thickness, Finish and Application Specifications

1. Service- For cold, dual temperature, hot and traced systems.

Temp. F	Temp. C
-40 to +1200	-40 to +649

Notation shown on drawings

F	F
<42><+>	to <166><+>

2. Insulation materials

-40 to 80 F. (-40 to 27 C.)
Polyurethane (Code 118)
81 to 1200 F. (28 to 649 C.)
Calcium Silicate (Codes 102,102.1)

3. Insulation Thickness

See individual specification

4. Insulation Jacket Materials

PVC, Polyethylene or FRP with polyurethane insulation.

Aluminum, Galvanized Steel, PVC coated Galvanized or stainless steel with calcium silicate insulation.

5. Application Specification

Pipe; see Section 6.10

4.0 MATERIAL INDEX

Code	Material Designation	Brand Name	Vendor
102	Calicum Silicate *Elbow insulation available	Thermo-12 Kaylo-10AF * Super Caltemp, Type NA * SPROULE WR1200 * Pamsil	Manville Corp Owens-Corning Fiberglas Corp Pabco Insulation Div Louisiana- Pacific Corp Sproule Mfg. Co. Pamrod, SA
102.1	Calcium silicate - inhibited	For insulation specified by this code number, see code 102	
102.2	Perlite silicate - Water resistant	Sproule WR1200	Sproule Mfg. Co.,
112.1	Glass fiber - high temperature pipe covering avail. with ASJ factory applied jacket	850 Snap-On Fiberglass Pipe Insulation Micro-Lok 650 Pipe Insulation Pipe Fiberglas Covering Knauf Pipe Insulation 850	Certain-Teed Corp Manville Corp Owens-Corning Fiberglas Corp Fnauf Fiber Glass GmbH
FFC (Dummy code)	Two-piece Fiberglass fitting covers	Armaglas-F Fitting covers	Speciality Products & Insulation Co.
112.6	Glass fiber- board with factory applied FSK jacket	IB300 Spin-Glass No. 814 Rigid Insulation Board 3 lb. Type703 Industrial Insulation Board	Certain-Teed Corp. Manville Sales Corp. Knauf Fiber Glass GmbH Owens-Corning Fiberglass Corp.
A10.2	Glass Fiberboard Heavy Density (For Acoustics)	Spin-Glass No. 817 IB600 Fiberboard, Type 705 Type IB Board	Manville Sales Corp. Certain-Teed Corp. Owens-Corning Fiberglas Corp. Knauf Fiberglass GmbH
114.1	Mineral wool - inhibited - 900 F	Epitherm - 1200 Molded Pipe FBX 1300 Block FBX MF1200 Pipe Insulation Cadafit 1200/S	Fibrex, Inc Fibrex, Inc Fibrex, Inc HAMFAB Corp

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		1212 Blok	Holmes Insulation
		K-Fac PC	U. S. Gypsum Co
		RXL 120 High Density Insul.	Roxul Co
114.2	Mineral wool- 1200 F	Epitherm- 1200 Molded Pipe	Fibrex, Inc
		FBX 1300 Block	Fibrex, Inc
		FBX MF1200 Pipe Insulation	Fibrex, Inc
		K-Fac PC (block&pipe)	U. S. Gypsum Co
		Delta 10 Board	Rock Wool Mfg Co
		1212 blok	Holmes Insulations
		RXL 120 High Density (block only)	Roxul Co
		Cadafit 1200	
		Lapinus 1200	HAMFAB Corp Rockwool Lapinus
118	Polyurethane foam - rigid	C-Tek T250	C-Teck Insulation Services Inc.
		Trymer CPR-190-2	Upjohn Co, CPR Div
118.1	Polyisocyanurate foam - rigid	Type T-250 Rigid Foam	C-Tech Insulation Services, Inc.
		Trymer CPR-9501	Upjohn Co., CPR Div
501	Asphalt cutback, cork filled	Cork-Filled Mastic - 407 FR	Electro Chemical Engineering and Manufacturing Co
		Lion Nokorode K- Kote	Tosco Corp
		Insul-Mastic, No. 553 - Type D	Porter Paint Co
502.4	Insulating and finishing cement - inhibited	Pabcote	Louisiana-Pacific Corp, Pabco Insulation Div
508	Heat transfer cement- water soluble	Tracit 300 Standard Thermon Zeston Z-10	Chemax Mfg Corp Thermon Mfg co Manville Corp
510	Heat transfer cement - nonhardening	Tracit-1100 ControHeat Grade B	Chemax Mfg Corp Controls southeast Inc.
709	Fibrated asphalt cutback	Weatherproof Plastic Mastic No. 401 FR	ACS Industries, Inc Electro Chemical Engineering and
	Note; The (AF) in		

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	front of the mastic indicates (AF) Foster C. I. asbestos free.	Mastic 60-25 (AF) Foster C. I. Mastic 60-26 (AF) Cadamastics 820, 826 Insulkote SG Insulkote ST Lion Nokorode Seal-Kote Insul-Mastic No. 4010 Seaboard Mastic	Manufacturing Co H. B. Fuller Co, Assembly Products Div H. B. Fuller Co, Assembly Products Div Epolux Mfg. Co Manville Corp Manville Corp Tosco Corp Porter Paint Co Seaboard Asphalt Product Co
710	Glass cloth Open weave	Glass Cloth, Style 1659/Geon Glass Cloth, Type 209 10x10 Woven Glass Scrim Fabric, Resin Treated Style 1659 Luben Scrim Fabric Style No. 59 Fiber Glass Scrim Style No. 1659	J.P. Stevens Co, Inc Perma Glas-Mesh Corp. Burlington Industries Inc Alpha Associates, Inc Clark Schwebel Fiber Glass Corp.
716	Smooth aluminum jacket 0.016" thick with 3-mil poly/ kraft backing	Tri-Thermodyne(3T) Jacketing Sure-Fit Roll Jacketing Premetco Aluminum Jacket/Poly- Surlyn Moisture Barrier Premetco Aluminum Jacket/3-Mil Polyethylene/Kraft Barrier Aluminum Jacket Aluminum Jacket	Childers Products Co Louisiana-Pacific Corp, Pabco Insulation Div Premetco International, Inc Premetco International, Inc RPR Products, Inc Quality Service Metals Co
716.5	Smooth aluminum jacket, Acrylic Coated 0.016" thick with 3-mil poly/ kraft backing	Aluminum Jacket Acrylic Finish Sure-Fit Roll Jacketing, Coated Aluminum Jacket, 3-Mil Polyethylene/Kraft	Childers Products Co Louisiana-Pacific Corp, Pabco Insulation Div Premetco International, Inc

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		Barrier, Acrylic Coated	
		Aluminum Jacket, Poly-Surlyn Barrier, Acrylic Coated	Premetco International, Inc
		Acrylic-Coated Aluminum Jacket	RPR Products Inc
		Acrylic-Coated Aluminum Jacket	Quality Service Metals Co
716.6	Deep-corrugated aluminum jacket 0.016" thick	Deep-Corrugated(3T) Jacketing	Childers Products Co
		Deep-Corrugated Aluminum Jacket, Poly-Surlyn Barrier	Premetco International, Inc
	Cross crimped. (Specify on order)	Deep-Corrugated Aluminum Jacket, 3-Mil Polyethylene/Kraft Barrier, Epoxy Coated	Premetco International, Inc
		Sure-Fit Roll Jacketing	Louisiana-Pacific Corp, Pabco Insulation Div
		Aluminum Jacket	RPR Products Inc
716.7	Deep-corrugated aluminum jacket, Acrylic coated 0.016" thick with 3-mil poly/kraft backing Cross crimped. (Specify on order)	Deep-Corrugated(3T) Aluminum Jacket Acrylic Finish	Childers Products Co
		Deep-Corrugated Aluminum Jacket, 3-Mil Polyethylene/Kraft Barrier, Acrylic Coated	Premetco International, Inc
		Deep-Corrugated Aluminum Jacket, Poly-Surlyn Barrier, Acrylic Coated	Premetco International, Inc
		Acrylic Coated Aluminum Jacketing	RPR Products Inc
		Sure-Fit Roll Jacketing, Coated	Louisiana-Pacific Corp Pabco Insulation Div
716.8	Smooth Aluminum Jacket, "Tedlar" Coated 0.016" thick with 3-mil poly/kraft backing	Aluminum Jacket Ultrolon Finish 0.016" thick	Childers Products Co.
		Aluminum Jacket Tedlar Finish	Quality Service Metals Co
TED (Dummy	Smooth Aluminum Jacket, "Tedlar"	Aluminum Jacket Ultrolon Finish	Childers Products Co.

Code)	Coated 0.032" thick with 3-mil poly/ kraft backing	0.032" thick Aluminum Jacket Tedlar Finish	Quality Service Metals Co
717.1	45 and 90deg. ell covers, two-piece aluminum die formed	Ell-Jac, CE5-6 Moisture Barrier Sure-Fit Elbow Covers Aluminels Ell Covers Two-piece	Childers Products Co Louisiana-Pacific Corp, Pabco Insulation Div Premetco International, Inc Quality Service Metals Co
717.2	Tee covers, two- piece aluminum	Ell-Jac, CE5-6 Moisture Barrier Sure-Fit Tee Covers Aluminels	Childers Products Co Louisiana-Pacific Corp, Pabco Insulation Div Premetco International, Inc
717.3	Valve covers, two- piece aluminum	Ell-Jac, CE5-6 Moisture Barrier Sure-Fit Covers Aluminels	Childers Products Co Louisiana-Pacific Corp, Pabco Insulation Div Premetco International, Inc
717.4	Flange covers, two- piece aluminum	Ell-Jac, CE5-6 Moisture Barrier Sure-Fit Covers Aluminels	Childers Products Co Louisiana-Pacific Corp, Pabco Insulation Div Premetco International, Inc
717.5	Flat end cap, two- piece aluminum	Ell-Jac, CE5-6 Moisture Barrier Sure-Fit Covers Aluminels	Childers Products Co Louisiana-Pacific Corp, Pabco Insulation Div Premetco International, Inc
717.6	Beveled end cap, one-piece aluminum	Ell-Jac, CE5-6 Moisture Barrier Sure-Fit Covers Aluminels	Childers Products Co Louisiana-Pacific Corp, Pabco Insulation Div Premetco International, Inc
717.7	45 and 90 deg. aluminum ell covers (gore or miter)	Aluminum Jacket, Epoxy/Polyester Finish Aluminum Jacket, Poly-Surlyn Barrier, Acrylic	Childers Products Co Premetco International,

		Coated Aluminum Jacket, 3-Mil Polyethylene/ Kraft Barrier, Acrylic Coated Sure-Fit Elbow Covers	Premetco International, Inc Louisiana-Pacific Corp, Pabco Insulation Div
721	Asphalt aluminum coating	Monsey Aluminum Roof Paint	Monsey Products Co
734	Insulation mastic	Vi-Cryl CP-10-F Eco-Mastic 55-50 Foster Aqua-Fas Mastic 38-00 Trowel, 48-00 Spray Foster Sealfas GPM 35-00 Foster Sealfas GPM 36-00 Jaxsan 600 Vimasco WC-1FR Vimasco WC-5-FR Mastic	Childers Products Co Mon-Eco Industries, Inc H. B. Fuller Co , Assembly Products Div H. B. Fuller Co, Assembly Products Div H. B. Fuller Co, Assembly Products Div Plastic Coatings Corp Vimasco Coatings Corp Vimasco Coatings Corp
741	Vapor-barrier membrane	Servi-Wrap P-500 Roywrap 550 M	W. R. Grace and Co Royston Laboratories, Inc
743	Synthetic organic fiber cloth, open weave	PC Fabric 79 Elasta Fab No.894 Quality Cloth	Pittsburgh Corning Corp Vimasco Coatings Corp Quality Service Metals
748	PVC one piece fitting (For light duty service only)	Ceel-Tite light-gauge Permajac SX PVC Zip Jacket (indoor only)	CEEL-CO Topline Products Inc. Speed-Line Mfg Co.
749.1	FRP 45, 90 deg. Ell Covers	Chil-Jac Fitting Covers Perma-Jac H.D. Fitting Covers	Childers Products Co Topline Products Co
749.2	FRP Tee Covers	Chil-Jac Fitting Covers Perma-Jac H.D. Fitting Covers	Childers Products Co Topline products Co
749.3	FRP End caps	Chil-Jac Fitting Covers Perma-Jac H.D. Fitting Covers	Childers Products Co Topline Products Co

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749.4	FRP Flange Covers	Chil-Jac Flange Covers Perma-Jac Flange	Childers Products Co Topline Products Co
751.1	Aluminum Jacket 32 mil thick Specify Acrylic Coated	Tri-Thermodyne(3T) Jacketing 32 mil .032 Sure-Fit Roll Jacketing 32 Mil Aluminum 32 Mil Premetco Aluminum Jacket/ 3-Mil Poly/Kraft or Poly-Surlyn	Childers Products Co Louisiana-Pacific Corp. Pabco Insulation Div. RPR Products, Inc Premetco International, Inc
752.1	Aluminum Jacket 24 mil thick Specify Acrylic Coated	Tri-Thermodyne(3T) Jacketing 24 mil .024 Sure-Fit Roll Jacketing 24 Mil Aluminum 24 Mil premetco Aluminum Jacket/ 3-Mil Poly/Kraft or Poly-Surlyn	Childers Products Co Louisiana-Pacific Corp. Pabco Insulation Div. RPR Products, Inc Premetco International, Inc
752.3	Deep-Corrugated 24 Mil Acrylic Coated Specify cross krimp on order	24 Mil Deep-Corrugated Acrylic Coated with 3 mil Poly/Kraft or Poly/Surlyn 24 Mil Deep-Corrugated (3T) Acrylic Coated Acrylic Coated Aluminum Jacket 24 Mil with 3 Mil Poly/Kraft Deep-Corrugated .024 Sure-Fit Roll Jacketing Acrylic Coated	Premetco International Childers Products Co RPR Products Inc Louisiana-Pacific Pabco Div
753	Smooth stainless Steel 0.010" thick jacketing (Specify Type 304 or 316 for fire protection and 316 only for corrosion protect.)	10 Mil Smooth Stainless Steel Jacket with 3 mil poly/kraft barrier	Childers Products Co Premetco international, Inc RPR Products, Inc Quality Service Metals Co Louisiana-Pacific Corp. Pabco Insulation Div.
753.1	45 and 90 deg. ell Stainless steel	Ell-Jac, Stainless Steel Stainless Steel	Childers Products Co RPR Products, Inc

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753.2	Tee covers, two-piece stainless steel	E11-Jac, Stainless Steel Stainless Steel Tee Covers	Childers Products Co RPR Products, Inc
753.3	Beveled end cap Stainless Steel	E11-Jac, Stainless Steel Stainless Steel Beveled End Cap	Childers Products Co RPR Products, Inc
753.4	Deep-corrugated stainless steel jacket 0.010" thick	10 Mil Deep-Corr. Type-316 Stainless Steel Jacket	Childers Products Co
A30.4	Lead Sheeting Aluminum jacket Specify 1 lb. or 2 lb./sq. ft. Lead	Muffl-Jac Super Lead-lined	Childers Products Co. Premetco International, Inc.
A60.5	Loaded mastic Apply at 0.14" thickness	Muffl-Lag	Childers Products Co., Inc.
802.1	Lagging adhesive	Sodium Silicate, Technical Grade F Sodium Silicate, N Brand	Du Pont Co, Chemicals and Pigments Dept PQ Corp
810	Water-resistant adhesive Note 1. Nonflammable in wet state	Foster Stic-Safe 85-15 (Brush, Spray Grade) Adhesive No. 33 Spray Grade Chil-Stix Clear CP-85 (Trowel) Chil-Spray NF CP-89 (Spray)(1)	H. B. Fuller Co. Assembly Products Div 3 M Co Childers Products Co
813	Caulking compound	Silastic 732 RTV Silicone Sealant SCS-1202, White Silicone Sealant Aluminum Chem-Calk 1200-75 No. 1020	Dow Corning Corp. General Electric Co General Electric Co Woodmont Products
817	Anchor Adhesive	Tuff-Bond Quik-Set	Goodloe E. Moore Co.
826	Insulation Adhesive	Tuff-Bond No. 9 Sytrofoam Brand	Goodloe E. Moore Co. Dow Chemical

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Mastic No. 11

901	Rain Shields (PVC)	Rainshield	Topline Products, Inc
921	Stainless steel wire (18 gage)	Stainless Steel Wire	Applicator or Distributor
926	Stainless steel bands and seals (3/8" x .015")	Stainless Steel Bands and Seals	Applicator or Distributor
927	Stainless steel bands and seals (3/4" x .015")	Stainless Steel Bands and Seals	Applicator or Distributor
964.1	Spindle Anchors (metal plate)	Spindle Anchors Metal Plate Spindle Anchors Metal Plate	Goodloe E. Moore Co Miracle Adhesives Corp
964.2	Spindle Anchors (nylon plate)	Spindle Anchors Nylon Plate	Goodloe E. Moore Co
971.1	Sheet-metal screws (stainless steel)	Sheet-Metal Screws (Type AB,ANSI) Sheet-Metal Screws (Type AB,ANSI)	K. G. Lilly Fasteners, Inc Premetco International, Inc
979	Insulation Pins (weldable 10 ga.) Specify length	Insulation Pins Insulation Pins Insulation Pins Insulation Pins	AGM industries, Inc H. A. Jones Co, Inc Nelson Div TRW, Inc Rilco Manufacturing Co Division of Sadler Industrial Services Inc
980	All weather breather springs	All Weather Breather Springs All Weather Breather Springs Techalloy All Weather Breather Techalloy All Weather Breather Springs Insul-Mate	Childers Products Co A. J. Gerrard and Co Techalloy Co, Inc, De-Tech Instrument Techalloy Co, Inc, De-Tech Instrument Div RPR Products, Inc
987	Masking Tape	Scotchbrand No. 280 Masking Tape	3M Co
992	Listing tape (glass cloth) Specify 2" wide x min. thk. 0.060"	Thermoglass Tape, 9731 Finish Thermoglass Tape, 9731 Finish Thermoglass Tape,	Alpha Associates, Inc Amatex Corp Claremont Co, Inc

		9731 Finish	
997	S-clips (stainless steel)	Stainless Steel Band (see Code 927)	Applicator or Distributor
998	Nylon Fasteners	Prefast Fasteners	Premetco International, Inc
999	Pressure Sensitive Tapes	1520 CW Foil 1540 CW ASJ Mactac ASJ 6100 IA-8000 2 Mil Foil Perma Tape ASJ Std. 105-7 2 Mil Foil 120-6 Fastape ASJ 0835 Fastape 0805 2 Mil Foil	Venture Tape Corp. Morgan Adhesives Co. Compac Corp. Fasson Industrial Div.
DEF (dummy code)	Preinsulated tubing(plain, elec. or steam traced) 1/8 to 3/4" tubing Order with transition fitting covers	Unitherm Dekatrace Thermotube	Samuel Moore and Co. Thermon Manufacturing Co

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5.0 THICKNESS INDEX

5.1 TABLE C2

THICKNESS INDEX TABLE C2

Temperature range: MINUS 200 TO 80 F (-129 TO 27 C)

Use for: Cold, dual temperature, electric or steam traced systems
 Insulation: Polyisocyanurate, Code 118.1

36 to 80 F.

Thicknesses shown are calculated to provide the economic insulation thickness and a surface temperature which does not exceed 140 deg. F

NOMINAL PIPE DIAMETER

Thick	.5	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24	Equip.
1	54	54	54	54	54	54										
1.5							54	54	54	54	54	54	54	54	54	54

EXAMPLE: 12" pipe, "Thickness Index" <53><C2>

1. Look under column for 12" pipe.
2. The number "53" is not listed: go to the next higher number listed - in this case "54" and the thickness is 1 1/2".

35 F and Below

The thicknesses listed below are calculated to prevent condensation at the exterior surface of the insulation when the ambient temperature condition is 95 deg. F with a 7 deg. F dew point depression.

Thick Inch.	NOMINAL PIPE DIAMETER															
	.5	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24	Equip.
1.5	44	46	48	48	48	49	49	49								
2	40	40	44	44	46	48	48	48	48	48	48	48	48	49	49	49
2.5	31	36	36	40	42	42	44	44	46	46	46	46	46	46	48	48
3	21	31	33	36	40	40	40	40	42	42	44	44	44	44	44	45
3.5		16	21	26	31	36	36	36	40	40	40	40	41	42	42	44
4			16	21	26	31	33	34	36	36	37	38	39	40	40	40
4.5				16	16	21	26	31	31	31	36	36	36	36	36	38
5						16	21	26	26	26	31	31	31	31	32	34
5.5							16	21	21	21	21	21	24	28	31	33
6								16	16	16	18	19	20	21	26	28
6.5											16	16	16	16	21	23
7															16	20

EXAMPLE: 8" PIPE, "THICKNESS INDEX" <42><C2>

1. Look under column for 8" pipe.
2. The number "42" is not listed: go to next lower index number listed - in this case "40" and the thickness is 3".

5.2 TABLE C4

THICKNESS INDEX TABLE C4

Temperature range: 36 to 375 F (2 to 190 C)

Use for: Anti-sweat and hot services; in low abuse areas where the insulation cannot get wet.

Insulation: Glass-fiber (Codes 112,112.6)

Thicknesses shown are calculated to provide the economic insulation thickness and a surface temperature which does not exceed 140 F.

		NOMINAL PIPE DIAMETER															Flat Surf.
Thick. Inch.		.5	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24	
1	SL	84	84	84	84	82	81	79	78	77	76	75	74	73	72	71	61
1.5	SL					84	84	84	84	84	84	84	83	82	82	81	71
2	SL												84	84	84	84	81
2.5	SL																84

"SL" denotes single layer.

EXAMPLE: 12" pipe, "Thickness Index" <80><C4>

1. Look under column for 12" pipe.
2. The number "80" is not listed: Go to next higher number.
3. In this case "84". Use 1 1/2" thickness.

5.3 TABLE H1

THICKNESS INDEX TABLE H1

Temperature Range: 140 to 1200 F (60 to 649 C)
Use for: Personnel Protection

Thicknesses shown are calculated to provide the economic insulation thickness and a surface temperature which does not to exceed 140 F.

TEMPERATURE RANGE: 140 to 1200 F
Insulation: CALCIUM SILICATE (CODES 102, 102.1)

Thick Inch	NOMINAL PIPE DIAMETER															Flat Surf.
	.5	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24	
1	96	95	89	88	84	83	78									
1.5	121	116	108	106	101	99	97	94	94	93	90	88	88	88	87	91
2	146	138	138	124	118	113	109	107	106	104	101	100	99	98	98	102
2.5	166	158	155	141	133	129	122	121	118	116	112	111	110	108	108	112
3		166	166	158	147	144	135	134	130	128	123	122	121	120	118	122
3.5				166	166	157	149	146	141	139	134	133	132	130	127	132
4						166	163	158	150	150	143	142	141	141	136	142
4.5							166	166	161	160	153	152	150	150	146	150
5								166	166	166	166	166	166	166	166	166

Example: 12" pipe, thickness index ^S<70><H1>

1. Look under column for 12" pipe.
2. The number 70 is not listed.
3. Go to next higher number listed- In this case 93.
4. Use 1 1/2 " thickness.

5.4 TABLE H2

THICKNESS INDEX TABLE H2

Temperature range: 81 TO 750 F (27 to 399 C)
 Use for: Energy conservation of steam energy
 Insulation: Calcium Silicate (Codes 102.1,102.2)

Thicknesses shown are calculated to provide the economic insulation thickness and a surface temperature which does not exceed 140 F.

Thick. Inch.	NOMINAL PIPE DIAMETER															Flat Surf.
	.5	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24	
1.5 SL	93	89	77	73	73	73	71	68								
2 SL	104	98	98	80	76	74	73	70								
2.5 SL	121	109	108	101	93	86	80	80	78	73	73	73	72	70	70	
3 SL		121	115	109	103	100	95	90	90	90	87	87	87	86	85	70
3.5 DL			121	116	110	107	105	103	101	100	98	96	95	94	93	85
4 DL				121	121	118	115	113	110	104	100	100	98	98	97	93
4.5 DL					121	121	121	116	114	112	110	108	107	105	97	
5 DL								121	121	121	117	113	111	109	105	
5.5 DL											121	121	121	115	109	
6 DL															121	115
6.5 DL																121

"SL" denotes single layer. "DL" denotes double layer.

EXAMPLE: 12" pipe, "Thickness Index" <93><H2>

1. Look under column for 12" pipe.
2. The number "93" is not listed: Go to next higher number.
3. In this case "100". Use 3 1/2" thickness.

5.5 TABLE H5

THICKNESS INDEX TABLE H5

Temperature Range: 41 to 1200 F (2 to 649 C)

Use for: Thermal/Acoustic without energy conservation

Thicknesses shown are calculated to provide a surface temperature which does not exceed 140 F.

Insulation
Thick.(In.)
Mat'l codes

112.1 or 102.1 A10.2		NOMINAL PIPE DIAMETER																	
.5	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24	Eq.				
+2	83	83	83	83	83	83	83	83	83	83	83	83	83	83	83	83	83	83	83
+2	165	165	158	147	144	135													
+2			165	165	157	149	146	141	139	134	133	132	130	127	132				
+2					165	163	158	150	150	143	142	141	141	136	142				
+2						165	165	161	160	153	152	150	150	146	150				
+2							165	165	165	165	165	165	165	165	165				

EXAMPLE: 12" pipe -" Thickness index" <132>^N<H5>

1. Look under column for 12" pipe.
2. The number "132" is not listed.
3. Go to next higher number which is "139".
4. Use 1.5" of Code 102.1 plus 2" of code 112.1 or A10.2 which gives a total thickness of 3.5".

5.6 TABLE H6

THICKNESS INDEX TABLE H6

Temperature Range: 41 to 750 F (2 to 399 C)
 Use for: Thermal/Acoustic with energy conservation

Thicknesses shown are calculated to provide a surface
 temperature which does not exceed 140 F.

Insulation Thick.(In.) Mat'l codes		NOMINAL PIPE DIAMETER																	
112.1 or		102.1	A10.2	.5	1	1.5	2	3	4	6	8	10	12	14	16	18	20	24	Eq.
0	+2	104	98	98	80	76	74	73											
1	+2	121	121	115	109	103	100	95	90	90	90	87	87	87	86	85	70		
1.5	+2			121	116	110	107	105	103	101	100	98	96	95	94	93	85		
2	+2				121	121	118	115	113	110	104	100	100	98	98	97	93		
2.5	+2					121	121	121	116	114	112	110	108	107	105	97			
3	+2								121	121	121	117	113	111	109	105			
3.5	+2											121	121	121	115	109			
4	+2																121	115	
4.5	+2																		121

EXAMPLE: 12" pipe - "Thickness Index" ^N<102><H6>

1. Look under column for 12" pipe.
2. The number "102" is not listed.
3. Go to next higher number which is "104".
4. Use 2" of Code 102.1 plus 2" of code 112.1 or A10.2 which gives a total thickness of 4".

6.0 PIPE INSULATION

6.1 GENERAL CONDITIONS

6.1.1 Keep the insulation dry at all times during storage and installation. No wet insulation shall be installed. If the insulation becomes wet during or after installation, it shall be removed and replaced with new dry insulation. The insulation may be protected with plastic film, but must be vented to prevent sweating.

6.1.2 Finish on pipe, fittings, flanges, valves, etc., to be metal. The only exceptions to this requirement are irregular surfaces and removable insulation described in the Appendix of this specification.

6.1.3 Provide the following corrosion protection to insulated pipe and tubing.

6.1.3.1 All carbon steel pipe shall be painted per the paint specification.

6.1.3.2 Stainless steel pipe and tubing which is not painted shall be protected with mastic at 35 deg. F and below and above 35 deg. F coat the pipe or tubing with sodium silicate per this specification.

6.1.3.3 Do not apply sodium silicate to the pipe where it will not be insulated.

6.1.3.4 When coating the stainless steel surface to be insulated with sodium silicate (Code 802.1) add red food coloring at the rate of 1 ounce per gallon. Use a minimum of 1 gallon per 100 sf. Let coating dry before applying insulation. Do not apply sodium silicate to items that cannot be covered by insulation on the same day.

6.1.4 Leave flanged joints un-insulated until connecting pipe and equipment has been hydrostatically tested by Du Pont, and released to the contractor for completion of insulation.

6.1.5 Steam tracer jumpers will be installed outside of the insulation at all flanged joints.

6.1.5.1 Cover steam tracer jumpers with 2" wide listing tape, (Code 992), spiral wrapped with 50% overlap. Finish listing tape with a coat of insulation mastic, (Code 734).

6.1.6 Instrument tubing can be insulated as indicated in the previous paragraph. Where long tubing lines or severe weather conditions are anticipated, it is recommended to use the preinsulated tubing (Code DEF).

6.1.7 All fittings (flanges, valves, nozzles, drains, etc) are to be insulated (unless specifically excluded) with the same

thickness as the adjacent piping. On screwed fittings, use insulation with same O.D. as adjacent pipe insulation.

6.1.8 At flanged joints, stop the insulation 1 bolt length plus 1" from the back of the flange. Do not bevel insulation.

6.1.9 See sketches in the Appendix for methods of installing and finishing removable insulation on hot and cold systems.

6.1.10 On piping where the insulation can get wet, install rain shields (Code 901) secured with nylon fasteners (Code 998) per Appendix B on horizontal lines where pipe hanger rods or pipe clamps penetrate top of insulation. Support all new lines outside the insulation jacket where possible with a 180 degree, 10 gage galvanized steel saddle (length to be 1.5 times the O.D. of the insulation).

6.1.11 Where protective guards or insulation is required for personnel protection follow these guide lines:

6.1.11.1 Guards are preferred instead of insulation for personnel protection where possible.

6.1.11.2 8 feet above floors, stairs, and regular working or travel platforms.

6.1.11.3 3 feet beyond the restrictions of platforms, catwalks, stairs, fixed ladders, or designated travel paths.

6.2 APPLICATION SPECIFICATION FOR THICKNESS INDICES <49> AND BELOW.(35 DEG.F & BELOW) TABLE C2

6.2.1 Insulate with polyisocyanurate, (Code 118.1).

6.2.1.1 Use plain joints for thickness indices <47> through <49>, 10 through 35 F.

6.2.1.2 Use offset butt and longitudinal joints for thickness index <46>, 0 F and below. If offset joints are not used, install double-layer insulation.

6.2.2 Stagger joints.

6.2.3 Install insulation in a full bedding coat of fibrated asphalt cutback (Code 709). Coat all contact surfaces of the insulation with the same material.

6.2.4 All cuts for protrusions such as nozzles, hangers, brackets, etc, shall be tightly fitted. No gaps are permitted around these cutouts. Seal all cutouts with fibrated asphalt cutback (Code 709) at time of application.

6.2.5 Secure insulation through 12 O.D. with 18 gage stainless steel wire (Code 921), applied over masking tape (Code 987), on 9" centers. Above 12" O.D. use 3/8" stainless steel bands and seals (Code 926).

6.2.6 Where insulation terminates at flanges, flanged fittings, etc, cover the end of the insulation and a 2" minimum of the insulation and the adjacent metal with fibrated asphalt cutback (Code 709), reinforced with organic fiber cloth, open weave (Code 743).

6.2.7 Insulate all metal in contact with the pipe and that which protrudes through the insulation with the same thickness as the pipe insulation. Cover the protrusions for a minimum of 12" from the insulation surface on the pipe.

6.2.8 Apply vapor barrier membrane (Code 741), to the pipe insulation. Overlap adjacent sheets a minimum of 2" at all joints. Vapor barrier membrane to be applied smooth, tight, adhered to the insulation wrinkle-free, and sealed-off to all penetrations.

6.2.9 When fittings are fabricated from pipe insulation, use thickness equal to that of the pipe insulation. Install fitting insulation in a full bedding coat of fibrated asphalt cutback (Code 709). Coat all butt joints of the insulation with the same material.

6.2.10 Finish fittings with reinforced mastic. Apply a tack coat of fibrated asphalt cutback (Code 709) and imbed organic fiber cloth, open weave (Code 743). Overlap adjacent reinforcing material a minimum of 2". Also overlap vapor barrier membrane

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(Code 741), a minimum of 2". Apply a second coat as soon as the first coat becomes tack-free. Both coats must be applied the same day. (First coat 25 S.F. per gallon, second coat 17 S.F. per gallon). Approximately 1/10" dry film thickness.

6.3 APPLICATION SPECIFICATION FOR THICKNESS INDICES <50> THRU <54> (35 THRU 80 F) TABLES H1, C2, H5, H6 -

6.3.1 Insulate with polyisocyanurate (Code 118.1).

6.3.2 For acoustical applications insulate with glass-fiber (Code 112.1). Secure the insulation in the same manner as indicated in this specification.

6.3.3 If cracks or imperfections cannot be satisfactorily closed, replaced the affected section of insulation.

6.3.4 Offset (ship-lap) insulation is preferred. Where plain joint insulation is used, coat (seal) all butt surfaces of insulation with fibrated asphalt cutback (Code 709). Coat all irregular metal projections a minimum of 6" from the pipe insulation surface with cork filled mastic (Code 501).

6.3.5 Stagger joints.

6.3.6 Secure insulation thru 12" O.D. with 1" masking tape (Code 987) on 9" centers. Above 12" O.D. use 3/8" x .015 stainless steel bands and seals (Code 926).

6.3.7 Do not bevel the insulation where it is terminated at flanges, valves, etc.

6.3.8 Commercially available fitting covers are preferred.

6.3.9 When fitting covers are fabricated from pipe insulation, use thickness equal to that of the pipe insulation.

6.3.10 All cuts for protrusions such as hangers, nozzles, nipples, etc, must be tightly fitted. No gaps are permitted around these cutouts.

6.4 APPLICATION SPECIFICATION FOR THICKNESS INDICES ABOVE <55>
(81 TO 1200 F) TABLES H1, H2, H5, H6 -

6.4.1 Insulate with calcium silicate (Code 102.1) or (Code 102.2).

6.4.2 For acoustical applications where the temperatures require the calcium silicate/glass-fiber composite system, secure the calcium silicate as indicated in this specification.

6.4.3 Stagger joints.

6.4.4 Secure with 18 gage stainless steel wire (Code 921), 3 per section through 20" O.D. Above 20" O.D. use 3/8" x .015 stainless steel bands and seals (Code 926).

6.4.5 Close cracks or imperfections by either tamping, or filling with insulating and finishing cement, inhibited (Code 502.4).

6.4.6 Commercially available fitting covers are required. Molded calcium silicate (Code 102.1), (Code 102.2) or Routed Mineral wool (Code 114.1), (Code 114.2).

6.4.7 When fittings are fabricated from pipe insulation, use insulation thickness equal to that of the pipe insulation.

6.4.8 Do not bevel the terminated insulation at flanges, valves, etc.

6.4.9 All cuts for protrusions such as hangers, nozzles, nipples, etc, must be tightly fitted. No gaps are permitted.

6.5 APPLICATION SPECIFICATION FOR TRACED PIPE FOR THICKNESS INDICES 55 THROUGH 96 (81 THRU 500 DEG. F) TABLES H1, H2 -

- 6.5.1 Insulate with perlite silicate, (Code 102.2)
- 6.5.2 Use insulation with I.D. for next larger size pipe which will accommodate, but not touch, tracer(s).
- 6.5.3 Do not "route-out" insulation or allow tracer to embed in insulation.
- 6.5.4 Provide nominal 1" wide x 9" long spacers on 18" centers between pipe O.D. and insulation I.D.
- 6.5.5 Spacer to be same material as pipe insulation.
- 6.5.6 Thickness of spacer must be sufficient to provide snug fit and firm support for pipe insulation.
- 6.5.7 Center every other spacer at butt joint of pipe insulation.
- 6.5.8 Stagger joints.
- 6.5.9 Install draft stops on vertical lines. Use heat transfer cement-nonsetting (Code 510) through 425 deg. F and water soluble cement (Code 508) above 425 deg. F on nominal 4 ft. centers. Width of stop to be a minimum of 1" wide and thick enough to completely fill the space between the pipe and insulation. Locate stops at top and bottom of vertical section and at terminations above and below flanged or screwed connections.
- 6.5.10 If cracks or imperfections cannot be satisfactorily closed, replace the affected section of insulation.
- 6.5.11 Secure insulation thru 12" O.D. with stainless steel wire, (Code 921), over 1" masking tape, (Code 987), 9" on centers. Above 12" O.D. use 3/8" x .015 stainless steel bands and seals, (Code 926).
- 6.5.12 Do not bevel terminated insulation at flanges, valves, etc.
- 6.5.13 Commercially available fittings are preferred.
- 6.5.14 When fittings are fabricated from pipe insulation, use thickness equal to that of the pipe insulation.
- 6.5.15 All cuts for protrusions such as hangers, nozzles, nipples, etc., must be tightly fitted. No gaps are permitted around these cutouts.
- 6.5.16 See sketches in Appendix for installation details.

6.6 FINISH -

6.6.1 Use .016" smooth acrylic coated aluminum jacketing (Code 716.5).

6.6.2 Lap jacket a minimum of 2" circumferentially and Longitudinally. Machine cut and roll to provide a tight fit. Install in a watershed fashion with laps on horizontal pipe between the two and three o'clock position.

6.6.3 On electrically traced lines, secure jacket with 3/8" x .015" thick stainless steel bands, (Code 926), on 9" centers with a band over each circumferential lap, or secure jacket with nylon fasteners, (Code 998), on 4" centers thru 6 1/2" O.D. and on 6" centers above 6 1/2" O.D. Do not use metal screws on jacket or fitting covers.

6.6.4 Jackets installed on lines which have a vapor barrier membrane (Code -741) or reinforced asphalt cutback (Code 709). Installed over the insulation, must be secured with 3/8" x .015" thick stainless steel bands and seals (Code 926) on centers. Do not use screws for covering or fitting finish. Do not let jacketing interfere with vapor barrier installation.

6.6.5 Banding is the required method to secure all jacketing on all sites. Provide 3/8" x 0.015" thick stainless steel bands (Code 926) on 9" centers with a band over each circumferential lap.

6.6.5.1 An alternative for hot piping, where permitted with Engineering Dept. concurrence, is using 3/8" long, No. 7 stainless steel sheet metal screws (Code 971.1) or nylon fasteners (Code 998) on 4" centers through 6-1/2" O.D., and 6" above 6-1/2" O.D.

6.6.6 Use aluminum fitting covers (Code 717.1), (Code 717.2), (Code 717.3), (Code 717.4), (Code 717.5) or (Code 717.6) on all fittings to the largest commercially available size. Otherwise use fabricated metal covers (Code 717.7) or purchased FRP covers (Code 749.1). The FRP covers are more economical to install and are preferred for water resistance over the aluminum gore or miter covers. FRP flange covers (Code 749.4) are preferred over aluminum flange covers (Code 717.4).

6.6.6.1 Where acrylic coated aluminum (Code 716.5) is specified, order the aluminum fitting covers with a matching acrylic or a Du Pont 326Y line "Imron" coating. FRP fitting covers (Code 749.1) (Code 749.2) (Code 749.3) and (Code 749.4) is also acceptable. Specify FRP finish to be white.

6.6.6.2 In highly corrosive areas where "Tedlar" coated aluminum (Code 716.8) is specified, only FRP fitting covers (Code 749.1) (Code 749.2) (Code 749.3) and (Code 749.4) are acceptable. Specify FRP finish to be white.

6.6.7 On irregular surfaces use the following finish.

6.6.7.1 Where insulation can get wet or in high mechanical abuse areas, use a reinforced polyester or epoxy finish system. See Engineering Std. SN221P or the attached Epoxy Resin Specification.

6.6.7.2 On hot services where the insulation cannot get wet and in low mechanical abuse areas, use a reinforced mastic system. Apply a tack coat of insulation mastic (Code 734), and imbed open weave cloth (Code 743). Overlap adjacent reinforcing material a minimum of 2". Apply a second coat as soon as the first coat becomes tack-free. Both coats must be applied the same day. Total coverage is 10 to 15 sq. ft. per gal.

6.6.8 Install aluminum beveled end caps (Code 717.6) at all insulation terminations above 35 F <50>. Do not bevel the insulation.

6.6.9 Seal all penetrations and possible points of moisture entry with a 3/8" bead (minimum) of caulking compound, (Code 813). This is to be done at the time of metal application. Do not feather edges. Apply on clean, dry surface at a temperature recommended by the manufacturer.

6.6.10 Finish for removable insulation on cold services will be a tack coat of fibrated asphalt cutback (Code 709) reinforced with organic fiber cloth, open-weave (Code 743). Embed the reinforcing in the wet tack coat. Lap adjacent pieces of reinforcing a minimum of 2 inches, and eliminate all wrinkles and protruding edges. Apply a second coat as soon as first coat becomes tack-free. Both coats must be applied the same day. (First coat 25 S.F. per gallon, second 17 S.F. per gal). Apply a final finish coat of asphalt aluminum coating (Code 721) after the (Code 709) is dry.

6.6.11 For acoustical applications, finish the insulation with lead laminated aluminum (Code A30.4).

6.6.11.1 the lead laminated aluminum (Code A30.4) can be purchased with an acrylic or tedlar finish.

6.6.11.2 The standard lead laminated aluminum has a 1 lb/sq.ft lead barrier. For severe noise conditions the jacket can be purchased with a 2 lb/sq.ft lead lamination.

6.6.11.3 Secure this jacketing with bands as indicated in this specification.

6.6.11.4 Fittings and irregular shapes shall be finished with loaded mastic (Code A60.5) and reinforcing open weave glass cloth (Code 710). Embed cloth into mastic which shall be a minimum thickness of 0.14".

6.7 FIRE RESISTANT FINISH (WHEN SUPPLEMENTARY CODE LETTER Q IS USED) -

6.7.1 Use .010 smooth stainless steel jacketing (Code 753).

6.7.2 Lap jacket a minimum of 2" circumferentially and longitudinally. Machine cut and roll to provide a tight fit. Install in a watershed fashion with laps on horizontal pipe between the two and three o'clock position.

6.7.3 Banding is the required method to secure all jacketing on all sites. Provide 3/8" x 0.015" thick stainless steel bands (Code 926) on 9" centers with a band over each circumferential lap.

6.7.3.1 On electrically traced lines, or lines which have a vapor barrier membrane (Code 741) or reinforced asphalt cutback (Code 709), installed over insulation, screws are never permitted to secure the jacket or fitting covers.

6.7.3.2 An alternative for hot piping, where permitted with Engineering Dept. concurrence, is using 3/8" long, No.7 stainless steel sheet metal screws (Code 971.1) on 4" centers through 6-1/2" O.D., and 6" above 6-1/2" O.D.

6.7.4 Use preformed stainless steel fitting covers (Code 753.1) (Code 753.2) to the largest commercially available size, otherwise use fabricated metal covers. Use stainless steel finish on all fittings and irregular surfaces.

6.7.5 Install stainless steel beveled end caps (Code 753.3), at all insulation terminations above 35 F, thickness indice <49>. Do not bevel the insulation. Install end caps at all flanged fittings.

6.7.6 Seal all penetrations and possible points of moisture entry with a 3/8" bead (minimum) of caulking compound, (Code 813). This is to be done at the time of metal application. Do not feather edges. Apply on clean, dry surface at a temperature recommended by the manufacturer.

6.7.7 Finish for removable insulation on cold services will be a tack coat of fibrated asphalt cutback, (Code 709), reinforced with organic fiber cloth, open-weave, (Code 743). Embed the reinforcing in the wet tack coat. Lap adjacent pieces of reinforcing a minimum of 2 inches, and eliminate all wrinkles and protruding edges. Apply a second coat as soon as first coat becomes tack-free. Both coats must be applied the same day. (First coat 25 S.F. per gallon, second 17 S.F. per gal). Cover reinforced mastic system with stainless steel (Code 753).

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6.8 FACTORY PRE-INSULATED PIPE (WHEN SUPPLEMENTARY CODE LETTER F IS USED) -

6.8.1 Factory pre-insulated pipe is available for above ground and underground systems.

6.8.2 When placing order, include the following information.

6.8.2.1 Minimum operating temperature of pipe.

6.8.2.2 Maximum normal operating temperature of pipe.

6.8.2.3 Complete DuPont pipe specifications for procurement of pipe including length desired. Vendor can handle up to 40 ft. lengths.

6.8.2.4 Maximum and minimum ambient air temperature.

6.8.2.5 Average wind velocity.

6.8.2.6 Maximum external surface temperature of insulation is not to exceed 140 F.

6.8.2.7 Maximum allowable heat gain/loss.

6.8.2.8 Thickness of insulation on cold systems is sufficient to prevent surface condensation when temperature is 95 F. with a 7 Deg. dewpoint depression.

6.8.2.9 End of pipe is to extend 6" beyond end of insulation.

6.8.2.10 Copy of necessary arrangement drawings clearly marked to show scope of work to be pre-insulated.

6.8.2.11 Request submission of approval drawings for review prior to release of fabrication.

6.8.2.12 For hot systems, protect exposed ends of insulation to prevent water entry and exposure to sunlight.

6.8.2.13 For cold systems, seal exposed ends of insulation heat shrunk sleeve to provide permanent vapor barrier.

6.8.2.14 The jacket material for cold and hot systems must be selected on environmental conditions.

6.8.2.14.1 For hot systems (81 to 1200 F.) the insulation shall be calcium silicate (Code 102) or (Code 102.1) with jacketing of 22 gauge aluminum, 24 gauge galvanized steel and PVC coated galvanized steel or 26 gauge stainless steel

6.8.2.14.2 For cold and warm temperatures (-40 to +80 F.) the insulation shall be polyurethane (Code 118) with jacketing of PVC, polyethylene or FRP.

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6.8.2.15 Caution must be considered when welding "sect" tracers to stainless steel pipe. Sect is a skin effect current tracing system patented by Ric- Wil.

Approved Vendor:
RIC-WIL
Energy Products Co.
950 Sussex Blvd.
P.O. box 232
Broomall, PA 19008

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7.0 EQUIPMENT INSULATION

7.1 GENERAL CONDITIONS -

7.1.1 Keep insulation materials dry at all times during storage and installation. No wet insulation shall be installed. If the insulation becomes wet during or after installation, it shall be removed and replaced with new and dry insulation. Insulation may be protected with plastic film, but must be vented to prevent condensation.

7.1.2 Equipment 24" or less in diameter may be insulated with pipe insulation in which case, the insulation thickness specified in the applicable pipe insulation tables will take precedence over the thickness specified in the "Equipment Insulation Tabulation".

7.1.3 All finishes on equipment, vessels and fittings surfaces will be metal. The exceptions to this are removable insulation, equipment heads, and irregular shapes as indicated in this specification.

7.1.4 Insulation index with the code letter "D" included indicates dual-temperature service. Install the insulation in two layers. Stagger all joints between layers.

7.1.5 Provide the following corrosion protection under insulation to equipment.

7.1.5.1 All carbon steel equipment shall be painted per the paint specification. Stainless steel equipment which is not painted shall be protected with mastic at 35 deg F and below and above 35 deg F coat with sodium silicate per this specification.

7.1.5.2 Do not coat with sodium silicate where it is not to be insulated.

7.1.5.3 When sodium silicate (Code 802.1) is used, add red food coloring at the rate of 1 ounce per gallon. Use a minimum of 1 gallon per 100 S.F. Let the coating dry before insulating. Do not apply sodium silicate to items that cannot be covered by insulation on the same day.

7.1.5.4 Where the insulation can get wet and identified on drawings with the letter "G" between the diamonds, heavier metal jacketing and flashing is required as indicated in the equipment finish section of this specification.

7.1.6 Sketches included in appendix of this specification illustrate methods of installing and finishing removable insulation on hot and cold systems.

7.1.7 All body flanges, manholes, nozzles, etc, are to be insulated (unless specifically excluded) with the same thickness as specified for the equipment. Flanges on nozzles shall be the

same thickness as specified for piping.

7.1.8 Leave flanged joints uninsulated until connecting pipe and equipment has been hydrostatically tested by Du Pont, and released to the contractor for completion of insulation.

7.1.9 At flanged joints, stop the insulation 1 bolt length plus 1" from the back of the flange. Do not bevel insulation.

7.2 APPLICATION SPECIFICATION FOR THICKNESS INDICES 49 AND BELOW
(35 DEG. F & BELOW) TABLE C2 -

7.2.1 Insulate with polyisocyanurate insulation, (Code 118.1).

7.2.1.1 Use plain joints for thickness indices <47> through <49>, 10 through 35 F.

7.2.1.2 Use offset joints for thickness indices <46> and below, 0 F and below. Double layer insulation must be used where tongue and groove or shi lap type insulation joints are not used.

7.2.2 Stagger joints.

7.2.3 Install insulation in a full bedding coat of fibrated asphalt cutback (Code 709). Coat all contact surfaces of the insulation with the same material.

7.2.4 When insulation is installed in double layer, seal the outer layer to the inner layer by a continuous coat of fibrated asphalt cutback (Code 709).

7.2.5 Where insulation terminates at flanges, flanged fittings, etc, cover the end of the insulation and 2" minimum of the insulation and the adjacent metal with fibrated asphalt cutback (Code 709) reinforced with organic fiber cloth, open weave (Code 743).

7.2.6 All cuts for protrusions such as nozzles, pipe, supports, angles, etc, must be tightly fitted. No gaps around these cutouts are permitted. Seal all cutouts at time of application.

7.2.7 Secure insulation in place with 3/8" x .015" thick stainless steel bands and seals (Code 927) 12" on centers.

7.2.8 18-gage stainless steel wire, (Code 921), over masking tape (Code 987) may be used where needed.

7.2.9 Insulate all metal in contact with equipment and which protrudes through the insulation with same thickness as the equipment insulation. Cover the protrusion for a minimum of 12" from the equipment insulation surface.

7.2.10 Apply vapor barrier membrane, (Code 741), over the cylindrical insulation. Overlap adjacent pieces a minimum of 2" at all joints.

7.2.11 The vapor barrier must be applied and sealed against all nozzles before flange covers are applied.

7.2.12 Where insulation cannot get wet and in low abuse areas, provide a finish for heads, cones, irregular shapes, etc, of reinforced mastic. Apply a tack coat of fibrated asphalt cutback (Code 709) and imbed organic fiber cloth, open weave (Code 743). Lap adjacent pieces of reinforcing material a minimum of 2" and

eliminate wrinkles. Apply a second coat as soon as the first coat becomes tack free. Both coats must be applied in the same day. (First coat 25 S.F. per gal, second 17 S.F. per gal).

7.2.13 Where insulation can get wet and high abuse areas apply the reinforced fibrated asphalt cutback (Code 709) finish indicated in the above para. Allow the mastic to dry prior to applying a protective finish of reinforced epoxy resin. See the specification for the application of epoxy resin finishes.

7.3 APPLICATION SPECIFICATION FOR THICKNESS INDICES <50> THRU <54> (36 TO 80 F) TABLES C2, H1, H5, H6 -

7.3.1 Insulate with polyisocyanurate (Code 118.1) per this application specification.

7.3.2 For acoustical applications, insulate with glass-fiber (Code A10.2). Secure the insulation in the same manner as indicated in this specification.

7.3.3 If cracks or imperfections cannot be satisfactorily closed, replace the affected section of insulation.

7.3.4 Offset or ship-lap insulation is preferred. Where plain joint insulation is used, coat (seal) all butt joints of insulation with fibrated asphalt cutback (Code 709). Coat all irregular metal projections a minimum of 6" from the equipment insulation surface with cork-filled mastic (Code 501).

7.3.5 Stagger joints.

7.3.6 If vessel is large enough, the insulation board may be bent around the tank.

7.3.7 Where insulation terminates at body flanges, skirts, etc., a beveled end collar (Code 717.6) is required. Do not bevel insulation. See sketches in the Appendix.

7.3.8 All cuts and protrusions such as nozzles, pipe, supports, angles, etc, must be tightly fitted. No gaps around these cutouts are permitted.

7.3.9 Secure insulation in place with 3/4" x .015" thick stainless steel bands and seals (Code 927) 12" on centers. Stainless steel wire (Code 921) 18-gage over masking tape (code 987) may be used where needed.

7.4 APPLICATION SPECIFICATION FOR THICKNESS INDICES 55 AND ABOVE
(80 TO 1200 F) TABLES H1, H2, H5, H6 -

7.4.1 Insulate with calcium silicate (Code 102.1) or (Code 102.2).

7.4.2 For acoustical applications where elevated temperatures require a calcium silicate/ glass-fiber (Code A10.2) composite insulation system, secure the insulation in the same manner as indicated in this specification.

7.4.3 Stagger joints.

7.4.4 Secure insulation in place with 3/4" x .015" thick stainless steel bands and seals (Code 927) 12" on centers. Stainless steel wire, 18 gage (Code 921), may be used where needed.

7.4.5 Close cracks or imperfections by either tamping or filling with insulating and finishing cement, inhibited (Code 502.4).

7.4.6 All cuts and protrusions such as nozzles, pipe, supports, angles, etc, must be tightly fitted. No gaps around these cutouts are permitted.

7.4.7 Insulate all metal in contact with the equipment and which protrudes through the insulation, with the same thickness as the equipment insulation. Cover the protrusions for a minimum of 12" from the equipment insulation surface.

7.4.8 Where insulation terminates at body flanges, skirts, etc, install a aluminum beveled-end collar (Code 717.6). Do not bevel the insulation. See sketch in the Appendix.

7.4.9 No scored or grooved insulation is permitted.

7.5 FINISH -

7.5.1 Where the insulation cannot get wet and in low abuse areas, the following finish may be used.

7.5.1.1 Use 0.016" smooth acrylic coated aluminum jacketing (Code 716.5). For vertical equipment above 4 ft. in diameter it is more economical to use deep corrugated acrylic coated aluminum (Code 716.7).

7.5.1.2 The heads of equipment and irregular shapes shall be finished with reinforced mastics. Apply a tack coat of insulation mastic (Code 734) and imbed organic fiber cloth, open weave (Code 743). Lap adjacent pieces of reinforcing material a minimum of 2" and eliminate wrinkles. Apply a second coat as soon as the first coat is tack free. Both coats must be applied in the same day. First coat 25 SF per gallon, second coat, 17 SF per gallon.

7.5.1.3 Lap smooth aluminum jacket a minimum of 3" circumferentially and longitudinally. Machine cut jacket to obtain a tight fit.

7.5.2 Where the insulation can get wet and in high abuse areas or where the letter "G" appears between the diamonds on drawings, the following finish is required.

7.5.2.1 For equipment 3'-6" in diameter or less the finish shall be 0.024 minimum thick acrylic coated aluminum (Code 752.1). Secure with stainless steel bands (Code 927) and a breather spring (Code 980) on each band. The 4" spring shall be tensioned to 5".

7.5.2.2 Equipment above 3'-6" in diameter use 0.032" smooth acrylic coated aluminum (Code 751.1), or for vertical equipment over 4 ft. in diameter, deep corrugated acrylic coated aluminum 0.024" (Code 752.3). For highly corrosive areas use the deep corrugated tedlar coated aluminum 0.024" (Code 752.4) or smooth aluminum 0.032" (Code TED).

7.5.2.3 CAULKING COMPOUNDS ARE NOT AN ACCEPTABLE SUBSTITUTE WHERE METAL FLASHING CAN BE APPLIED. Cover all body flanges, stiffener rings and similar protrusions with metal equal in thickness to the side wall finish. See the Appendix for fabrication details.

7.5.2.4 The jacketing longitudinal joints on vertical equipment shall be sealed with closure strips or "Z" joints. The jacket shall recess a minimum of 2" in the joint. Lap the circumferential joint a minimum of 3". Support each course with S-clips (Code 997) on 36" centers.

7.5.2.5 The heads of equipment and irregular shapes shall be finished with a reinforced polyester or epoxy resin system. See Engineering Std. SN221P or the Epoxy Resin System in this

specification.

7.5.2.6 Immediately after application of metal jacketing, seal all penetrations and possible points of moisture entry with a 3/8" bead (minimum) of caulking compound (Code 813). Do not feather edges. Apply caulking on clean, dry surfaces at a temperature recommended by the caulking manufacturer.

7.5.3 Jackets installed on equipment having a vapor barrier membrane (Code 741) installed over the insulation must be secured with bands. No screws are permitted with finish over membrane.

7.5.4 Cut the metal jacket so that the vertical seams overlap at the center of the nozzles. Where it is practical use metal collars or back-up strips secured by stainless steel sheet metal screws. See sketches in the Appendix.

7.5.5 Install metal beveled end caps, or collars, at all insulation terminations. See sketches in the Appendix.

7.5.6 Use 3/4" x .015" thick stainless steel bands (Code 927) on all equipment. The bands are to cover each overlap and one in the middle for smooth aluminum jacketing. All equipment operating above 35 deg. F <50> requires at least one breather spring (Code 980) per band. Use two breather springs per 30 L.F. of band on equipment operating at or above 200 F<66>. Screws may be supplemented with bands as required to provide improved watertight seams. Use 3/8" long, No.7 stainless steel screws (Code 971.1) on 6" centers.

7.5.7 Install the deep corrugated aluminum jacketing (Code 716.7) (Code 752.3) (Code 752.4) in the following manner. Lap corrugated sheets a minimum of 2-1/2 corrugations. Secure laps with stainless steel sheet metal screws, (Code 971.1), on 6-inches centers. Locate screws on ridge of overlap. Use a screw length which does not penetrate the insulation. Support succeeding courses with a minimum of 2 stainless steel "S" clips per sheet. Apply 3/4" stainless steel bands on about 3-foot centers. All openings cut in metal jacketing that provide a gap in excess of 1/8" shall have separate flashing applied of the same material. Seal all cuts and other possible sources of water entry with a 3/8" bead (minimum) of caulking compound (Code 813). See para. on proper application of caulking.

7.5.8 Approved metal flashing and removable insulation details are illustrated in the Appendix of this specification.

7.5.9 For removable/reusable insulation covers on cold systems below 35 F, use rigid insulation covers. Finish to be aluminum in the same thickness as the jacket. See sketches in the Appendix. Seal the joints with caulking (Code 813). For hot systems, the soft type removable/reusable insulation covers are acceptable. See Appendix for the Specification.

7.5.10 An acceptable method of installing metal end caps is shown in the Appendix.

7.5.11 For acoustical applications, finish insulation with lead laminated aluminum (Code A30.4).

7.5.11.1 the lead laminated aluminum (Code A30.4) can be purchased with an acrylic or tedlar finish.

7.5.11.2 The standard lead laminated aluminum has a 1 lb./sq.ft. lead barrier. For severe noise conditions the jacketing can be purchased with a 2 lb./sq.ft. lead lamination.

7.5.11.3 Secure this jacketing with bands as indicated for smooth aluminum in this specification.

7.5.11.4 Equipment heads and irregular shapes shall be finished with loaded mastic (Code A60.5) and reinforced open weave glass cloth (Code 710). Embed cloth into mastic which shall be a minimum thickness of 0.014".

7.6 FIRE RESISTANT FINISH FOR EQUIPMENT (WHEN SUPPLEMENTARY CODE LETTER "Q" IS USED) -

7.6.1 Finish with .010" thick, smooth (Code 753) or corrugated (Code 753.4), Type 304 or 316 as required, stainless steel jacket. (See paragraph in this specification for alternatives to deep corrugated jacket).

7.6.2 Cover all equipment insulation with stainless steel finish, smooth or deep corrugated as applicable, including body, heads, fittings, protrusions, irregular surfaces, etc.

7.6.3 Lap jacket a minimum of 3" circumferentially and longitudinally. Machine cut and roll jacket to obtain a tight fit.

7.6.4 Gored segments for heads are to be crimped on the concealed side and beaded on the other. Apply a bead of caulking compound (Code 813) into the bead of each gore prior to installation.

7.6.5 Jackets installed on equipment having vapor barrier membrane, (Code 741), installed over the insulation must be secured with 3/4" x 0.015" thick stainless steel bands (Code 927). No screws are permitted with finish over membrane. When a vapor barrier membrane is not installed, 3/8" long, No. 7, stainless steel screws (Code 971.1) on 6" centers may be used with approval of the Engineering Dept.

7.6.6 Where openings are cut in the metal jacket to fit around nozzles, use metal collars or back-up strips secured by stainless steel sheet metal screws. See sketches in the Appendix.

7.6.7 Seal all penetrations and possible points of moisture entry with a 3/8" bead (minimum) of caulking compound, (Code 813). Do not feather edges. Apply on clean, dry surfaces at a temperature recommended by the caulking manufacturer.

7.6.8 Install stainless steel beveled end caps or collars at all insulation terminations.

7.6.9 Use 3/4" x .015" thick stainless steel bands on all equipment. Use one 4" breather spring (Code 980) on each band. Provide a additional spring per 30 L.F. of band on equipment operating at or above 200 F<66> .

7.6.10 Deep corrugated jacketing may be used on vertical equipment and vessels over 4 feet in diameter. Lap corrugated sheets a minimum of 2-1/2 corrugations. Secure laps with stainless steel sheet metal screws (Code 971.1) on about 6-inches centers. Locate screws on ridge of overlap. Use a screw length which does not penetrate the insulation. Support succeeding courses with a minimum of 2 stainless steel "S" clips per sheet. Apply 3/4" stainless steel bands on 3 ft. centers. Breather springs on the bands are required.

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7.6.10.1 Do not use screws on equipment operating below 35 deg. F since the vapor barrier membrane may be penetrated. Apply 3/4" stainless steel bands on 2 ft. centers.

7.6.10.2 All openings cut in metal jacketing that provide a gap in excess of 1/8" shall have a separate flashing applied of the same material. Seal all cuts and other possible sources of water entry with a 3/8" bead (minimum) of caulking compound (Code 813). See above para. for proper application.

7.6.11 Approved flashing and removable insulation are illustrated by sketches in the Appendix of this specification.

7.6.12 For finishes on cold and hot removable insulation, use 0.010" stainless steel jacketing (Code 753). See sketch in the Appendix.

7.6.13 An acceptable method of installing metal end caps is shown in the Appendix.

7.6.14 Insulation support rings, stiffener rings, etc, that protrude beyond the insulation finish on vertical vessels must have a water shed flashing installed per the attached sketches in the the Appendix.

7.7 FIBERGLASS-REINFORCED EPOXY RESIN FINISH -

7.7.1 This specification describes the methods and materials used to provide a fiberglass-reinforced epoxy resin finish over insulation.

7.7.1.1 This finish system can be used on insulated equipment heads and irregular shapes.

7.7.2 The principal safety hazard is dermatitis. Eye and hand protection is required.

This system is solvent free and therefore does not require special ventilation.

7.7.3 Procedure

7.7.3.1 This finish can be applied to polyisocyanurate foam-rigid, calcium silicate, cellular glass or mineral wool without any special preparation required.

7.7.3.2 When applying this finish to fiber glass insulation it is recommended to lay a lightweight woven glass lagging cloth on the insulation in order to eliminate epoxy resin penetration. Precut a sufficient number of pieces of cloth and allow for a minimum of 1" overlap.

7.7.3.3 Fill cracks or openings in the insulation before applying finish.

7.7.3.4 For cold temperature systems, apply the epoxy resin directly over the mastic system when it has become dry.

7.7.3.5 This system must be applied at temperatures above 32 F (0 C). For ease of application, when outdoor temperatures are below 50 F (10 C), keep epoxy in a warm area until ready for application.

7.7.3.6 The resin is a two-component mix with a pot-life of 20 to 60 minutes after mixing. Mix only the amount resin which can be readily applied.

7.7.3.7 For ease of handling, order material in containers no larger than one gallon.

7.7.4 Application

7.7.4.1 Cut the reinforcing cloth in lengths for ease of handling. Lay the sections of cloth directly on the insulation. Overlap adjoining sections of cloth by 2" min. Cloth can be pinned to the insulation.

7.7.4.2 Mix Alocit Thixotrope 28.96 with hardener (resin base coat) and apply directly to the surface of the cloth and insulation with a stiff bristled brush (cut bristles).

7.7.4.2.1 For large areas(10 square feet or greater), such as equipment heads, or where severe mechanical abuse or foot traffic is expected, use 6 x 6 or 8 x 8 reinforcing cloth with a resin base coat of 20 mils wet thickness (80 sq ft per gal.).

7.7.4.2.2 For small areas, and where only moderate abuse is expected, use 10 x 10 to 13 x 13 reinforcing cloth, with a resin base coat of 10 mils wet thickness (160 sq ft per gal).

7.7.4.3 The base coat need not be dry prior to applying the brush application top coat of Alocit Aquacoat Adhesive 28.15.

7.7.4.4 The thickness of the top coat should be 10 mils wet thickness (160 sq ft./gal) for all applications.

7.7.4.5 When ordering Aquacoat Adhesive 28.15, specify desired color. Available colors in stock are white and gray. Other colors available on special order. required.

7.7.4.6 For a non-skid surface texture, broadcast quartz or 70 mesh silica sand in the wet top coat.

7.7.4.7 Clean tools with paint thinners immediately after use.

Approved Vendors:

Epoxy Resins:

Alocit Thixotrope 28.96
Alocit Aquacoat Adhesive 28.15
Alcoit Products
A division of Warfield co., Inc.
1005 Sussex Boulevard
Broomall, Pennsylvania 19008
Tele: 215-328-9440

Synthetic Organic Reinforcing Cloth 6x6 to 8x8
(for large areas)

Elasta Fab No. 894 - Vimasco Corp.
PC Fabric 79 - Pittsburgh Corning Corp.
Quality Cloth - Quality Service Metals

Glass Reinforcing Cloth 10x10 to 13x13 (for small areas)

Glass cloth, Style 1659/Geon - J.P. Stevens and Co.
Woven Glass Scrim Fabric, Resin Treated Style 1659 -
Burlington Industries, Inc.
Luben Scrim Fabric Style No. 59 (white)
Alpha Associates, Inc.
Fiber Glass Scrim Style No. 1659 - Clark Schwebel Fiber
Glass Corp.

8.0 DUCT INSULATION

8.1 GENERAL CONDITIONS -

8.1.1 The specification provides for insulation inside or outside the duct.

8.1.2 The insulation must be kept dry at all times during storage and installation. The insulation may be protected with plastic film, but must be vented to prevent sweating.

8.1.3 Check all ducts seams and flanges for air tightness since any leak can destroy the insulation vapor barrier.

8.1.4 In the event of a work delay, all possible points of moisture penetration must be sealed before work is halted.

8.2 APPLICATION SPEC. FOR DUCTS (SUPPLEMENTARY CODE LETTER "J")
INSULATION OUTSIDE THE DUCT -OUTDOORS -

8.2.1 This specification is for ducts where the insulation can get wet or in high abuse areas, with operating temperatures to 300 F. <76>J<+>.

8.2.2 The insulation shall be polyisocyanurate (Code 118.1).

8.2.2.1 The insulation thickness shall be 1" for temperatures to 250 F. <71>J<+>.

The insulation thickness shall be 1 1/2" for temperatures above 250 F. <72>J<+>.

8.2.2.2 Where the insulation can cover stiffeners and flanges, increase the thickness by 1/2", thus providing an uninterrupted jacket.

8.2.3 Where the duct temperature is between 35 and 80 F. with the insulation index on drawings <50>J<+> through <54>J<+>, apply fibrated asphalt cutback (Code 709) to all butt ends of insulation where it terminates such as at flanges and all insulation joints which are not the offset (shiplap) type.

8.2.4 Secure insulation to the duct. Duct surface must be clean. Use insulation adhesive (Code 826) 150 F max. <61>, on top, sides and bottom.

8.2.4.1 For ducts greater than 18" on sides and bottom install Spindle anchors (Code 964.1), (Code 964.2) on 16" centers and no greater than 2" from any edge. Use anchor adhesive (Code 817) on ducts operating up to 200 F <60>.

Weld pins (Code 979) must be used on ducts operating above 200 F.

8.2.5 For additional information, see sketches in Appendix "H".

DUP 0838712

8.3 APPLICATION SPEC. FOR DUCTS (SUPPLEMENTARY CODE LETTER "J")
INSULATION OUTSIDE THE DUCT - DRY, LOW ABUSE AREAS -

8.3.1 This specification is for ducts and pipe indoors, dry and low abuse areas in the temperature range of 35 to 375 F., and indicated on drawings <50>J<+> through <84>J<+>.

8.3.2 The insulation shall be glass fiber (Code 112.6) and (Code 112), with a factory applied finish.

8.3.3 For square or rectangular ducts use glass fiberboard insulation (Code 112.6) with factory applied FSK finish.

8.3.3.1 Where insulation can cover stiffeners and flanges, increase the thickness by 1/2", thus providing an uninterrupted jacket.

8.3.3.2 For anti-sweat and temperatures to 150 F. <61> use 1" thickness insulation. Above 150 F. <62> refer to the insulation thickness Table C4.

8.3.3.3 Secure insulation to the duct in the following manner.

Duct surface must be clean. Use insulation adhesive (Code 826) to 150 F. maximum temperature or (Code 810) to 200 F. maximum temperature.

For ducts greater than 18" on sides and bottom, install spindle anchors (Code 964.1) or (Code 964.2) on 16" centers and no greater than 2" from any edge. Use anchor adhesive (Code 817).

For ducts operating above 200 F. <66> weld pins (Code 979) must be used.

8.3.3.4 Seal the duct seams with 2 mil foil tape (Code 999). Use 3" wide tape on butt joints and 5" wide tape on corner joints.

8.3.3.5 Where pins are required to secure the insulation system, impale the pin through the jacket, bend and depress or cut the ptn over the washer and cover with strip of 2 mil foil tape (Code 999).

8.3.4 For round ducts and pipe use one-piece, hinged glass fiber insulation (Code 112) with factory applied ASJ finish and longitudinal lap adhesive.

8.3.4.1 Where the insulation can cover flanges, increase the thickness by 1/2", thus providing an uninterrupted jacket.

8.3.4.2 For anti-sweat and temperatures to 150 F. <61> use 1" thickness insulation. Above 150 F. <62> refer to the insulation thickness Table C4.

8.3.4.3 Insulate the fittings with routed or molded fiberglass two piece fitting covers (Code FFC).

Finish the fittings with one piece PVC fitting covers (Code 748).

8.3.4.4 Seal the circumferential seams with 3" wide matching ASJ tape Code 999).

8.3.5 All tape must be applied in accordance with the tape manufacturers recommendations.

8.3.5.1 The surface where the tape is to be applied must be free of oil or grease and dry. The area temperature shall be above 32 deg. F. Do not stretch the tape, but lay it on the surface and apply firm wiping pressure on the tape with a nylon squeegee.

8.3.6 For additional information, see sketches in Appendix "H".

8.4 FINISH FOR INSULATION OUTSIDE THE DUCT -

8.4.1 Finish on ducts that are outdoors, in washdown or high abuse areas are to be metal covered.

8.4.2 Finish with .016" stucco embossed aluminum jacketing (Code 716) or (Code 716.5). The embossed surface must be specified in the order. Cross break the flat surfaces on metal jacketing to eliminate a wrinkled appearance. Deep corrugated aluminum (Code 716.6) or (Code 716.7) shall be used on ducts greater than 48" on any side. Lap all metal jacketing a minimum of 3" in a water shed fashion. Install insulation metal corner beading 2" X 2" .X .020" minimum.

8.4.3 Secure the embossed aluminum jacketing in the following manner. Over the insulation, provide metal bands .020" X 3" wide minimum secured with appropriate pins, bent and depressed over the band. Locate bands at jacketing overlap. Screw (Code 971.1) metal jacketing to the bands 4" on center. Provide a bead of caulking compound (Code 813) between all metal overlaps on all horizontal ducts.

8.4.4 Secure the corrugated aluminum jacketing in the following manner. Secure Z type sub-girts by welding or with self drilling/self tapping screws to the duct stiffeners or flanges. Sub-girts to be 16 gage galv. steel and spaced on 18" centers maximum. Attach the jacketing to the sub-girts with stainless steel screws spaced on 6" centers maximum. Seal the head of each screw with caulking compound (Code 813).

8.4.5 Install metal collars, at all insulation terminations. All openings in metal jacketing in excess of 1/8" shall have flashing applied of the same material. Seal all cuts and other possible sources of water entry with a minimum 3/8" bead of flashing compound.

8.4.6 Where the insulation can get wet, in high abuse areas, for irregular surfaces, and for removable insulation where metal jacketing cannot be properly installed, apply a polyester/epoxy resin system. See Engineering Std. SN221P or the Epoxy Resin Specification included in this specification.

8.4.7 Where the insulation cannot get wet, in low abuse areas, for irregular surfaces, and for removable insulation apply a tack coat of insulation mastic (Code 734), .03" wet thickness. Reinforce with open weave cloth, (Codes 710 or 743). Embed the reinforcing in the wet tack coat. Lap adjacent pieces of reinforcing a minimum of 2 inches, and eliminate all wrinkles and protruding edges. Apply a second coat .08" wet thickness as soon as first coat becomes tack-free. Both coats must be applied the same day [first coat 50 SF (square feet) per gal., second coat 20 SF per gal.] Apply a final finish coat of asphalt aluminum coating after the finish is dry where metal jacketing is not used.

8.4.8 Seal all points of possible moisture penetration with 3/8" bead of caulking compound (Code 709).

8.4.9 For additional information, see sketches in Appendix "H".

9.0 APPENDIXES

APPENDIXES

"A"- INSULATION SYSTEM SKETCHES FOR PIPE

"B"- HANGER ROD RAIN SHIELDS

"C"- INSULATION OF TRAPS

"D"- REMOVABLE INSULATION COVERS
RIGID AND SOFT TYPE

"E"- INSULATION SYSTEM SKETCHES FOR TRACED PIPE

"F"- INSULATION SYSTEM SKETCHES FOR COLD EQUIPMENT

"G"- INSULATION SYSTEM SKETCHES FOR HOT EQUIPMENT

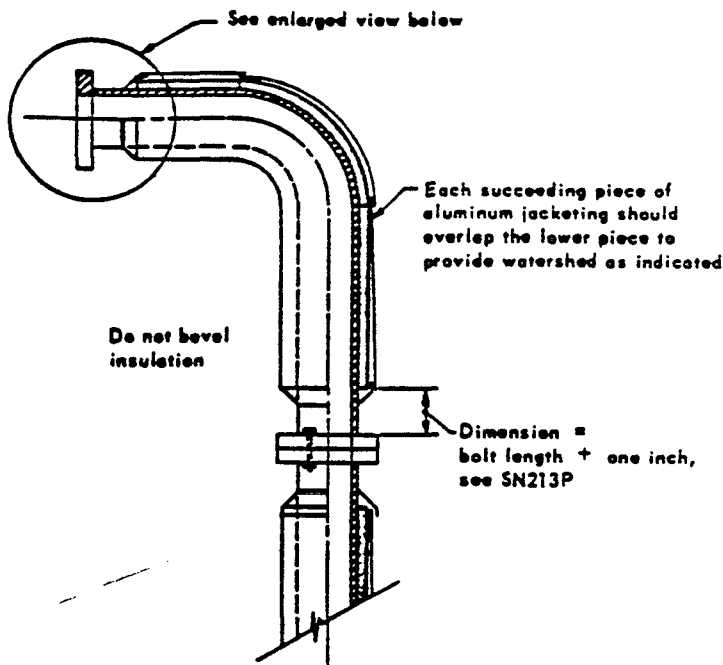
"H"- INSULATION SYSTEM SKETCHES FOR DUCTS OR BREECHING

DUP 0838717

9.1 APPENDIX "A"- INSULATION SYSTEM SKETCHES FOR PIPE -

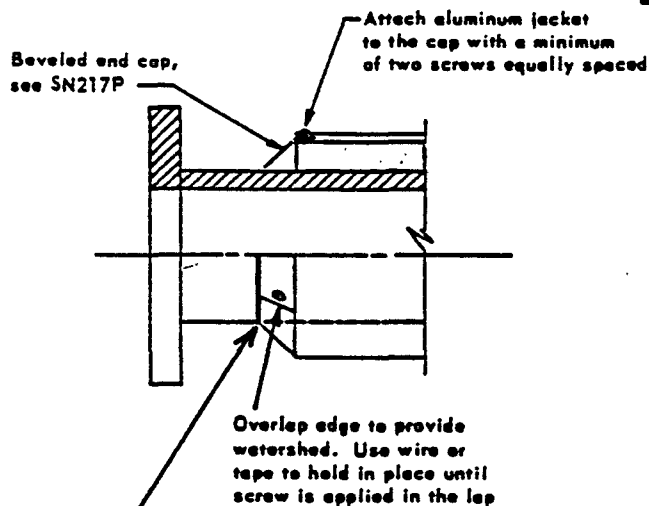
DUP 0838718

INSULATION SYSTEM SKETCHES FOR PIPE



Do not bevel insulation

Elevation - Vertical Section

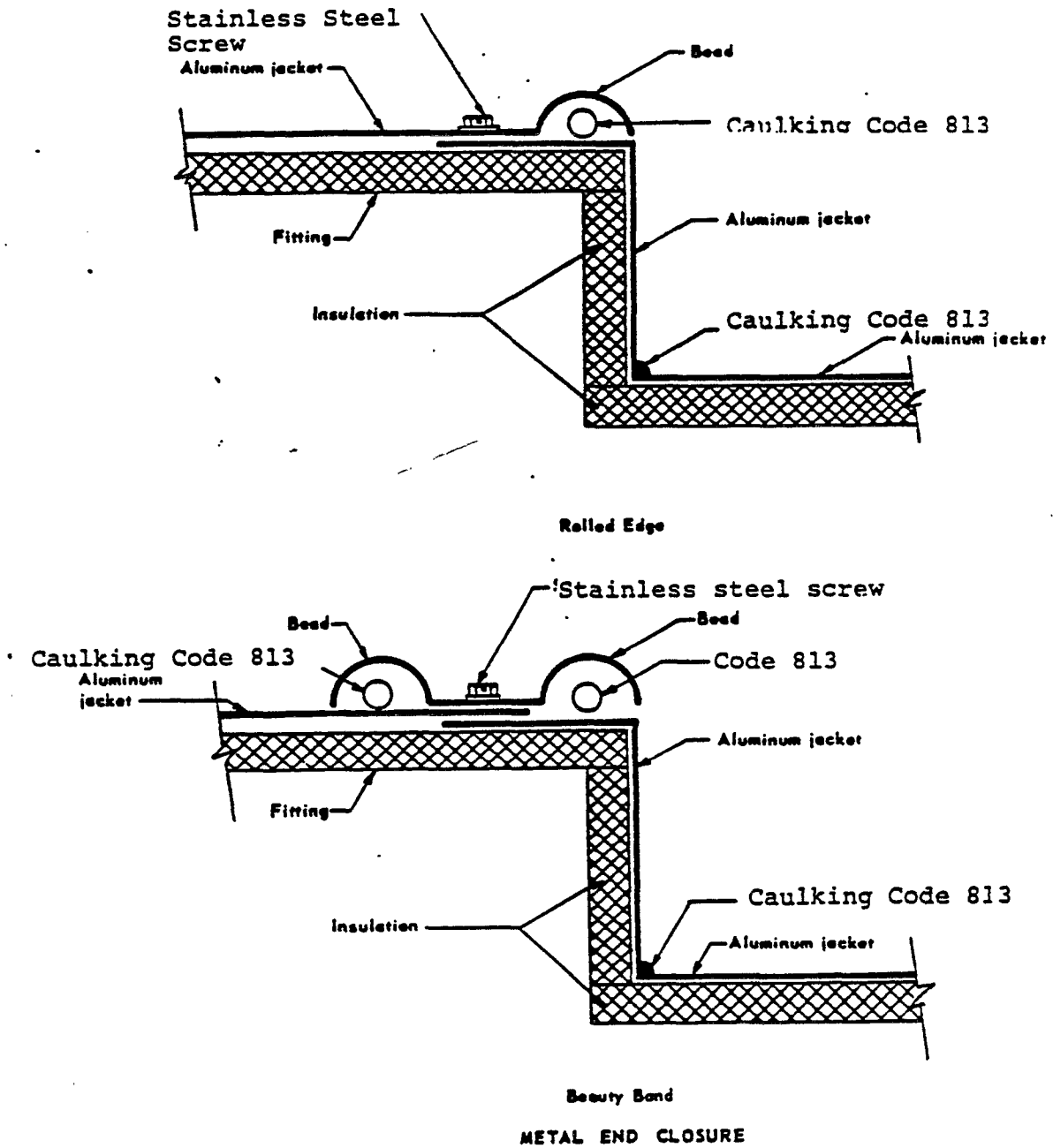


For outdoor or wet area installations, apply flashing compound.

BEVELED END CAP FOR TERMINATION OF INSULATION

DUP 0838719

INSULATION SYSTEM SKETCHES FOR PIPE FITTINGS



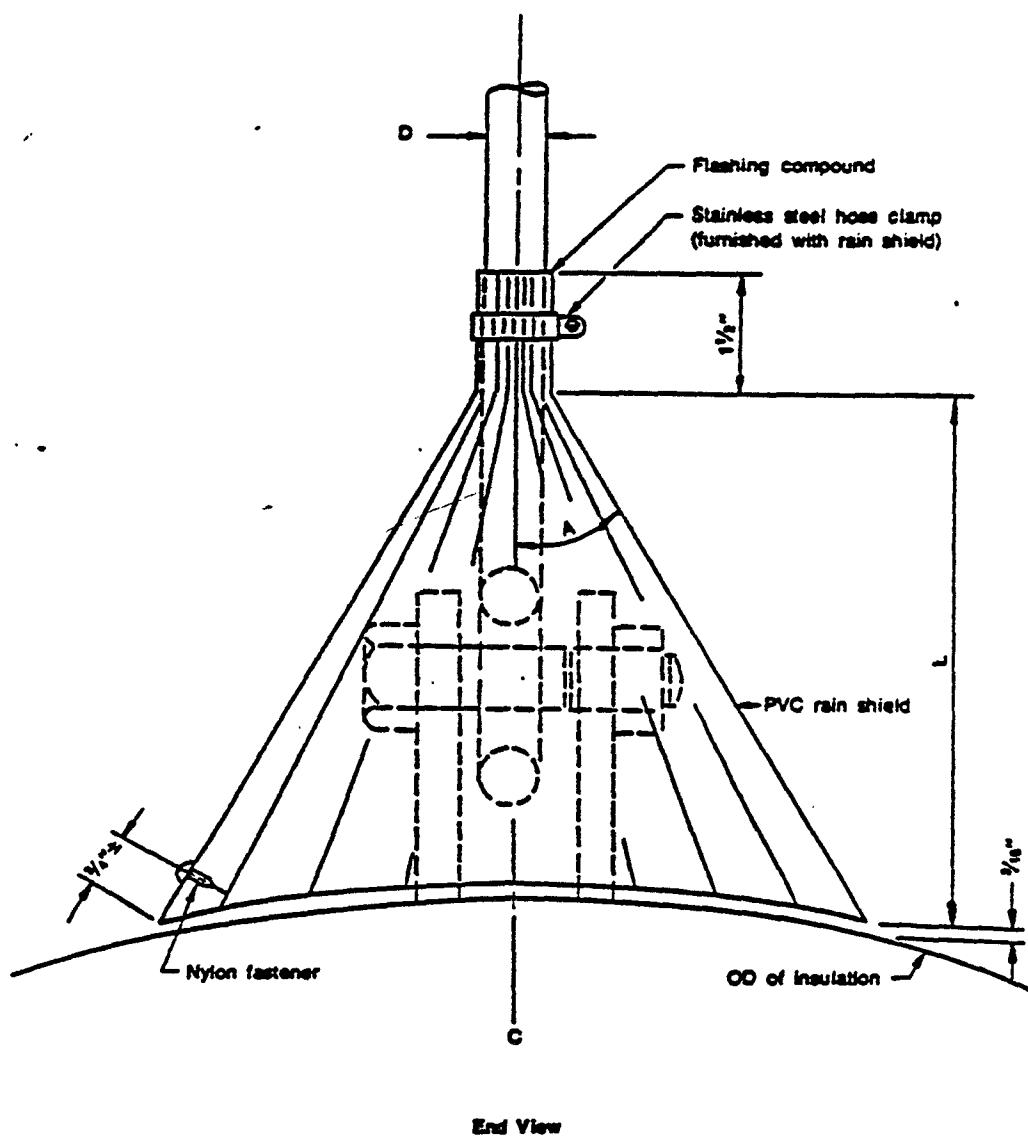
DUP 0838720

9.2 APPENDIX "B"- HANGER ROD RAIN SHIELDS -

9.2.1 APPLICATION -

1. Trim bottom of rain shield (Code 901) to follow the contour of the outside diameter of the pipe insulation.
2. Temporarily position rain shield on hanger and allow approximately 3/16" clearance between bottom of skirt and top of pipe insulation.
3. Mark location of cylindrical portion of rain shield on hanger rod.
 1. Remove rain shield.
 2. Remove all loose dirt, grease, and scale from this section of hanger rod.
4. Apply a continuous bead of flashing compound (Code 813) around the circumference of the rod where the rain shield neck area will make contact.
5. Open rain shield and install on hanger rod with the cylindrical section (neck area) fully bedded in the wet flashing compound.
6. Pull tight and secure the cylindrical section with a stainless steel hose clamp.
7. Fasten the skirt overlap of the rain shield with a nylon fastener (code 998) located approximately 3/4" from the bottom of the skirt.
8. Punch hole for nylon fastener with special punch available from Premetco International, Inc.

DUP 0838721



HANGER ROD RAIN SHIELDS

Hanger Rod Dia D (in)	Rain Shield No.	Flare Angle A	Skirt Length L (in)
1/8 - 1/2	RS 38-12	20°	6 3/4
1/8 - 3/4	RS 58-34	30°	6 3/4
1/8 - 1 1/8	RS 78-118	40°	7 1/2
1 1/4 - 1 1/2	RS 114-112	50°	8 1/2

DUP 0838722

9.3 APPENDIX "C"- INSULATION OF TRAPS -

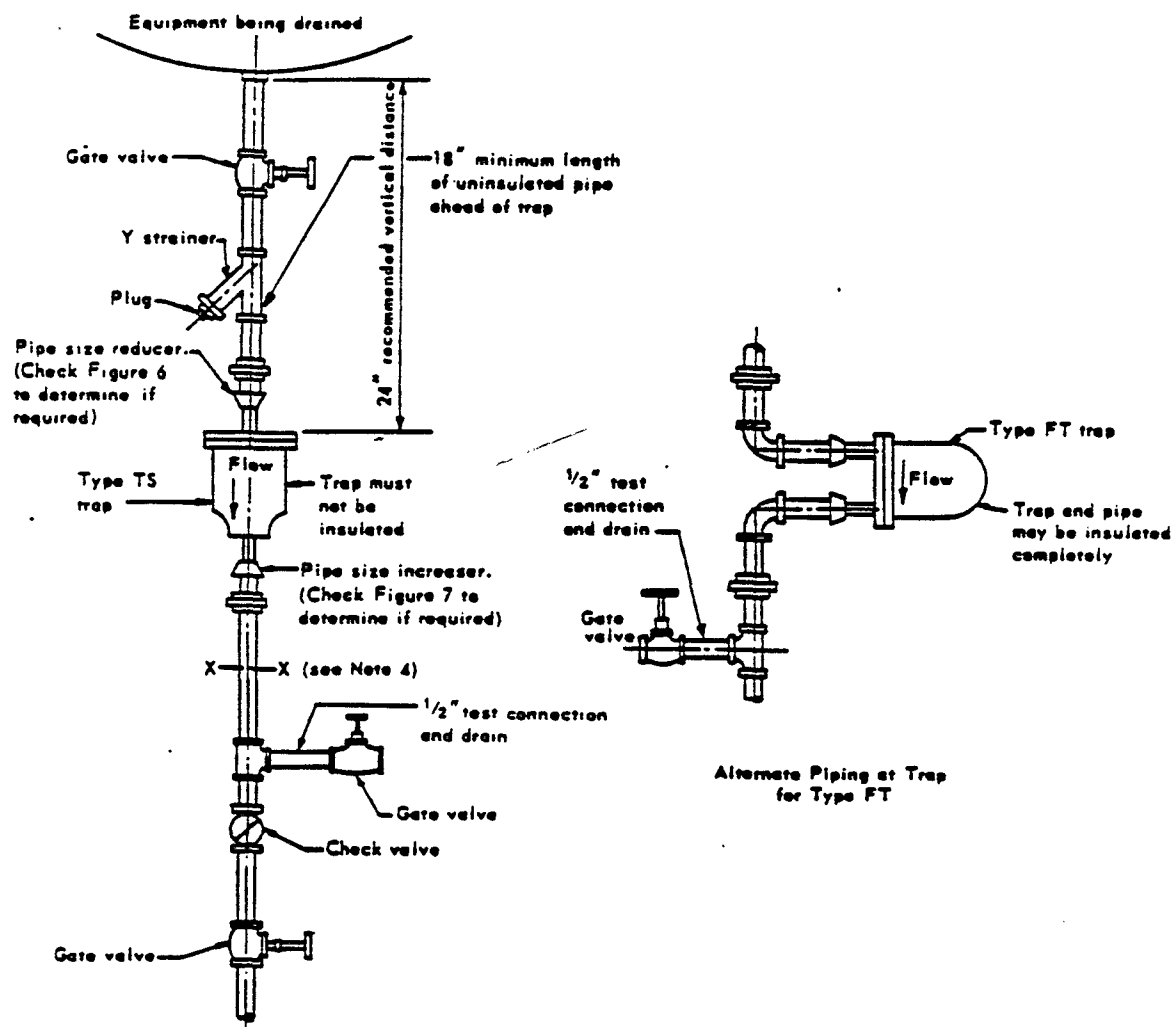


TABLE - INSULATION OF TRAPS

Type of Trap	18 in. Bare Pipe Ahead of Trap Required	Uninsulated Trap Body Required
Bimetallic	Yes	Yes
Bucket	No	Yes
Disk	Yes	Yes
Float and Thermostatic	No	No
Impulse	No	No
Level Chamber	No	No
Orifice	No	No
Thermal Expansion	Yes	Yes
Thermostatic	Yes	Yes

Notes:

- Where specified, 18 inches of bare pipe are necessary to provide subcooling for proper trap operation.

Use mesh guards when necessary around traps to protect personnel from contact with hot surfaces.

DUP 0838723

9.4 APPENDIX "D" -

9.4.1 SOFT TYPE REMOVABLE (REUSABLE) INSULATION COVERS FOR PIPING AND EQUIPMENT OPERATING UP TO 650 DEG. F -

1. Conditions for use:

- o Wherever removable insulation covers are required, the soft type covers shall be used per this specification.
- o For indoor or outdoor use, see material qualifications.

2. Insulation thickness guide (minimum installed thickness).

- a. Below 300 deg. F - 1" thick for pipe.
 - 1-1/2" thick for flanges and equipment.
- b. 300 to 500 deg. F - 1-1/2" thick for pipe.
 - 2" thick for flanges and equipment.
- c. 500 to 650 deg. F - 2" thick for pipe.
 - 3" thick for flanges and equipment.
- d. 500 to 650 deg. F - Dow jacketed process systems -
Indoors.
 - See materials paragraph "A-1" for thickness.

3. Materials

- a. Insulation for Indoor use where insulation will not get wet. (Also see Item 7.)

1. Low density (1.05 lb/ft³) Ref. SN200M, Code 204.1.

- Insulation Wool TIW Type I (Order without metal mesh).
Owens-Corning Fiberglass Corporation.
- Thickness to be 6" compressed to 4", 3" minimum installed.
- For pipe less than 2" diameter, compress 4-1/2" to 2".

2. Low Density (2.5 lb/ft³) (Code 204.2).
Insulation Wool TIW Type II (Order without metal mesh).

DUP 0838724

Owens-Corning Fiberglass Corporation.

b. Insulation for indoor and outdoor use. (see also Item 7.)

1. High density insulation (9 to 11 lb.ft3) (Code 209).

- Temp-Mat, Pittsburgh Corning Corporation, Inc.
- Burglass 1200, Burlington Industries.
- Insulgard Type 2, Southern Mfg. Co.
- Claremont 1200 Glass Blanket, Claremont Co., Inc.
- Filomet D, Alpha Associates.

Note- Should the insulation get wet, it will maintain its integrity when it has become dry.

2. Medium density insulation (6 lb/ft3). (Also see Item 7.)

- Kaowool, Babcock & Wilcox Company
- Thermo-Mat, Johns-Manville Sales Corporation
- Fiberfrax Fibermat Blanket, Carborundum

c. Outside cover finish (cold side) on indoor applications and finish on both sides for outdoor applications to 500 deg. F. High temperature glass cloth, silicone coated (Code 746).

- Alpha-Maritex, Fiber Glass/Silicone Style 3259-2-SS or 8301-2-ssL. Alpha Associates, Inc.
- Style 2300 - Silicone coated (for indoor use only). Southern Textile Corporation.
- Thermoglass, style GOP752/9736, Amatex Corporation.

d. Inside cover finish (hot side) on indoor applications and outdoor applications above 500 deg. F. Can also be used as a outside cover finish on indoor applications. High temperature cloth, Plain (Code 745).

- Alpha-Maritex, Style 2025/9383. Alpha Associates, Inc.

- Thermoglass, Style G10P752, Finsih 9731.
Amatex Corporation.
- Style 2025 - Finish 100, Southern Textile Corporation.

e. Accessories

1. High-temperature glass thread Teflon coated (Code 993).

Alpha D-24 Machine
D-39-Hand
Alpha Associates, Inc.

2. Lacing Ring and Lacing Washers (stainless steel).

- Lacing Ring, Part No. 111-0201-00.
- Lacing 2 - Hole washers (use 2.Ring).
1" Diameter, 2-Hole, Part No. 033-0201-20.
- Available from: H. A. Jones Co., Inc.
Box 34, Dayton View Station
Dayton, Ohio 45406

A.G.M.
110 Shawmut Road
Canton, MA 02021

- Pan-Ty Cable Ties, PLT Locking Ties
Heat Stabilized
Color: Black (Panduit Color No. 30).
Panduit Corporation

Note: Size cable tie to assure appropriate tensile strength.

4. Measurement, Fit and Clearance

- o When installed, the overlapping or butted edges of the cover must be tight to prevent any chimney affect or safety burn hazard. Chinking is not acceptable.
- o Removable insulation must overlap permanent insulation a distance equal to the thickness of the soft insulation being applied or minimum of 3 inches whichever is greater.
- o It is recommended when possible that the fabricator do all dimensional take-offs on custom applications for fit and clearance.

DUP 0838726

- o Where design and construction of soft covers for a unit (vessel, manifold, etc) are such that similar, or multiple pieces exist, the vendor shall supply an installation drawing and/or assembly instruction to aid in installing the covers.
- o Cover vendor shall provide Du Pont with a fabrication sketch of the cover and maintain a record of the sketch in file with proper identification in the event a replacement cover is required.
- o Provide access to pressure bulbs, thermowells and sample/purge connections (separate covers are required) for a specific area.
- o Keep the number of segmented covers for a specific area to a minimum without exceeding the weight limit.

5. Design and Construction

- o Locate horizontal seams on the bottom or sides of pipe or equipment, where possible.
- o Weight for practical working pieces not to exceed 50 pounds unless approved by Du Pont. Use the recommended low density insulation where handling the cover may be a problem.
- o Provide adequate stitching to prevent migration of the insulation within the cover. Use a minimum of one stitch per foot.
- o Provide permanent stainless steel tag or approved alternate identification outside the cover which will not be affected by heat and environment.
- o Maximum spacing of lacing rings to be 3" for pipe covering and 4" for equipment covers.
- o Maximum length of pipe cover to be 8 ft. unless the site specifically requests a longer cover.
- o When requested, provide tell-tale hole on the bottom of each cover to identify leaks.
- o Joints - To prevent a chimney effect at blanket to blanket joints. Use either Butt or Overlap joints. Where overlap is used, provide 3" tapered ends and draw-down wire (16 ga sst or monel). A 1" seam will be provided to house the wire or cord. Kevlar cord may be used in lieu of wire.

DUP 0838727

- o Hog rings will not be used except on the inside cut.
- o Sewing shall be double straight stitched at 8 to 10 stitches per inch, with each row spaced a minimum of 1/8" to a maximum of 1/2" apart. Fabric seams will be inside seams whenever possible. Final closing seam can be outside and must be machined stitched.

6. Approved Vendors

- o It is recommended that a vendor near the plant site be considered.
- o In selecting a vendor, the number of soft covers required and the complexity of the covers will be a determining factor.
- o Vendors must be approved by the Engineering Department.

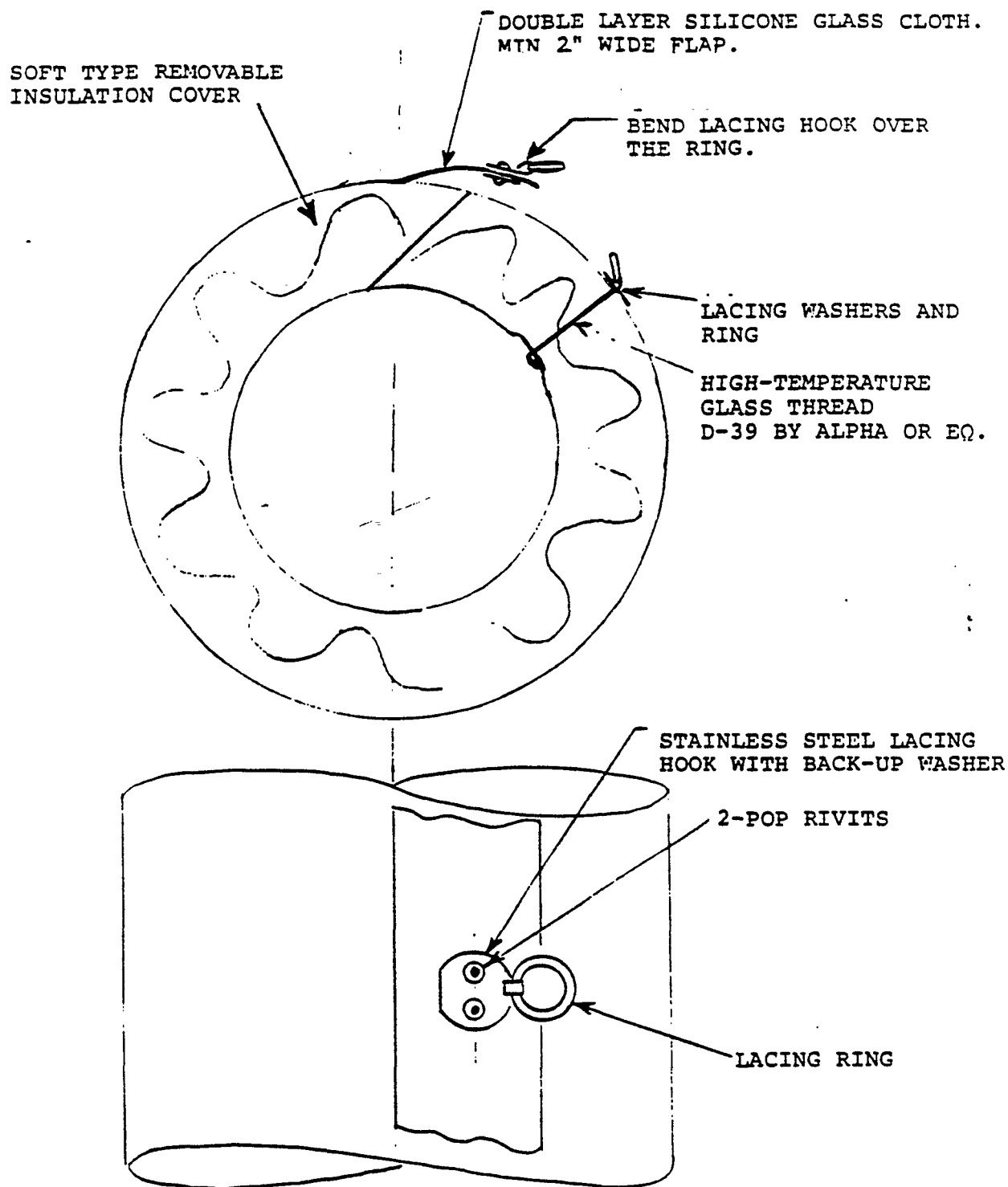
7. Insulation Thermal Efficiency

The following information may be used as a guide to the thermal efficiency of the insulation materials indicated in this specification.

Example: An insulation with a K factor of .20 is twice as efficient (approximately 1/2 the heat loss) as a insulation with a K factor of .40 for the same thickness.

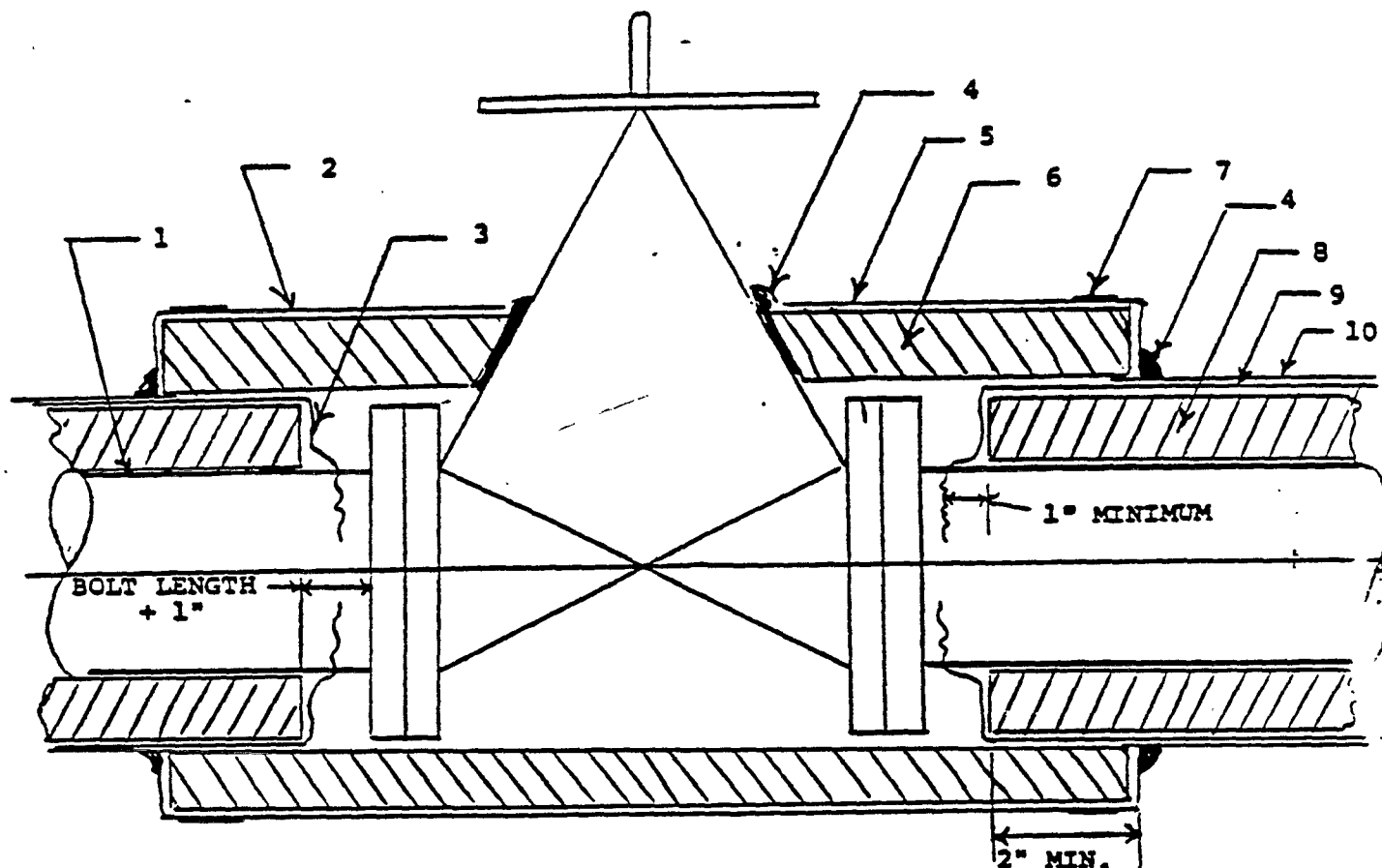
Insulation Material	K Factor (btu/(h)(ft ²)(deg.F/In.))	
	@200 deg.F Mean	@300 deg.F Mean
Insulation Wool TIW Type 1	.40	.57
Compressed to 1/2 the Thickness	.35	.50
Insulation Wool TIW Type 2	.30	.42
Temp-Mat or equal (11 lb/ft ³ density)	.28	.32
Kaowool or equal (6 lb/ft ³ density)	.29	.36

DUP 0838728



ALTERNATE METHOD OF SECURING
SOFT COVER

APPENDIX "D"
 TYPICAL RIGID REMOVABLE/REUSABLE INSULATION
 AT FLANGED FITTINGS
 (REQUIRED FOR COLD TEMPERATURE SYSTEMS)



- 1 CODE 709 FIBRATED ASPHALT CUTBACK.-- BEDDING
- 2 CODE 721 ASPHALT ALUMINUM COATING.-- PAINT
- 3 CODE 743 SYNTHETIC ORGANIC FIBER CLOTH-OPEN WEAVE.
CODE 709 FIBRATED ASPHALT CUTBACK.-- FOR IRREGULAR SURFACES AND REMOVABLE INSULATION.
- 4 CODE 813 FLASHING COMPOUND.-- SEALANT AT ALL POINTS OF MOISTURE ENTRY.
- 5 CODE 743 SYNTHETIC ORGANIC FIBER CLOTH-OPEN WEAVE.
CODE 709 FIBRATED ASPHALT CUTBACK.-- SAME AS ITEM 3 ABOVE
- 6 CODE --- REMOVABLE INSULATION.
- 7 CODE 927 STAINLESS STEEL BANDS AND SEALS.
- 8 CODE --- PERMANENT INSULATION.
- 9 CODE 741 VAPOR BARRIER MEMBRANE.
- 10 CODE 716 SMOOTH ALUMINUM JACKET.

NOTE: ON COLD SYSTEM, DO NOT LET ALUMINUM JACKET EXTEND UNDER REMOVABLE INSULATION.

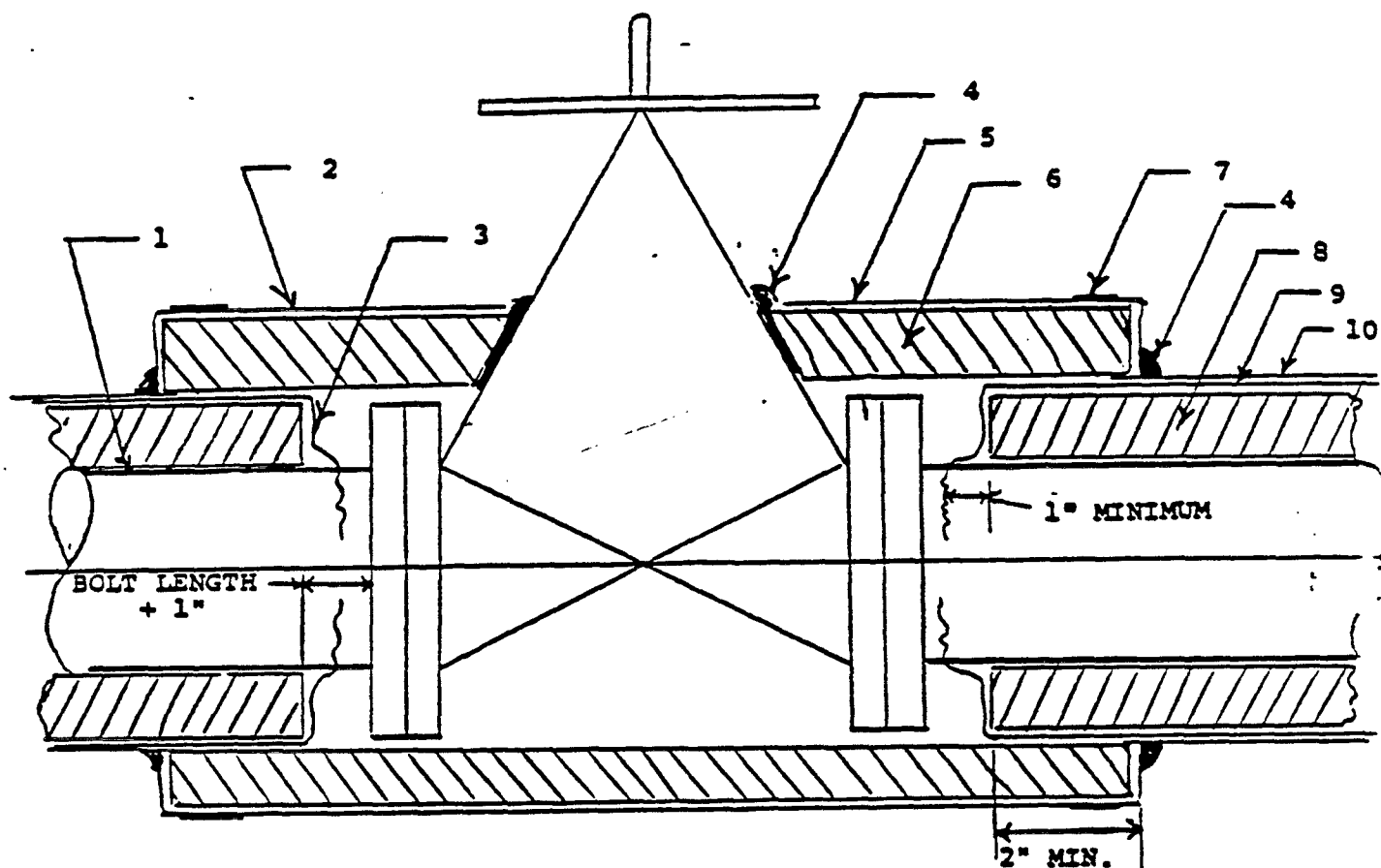
APPLY BEAD OF FLASHING COMPOUND ON THE LONGITUDINAL JOINTS OF THE REMOVABLE INSULATION.

ALTERNATE: FOR FLANGES USE PREFABRICATED RIGID (FRP) REMOVABLE/REUSABLE INSULATION COVERS, (CODE 749.4)

DUP 0838730

APPENDIX "D"

TYPICAL RIGID REMOVABLE/REUSABLE INSULATION
AT FLANGED FITTINGS
(REQUIRED FOR COLD TEMPERATURE SYSTEMS)



- 1 CODE 709 FIBRATED ASPHALT CUTBACK.-- BEDDING
- 2 CODE 721 ASPHALT ALUMINUM COATING.-- PAINT
- 3 CODE 743 SYNTHETIC ORGANIC FIBER CLOTH-OPEN WEAVE.
CODE 709 FIBRATED ASPHALT CUTBACK.-- FOR IRREGULAR SURFACES AND
REMOVABLE INSULATION.
- 4 CODE 813 FLASHING COMPOUND.-- SEALANT AT ALL POINTS OF MOISTURE
ENTRY.
- 5 CODE 743 SYNTHETIC ORGANIC FIBER CLOTH-OPEN WEAVE.
CODE 709 FIBRATED ASPHALT CUTBACK.-- SAME AS ITEM 3 ABOVE
- 6 CODE --- REMOVABLE INSULATION.
- 7 CODE 927 STAINLESS STEEL BANDS AND SEALS.
- 8 CODE --- PERMANENT INSULATION.
- 9 CODE 741 VAPOR BARRIER MEMBRANE.
- 10 CODE 716 SMOOTH ALUMINUM JACKET.

NOTE: ON COLD SYSTEM, DO NOT LET ALUMINUM JACKET EXTEND UNDER
REMOVABLE INSULATION.

APPLY BEAD OF FLASHING COMPOUND ON THE LONGITUDINAL
JOINTS OF THE REMOVABLE INSULATION.

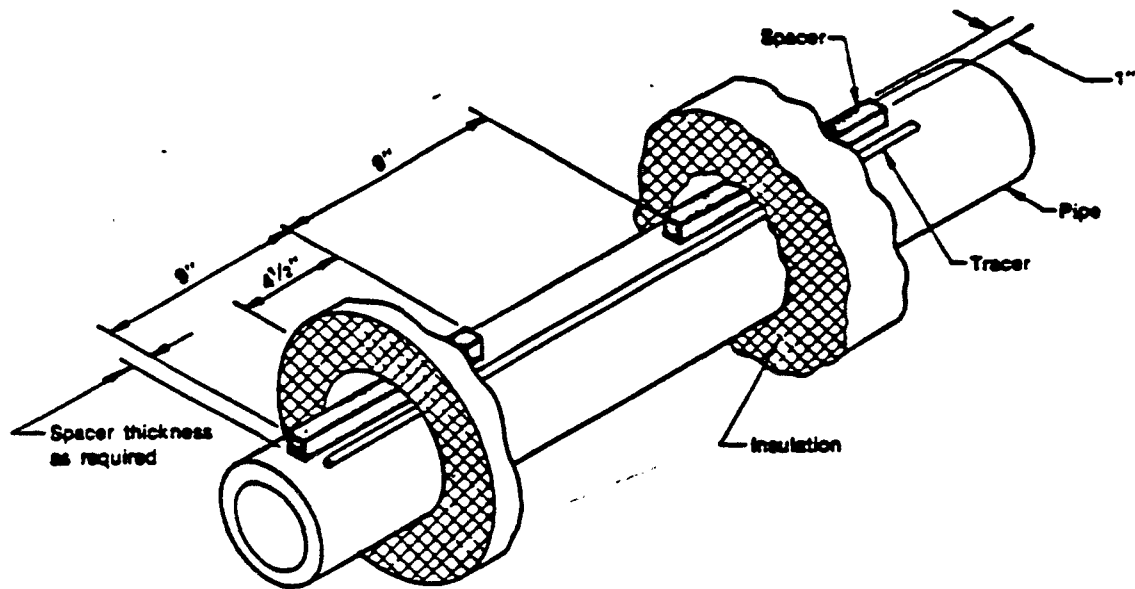
ALTERNATE: FOR FLANGES USE PREFABRICATED RIGID (FRP) REMOVABLE/
REUSABLE INSULATION COVERS, (CODE 749.4)

DUP 0838731

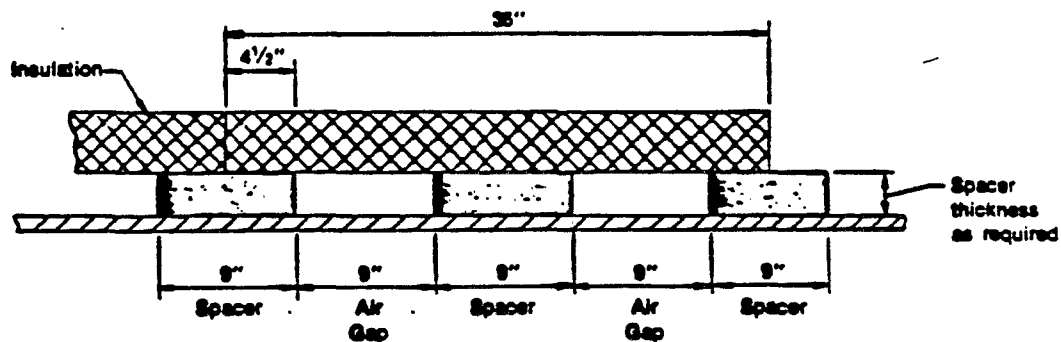
9.5 APPENDIX "E"- INSULATION SYSTEM SKETCHES FOR TRACED PIPE -

DUP 0838732

INSULATION SYSTEMS FOR TRACED PIPE



Typical Spacer Detail

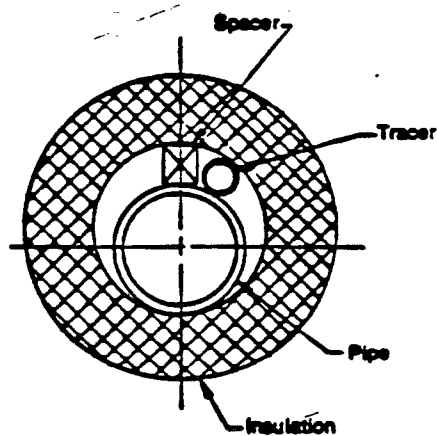
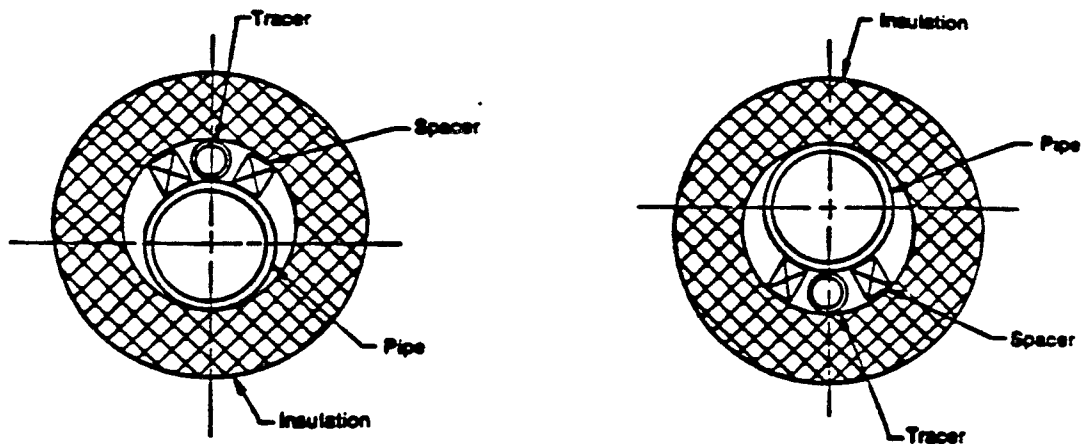


Typical Cross Section

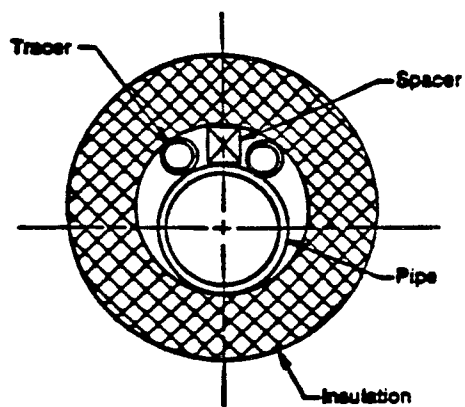
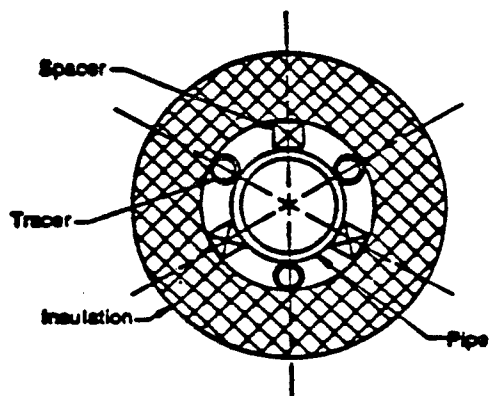
Figure 4A - Typical Spacer Detail

TYPICAL TRACER ARRANGEMENTS

INSULATION SYSTEMS FOR TRACED PIPE



Typical Single Tracers



Typical Multiple Tracers

TYPICAL TRACER ARRANGEMENTS

DUP 0838734

9.6 APPENDIX "F"- INSULATION SYSTEM SKETCHES FOR COLD EQUIPMENT

DUP 0838735

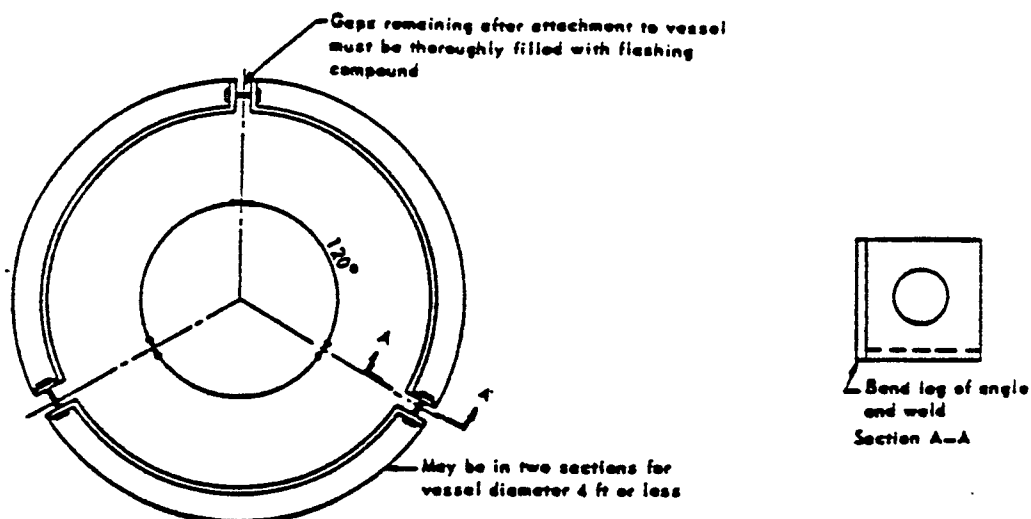


FIGURE 1 - ANGLE-IRON SUPPORT DETAIL

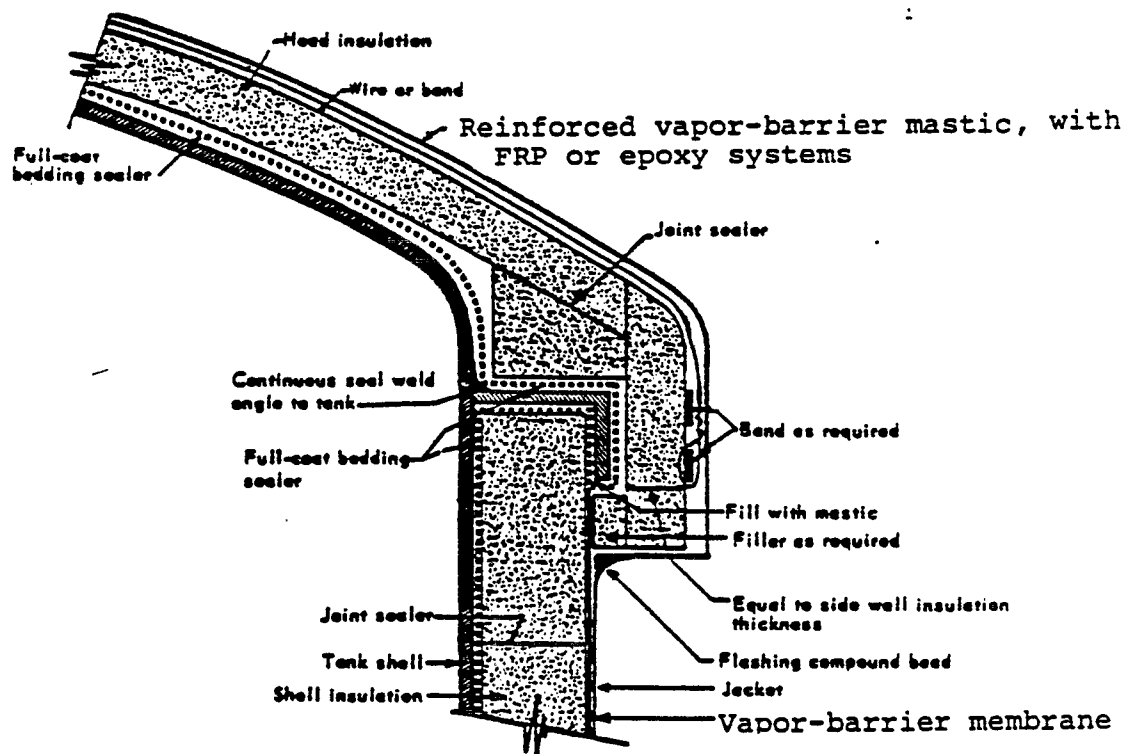


FIGURE 2 - PREFERRED INSULATION SYSTEM FOR VERTICAL TANKS TOP

DUP 0838736

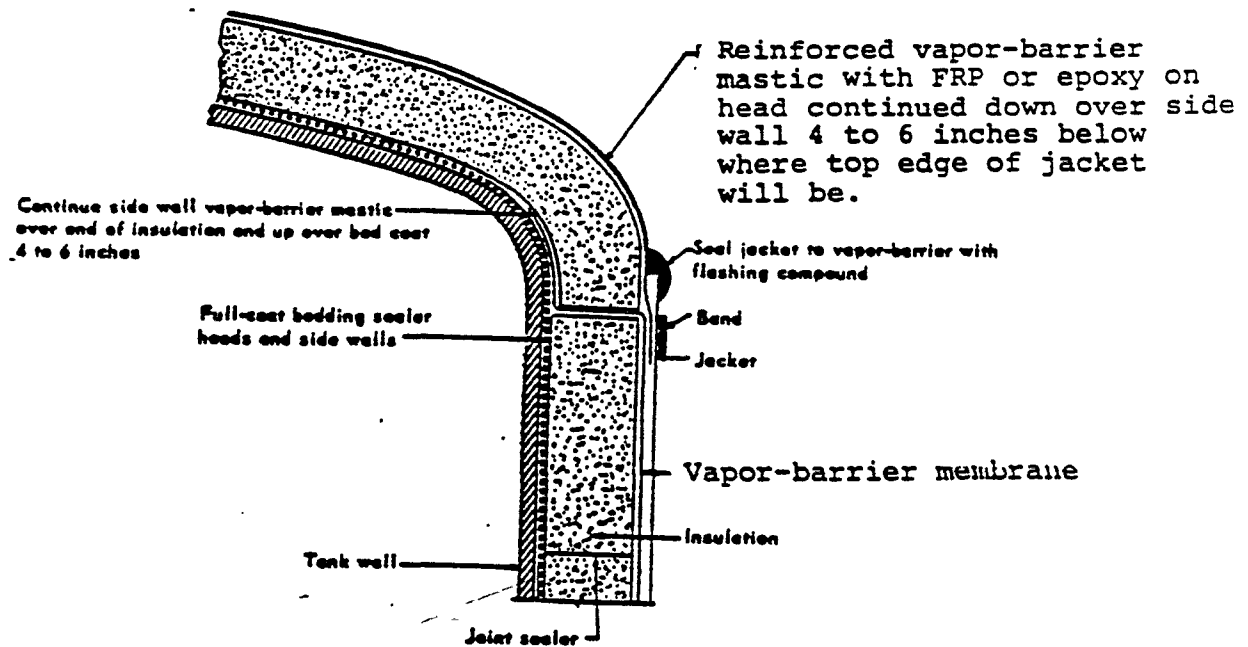
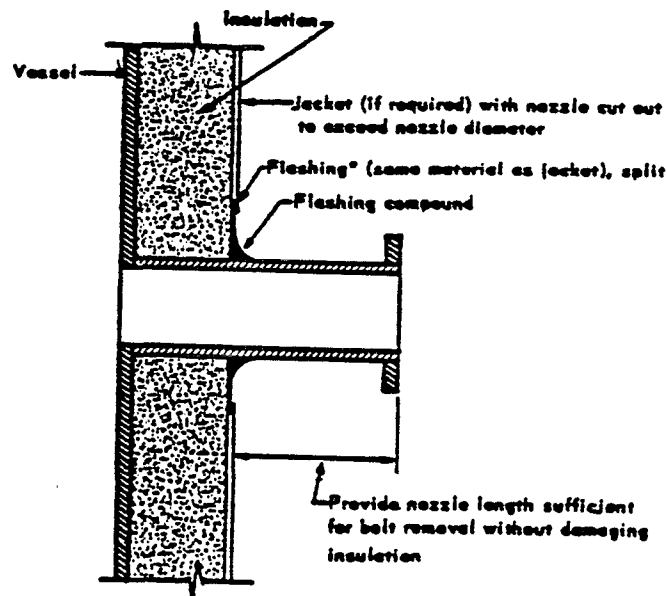


FIGURE 3 - ALTERNATE INSULATION SYSTEM FOR VERTICAL TANKS -
TOP HEAD FLAT, CONICAL, OR DISHED
(Where Angle or Top Projection cannot be Provided)



* Use same procedure for an insulated nozzle except flashing should be cut to outside diameter of insulation instead of pipe as shown on detail

FIGURE 4 - FLASHING AT NOZZLES

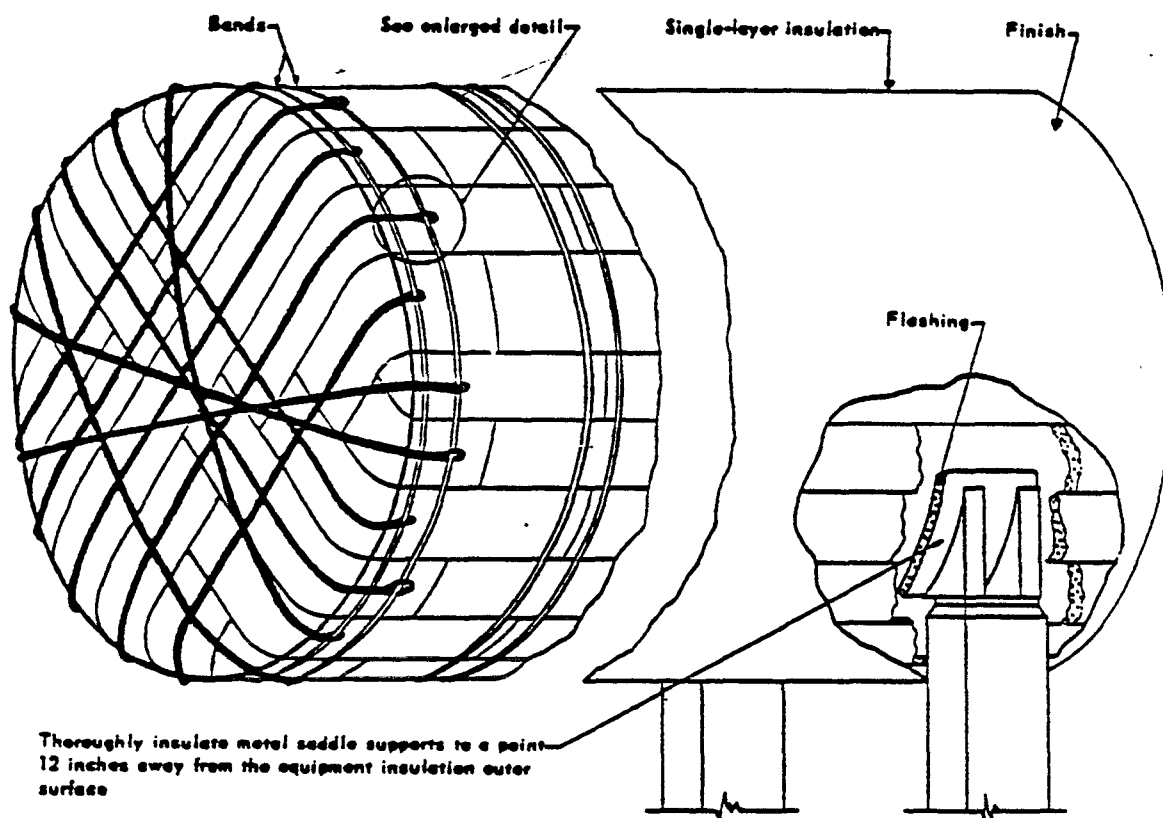
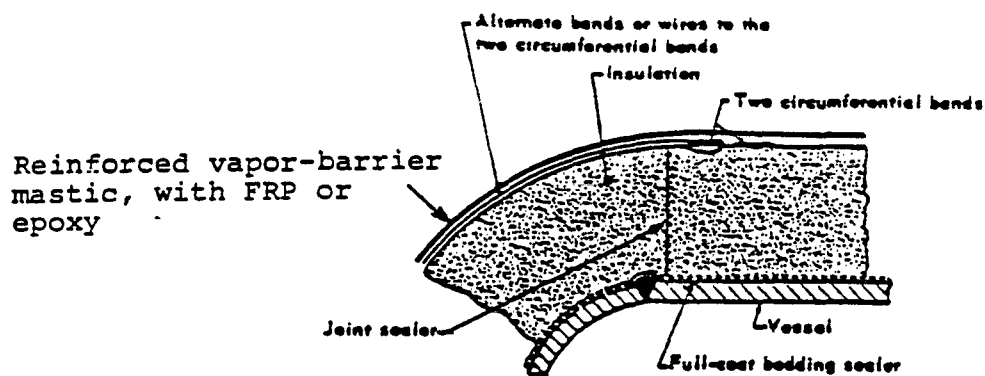


FIGURE 5 - HORIZONTAL CYLINDRICAL EQUIPMENT INSULATION - SINGLE-LAYER

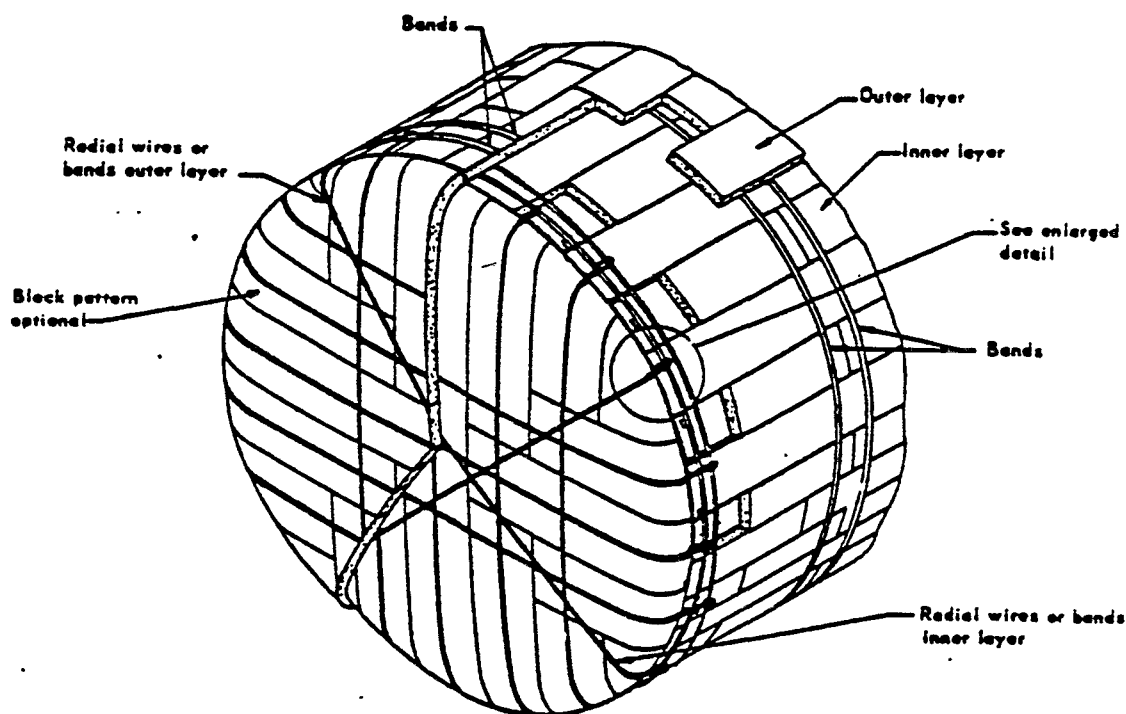
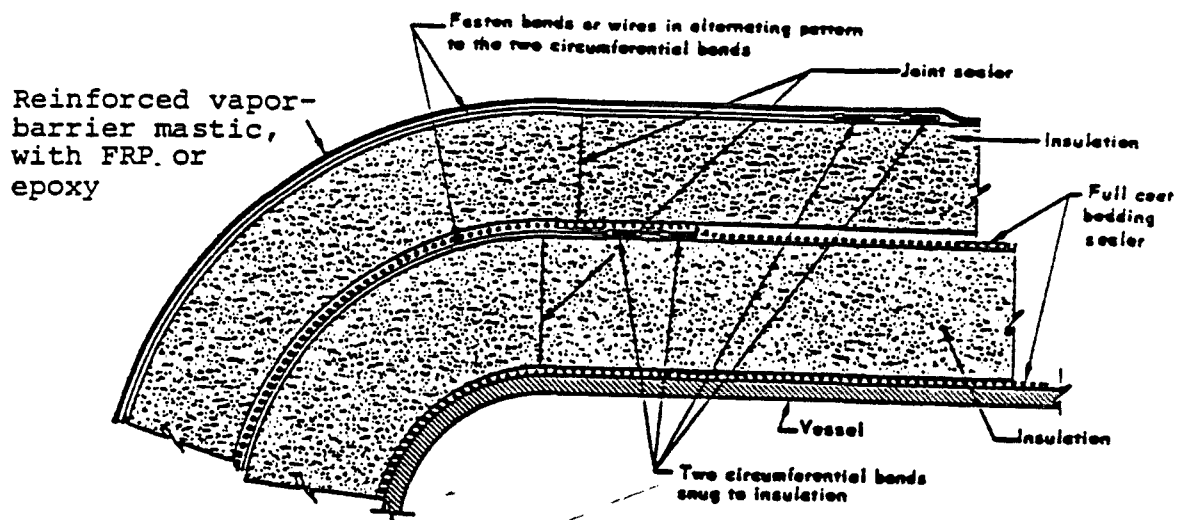


FIGURE 6 - HORIZONTAL CYLINDRICAL EQUIPMENT - DOUBLE LAYER

DUP 0838739

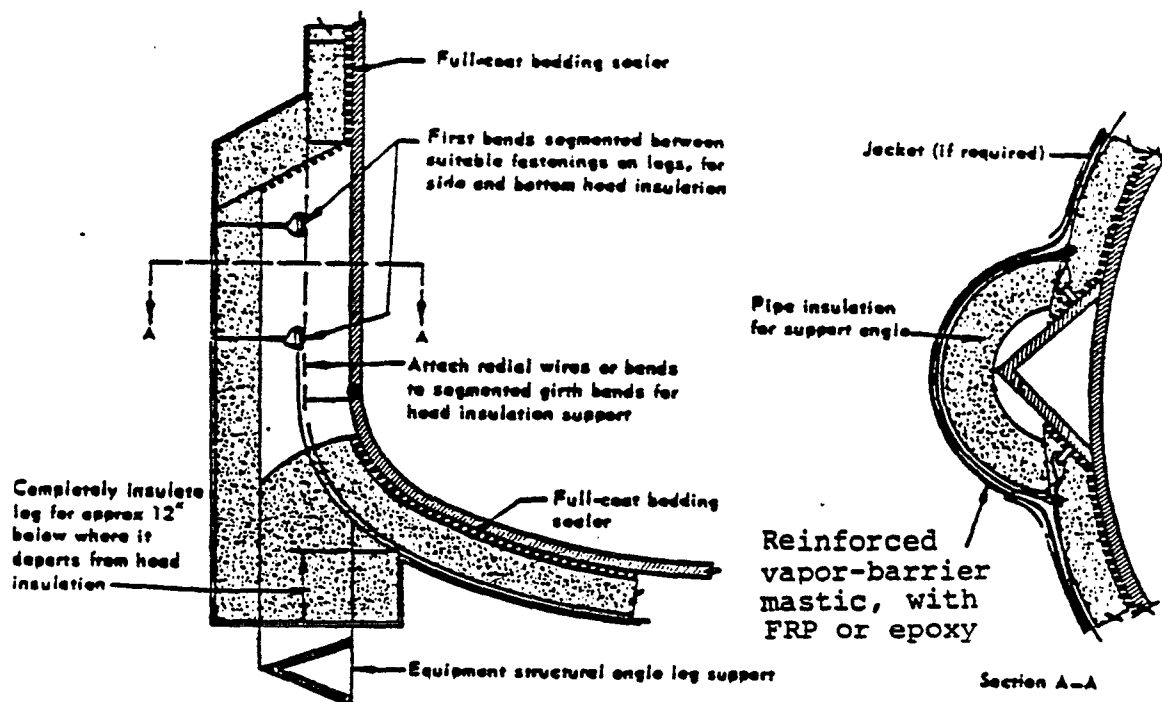


FIGURE 7 - VERTICAL CYLINDRICAL EQUIPMENT WITH STRUCTURAL ANGLE LEG SUPPORTS

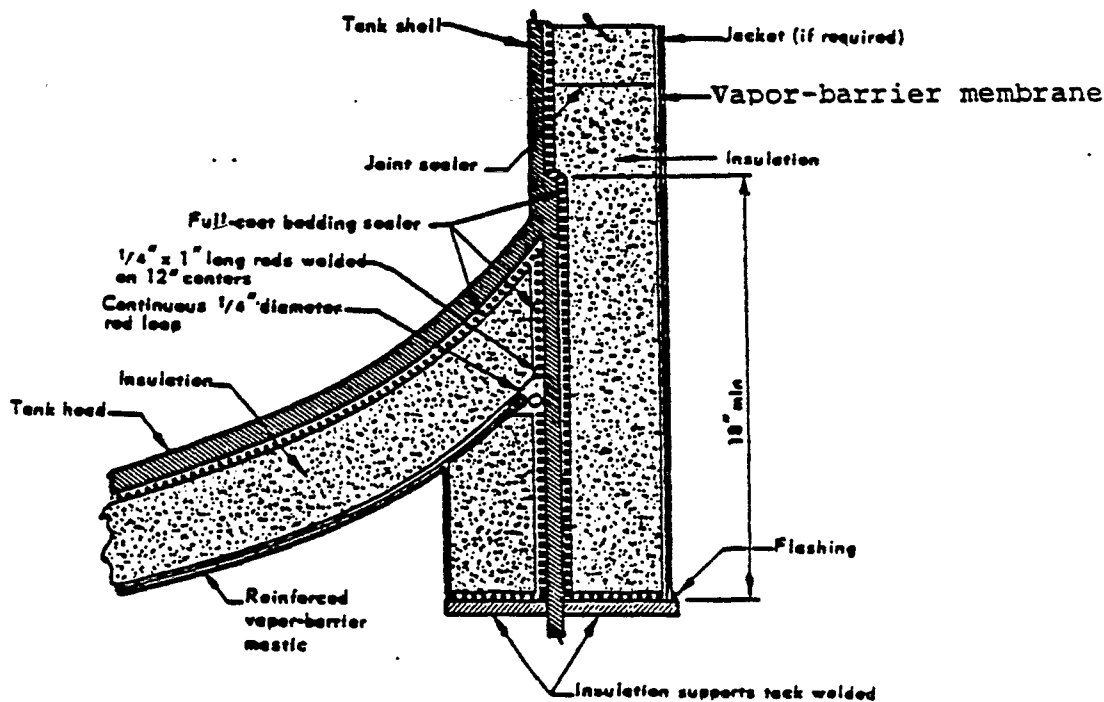


FIGURE 7A - VERTICAL CYLINDRICAL EQUIPMENT WITH SKIRT SUPPORT

DUP 0838740

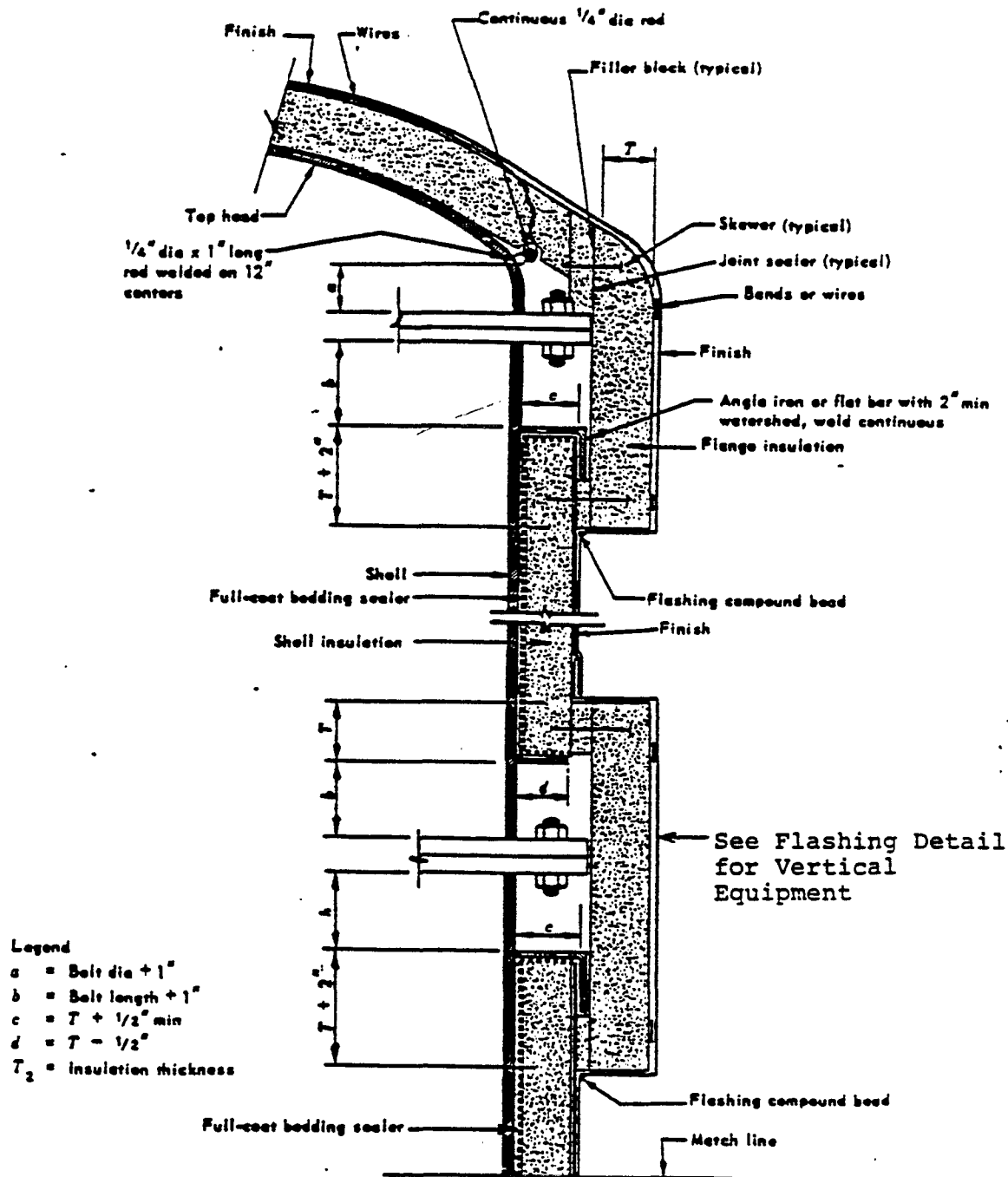


Figure 8A - Upper Detail of Flanged Vertical Equipment

FIGURE 8 - FLANGED VERTICAL EQUIPMENT

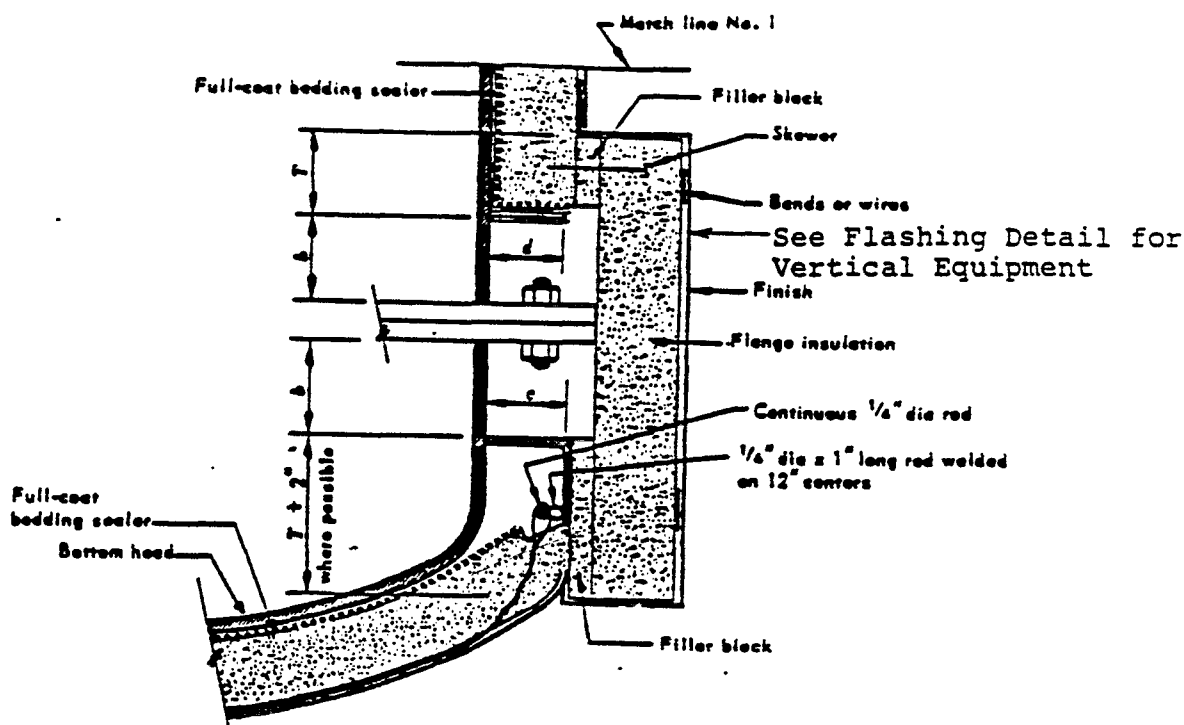


Figure 8B - Lower Dished Head Where Straight Tangent is
Bolt Length Plus 1 Inch or More

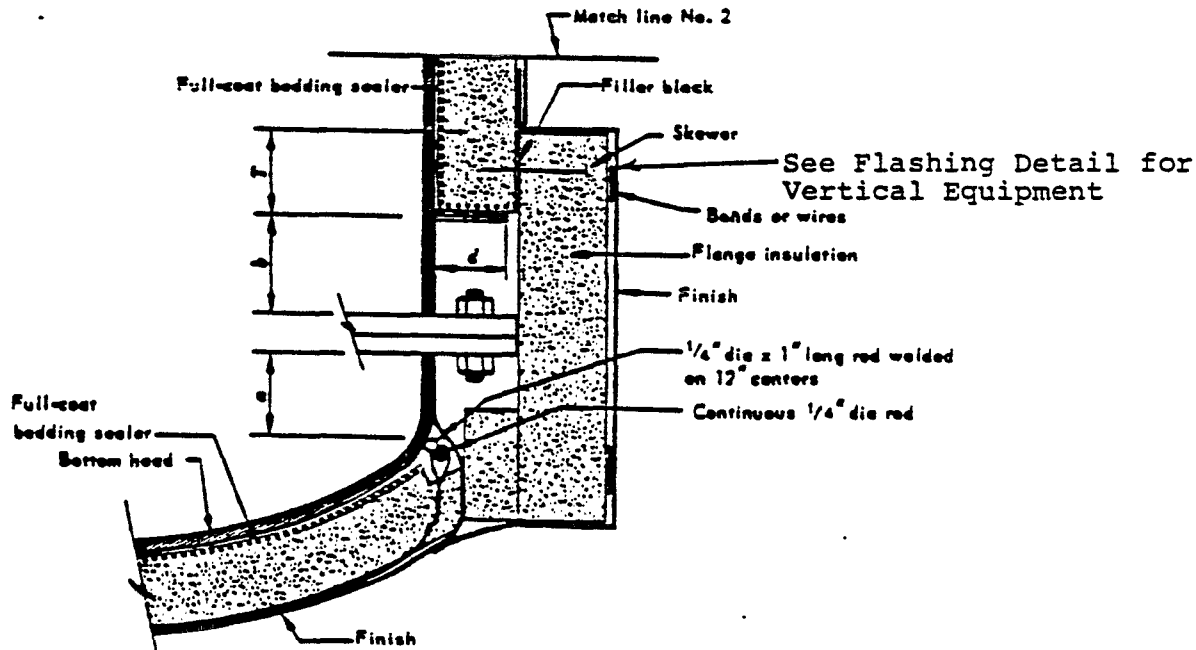


Figure 8C - Lower Dished Head Where Straight Tangent is
Less Than Bolt Length Plus 1 Inch

FIGURE 8 - FLANGED VERTICAL EQUIPMENT (CONT'D)

DUP 0838742

9.7 APPENDIX "G"- INSULATION SYSTEM SKETCHES FOR HOT EQUIPMENT -

DUP 0838743

INSULATION SYSTEMS FOR EQUIPMENT 35 TO 1200°F (2 TO 649°C)

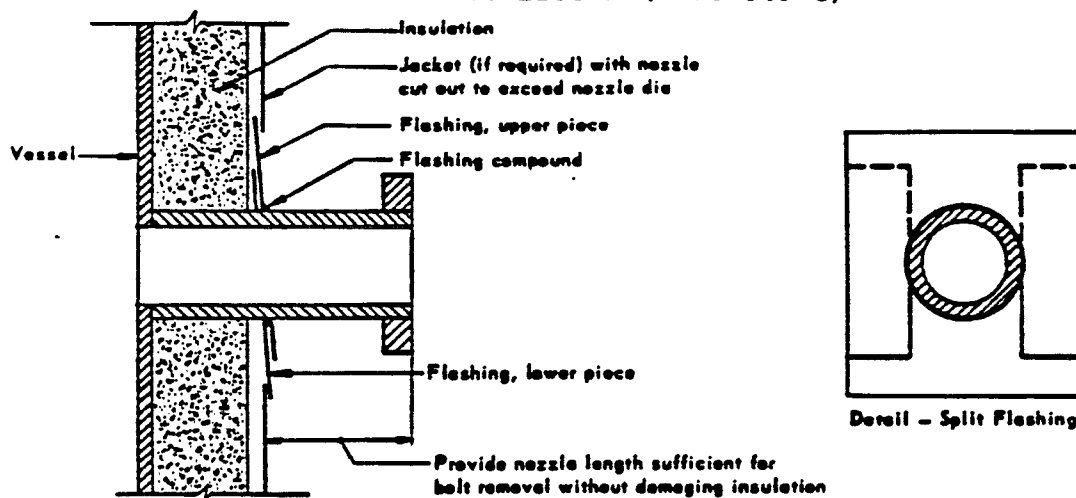


FIGURE 1 - FLASHING AT NOZZLES

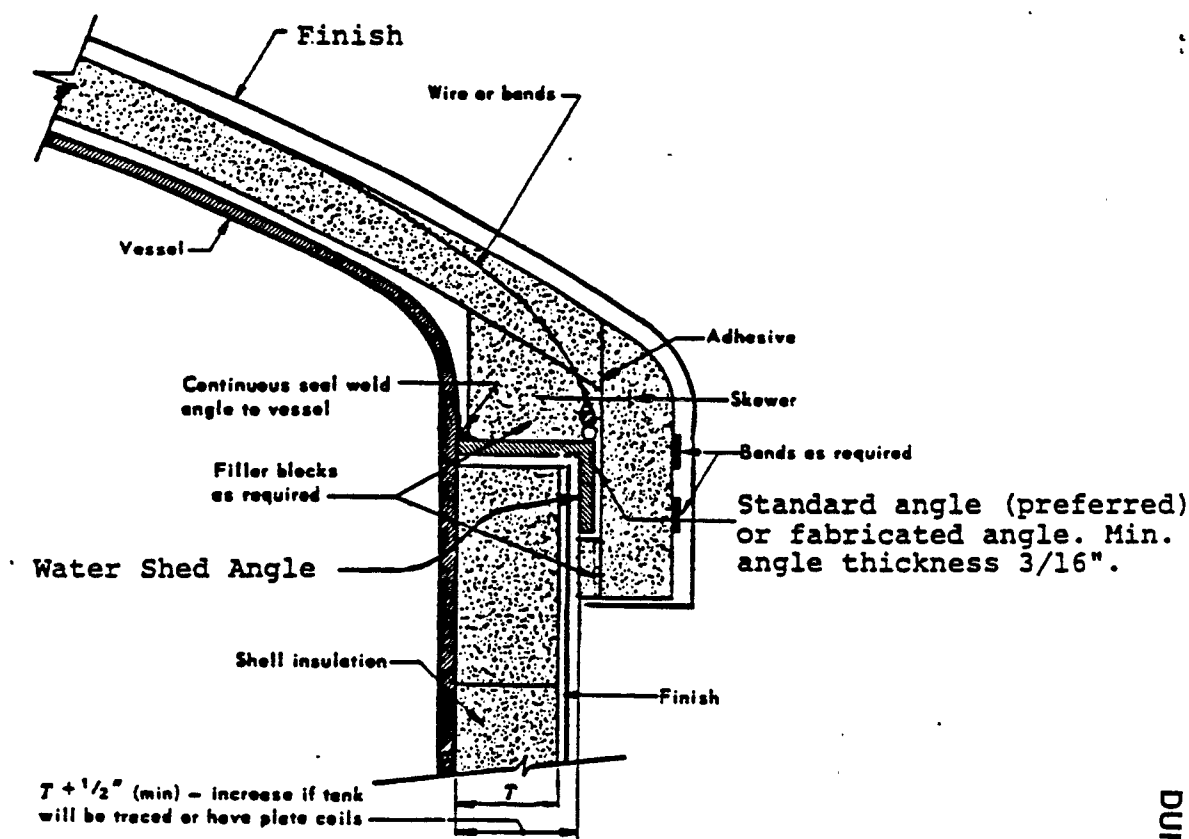


FIGURE 2 - PREFERRED INSULATION SYSTEM FOR VERTICAL TANKS -
TOP HEAD-FLAT, CONICAL, OR DISHED WITH WATER
SHED ANGLE
(FOR EQUIPMENT OPERATING ABOVE 300°F 149°C)

DUP 0838744

INSULATION SYSTEMS FOR EQUIPMENT
35 TO 1200°F (2 TO 649°C)

Continue head finish over
end of insulation and up over
head 4 to 6".

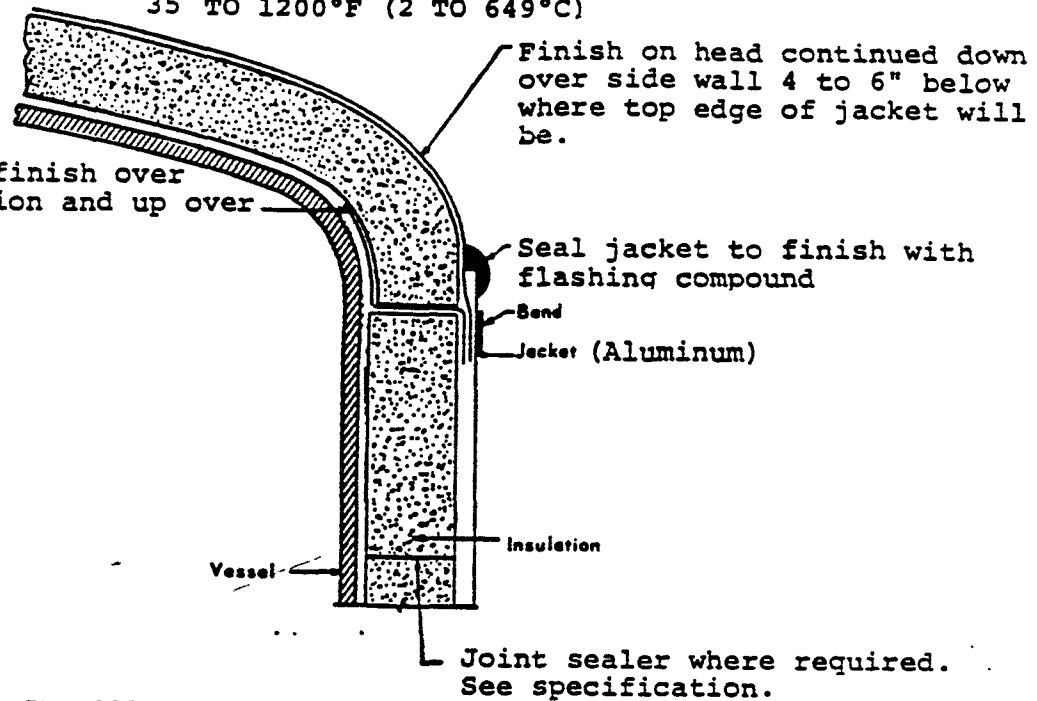


FIGURE 3 - INSULATION SYSTEM FOR VERTICAL TANKS WITHOUT WATER SHED ANGLES

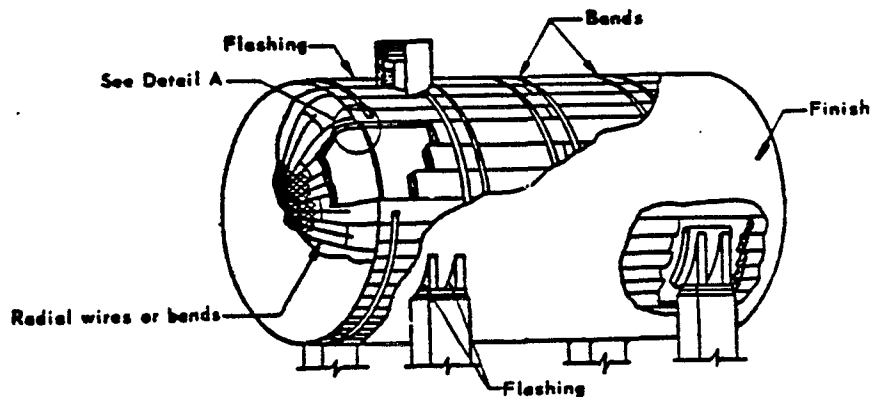
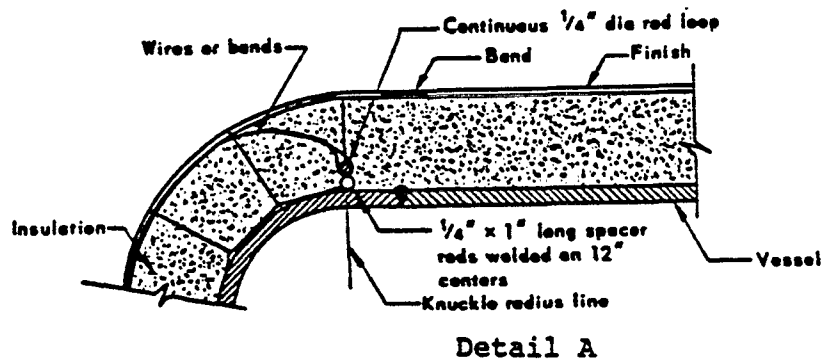


FIGURE 4 - CYLINDRICAL EQUIPMENT - HORIZONTAL

DUP 0838745

INSULATION SYSTEMS FOR EQUIPMENT 35 TO 1200°F (2 TO 649°C)

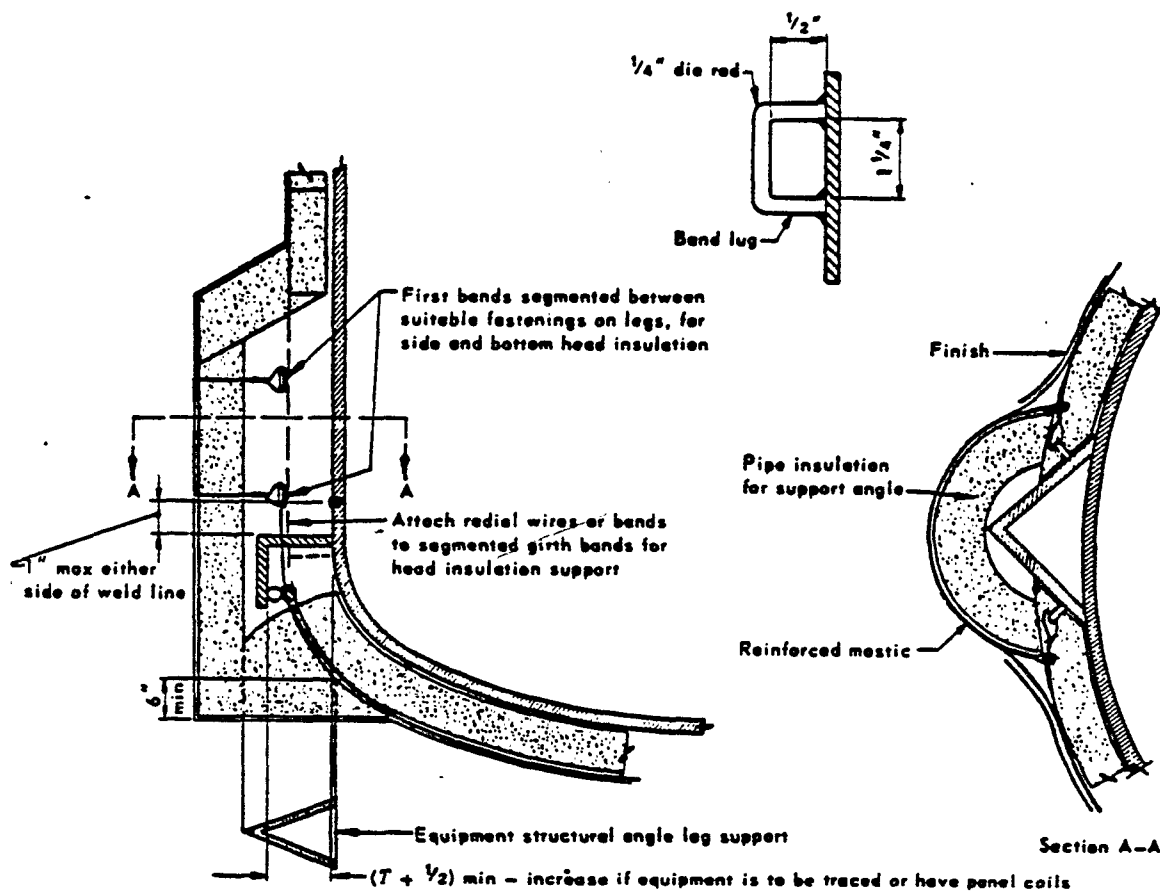


FIGURE 5 - VERTICAL CYLINDRICAL EQUIPMENT WITH STRUCTURAL ANGLE LEG SUPPORTS

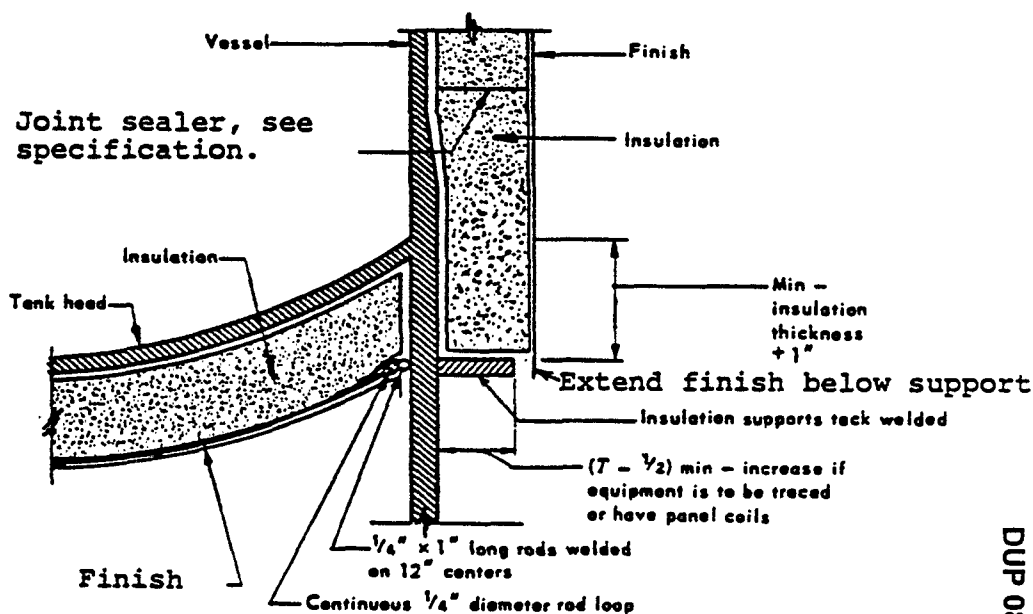


FIGURE 6 - VERTICAL CYLINDRICAL EQUIPMENT WITH SKIRT SUPPORT

DUP 0838746

INSULATION SYSTEMS FOR EQUIPMENT 35 TO 1200°F (2 TO 649°C)

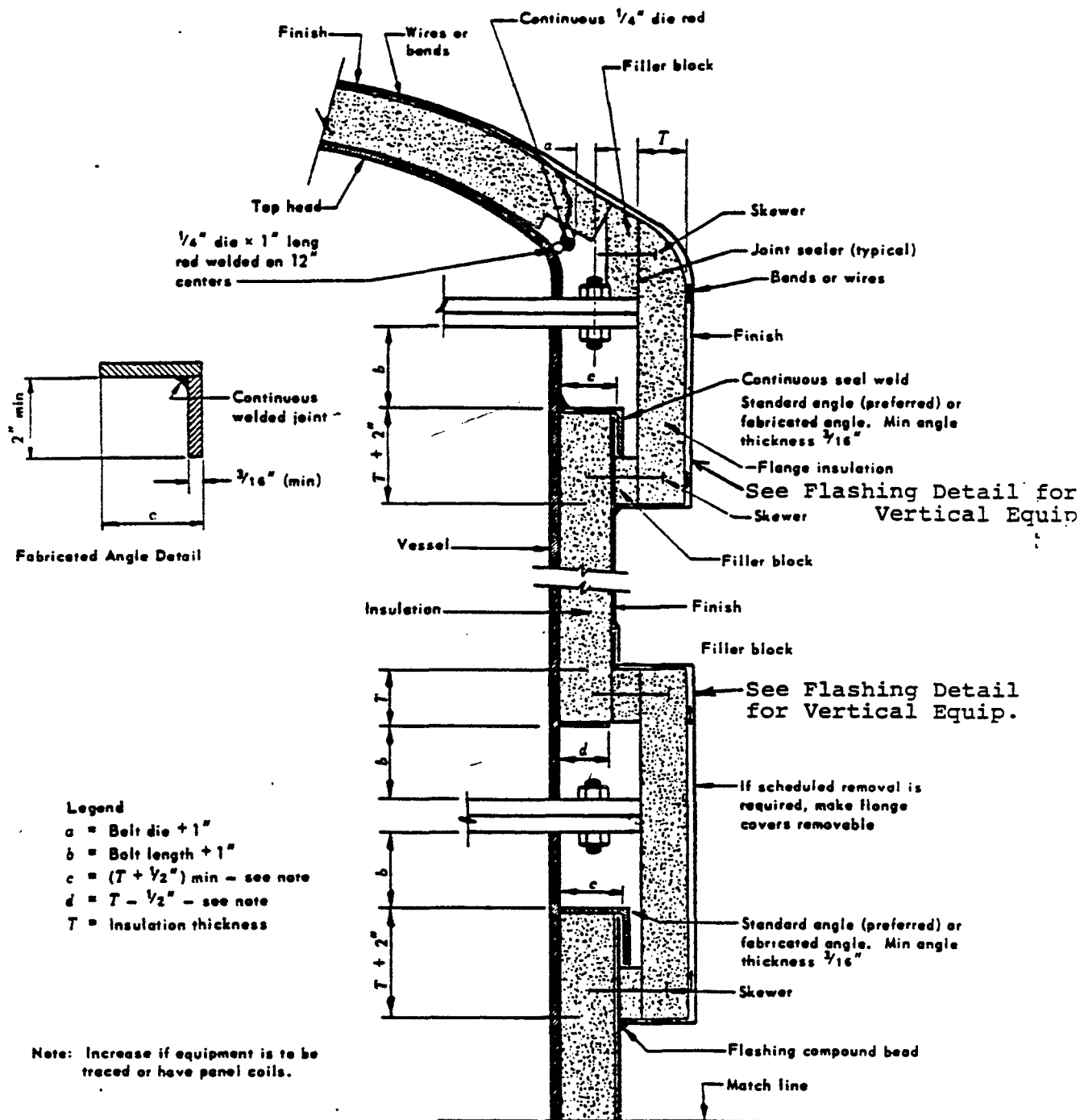
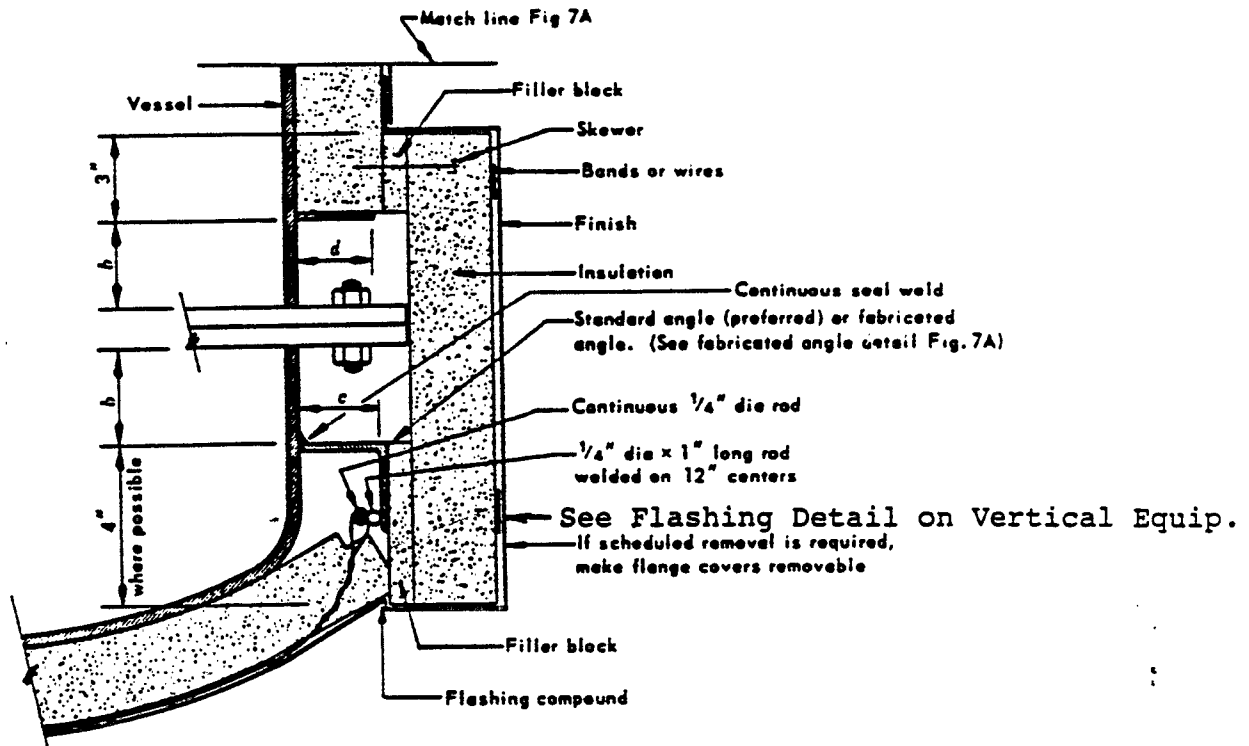


Figure 7A - Upper Detail

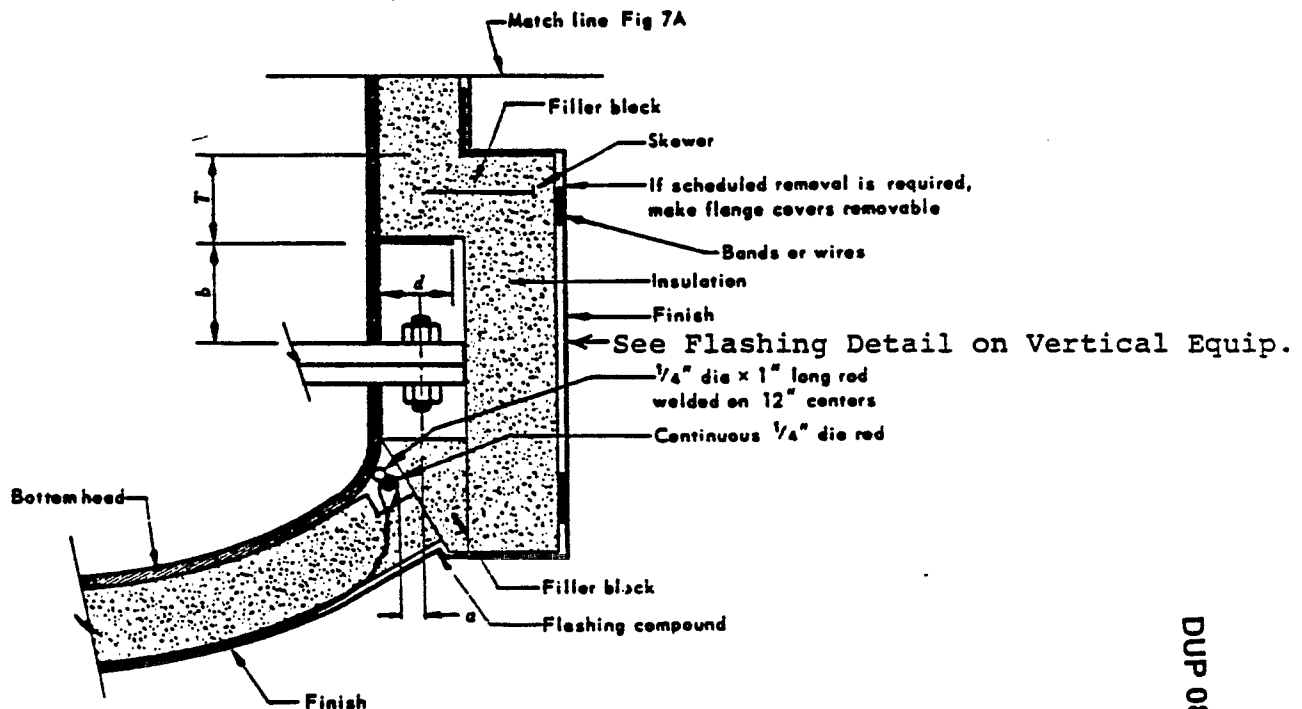
FIGURE 7 - FLANGED VERTICAL EQUIPMENT

DUP 0838747

**INSULATION SYSTEMS FOR EQUIPMENT
35 TO 1200°F (2 TO 649°C)**



**Figure 7B - Lower Dished Head Where Straight Tangent is
Belt Length Plus 1 Inch or More**



**Figure 7C - Lower Dished Head Where Straight Tangent is
Less Than Belt Length Plus 1 Inch**

FIGURE 7 - FLANGED VERTICAL EQUIPMENT (CONT'D FROM PAGE 4)

DUP 0838748

INSULATION SYSTEMS FOR EQUIPMENT
35 TO 1200°F (2 TO 649°C)

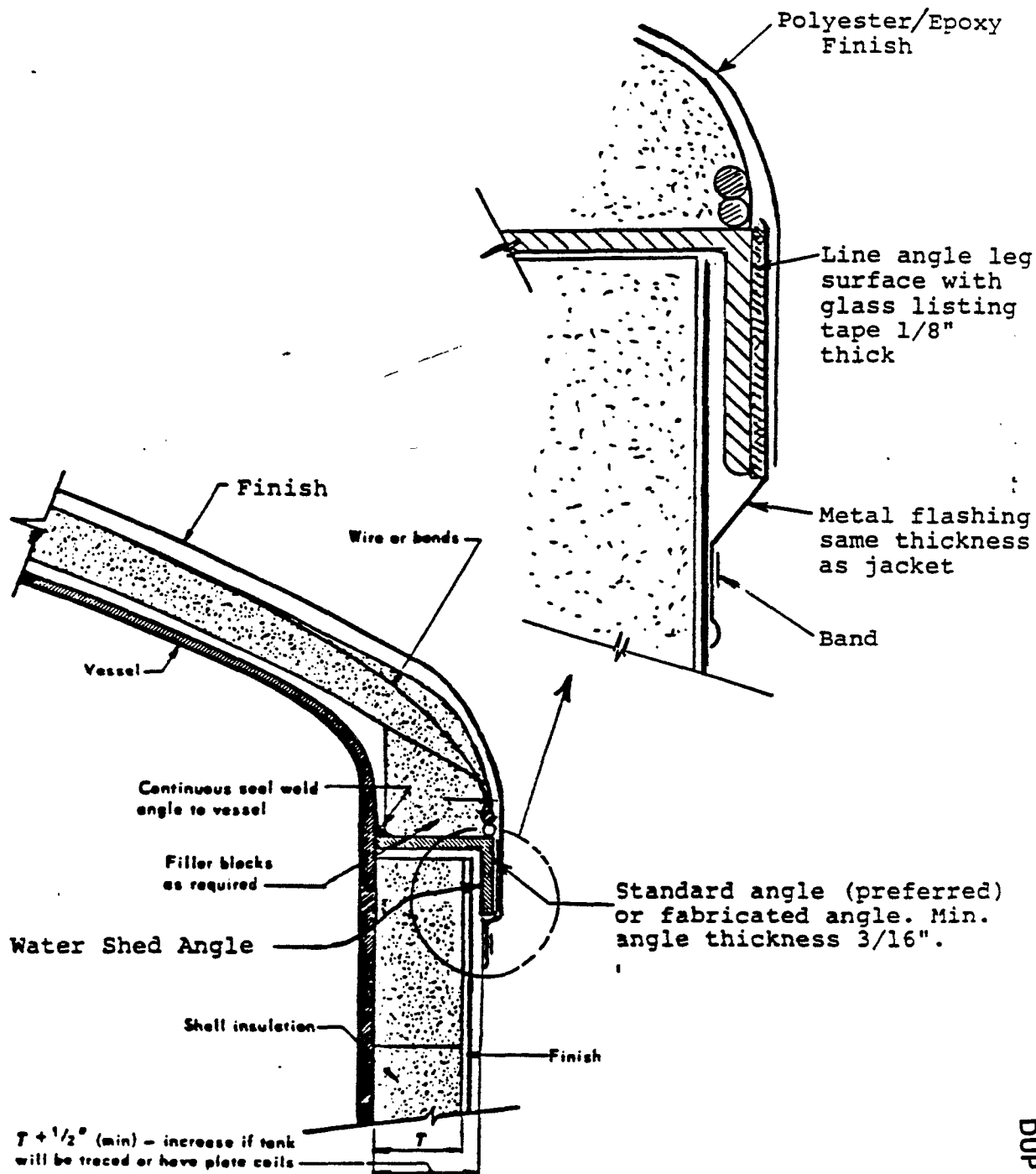
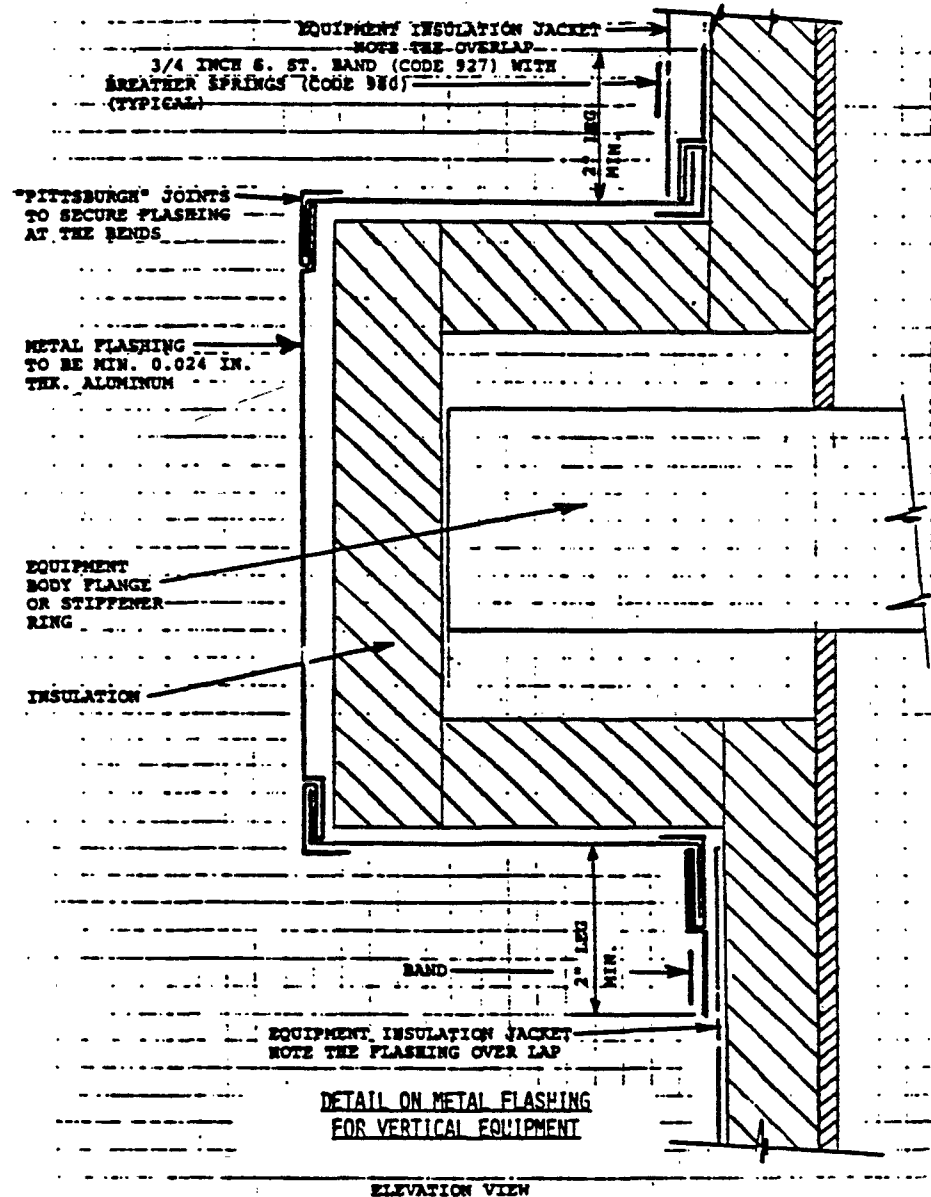


FIGURE PREFERRED INSULATION SYSTEM FOR VERTICAL TANKS -
TOP HEAD FLAT, CONICAL, OR DISHED WITH WATER
SHED ANGLE
(FOR EQUIPMENT OPERATING BELOW 300°F 149°C)

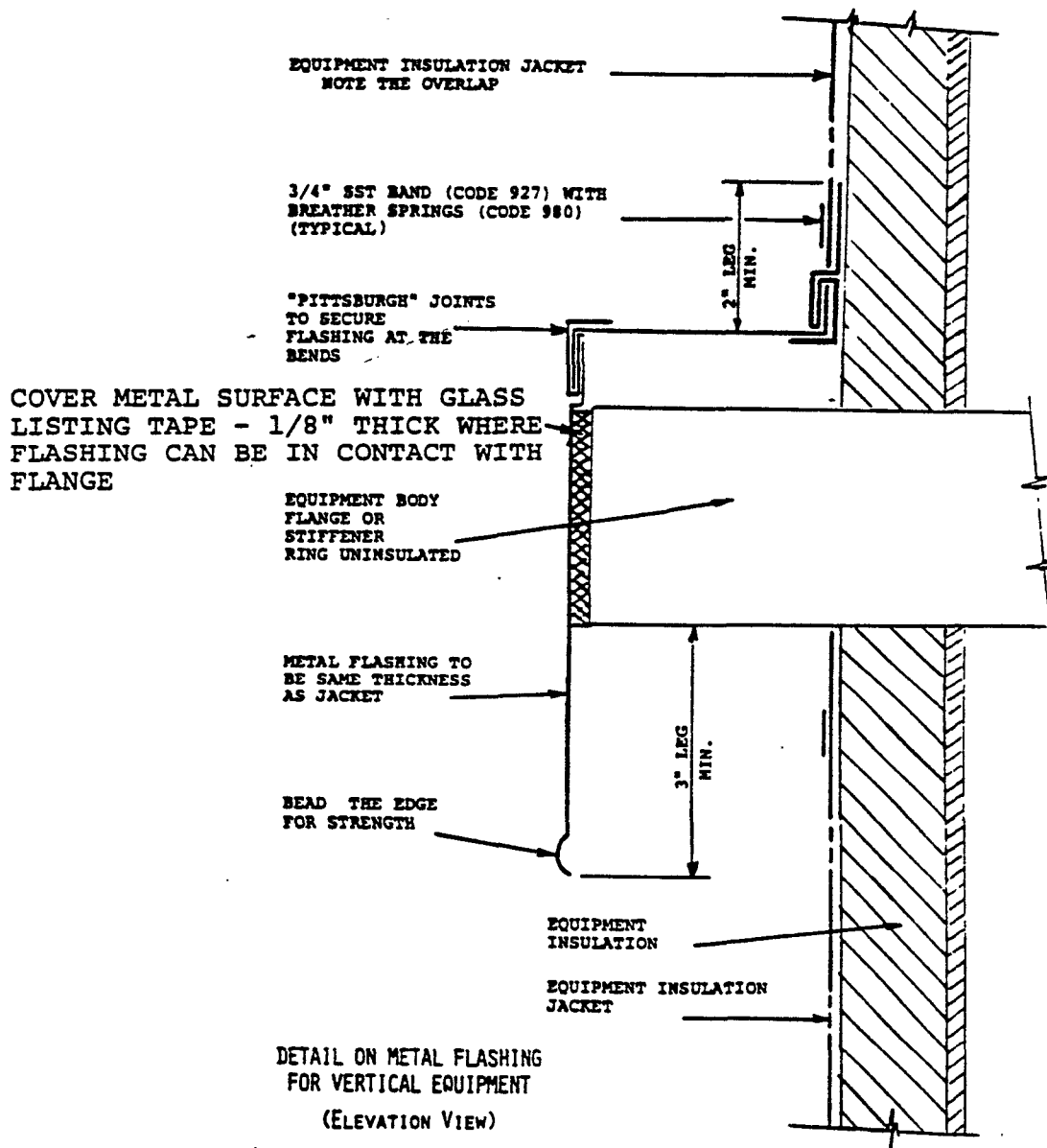
DUP 0838749

FLASHING ON VERTICAL EQUIPMENT
 WHERE BODY FLANGES AND STIFFENER RINGS ARE INSULATED (FOR
 EQUIPMENT OPERATING ABOVE 300°F 149°C)



DUP 0838750

FLASHING ON VERTICAL EQUIPMENT WHERE BODY FLANGES
AND STIFFENER RINGS ARE UNINSULATED
(FOR EQUIPMENT OPERATING LESS THAN 300°F 149°C)



DUP 0838751

**FLASHING ON VERTICAL EQUIPMENT
WHERE BODY FLANGES REQUIRE REMOVABLE
INSULATION COVERS**

"PITTSBURGH" JOINTS TO SECURE
FLASHING AT THE BENDS

3/4" SST BANDS TO
SECURE REMOVABLE
COVER-USE
BREATHING SPRINGS

METAL JACKET ON
REMOVABLE COVER
TO BE SAME
THICKNESS AS
EQUIPMENT JACKET

EQUIPMENT BOLTED
FLANGE

REMOVABLE COVER
INSULATION TO BE
SAME THICKNESS
AS BODY INSULATION

EQUIPMENT INSULATION

METAL
BEVELED
END CAP

BEAD OF CAULKING
(CODE 813)

(ELEVATION VIEW)

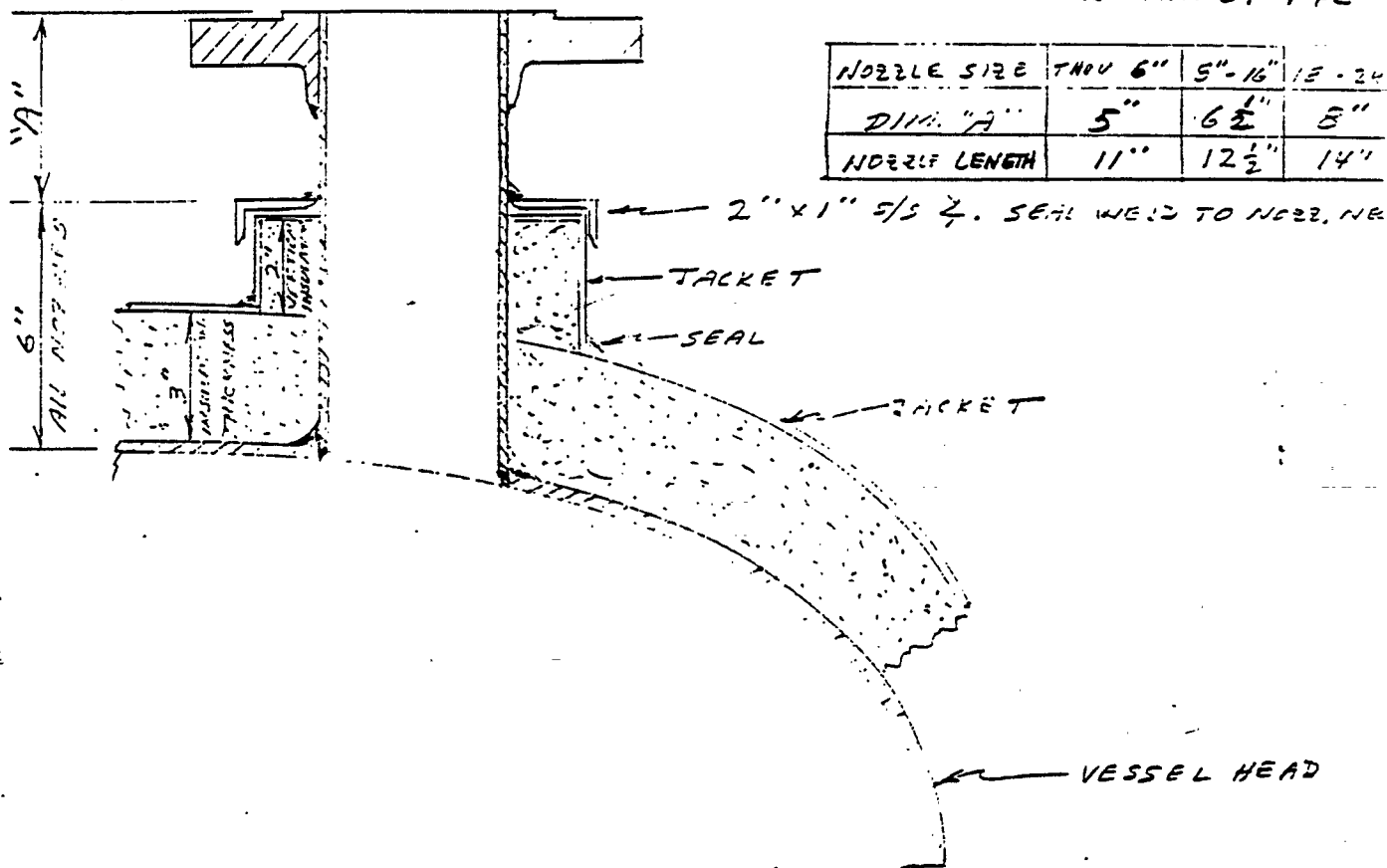
DUP 0838752

CENTRIFUGES WATERSHED ANGLE ON VESSEL NOZZLES

1908
VICTORIA

7/16/80

Flange Thickness : 1" for 6" pipe & under
1 1/2" thru 16" pipe
2" thru 24" pipe



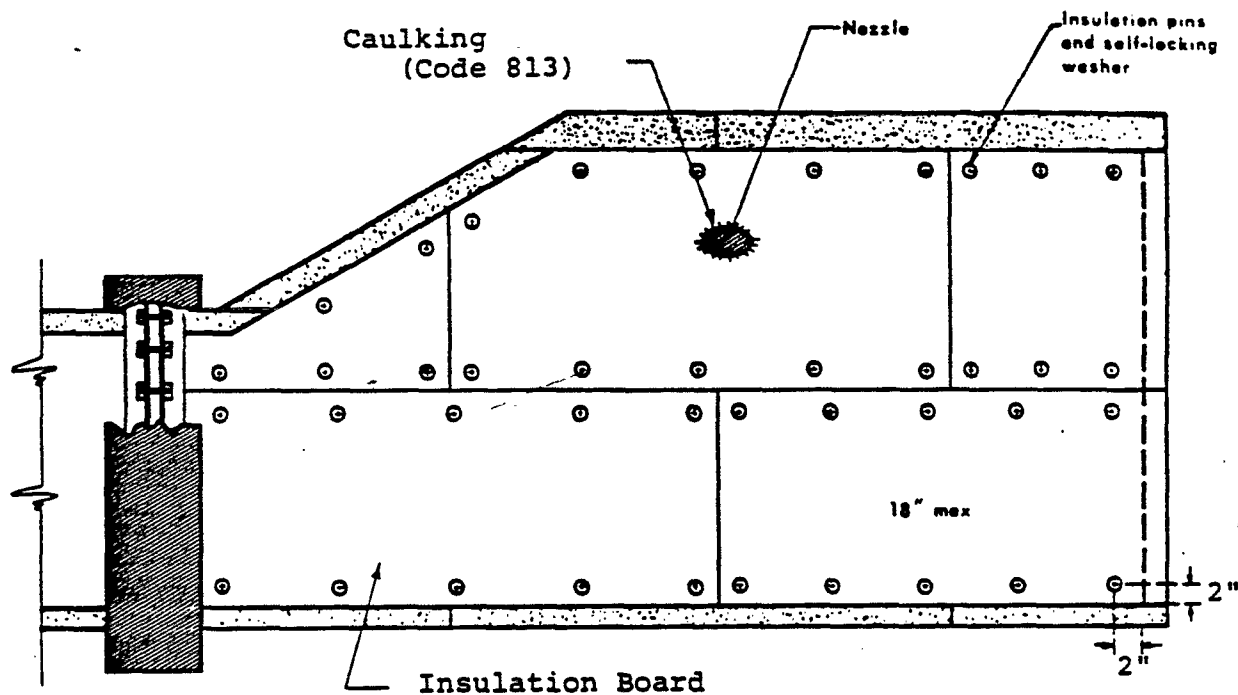
DESIGN BASIS:

1. FOR PROS 1908 ONLY.
2. VESSEL INSULATION FOR ALL VESSELS IS CALCIUM SILICATE 3" THICK.
3. NOZZLE NECK INSULATION FOR ALL VESSELS IS CALCIUM SILICATE 1 1/2" THICK
4. SPACE BETWEEN TOP OF 7/8" AND BOTTOM OF FLANGE IS ADEQUATE FOR BOLT LENGTH (2X FLANGE + NOT) + 1" FOR BOLT REG. SYNL
5. THIS SKETCH IS NOT INTENDED TO SHOW INSULATION INSTALLATION SPECS. IT IS FOR LAYOUT TO DETERMINE NOZZLE NECK LENGTH ONLY.

DUP 0838753

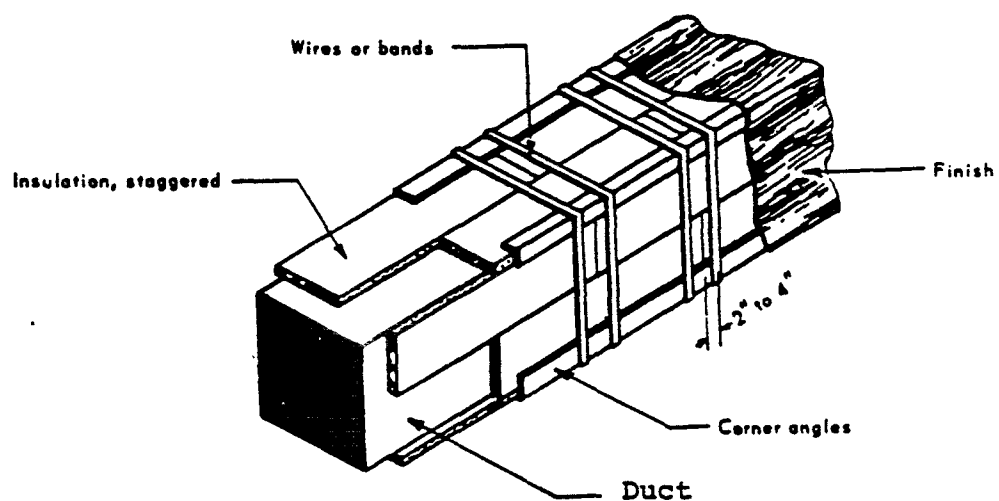
9.8 APPENDIX "H"- INSULATION SYSTEM SKETCHES FOR DUCTS OR
BREECHING -

DUP 0838754



Side View

DUCT INSULATION



USE OF CORNER ANGLES

DUCT SKETCH

DUP 0838755