PLAINTIFF'S EXHIBIT

UC-2366

SPECIFICATIONS FOR THERMAL INSULATION

SOUTH CHARLESTON PLANT

Works Engineering Department

CARBIDE AND CARBON CHEMICALS COMPANY

A Division of

Union Carbide and Carbon Corporation

Institute, West Virginia

SPECIFICATIONS

FOR

THERMAL INSULATION

SOUTH CHARLESTON PLANT

WORKS ENGINEERING DEPARTMENT

CARBIDE AND CARBON CHEMICALS COMPANY
A Division of
UNION CARBIDE AND CARBON CORPORATION

INSTITUTE, WEST VIRGINIA

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UCC 003394

INSTITUTE PLANT

THERMAL INSULATION SPECIFICATIONS

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THERMAL INSULATION SPECIFICATIONS

MATERIALS AND APPLICATION SPECIFICATIONS

IN NUMERICAL ORDER

I - ALL MATERIALS AND APPLICATIONS:

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II - CELLULAR GLASS:

10-H - Material and Application Specification for cellular glass thermal insulation for use on equipment and piping normally operating at temperatures above 70°F and up to 600°F and a cushioning blanket is required on all vessels. It is applicable to both indoor and outdoor service.

10-J - Material and Application Specification for cellular glass thermal insulation for use on equipment and piping normally operating at temperatures above 70°F and up to 500°F and a cushioning blanket is not required on any vessels. It is applicable to both indoor and outdoor service.

10-L - Material and Application Specification for cellular glass thermal insulation for use on equipment and piping normally operating at temperatures below 70°F and including cycle operation and thawout service up to 400°F. A cushioning blanket is required on all vessels. It is applicable to both indoor and outdoor service.

III - CALCIUM SILICATE:

20-H - Material and Application Specification for calcium silicate insulation for use on equipment and piping normally operating at temperatures from 70°F up to and including 750°F. It is applicable to both indoor and outdoor service.

IV - ASBESTOS FIBER:

21-H - Material and Application Specification for asbestos fiber thermal insulation for use on piping normally operating at temperatures from 70°F up to and including 750°F. It is applicable to both indoor and outdoor service.

Note - Specification 21-H covers piping only. For equipment requiring insulation use Specification 20-H.

V - HYDROUS CALCIUM SILICATE:

25-H - Material and Application Specification of "Kaylo 20" insulation for use on high temperature equipment and piping operating between 750°F up to and including 1200°F. It is applicable to both indoor and outdoor service.

32-H - Material and Application Specification of "Kaylo 20" insulation for use on high temperature equipment and piping to be protected from fire exposure. It is applicable to both indoor and outdoor service.

THERMAL INSULATION SPECIFICATIONS

MATERIALS DESCRIPTION, MANUFACTURERS AND TRADE NAMES

Insulation Spec. No.	Material	Description	Manufacturer	Trade Names	Temp. Limits Min. (F°)	Temp. Limits Max. (F°)
10-H 10-J 10-L	Cellular Glass (Block and Pipe Covering)	Inorganic, pure glass containing millions of separate hermetically sealed cells, each filled with air. Unusually high resistance to moisture, vapor and acid atoms. Incombustible and vermin proof. Combines light weight and high compressive strength.	Pittsburgh-Corning Corp.	Foamglas	-400	800
20-H	Calcium Silicate (Block and Pipe Covering)	Calcium silicate and asbestos fiber processed into rigid insulation. High compressive strength and relative hard surface. Does not disintegrate when wet.	Baldwin-Hill Johns-Manville Keasby-Mattison Mundet Owens-Corning Pabco Ruberiod	Calcium Silicate Thermobestos Kaytherm Tri-Calite Kaylo Caltemp Calsilite	32 32 100 100 32 32 32	1200 1200 1500 1200 1200 1200 1250
21-H	Asbestos Fibers, Felted with Sodium Silicate Binder (Pipe Covering Only)	Amosite asbestos fibers bonded with sodium silicate and processed into pipe insulation. Has considerable mechanical strength, and will resist vibration. Will "bridge" voids.	Armstrong Union Asbestos and Rubber	Armobestos Unibestos #1200	32 32	1200 1200
	Calcium Silicate (Block Covering Only)	Calcium Silicate same as Spec. 20-H above.	See Spec. 20-H above.	See Spec. 20-H above.		
25-H 32-H	Hydrous Calcium Silicate (Block and Pipe Covering)	Calcium silicate and asbestos fiber processed into rigid insulation. High compressive strength and relative hard surface. Does not disintegrate when wet. Low shrinkage.	Owens-Corning	Kaylo-20	100	2000

SERVICE: 10 PSI STEAM—25 PSI STEAM—LOW PRESSURE CONDENSATE (0-75 PSI)—ALL BOILER WATER—HOT CITY WATER—CHEMICAL SERVICE UP TO 355 °F

INSULATION SPECIFICATION NO.: 20-H **MAXIMUM TEMP. FOR THIS SHEET: 355 °F**

LINE SIZE (IN.)	INSULATION MATERIAL	TOTAL THICKNESS (IN.)	NO. LAYERS	VA., FIT. & FLG. COVER	WIRE	BAND	REINF. MESH	WEATHER-COATING MAT'L.	WEATHER-COATING APPL.
½	CALCIUM SILICATE	1	1	FLD. FAB. OR INS. CEM.	18 USSWG. (.0475") x TYPE 304 S. S. SOFT ANNEALED	NONE	GLASS FABRIC 10 x 10 MESH / STARCH BINDER	VIMASCO WC-1 OR BENJAMIN-FOSTER SEALFAS "C"	PALM
¾		1	1						
1		1	1		SEE DWG. #D-383300 (PAGE 40) FOR SPACING				
1-½		1	1						
2		1	1						
2-½		1	1	SHOP PRE-FAB					
3		1	1						
3-½		1	1						
4		1	1		NONE	½" WIDE x .020" THICK x TYPE 304 SS			
6		1-½	1						
8		1-½	1	SEE FABRICATION MANUAL					
10		1-½	1						
12		1-½	1					SEE GENERAL NOTE #5	
14		1-½	1						
16		1-½	1			SEE DWG. #D-383300 (PAGE 40) FOR SPACING			
18		1-½	1						SEE GENERAL NOTE #6
20		1-½	1						
22		1-½	1						
24		1-½	1						
26		1-½	1	SEE GENERAL NOTE #8					
28		1-½	1						
30		1-½	1						
32		1-½	1						
34		1-½	1						
36		1-½	1						
EQUIPMENT (FLAT OR OVER 36")		1-½	1	CUT FOR SIZE REQ'D. (FAB. MAN.)	SEE DWG. #D-383301 (PAGE 41) AND GENERAL NOTE #4 FOR SPACING AND DETAILS				

EQUIPMENT AND PIPING ACCESSORIES:

a) Clips—½" double pronged Type 304 SS, A. J. Gerrard or approved alternate.
b) Fabricating Cement—A. P. Green Fire Brick Co. "Insulation Adhesive", or approved alternate.
c) Insulating Cement—Hydraulic setting, Baldwin-Hill "Powerhouse", Eagle-Picher "One-Coat", or approved alternate.
d) Heat Resistant Sealer—Benjamin-Foster #30-43 or approved alternate.

EQUIPMENT ACCESSORIES ONLY:

a) Mineral Wool Blanket—Black, spun rock wool, hexagonal wire netting one side, expanded metal lath on the other side. (To be used on equipment expansion joints of the bellows type.)
b) Mineral Wool Blanket—Black, spun rock wool, hexagonal wire netting on both sides. (To be used on very irregular shapes where metal lath type is not satisfactory.)
c) Wire Netting—One inch, hexagonal mesh, #20 gage, Type 304 SS or approved alternate.
d) Finishing Cement—Hard surface, Eagle-Picher #106, J. M. #678, or approved alternate.

PIPING ACCESSORIES ONLY:

a) Finishing Cement—J. M. #352 or approved alternate. (For pipe patching)

UCC 003401

SERVICE: 75 PSI STEAM—MEDIUM PRESSURE CONDENSATE (75-200 PSI)—CHEMICAL SERVICE UP TO 391 °F

INSULATION SPECIFICATION NO.: 20-H | **MAXIMUM TEMP. FOR THIS SHEET: 391 °F**

LINE SIZE (IN.)	INSULATION MATERIAL	TOTAL THICKNESS (IN.)	NO. LAYERS	VA., FIT. & FLG. COVER	WIRE	BAND	REINF. MESH	WEATHER-COATING MAT'L.	WEATHER-COATING APPL.
½	CALCIUM SILICATE	1	1	FLD. FAB. OR INS. CEM.	18 USSWG. (.0478") x TYPE 304 S. S. SOFT ANNEALED	NONE	GLASS FABRIC 10 x 10 MESH / STARCH BINDER	VIMASCO WC-1 OR BENJAMIN-FOSTER SEALFAS "C"	PALM
¾		1	1						
1		1	1						
1-½		1	1						
2		1	1	SHOP PRE-FAB	SEE DWG. #D-383300 (PAGE 40) FOR SPACING				
2-½		1	1						
3		1	1						
3-½		1	1						
4		1	1		NONE	½" WIDE x .020" THICK x TYPE 304 SS			
6		1-½	1						
8		1-½	1	SEE FABRICATION MANUAL					
10		1-½	1						
12		1-½	1						
14		1-½	1						
16		1-½	1			SEE DWG. #D-383300 (PAGE 40) FOR SPACING		SEE GENERAL NOTE #5	
18		1-½	1						
20		1-½	1						
22		1-½	1						
24		1-½	1						
26		1-½	1	SEE GENERAL NOTE #3					SEE GENERAL NOTE #8
28		2	1						
30		2	1						
32		2	1						
34		2	1						
36		2	1						
EQUIPMENT (FLAT OR OVER 36")		2	1	CUT FOR SIZE REQ'D. (FAB. MAN.)	SEE DWG. #D-383301 (PAGE 41) AND GENERAL NOTE #4 FOR SPACING AND DETAILS				

EQUIPMENT AND PIPING ACCESSORIES:

a) Clips—½" double pronged Type 304 SS, A. J. Gerrard or approved alternate.
b) Fabricating Cement—A. P. Green Fire Brick Co. "Insulation Adhesive", or approved alternate.
c) Insulating Cement—Hydraulic setting, Baldwin-Hill "Powerhouse", Eagle-Picher "One-Coat", or approved alternate.
d) Heat Resistant Sealer—Benjamin-Foster #30-43 or approved alternate.

EQUIPMENT ACCESSORIES ONLY:

a) Mineral Wool Blanket—Black, spun rock wool, hexagonal wire netting one side, expanded metal lath on the other side. (To be used on equipment expansion joints of the bellows type.)
b) Mineral Wool Blanket—Black, spun rock wool, hexagonal wire netting on both sides. (To be used on very irregular shapes where metal lath type is not satisfactory.)
c) Wire Netting—One inch, hexagonal mesh, #20 gage, Type 304 SS or approved alternate.
d) Finishing Cement—Hard surface, Eagle-Picher #106, J. M. #678, or approved alternate.

PIPING ACCESSORIES ONLY:

a) Finishing Cement—J. M. #352 or approved alternate. (For pipe patching)

UCC 003402

SERVICE: 200 PSI STEAM—HIGH PRESSURE CONDENSATE (200-400 PSI)

INSULATION SPECIFICATION NO.: 20-H **MAXIMUM TEMP. FOR THIS SHEET: 499 °F**

LINE SIZE (IN.)	INSULATION MATERIAL	TOTAL THICKNESS (IN.)	NO. LAYERS	VA., FIT. & FLG. COVER	WIRE	BAND	REINF. MESH	WEATHER-COATING MAT'L.	WEATHER-COATING APPL.
¼	CALCIUM SILICATE	1½	1	FLD. FAB. OR INS. CEM.	18 USSWG. (.0475") x TYPE 304 S. S. SOFT ANNEALED	NONE	GLASS FABRIC 10 x 10 MESH / STARCH BINDER	VIMASCO WC-1 OR BENJAMIN-FOSTER SEALFAS "C"	PALM
¾		1-½	1						
1		1-½	1	SHOP PRE-FAB					
1-¼		2	1						
2		2	1		NONE	½" WIDE x .020" THICK x TYPE 304 S. S.			
2-½		2	1						
3		2	1						
3-½		2	1						
4		2	1						
6		2	1						
8		2	1	SEE FABRICATION MANUAL					
10		2-½	1						
12		2-½	1						
14		2-½	1			SEE DWG. #D-383300 (PAGE 40) FOR SPACING		SEE GENERAL NOTE #5	
16		2-½	1						
18		2-½	1						SEE GENERAL NOTE #6
20		2-½	1						
22		2-½	1						
24		2-½	1						
26		2-½	1	SEE GENERAL NOTE #3					
28		2-½	1						
30		2-½	1						
32		2-½	1						
34		2-½	1						
36		2-½	1						
EQUIPMENT (FLAT OR OVER 36")		2-½	1	CUT FOR SIZE REQ'D. (FAB. MAN.)	SEE DWG. #D-383301 (PAGE 41) AND GENERAL NOTE #4 FOR SPACING AND DETAILS				

EQUIPMENT AND PIPING ACCESSORIES:

a) Clips—½" double pronged Type 304 SS, A. J. Gerrard or approved alternate.
b) Fabricating Cement—A. P. Green Fire Brick Co. "Insulation Adhesive", or approved alternate.
c) Insulating Cement—Hydraulic setting, Baldwin-Hill "Powerhouse", Eagle-Picher "One-Coat", or approved alternate.
d) Heat Resistant Sealer—Benjamin-Foster #30-43 or approved alternate.

EQUIPMENT ACCESSORIES ONLY:

a) Mineral Wool Blanket—Black, spun rock wool, hexagonal wire netting one side, expanded metal lath on the other side. (To be used on equipment expansion joints of the bellows type.)
b) Mineral Wool Blanket—Black, spun rock wool, hexagonal wire netting on both sides. (To be used on very irregular shapes where metal lath type is not satisfactory.)
c) Wire Netting—One inch, hexagonal mesh, #20 gage, Type 304 SS or approved alternate.
d) Finishing Cement—Hard surface, Eagle-Picher #106, J. M. #678, or approved alternate.

PIPING ACCESSORIES ONLY:

a) Finishing Cement—J. M. #352 or approved alternate. (For pipe patching)

UCC 003403

SERVICE: 400 PSI STEAM

INSULATION SPECIFICATION NO.: 20-H **MAXIMUM TEMP. FOR THIS SHEET: 643 °F**

LINE SIZE (IN.)	INSULATION MATERIAL	TOTAL THICKNESS (IN.)	NO. LAYERS	LAYER DATA		VA., FIT. & FLG. COVER	WIRE (INNER LAYER)	BAND (OUTER LAYER)	REINF. MESH	WEATHER-COATING MAT'L.	WEATHER-COATING APPL.
				INNER	OUTER						
1½	CALCIUM SILICATE	2	1	NONE	¼" IPS x 2"	FLD. FAB. OR INS. CEM.	18 USSWG (.0475") x TYPE 304 S. S. SOFT ANNEALED	NONE	GLASS FABRIC 10 x 10 MESH / STARCH BINDER	VIMASCO WC-1 OR BENJAMIN-FOSTER SEALFAS "C"	PALM
2½		2	1		¾" IPS x 2"						
1		2	1		1" IPS x 2"	SHOP PRE-FAB					
1-½		2-½	1		1-¼" IPS x 2-½"		NONE	½" WIDE x .020" THICK x TYPE 304 S. S.			
2		2-½	1		2" IPS x 2-½"						
2-½		2-½	1		2-½" IPS x 2-½"						
3		2-½	1		3" IPS x 2-½"						
3-½		2-½	1		3-½" IPS x 2-½"						
4		3	2	4" IPS x 1-½"	7" IPS x 1-½"		18 USSWG (.0475") x TYPE 304 S. S. SOFT ANNEALED				
6		3	2	6" IPS x 1-½"	9" IPS x 1-½"						
8		3	2	8" IPS x 1-½"	11" IPS x 1-½"						
10		3	2	10" IPS x 1-½"	14" IPS x 1-½"						
12		3	2	12" IPS x 1-½"	16" IPS x 1-½"	SEE FABRICATION MANUAL	SEE DWG. #D-383300 (PAGE 40) FOR SPACING	SEE DWG. #D-383300 (PAGE 40) FOR SPACING		SEE GENERAL NOTE #5	
14		3	2	14" IPS x 1-½"	17" IPS x 1-½"						
16		3-½	2	15" IPS x 1-½"	19" IPS x 2"						
18		3-½	2	18" IPS x 1-½"	21" IPS x 2"						
20		3-½	2	20" IPS x 1-½"	23" IPS x 2"						
22		3-½	2	22" IPS x 1-½"	25" IPS x 2"						
24		3-½	2	24" IPS x 1-½"	27" IPS x 2"						
26		3-½	2	26" IPS x 1-½	29" IPS x 2"						
28		3-½	2	28" IPS x 1-½"	31" IPS x 2"	SEE GENERAL NOTE #3					
30		3-½	2	30" IPS x 1-½"	33" IPS x 2"						
32		3-½	2	32" IPS x 1-½"	35" IPS x 2"						
34		3-½	2	34" IPS x 1-½"	37" IPS x 2"						
36		3-½	2	36" IPS x 1-½"	39" IPS x 2"						SEE GENERAL NOTE #6
EQUIPMENT (FLAT OR OVER 36")		3-½	2	1-½"	2"	CUT FOR SIZE REQ'D. (FAB. MAN.)	SEE DWG. #D-383301 (PAGE 41) AND GENERAL NOTE #4 FOR SPACING AND DETAILS				

EQUIPMENT AND PIPING ACCESSORIES:

a) Clips—½" double pronged Type 304 SS, A. J. Gerrard or approved alternate.
b) Fabricating Cement—A. P. Green Fire Brick Co. "Insulation Adhesive", or approved alternate.
c) Insulating Cement—Hydraulic setting, Baldwin-Hill "Powerhouse", Eagle-Picher "One-Coat", or approved alternate.
d) Heat Resistant Sealer—Benjamin-Foster #30-43 or approved alternate.

EQUIPMENT ACCESSORIES ONLY:

a) Mineral Wool Blanket—Black, spun rock wool, hexagonal wire netting one side, expanded metal lath on the other side. (To be used on equipment expansion joints of the bellows type.)
b) Mineral Wool Blanket—Black, spun rock wool, hexagonal wire netting on both sides. (To be used on very irregular shapes where metal lath type is not satisfactory.)
c) Wire Netting—One inch, hexagonal mesh, #20 gage, Type 304 SS or approved alternate.
d) Finishing Cement—Hard surface, Eagle-Picher #106, J. M. #678, or approved alternate.

PIPING ACCESSORIES ONLY:

a) Finishing Cement—J. M. #352 or approved alternate. (For pipe patching)

UCC 003404

SERVICE: 100 PSI SUPERHEATED STEAM AT H2N (856)

INSULATION SPECIFICATION NO.: 25-H **MAXIMUM TEMP. FOR THIS SHEET: 1200 °F**

LINE SIZE (IN.)	INSULATION MATERIAL	TOTAL THICKNESS (IN.)	NO. LAYERS	LAYER DATA			VA., FIT. & FLG. COVER	WIRE (INNER & MIDDLE LAY.)	BAND (OUTER LAYER)	REINF. MESH.	WEATHER-COATING MAT'L.	WEATHER-COATING APPL.
				INNER	MIDDLE	OUTER						
½	HYDROUS CALCIUM SILICATE	3-½	2	½" IPS x 1-½"	NONE	3-½" IPS x 2"	SHOP PRE-FAB	18 USSWG (.0478") x TYPE 304 SS SOFT ANNEAL	½" WIDE x .020" THICK x TYPE 304 SS	GLASS FABRIC 10 x 10 MESH / STARCH BINDER	VIMASCO WC-1 OR BENJAMIN-FOSTER SEALFAS "C"	PALM
¾		3-½	2	¾" IPS x 1-½"		3-½" IPS x 2"						
1		4	2	1" IPS x 2"		5" IPS x 2"						
1-½		4	2	1-½" IPS x 2"		5" IPS x 2"						
2		4-½	2	2" IPS x 2"		6" IPS x 2-½"						
2-½		4-½	2	2-½" IPS x 2"		6" IPS x 2-½"						
3		4-½	2	3" IPS x 2"		7" IPS x 2-½"						
3-½		5	2	3-½" IPS x 2-½"		8" IPS x 2-½"						
4		5	2	4" IPS x 2-½"		8" IPS x 2-½"						
6		5-½	3	6" IPS x 1-½"	9" IPS x 2"	14" IPS x 2"						
8		5-½	3	8" IPS x 1-½"	11" IPS x 2"	16" IPS x 2"						
10		6	3	10" IPS x 2"	15" IPS x 2"	19" IPS x 2"						
12		6	3	12" IPS x 2"	17" IPS x 2"	21" IPS x 2"						
14		6	3	14" IPS x 2"	18" IPS x 2"	22" IPS x 2"	SEE FABRICATION MANUAL	SEE DWG. #D-383300 (PAGE 40) FOR SPACING	SEE DWG. #D-383300 (PAGE 40) FOR SPACING		SEE GENERAL NOTE #5	
16		6	3	16" IPS x 2"	20" IPS x 2"	24" IPS x 2"						
18		6-½	3	18" IPS x 2"	22" IPS x 2"	26" IPS x 2-½"						
20		6-½	3	20" IPS x 2"	24" IPS x 2"	28" IPS x 2-½"						
22		6-½	3	22" IPS x 2"	26" IPS x 2"	30" IPS x 2-½"						
24		6-½	3	24" IPS x 2"	28" IPS x 2"	32" IPS x 2-½"						
26		6-½	3	26" IPS x 2"	30" IPS x 2"	34" IPS x 2-½"						
28		6-½	3	28" IPS x 2"	32" IPS x 2"	36" IPS x 2-½"	SEE GENERAL NOTE #3					SEE GENERAL NOTE #6
30		7	3	30" IPS x 2"	34" IPS x 2"	39" IPS x 2-½"						
32		7	3	32" IPS x 2"	36" IPS x 2-½"	41" IPS x 2-½"						
34		7	3	34" IPS x 2"	38" IPS x 2-½"	2-½"						
36		7	3	36" IPS x 2"	40" IPS x 2-½"	2-½"						
EQUIPMENT (FLAT OR OVER 36")		8	3	2-½"	2-½"	3"	CUT FOR SIZE REQ'D. (FAB. MAN.)	SEE DWG. #D-383301 (PAGE 41) AND GENERAL NOTE #4 FOR SPACING AND DETAILS				

EQUIPMENT AND PIPING ACCESSORIES:

a) Clips—½" double pronged Type 304 SS, A. J. Gerrard or approved alternate.
b) Fabricating Cement—A. P. Green Fire Brick Co. "Insulation Adhesive", J. H. France Co. "Franset", or approved alternate.
c) Insulating Cement—Hydraulic setting, Baldwin-Hill "Powerhouse", Eagle-Picher "One-Coat", or approved alternate.
d) Heat Resistant Sealer—There is no heat resistant sealer available for this temperature. Use 24 MSG (.0239") steel sheet metal flashing instead.

EQUIPMENT ACCESSORIES ONLY:

a) Mineral Wool Blanket—Black, spun rock wool, hexagonal wire netting one side, expanded metal lath on the other side. (To be used on equipment expansion joints of the bellows type.)
b) Mineral Wool Blanket—Black, spun rock wool, hexagonal wire netting on both sides. (To be used on very irregular shapes where metal lath type is not satisfactory.)
c) Wire Netting—One inch, hexagonal mesh, #20 gage, Type 304 SS or approved alternate.
d) Finishing Cement—Hard surface, Eagle-Picher #106, J. M. #678, or approved alternate.

PIPING ACCESSORIES ONLY:

a) Finishing Cement—J. M. #352 or approved alternate. (For pipe patching)

UCC 003405

SERVICE: DOWTHERM

INSULATION SPECIFICATION NO.: 21-H **MAXIMUM TEMP. FOR THIS SHEET: 715 °F**

NOTE: The temperature at which the dowtherm line would be kept is over 100 °F if the procedure as shown below is followed and 75 PSI steam is used in the tracer. Dowtherm freezes at approximately 53 °F and this would keep it fluid over any extended shut-down period. Steam tracer details are per Engineering Standard P-84, page 46 of this book. Clamp and spacer details are per Engineering Standard P-84A, page 47 of this book. For information on other sizes of tracers see Engineering Standard P-84.

LINE SIZE (IPS)	INSULATION MATERIAL	TOTAL THICKNESS (IN.)	NO. LAYERS	TRACER SIZE	LAYER DATA: INNER LAYER	LAYER DATA: OUTER LAYER	VALVE, FITTING, & FLG. COVER	WIRE INNER	BAND (OUTER LAYER)	REINF. MESH	WEATHER-COATING MAT'L.	WEATHER-COATING APPL.
½	ASBESTOS FIBER	2-½	1	3/8" O.D.	NONE	2" IPS x 2-½"	FLD. FAB. OR INS. CEM.	18 USSWG (.0475") x TYPE 304 SS SOFT ANNEALED	NONE	GLASS FABRIC 10 x 10 MESH / STARCH BINDER	VIMASCO WC-1 OR BENJAMIN-FOSTER SEALFAS "C"	PALM
¾	↓	2-½	1	3/8" O.D.	↓	1-¼" IPS x 2-½"	↓	↓	↓	↓	↓	↓
1	↓	2-½	1	3/8" O.D.	↓	1-½" IPS x 2-½"	SHOP PRE-FAB	↓	↓	↓	↓	↓
1-½	↓	3	2	3/8" O.D.	2-½" IPS x 1-½"	5" IPS x 1-½"	↓	↓	½" WIDE x .020" THICK x 304 SS	↓	↓	↓
2	↓	3	2	3/8" O.D.	3" IPS x 1-½"	6" IPS x 1-½"	↓	↓	↓	↓	↓	↓
2-½	↓	3-½	2	3/8" O.D.	3-½" IPS x 1-½"	6" IPS x 2"	↓	↓	↓	↓	↓	↓
3	↓	3-½	2	3/8" O.D.	4" IPS x 1-½"	7" IPS x 2"	↓	SEE DWG. #D-383300 (PAGE 40) FOR SPACING	SEE DWG. #D-383300 (PAGE 40) FOR SPACING	↓	SEE GENERAL NOTE #5	↓
4	↓	3-½	2	5/8" O.D.	5" IPS x 1-½"	8" IPS x 2"	↓	↓	↓	↓	↓	↓
6	↓	4	2	5/8" O.D.	7" IPS x 2"	11" IPS x 2"	↓	↓	↓	↓	↓	SEE GENERAL NOTE #5
8	↓	4	2	5/8" O.D.	10" O.D. x 2"	15" IPS x 2"	↓	↓	↓	↓	↓	↓
10	↓	4	2	7/8" O.D.	12" O.D. x 2"	17" IPS x 2"	↓	↓	↓	↓	↓	↓
12	↓	4	2	7/8" O.D.	14" IPS x 2"	18" IPS x 2"	↓	↓	↓	↓	↓	↓
EQUIPMENT (FLAT OR OTHER)	CALCIUM SILICATE	6	2		2-½"	2-½"	CUT FOR SIZE REQ'D. (FAB. MAN.)	SEE DWG. #D-383301 (PAGE 41) AND GENERAL NOTE #4 FOR SPACING AND DETAILS	↓	↓	↓	↓

SEE FABRICATION MANUAL

EQUIPMENT AND PIPING ACCESSORIES:

a) Clips—½" double pronged Type 304 SS, A. J. Gerrard or approved alternate.
b) Fabricating Cement—A. P. Green Fire Brick Co. "Insulation Adhesive", or approved alternate.
c) Insulating Cement—Hydraulic setting, Baldwin-Hill "Powerhouse", Eagle-Picher "One-Coat", or approved alternate.
d) Heat Resistant Sealer—Benjamin-Foster #30-43 or approved alternate.

EQUIPMENT ACCESSORIES ONLY:

a) Mineral Wool Blanket—Black, spun rock wool, hexagonal wire netting one side, expanded metal lath on the other side. (To be used on equipment expansion joints of the bellows type.)
b) Mineral Wool Blanket—Black, spun rock wool, hexagonal wire netting on both sides. (To be used on very irregular shapes where metal lath type is not satisfactory.)
c) Wire Netting—One inch, hexagonal mesh, #20 gage, Type 304 SS or approved alternate.
d) Finishing Cement—Hard surface, Eagle-Picher #106, J. M. #678, or approved alternate.

PIPING ACCESSORIES ONLY:

a) Finishing Cement—J. M. #352 or approved alternate. (For pipe patching)

UCC 003406

SERVICE: TETRALIN

INSULATION SPECIFICATION NO.: 20-H **MAXIMUM TEMP. FOR THIS SHEET: 535 °F**

LINE SIZE (IN.)	INSULATION MATERIAL	TOTAL THICKNESS (IN.)	NO. LAYERS	LAYER DATA		VA., FIT. & FLG. COVER	WIRE (INNER LAYER)	BAND (OUTER LAYER)	REINF. MESH	WEATHER-COATING MAT'L.	WEATHER-COATING APPL.
				INNER	OUTER						
½	CALCIUM SILICATE	2	1	NONE	½" IPS x 2"	FLD. FAB. OR INS. CEM.	18 USSWG (.0475") x TYPE 304 S. S. SOFT ANNEALED	NONE	GLASS FABRIC 10 x 10 MESH / STARCH BINDER	VIMASCO WC-1 OR BENJAMIN-FOSTER SEALFAS "C"	PALM
¾		2	1		¾" IPS x 2						
1		2	1		1" IPS x 2"	SHOP PRE-FAB					
1-½		2	1		1-½" IPS x 2"						
2		2	1		2" IPS x 2"						
2-½		2-½	1		2-½ IPS x 2-½"		NONE	½" WIDE x .020" THICK x TYPE 304 SS			
3		2-½	1		3" IPS x 2-½"						
3-½		2-½	1		3-½" IPS x 2-½"						
4		2-½	1		4" IPS x 2-½"						
6		2-½	1		6" IPS x 2-½"						
8		3	2	8" IPS x 1-½"	11" IPS x 1-½"		18 USSWG (.0479") x TYPE 304 SS SOFT ANNEALED				
10		3	2	10" IPS x 1-½"	14" IPS x 1-½"						
12		3	2	12" IPS x 1-½"	16" IPS x 1-½"	SEE FABRICATION MANUAL		SEE DWG. #D-383300 (PAGE 40) FOR SPACING		SEE GENERAL NOTE #5	
14		3	2	14" IPS x 1-½"	17" IPS x 1-½"						
16		3	2	16" IPS x 1-½"	19" IPS x 1-½"						
18		3	2	18" IPS x 1-½"	21" IPS x 1-½"						SEE GENERAL NOTE #6
20		3	2	20" IPS x 1-½"	23" IPS x 1-½"						
22		3	2	22" IPS x 1-½"	25" IPS x 1-½"		SEE DWG. #D-383300 (PAGE 40) FOR SPACING				
24		3	2	24" IPS x 1-½"	27" IPS x 1-½"						
26		3	2	26" IPS x 1-½"	29" IPS x 1-½"	SEE GENERAL NOTE #3					
28		3	2	28" IPS x 1-½"	31" IPS x 1-½"						
30		3	2	30" IPS x 1-½"	33" IPS x 1-½"						
32		3	2	32" IPS x 1-½"	35" IPS x 1-½"						
34		3	2	34" IPS x 1-½"	37" IPS x 1-½"						
36		3	2	36" IPS x 1-½"	39" IPS x 1-½"						
EQUIPMENT (FLAT OR OVER 36")		3½	2	1-½"	2"	CUT FOR SIZE REQ'D. (FAB. MAN.)	SEE DWG. #D-383301 (PAGE 41) AND GENERAL NOTE #4 FOR SPACING AND DETAILS				

EQUIPMENT AND PIPING ACCESSORIES:

a) Clips—½" double pronged Type 304 SS, A. J. Gerrard or approved alternate.
b) Fabricating Cement—A. P. Green Fire Brick Co. "Insulation Adhesive", or approved alternate.
c) Insulating Cement—Hydraulic setting, Baldwin-Hill "Powerhouse", Eagle-Picher "One-Coat", or approved alternate.
d) Heat Resistant Sealer—Benjamin-Foster #30-43 or approved alternate.

EQUIPMENT ACCESSORIES ONLY:

a) Mineral Wool Blanket—Black, spun rock wool, hexagonal wire netting one side, expanded metal lath on the other side. (To be used on equipment expansion joints of the bellows type.)
b) Mineral Wool Blanket—Black, spun rock wool, hexagonal wire netting on both sides. (To be used on very irregular shapes where metal lath type is not satisfactory.)
c) Wire Netting—One inch, hexagonal mesh, #20 gage, Type 304 SS or approved alternate.
d) Finishing Cement—Hard surface, Eagle-Picher #106, J. M. #678, or approved alternate.

PIPING ACCESSORIES ONLY:

a) Finishing Cement—J. M. #352 or approved alternate. (For pipe patching)

UCC 003407

SERVICE: OIL AND PASTE LINES AT H2N (856)

INSULATION SPECIFICATION NO.: 20-H **MAXIMUM TEMP. FOR THIS SHEET: 750 °F**

LINE SIZE (IN.)	INSULATION MATERIAL	TOTAL THICKNESS (IN.)	NO. LAYERS	LAYER DATA INNER	LAYER DATA OUTER	VA., FIT. & FLG. COVER	WIRE (INNER LAYER)	BAND (OUTER LAYER)	REINF. MESH	WEATHER-COATING MAT'L.	WEATHER-COATING APPL.
½	CALCIUM SILICATE	2-½	1	NONE	½" IPS x 2-½"	SHOP PRE-FAB	18 GAGE (.0475") x TYPE 304 S. S. SOFT ANNEALED	NONE	GLASS FABRIC-10 x 10 MESH / STARCH BINDER	VIMASCO WC-1 OR BENJAMIN-FOSTER SEALFAS "C"	PALM
¾		2-½	1		¾" IPS x 2-½"						
1		2-½	1		1" IPS x 2-½"						
1-½		3	2	1-½" IPS x 1-½"	4-½" IPS x 1-½"			½" WIDE x .020" THICK x TYPE 304 SS			
2		3	2	2" IPS x 1-½"	5" IPS x 1-½"						
2-½		3	2	2-½" IPS x 1-½"	5" IPS x 1-½"						
3		3	2	3" IPS x 1-½"	6" IPS x 1-½"						
3-½		3	2	3-½" IPS x 1-½"	6" IPS x 1-½"						
4		3-½	2	4" IPS x 1-½"	7" IPS x 2"						
6		3-½	2	6" IPS x 1-½"	9" IPS x 2"						
8		3-½	2	8" IPS x 1-½"	11" IPS x 2"						
10		3-½	2	10" IPS x 1-½"	14" IPS x 2"						
12		4	2	12" IPS x 2"	17" IPS x 2"	SEE FABRICATION MANUAL	SEE DWG. #D-383300 (PAGE 40) FOR SPACING	SEE DWG. #D-383300 (PAGE 40) FOR SPACING		SEE GENERAL NOTE #5	SEE GENERAL NOTE #6
14		4	2	14" IPS x 2"	18" IPS x 2"						
16		4	2	16" IPS x 2"	20" IPS x 2"						
18		4	2	18" IPS x 2"	22" IPS x 2"						
20		4	2	20" IPS x 2"	24" IPS x 2"						
22		4	2	22" IPS x 2"	26" IPS x 2"						
24		4	2	24" IPS x 2"	28" IPS x 2"						
26		4	2	26" IPS x 2"	30" IPS x 2"	SEE GENERAL NOTE #3					
28		4	2	28" IPS x 2"	32" IPS x 2"						
30		4	2	30" IPS x 2"	34" IPS x 2"						
32		4-½	2	32" IPS x 2"	36" IPS x 2-½"						
34		4-½	2	34" IPS x 2"	38" IPS x 2-½"						
36		4-½	2	36" IPS x 2"	40" IPS x 2-½"						
EQUIPMENT (FLAT OR OVER 36")		4-½	2	2"	2-½"	CUT FOR SIZE REQ'D. (FAB. MAN.)	SEE DWG. #D-383301 (PAGE 41) AND GENERAL NOTE #4 FOR SPACING AND DETAILS				

EQUIPMENT AND PIPING ACCESSORIES:

a) Clips—½" double pronged Type 304 SS, A. J. Gerrard or approved alternate.
b) Fabricating Cement—A. P. Green Fire Brick Co. "Insulation Adhesive", or approved alternate.
c) Insulating Cement—Hydraulic setting, Baldwin-Hill "Powerhouse", Eagle-Picher "One-Coat", or approved alternate.
d) Heat Resistant Sealer—Benjamin-Foster #30-43 or approved alternate.

EQUIPMENT ACCESSORIES ONLY:

a) Mineral Wool Blanket—Black, spun rock wool, hexagonal wire netting one side, expanded metal lath on the other side. (To be used on equipment expansion joints of the bellows type.)
b) Mineral Wool Blanket—Black, spun rock wool, hexagonal wire netting on both sides. (To be used on very irregular shapes where metal lath type is not satisfactory.)
c) Wire Netting—One inch, hexagonal mesh, #20 gage, Type 304 SS or approved alternate.
d) Finishing Cement—Hard surface, Eagle-Picher #106, J. M. #578, or approved alternate.

PIPING ACCESSORIES ONLY:

a) Finishing Cement—J. M. #352 or approved alternate. (For pipe patching)

SERVICE: PASTE WITH HYDROGEN AT H2N (856)

INSULATION SPECIFICATION NO.: 25-H **MAXIMUM TEMP. FOR THIS SHEET: 1003 °F**

LINE SIZE (IN.)	INSULATION MATERIAL	TOTAL THICKNESS (IN.)	NO. LAYERS	LAYER DATA			VA., FIT, & FLG. COVER	WIRE (INNER & MIDDLE LAY.)	BAND (OUTER LAYER)	REINF. MESH.	WEATHER-COATING MAT'L.	WEATHER-COATING APPL.
				INNER	MIDDLE	OUTER						
½	HYDROUS CALCIUM SILICATE	3	2	¼" IPS x 1-½"	NONE	3-½" IPS x 1-½"	SHOP PRE-FAB	18 USSWG (.0478") x TYPE 304 SS SOFT ANNEAL	½" WIDE x .020" THICK x TYPE 304 SS	GLASS FABRIC 10 x 10 MESH / STARCH BINDER	VIMASCO WC-1 OR BENJAMIN-FOSTER SEALFAS "C"	PALM
¾		3-½	2	¾" IPS x 1-½"		3-½" IPS x 2"						
1		3-½	2	1" IPS x 1-½"		4" IPS x 2"						
1-¼		4	2	1-¼" IPS x 2"		5" IPS x 2"						
2		4	2	2" IPS x 2"		6" IPS x 2"						
2½		4	2	2-½" IPS x 2"		6" IPS x 2"						
3		4-½	2	3" IPS x 2"		7" IPS x 2-½"						
3½		4-½	2	3-½" IPS x 2"		7" IPS x 2-½"						
4		4-½	2	4" IPS x 2"		8" IPS x 2-½"						
6		5	2	6" IPS x 2-½"		11" IPS x 2-½"						
8		5	2	8" IPS x 2-½"	↓	14" IPS x 2-½"						
10		5-½	3	10" IPS x 1-½"	14" IPS x 2"	18" IPS x 2"						
12		5-½	3	12" IPS x 1-½"	16" IPS x 2"	20" IPS x 2"						
14		5-½	3	14" IPS x 1-½"	17" IPS x 2"	21" IPS x 2"						
16		6	3	16" IPS x 2"	20" IPS x 2"	24" IPS x 2"						
18		6	3	18" IPS x 2"	22" IPS x 2"	26" IPS x 2"						
20		6	3	20" IPS x 2"	24" IPS x 2"	28" IPS x 2"						
22		6	3	22" IPS x 2"	26" IPS x 2"	30" IPS x 2"						
24		6	3	24" IPS x 2"	28" IPS x 2"	32" IPS x 2"	SEE FABRICATION MANUAL	SEE DWG. #D-383300 (PAGE 40) FOR SPACING	SEE DWG. #D-383300 (PAGE 40) FOR SPACING		SEE GENERAL NOTE #6	SEE GENERAL NOTE #6
26		6	3	26" IPS x 2"	30" IPS x 2"	34" IPS x 2"						
28		6-½	3	28" IPS x 2"	32" IPS x 2"	36" IPS x 2-½"						
30		6-½	3	30" IPS x 2"	34" IPS x 2"	38" IPS x 2-½"	SEE GENERAL NOTE #3					
32		6-½	3	32" IPS x 2"	36" IPS x 2"	40" IPS x 2-½"						
34		6-½	3	34" IPS x 2"	38" IPS x 2"	2-½"						
36		6-½	3	36" IPS x 2"	40" IPS x 2"	2-½"	↓	↓	↓			
EQUIPMENT (FLAT OR OVER 38")	↓	7-½	3	2-½"	2-½"	2-½"	CUT FOR SIZE REQ'D. (FAB. MAN.)	SEE DWG. #D-383301 (PAGE 41) AND GENERAL NOTE #4 FOR SPACING AND DETAILS		↓	↓	↓

EQUIPMENT AND PIPING ACCESSORIES:

a) Clips—½" double pronged Type 304 SS, A. J. Gerrard or approved alternate.
b) Fabricating Cement—A. P. Green Fire Brick Co. "Insulation Adhesive", J. H. France Co. "Franset" or approved alternate.
c) Insulating Cement—Hydraulic setting, Baldwin-Hill "Powerhouse", Eagle-Picher "One-Coat", or approved alternate.
d) Heat Resistant Sealer—There is no heat resistant sealer available for this temperature. Use 24 MSG (.0239") steel sheet metal flashing instead.

EQUIPMENT ACCESSORIES ONLY:

a) Mineral Wool Blanket—Black, spun rock wool, hexagonal wire netting one side, expanded metal lath on the other side. (To be used on equipment expansion joints of the bellows type.)
b) Mineral Wool Blanket—Black, spun rock wool, hexagonal wire netting on both sides. (To be used on very irregular shapes where metal lath type is not satisfactory.)
c) Wire Netting—One inch, hexagonal mesh, #20 gage, Type 304 SS or approved alternate.
d) Finishing Cement—Hard surface, Eagle-Picher #106, J. M. #678, or approved alternate.

PIPING ACCESSORIES ONLY:

a) Finishing Cement—J. M. #352 or approved alternate. (For pipe patching)

SERVICE: ETHYLENE OXIDE (ABOVE 70 °F)

INSULATION SPECIFICATION NO.: 32-H **MAXIMUM TEMP. FOR THIS SHEET: PIPING: 535 °F EQUIPMENT: 427 °F**

LINE SIZE (IN.)	INSULATION MATERIAL	TOTAL THICKNESS (IN.)	NO. LAYERS	LAYER DATA INNER	LAYER DATA OUTER	VA., FIT. & FLG. COVER	WIRE	BAND (BOTH LAYERS)	REINF. MESH	WEATHER-COATING MAT'L.	WEATHER-COATING APPL.
½	HYDROUS CALCIUM SILICATE	2	2	½" IPS x 1"	2-½" IPS x 1"	SHOP PRE-FAB	NONE	¾" WIDE x .020" THICK x TYPE 304 SS	GLASS FABRIC-10 x 10 MESH / STARCH BINDER	VIMASCO WC-1 OR BENJAMIN-FOSTER SEALFAS "C"	PAINT
¾		2	2	¾" IPS x 1"	2-½" IPS x 1"						
1		2	2	1" IPS x 1"	3" IPS x 1"						
1-½		2	2	1-½" IPS x 1"	3-½" IPS x 1"						
2		2	2	2" IPS x 1"	4" IPS x 1"						
2-½		2	2	2-½" IPS x 1"	4-½" IPS x 1"						
3		2	2	3" IPS x 1"	6" IPS x 1"						
3-½		2	2	3-½" IPS x 1"	5" IPS x 1"						
4		2	2	4" IPS x 1"	6" IPS x 1"						
6		2-½	2	6" IPS x 1"	8" IPS x 1-½"						
8		3	2	8" IPS x 1-½"	11" IPS x 1-½"						
10		3	2	10" IPS x 1-½"	14" IPS x 1-½"						
12		3	2	12" IPS x 1-½"	16" IPS x 1-½"						
14		3	2	14" IPS x 1-½"	17" IPS x 1-½"						
16		3	2	16" IPS x 1-½"	19" IPS x 1-½"						
18		3	2	18" IPS x 1-½"	21" IPS x 1-½"						
20		3	2	20" IPS x 1-½"	23" IPS x 1-½"						
22		3	2	22" IPS x 1-½"	25" IPS x 1-½"						
24		3	2	24" IPS x 1-½"	27" IPS x 1-½"						
26		3	2	26" IPS x 1-½"	29" IPS x 1-½"						
28		3	2	28" IPS x 1-½"	31" IPS x 1-½"						
30		3	2	30" IPS x 1-½"	33" IPS x 1-½"						
32		3	2	32" IPS x 1-½"	35" IPS x 1-½"						
34		3	2	34" IPS x 1-½"	37" IPS x 1-½"						
36		3	2	36" IPS x 1-½"	39" IPS x 1-½"						
EQUIPMENT (FLAT OR OVER 36")		2	2	1"	1"	CUT FOR SIZE REQ'D. (FAB. MAN.)	SEE DWG. #D-38330† (PAGE 41) AND GENERAL NOTE #4 FOR SPACING & DETAILS. WIRE IS NOT PERMITTED EXCEPT WHEN UNAVOIDABLE.				

SEE FABRICATION MANUAL

SEE GENERAL NOTE #3

SEE DWG. #D-38330† (PAGE 40) FOR SPACING

SEE GENERAL NOTE #5

SEE GENERAL NOTE #6

EQUIPMENT AND PIPING ACCESSORIES:

a) Clips—½" double pronged Type 304 SS, A. J. Gerrard or approved alternate.
b) Fabricating Cement—J. H. France Co. "Franset" or approved alternate.
c) Insulating Cement—Hydraulic setting, Baldwin-Hill "Powerhouse", Eagle-Picher "One-Coat", or approved alternate.
d) Heat Resistant Sealer—Benjamin-Foster #30-43 or approved alternate.

EQUIPMENT ACCESSORIES ONLY:

a) Mineral Wool Blanket—Black, spun rock wool, hexagonal wire netting one side, expanded metal lath on the other side. (To be used on equipment expansion joints of the bellows type.)
b) Mineral Wool Blanket—Black, spun rock wool, hexagonal wire netting on both sides. (To be used on very irregular shapes where metal lath type is not satisfactory.)
c) Wire Netting—One inch, hexagonal mesh, #20 gage, Type 304 SS or approved alternate.
d) Finishing Cement—Hard surface, Eagle-Picher #106, J. M. #678, or approved alternate.
e) Wire—18 USSWG (.0475") Type 304 SS soft annealed.

PIPING ACCESSORIES ONLY:

a) Finishing Cement—J. M. #352 or approved alternate. (For pipe patching)

NOTE: The above are **minimum** thicknesses that may be applied to lines or equipment in Ethylene Oxide service for fire protection purposes.

SERVICE: CARBOWAX

INSULATION SPECIFICATION NO.: 10-J **MAXIMUM TEMP. FOR THIS SHEET: 355 °F**

LINE SIZE (IN.)	INSULATION MATERIAL	TOTAL THICKNESS (IN.)	NO. LAYERS	VA. FIT. & FLG. COVER	WIRE	BAND	REINF. MESH	WEATHER-COATING MAT'L.	WEATHER-COATING APPL.
½	CELLULAR GLASS	1	1	SHOP PRE-FAB	18 USSWG. (.0478") x TYPE 304 S. S. SOFT ANNEALED	NONE	GLASS FABRIC 10 x 10 MESH / STARCH BINDER	VIMASCO WC-1 OR BENJAMIN-FOSTER SEALFAS "C"	PALM
¾		1	1						
1		1	1		SEE DWG. #D-383300 (PAGE 40) FOR SPACING				
1-½		1	1						
2		1	1						
2-½		1	1						
3		1	1						
3-½		1	1						
4		1	1		NONE	½" WIDE x .020" THICK x TYPE 304 SS			
6		1-½	1						
8		1-½	1	SEE FABRICATION MANUAL					
10		1-½	1						
12		1-½	1						
14		1-½	1					SEE GENERAL NOTE #5	
16		1-½	1			SEE DWG. #D-383300 (PAGE 40) FOR SPACING			
18		1-½	1						SEE GENERAL NOTE #6
20		1-½	1						
22		1-½	1						
24		1-½	1						
25		1-½	1						
28		1-½	1	SEE GENERAL NOTE #3					
30		1-½	1						
32		1-½	1						
34		1-½	1						
36		1-½	1						
EQUIPMENT (FLAT OR OVER 36")		1-½	1	CUT FOR SIZE REQ'D. (FAB. MAN.)	SEE DWG. #D-383301 (PAGE 41) AND GENERAL NOTE #4 FOR SPACING AND DETAILS				

EQUIPMENT AND PIPING ACCESSORIES:

a) Clips—½" double pronged Type 304 SS, A. J. Gerrard or approved alternate.
b) Fabricating Cement—Miracle Adhesive RT-1000 P up to 500 °F, HFR cement above 500 °F, or approved alternate.
c) Anti-Abrasion Coating—Vinyl, Carlon #500-H up to 400 °F, HFR cement above 400 °F, or approved alternate.
d) Heat Resistant Sealer—Benjamin-Foster #30-43 or approved alternate.
e) Adhesive Cement—Miracle Adhesive Type H or approved alternate.
f) Insulating Cement—Baldwin-Hill "Powerhouse", Eagle Picher, "one-coat" or approved alternate.

EQUIPMENT ACCESSORIES ONLY:

a) Die Cut Strap—¾" wide x .023" thick x Type 304 SS, 2" fingers on 9" centers, A. J. Gerrard or approved alternate.
b) Glass Wool Blanket—White Glass Wool, HEX netting one side, expanded metal lath on other side—Fiberglas "Metal Mesh Blanket" or approved alternate.

NOTE: All chemical lines and the 2"-200 PSI steam supply line to the neutralizer jet at the Carbowax unit to be insulated as shown above. However, the 2"-200 PSI steam supply line shall be insulated with one layer of two (2) inch thick cellular glass. This is good up to a temperature of 500 °F.

UCC 003411

SERVICE: GENERAL SERVICE REQUIRING STEAM TRACING (75 PSI STEAM, OR UNDER, IN TRACER)

INSULATION SPECIFICATION NO.: 21-H **MAXIMUM TEMP. FOR THIS SHEET: 355 °F**

NOTE: The temperature, as shown below, at which the process line will be kept is based on using 75 PSI steam in the tracer. For lower pressure steam the process line will be kept at a proportionately lower temperature. Steam tracer details are per Engineering Standard P-84, page 46 of this book. Clamps and spacer details are per Engineering Standard P-84A, page 47 of this book. For other sizes see Engineering Standard P-84.

LINE SIZE (IPS)	INSULATION MATERIAL	TOTAL THICKNESS (IN.)	NO. LAYERS	INSULATION & TRACER DATA: 3/8" O.D. TRACER (PROCESS LINE TEMP.)	5/8" O.D. TRACER (PROCESS LINE TEMP.)	7/8" O.D. TRACER (PROCESS LINE TEMP.)	VALVE FITTING & FLG. COVER	WIRE	BAND	REINF. MESH	WEATHER-COATING MAT'L.	WEATHER-COATING APPL.
½	ASBESTOS FIBER	1	1	2" IPS x 1" THK. (146°F)	2" IPS x 1" THK. (175 °F)	....	SHOP PRE-FAB	18 USSWG (.0475") x TYPE 304 SS SOFT ANNEALED	NONE	GLASS FABRIC 10 x 10 MESH / STARCH BINDER	VIMASCO WC-1 OR BENJAMIN-FOSTER SEALFAS "C"	PALM
¾		1	1	1-¼" IPS x 1" THK. (141 °F)	1-½" IPS x 1" THK. (170 °F)	2" IPS x 1" THK. (193 °F)						
1		1	1	1-½" IPS x 1" THK. (136 °F)	2" IPS x 1" THK. (166 °F)	2-½" IPS x 1" THK. (188 °F)		SEE DWG. #D-383300 (PAGE 40) FOR SPACING				
1-½		1	1	2-½" IPS x 1" THK. (119 °F)	3" O.D. x 1" THK. (164 °F)	3" IPS x 1" THK. (166 °F)						
2		1	1	3" IPS x 1" THK. (108 °F)	3" IPS x 1" THK. (144 °F)	3-½" IPS x 1" THK. (154 °F)						
2-½		1	1	3-½" IPS x 1" THK. (99 °F)	3-½" IPS x 1" THK. (133 °F)	4" IPS x 1" THK. (144 °F)					SEE GENERAL NOTE #5	
3		1	1	4" IPS x 1" THK. (93 °F)	4" IPS x 1" THK. (122 °F)	5" O.D. x 1" THK. (133 °F)						
4		1	1	5" IPS x 1" THK. (79 °F)	6" IPS x 1" THK. (111 °F)	6" O.D. x 1" THK. (122°F)		NONE	½" WIDE x .020" THK. x TYPE 304 SS			
6		1-½	1	7" IPS x 1-½" THK. (73 °F)	7" IPS x 1-½" THK. (106 °F)	8" O.D. 1-½" THK. (122 °F)	SEE FABRICATION MANUAL					
8		1-½	1	9" IPS x 1-½" THK. (61 °F)	10" O.D. x 1-½" THK. (92 °F)	10" O.D. x 1-½" THK. (106 °F)			SEE DWG. #D-383300 (PAGE 40) FOR SPACING			
10		1-½	1	12" O.D. x 1-½" THK. (62 °F)	12" O.D. x 1-½" THK. (82 °F)	12" O.D. x 1-½" THK. (95 °F)						SEE GENERAL NOTE #6
12		1-½	1	14" IPS x 1-½" THK. (46 °F)	14" IPS x 1-½" THK. (73 °F)	14" IPS x 1-½" THK. (82 °F)						
EQUIPMENT FLAT OR OTHER)	CALCIUM SILICATE	2	1	2"	2"	2"	CUT FOR SIZE REQ'D. (FAB. MAN.)	SEE DWG. #D- 383301 (PAGE 41) AND GENERAL NOTE #4 FOR SPACING AND DETAILS				

EQUIPMENT AND PIPING ACCESSORIES:

a) Clips—½" double pronged Type 304 SS, A. J. Gerrard or approved alternate.
b) Fabricating Cement—A. P. Green Fire Brick Co. "Insulation Adhesive", or approved alternate.
c) Insulating Cement—Hydraulic setting, Baldwin-Hill "Powerhouse", Eagle-Picher "One-Coat", or approved alternate.
d) Heat Resistant Sealer—Benjamin-Foster #30-43 or approved alternate.

EQUIPMENT ACCESSORIES ONLY:

a) Mineral Wool Blanket—Black, spun rock wool, hexagonal wire netting **one** side, expanded metal lath on the other side. (To be used on equipment expansion joints of the bellows type.)
b) Mineral Wool Blanket—Black, spun rock wool, hexagonal wire netting on **both** sides. (To be used on very irregular shapes where metal lath type is not satisfactory.)
c) Wire Netting—One inch, hexagonal mesh, #20 gage, Type 304 SS or approved alternate.
d) Finishing Cement—Hard surface, Eagle-Picher #106, J. M. #678, or approved alternate.

PIPING ACCESSORIES ONLY:

a) Finishing Cement—J. M. #352 or approved alternate. (For pipe patching)

UCC 003412

SERVICE: ALL COLD TEMPERATURE SERVICE (EXCEPT ETHYLENE OXIDE)

INSULATION SPECIFICATION NO.: 10-L **MINIMUM TEMP. FOR THIS SHEET: DOWN TO 32 °F (0 °C)**

LINE SIZE (IN.)	INSULATION MATERIAL	TOTAL THICKNESS (IN.)	NO. LAYERS	VA., FIT. & FLG. COVER	WIRE	BAND	REINF. MESH	WEATHER-COATING MAT'L.	WEATHER-COATING APPL.
½	CELLULAR GLASS	1½	1	SHOP PRE-FAB	18 USSWG. (.0475") x TYPE 304 S. S. SOFT ANNEALED	NONE	GLASS FABRIC 10 x 10 MESH / STARCH BINDER	VIMASCO WC-1 OR BENJAMIN-FOSTER SEALFAS "C"	PALM
¾		1-½	1						
1		1-½	1						
1-½		2	1						
2		2	1		NONE	½" WIDE x .020" THICK x TYPE 304 SS			
2-½		2	1						
3		2	1						
3-½		2	1						
4		2	1						
6		2	1						
8		2	1	SEE FABRICATION MANUAL					
10		2-½	1						
12		2-½	1						
14		2-½	1						
16		2-½	1			SEE DWG. #D-383300 (PAGE 40) FOR SPACING		SEE GENERAL NOTE #5	
18		2-½	1						
20		2-½	1						
22		2-½	1						
24		2-½	1						SEE GENERAL NOTE #6
26		2-½	1	SEE GENERAL NOTE #3					
28		2-½	1						
30		2-½	1						
32		2-½	1						
34		2-½	1						
36		2-½	1						
EQUIPMENT (FLAT OR OVER 36")		2-½	1	CUT FOR SIZE REQ'D. (FAB. MAN.)	SEE DWG. #D-383301 (PAGE 41) AND GENERAL NOTE #4 FOR SPACING AND DETAILS				

EQUIPMENT AND PIPING ACCESSORIES:

a) Clips—½" double pronged Type 304 SS, A. J. Gerrard or approved alternate.
b) Adhesive Cement—Miracle Adhesive Type H or approved alternate.
c) Fabricating Cement—Hot (180 °F) Asphalt or approved alternate.
d) Anti-Abrasion Coating—Vinyl, Vimasco #49 or approved alternate.
e) Joint Sealer—Vinyl asphalt, Vimasco #49 or approved alternate.
f) Caulking Mastic—Vimasco Caulking Compound or approved alternate.
g) Valve Sealer—Lion Oil Co. "Nokorode Low Temp" or approved alternate.
h) Non-Setting Sealer—Benjamin Foster #30-73 or approved alternate.

EQUIPMENT ACCESSORIES ONLY:

a) Cushioning Blanket—1½ lb. density Aerowrap P-308, Fine Fyber Felt, Ultralite, Superfine or approved alternate.
b) Die Cut Strap—¾" wide x .023" thick x Type 304 SS, 2" fingers on 9" centers, A. J. Gerrard or approved alternate.
c) Expansion Strap—¾" wide x .023" thick x Type 304 SS, A. J. Gerrard "Expand-R-Strap" or approved alternate.

PIPING ACCESSORIES ONLY:

a) Cushioning Blanket—1½ lb. density Aerowrap P-308, Fine Fyber Felt, Ultralite, Superfine, or approved alternate. (To be used on piping only where excessive vibration is likely to occur.)

UCC 003413

SERVICE: ALL WATER, EXPOSED (TO PREVENT FREEZING)— COLD TEMPERATURE SERVICE (EXCEPT ETHYLENE OXIDE)

INSULATION SPECIFICATION NO.: 10-L **MINIMUM TEMP. FOR THIS SHEET —4 °F (—20 °C)**

LINE SIZE (IN.)	INSULATION MATERIAL	TOTAL THICKNESS (IN.)	NO. LAYERS	LAYER DATA INNER	LAYER DATA OUTER	VA., FIT, & FLG. COVER	WIRE (INNER LAYER)	BAND (OUTER LAYER)	REINF. MESH	WEATHER-COATING MAT'L.	WEATHER-COATING APPL.
½	CELLULAR GLASS	2	1	NONE	½" IPS x 2"	SHOP PRE-FAB	18 USSWG (.0475") x TYPE 304 S. S. SOFT ANNEALED	NONE	GLASS FABRIC-10 x 10 MESH / STARCH BINDER	VIMASCO WC-1 OR BENJAMIN-FOSTER SEALFAS "C"	PAINT
¾		2	1		¾" IPS x 2"						
1		2-½	1		1" IPS x 2-½"		NONE	1½" WIDE x .020" THICK x TYPE 304 SS			
1½		2-½	1		1-½" IPS x 2-½"						
2		2-½	1		2" IPS x 2-½"						
2-½		2-½	1		2-½" IPS x 2-½"						
3		2-½	1		3" IPS x 2-½"						
3-½		3	2	3-½" IPS x 1-½"	7" IPS x 1-½"		18 USSWG (.0475") x TYPE 304 SS SOFT ANNEALED				
4		3	2	4" IPS x 1-½"	7" IPS x 1-½"						
6		3	2	6" IPS x 1-½"	9" IPS x 1-½"						
8		3	2	8" IPS x 1-½"	11" IPS x 1-½"						
10		3	2	10" IPS x 1-½"	14" IPS x 1-½"						
12		3-½	2	12" IPS x 1-½"	16" IPS x 2"	SEE FABRICATION MANUAL	SEE DWG. #D-383300 (PAGE 40) FOR SPACING	SEE DWG. #D-383300 (PAGE 40) FOR SPACING		SEE GENERAL NOTE #5	SEE GENERAL NOTE #6
14		3-½	2	14" IPS x 1-½"	17" IPS x 2"						
16		3-½	2	16" IPS x 1-½"	19" IPS x 2"						
18		3-½	2	18" IPS x 1-½"	21" IPS x 2"						
20		3-½	2	20" IPS x 1-½"	23" IPS x 2"						
22		3-½	2	22" IPS x 1-½"	25" IPS x 2"						
24		3-½	2	24" IPS x 1-½"	27" IPS x 2"						
26		3-½	2	26" IPS x 1-½"	29" IPS x 2"	SEE GENERAL NOTE #3					
28		3-½	2	28" IPS x 1-½"	31" IPS x 2"						
30		3-½	2	30" IPS x 1-½"	33" IPS x 2"						
32		3-½	2	32" IPS x 1-½"	35" IPS x 2"						
34		3-½	2	34" IPS x 1-½"	37" IPS x 2"						
36		3-½	2	36" IPS x 1-½"	39" IPS x 2"						
EQUIPMENT (FLAT OR OVER 36")		4	2	2"	2"	CUT FOR SIZE REQ'D. (FAB. MAN.)	SEE DWG. #D-383301 (PAGE 41) AND GENERAL NOTE #4 FOR SPACING AND DETAILS				

EQUIPMENT AND PIPING ACCESSORIES:

a) Clips—½" double pronged Type 304 SS, A. J. Gerrard or approved alternate.
b) Adhesive Cement—Miracle Adhesive Type H or approved alternate.
c) Fabricating Cement—Hot (180 °F) Asphalt or approved alternate.
d) Anti-Abrasion Coating—Vinyl, Vimasco #49 or approved alternate.
e) Joint Sealer—Vinyl asphalt, Vimasco #49 or approved alternate.
f) Caulking Mastic—Vimasco Caulking Compound or approved alternate.
g) Valve Sealer—Lion Oil Co. "Nokorode Low Temp" or approved alternate.
h) Non-Setting Sealer—Benjamin Foster #30-73 or approved alternate.

EQUIPMENT ACCESSORIES ONLY:

a) Cushioning Blanket—1½ lb. density Aerowrap P-308, Fine Fyber Felt, Ultralite, Superfine or approved alternate.
b) Die Cut Strap—¾" wide x .023" thick x Type 304 SS, 2" fingers on 9" centers, A. J. Gerrard or approved alternate.
c) Expansion Strap—¾" wide x .023" thick x Type 304 SS, A. J. Gerrard "Expand-R-Strap" or approved alternate.

PIPING ACCESSORIES ONLY:

a) Cushioning Blanket—1½ lb. density Aerowrap P-308, Fine Fyber Felt, Ultralite, Superfine, or approved alternate. (To be used on piping only where excessive vibration is likely to occur.)

UCC 003414

SERVICE: ALL COLD TEMPERATURE SERVICE (EXCEPT ETHYLENE OXIDE)

INSULATION SPECIFICATION NO.: 10-L **MINIMUM TEMP. FOR THIS SHEET: DOWN TO —40 °F (—40 °C)**

LINE SIZE (IN.)	INSULATION MATERIAL	TOTAL THICKNESS (IN.)	NO. LAYERS	LAYER DATA		VA., FIT. & FLG. COVER	WIRE (INNER LAYER)	BAND (OUTER LAYER)	REINF. MESH	WEATHER-COATING MAT'L.	WEATHER-COATING APPL.
				INNER	OUTER						
½	CELLULAR GLASS	2-½	1	NONE	½" IPS x 2-½"	SHOP PRE-FAB	18 USSWG (.0475") x TYPE 304 S. S. SOFT ANNEALED	NONE	GLASS FABRIC-10 x 10 MESH / STARCH BINDER	VIMASCO WC-1 OR BENJAMIN-FOSTER SEALFAS "C"	PALM
¾		2-½	1	↓	¾" IPS x 2-½"			↓			
1		3	2	1" IPS x 1-½"	4" IPS x 1-½"			1" WIDE x .020" THICK x TYPE 304 SS			
1-¼		3	2	1-¼" IPS x 1-½"	4-½" IPS x 1-½"						
2		3	2	1-½" IPS x 1-½"	5" IPS x 1-½"						
2-½		3	2	2-½" IPS x 1-½"	6" IPS x 1-½"						
3		3-½	2	3" IPS x 1-½"	6" IPS x 2"						
3-½		3-½	2	3-½" IPS x 1-½"	7" IPS x 2"						
4		3-½	2	4" IPS x 1-½"	7" IPS x 2"						
6		4	2	6" IPS x 2"	10" IPS x 2"						
8		4	2	8" IPS x 2"	12" IPS x 2"						
10		4	2	10" IPS x 2"	15" IPS x 2"						
12		4	2	12" IPS x 2"	17" IPS x 2"	SEE FABRICATION MANUAL	SEE DWG. #D-383300 (PAGE 40) FOR SPACING	SEE DWG. #D-383300 (PAGE 40) FOR SPACING		SEE GENERAL NOTE #5	
14		4	2	14" IPS x 2"	18" IPS x 2"						
16		4	2	16" IPS x 2"	20" IPS x 2"						
18		4-½	2	18" IPS x 2"	22" IPS x 2-½"						SEE GENERAL NOTE #6
20		4-½	2	20" IPS x 2"	24" IPS x 2-½"						
22		4-½	2	22" IPS x 2"	26" IPS x 2-½"						
24		4-½	2	24" IPS x 2"	28" IPS x 2-½"	↓					
26		4-½	2	26" IPS x 2"	30" IPS x 2-½"	↑					
28		4-½	2	28" IPS x 2"	32" IPS x 2-½"	SEE GENERAL NOTE #3					
30		4-½	2	30" IPS x 2"	34" IPS x 2-½"						
32		4-½	2	32" IPS x 2"	36" IPS x 2-½"						
34		4-½	2	34" IPS x 2"	38" IPS x 2-½"						
36		4-½	2	36" IPS x 2"	40" IPS x 2-½"	↓					
EQUIPMENT (FLAT OR OVER 36")	↓	5	2	2-½"	2-½"	CUT FOR SIZE REQ'D. (FAB. MAN.)	SEE DWG. #D-383301 (PAGE 41) AND GENERAL NOTE #4 FOR SPACING AND DETAILS		↓	↓	↓

EQUIPMENT AND PIPING ACCESSORIES:

a) Clips—½" double pronged Type 304 SS, A. J. Gerrard or approved alternate.
b) Adhesive Cement—Miracle Adhesive Type H or approved alternate.
c) Fabricating Cement—Hot (180 °F) Asphalt or approved alternate.
d) Anti-Abrasion Coating—Vinyl, Vimasco #49 or approved alternate.
e) Joint Sealer—Vinyl asphalt, Vimasco #49 or approved alternate.
f) Caulking Mastic—Vimasco Caulking Compound or approved alternate.
g) Valve Sealer—Lion Oil Co. "Nokoroda Low Temp" or approved alternate.
h) Non-Setting Sealer—Benjamin Foster #30-73 or approved alternate.

EQUIPMENT ACCESSORIES ONLY:

a) Cushioning Blanket—1½ lb. density Aerowrap P-308, Fine Fyber Felt, Ultralite, Superfine or approved alternate.
b) Die Cut Strap—¾" wide x .023" thick x Type 304 SS, 2" fingers on 9" centers, A. J. Gerrard or approved alternate.
c) Expansion Strap—¾" wide x .023" thick x Type 304 SS, A. J. Gerrard "Expand-R-Strap" or approved alternate.

PIPING ACCESSORIES ONLY:

a) Cushioning Blanket—1½ lb. density Aerowrap P-308, Fine Fyber Felt, Ultralite, Superfine, or approved alternate. (To be used on piping only where excessive vibration is likely to occur.)

UCC 003415

SERVICE: ALL COLD TEMPERATURE SERVICE (EXCEPT ETHYLENE OXIDE)

INSULATION SPECIFICATION NO.: 10-L — **MINIMUM TEMP. FOR THIS SHEET: DOWN TO —112 °F (—80 °C)**

LINE SIZE (IN.)	INSULATION MATERIAL	TOTAL THICKNESS (IN.)	NO. LAYERS	LAYER DATA			VA., FIT, & FLG. COVER	WIRE (INNER & MIDDLE LAY.)	BAND (OUTER LAYER)	REINF. MESH.	WEATHER-COATING MAT'L.	WEATHER-COATING APPL.
				INNER	MIDDLE	OUTER						
¼	CELLULAR GLASS	3-½	2	¼" IPS x 1-½"	NONE	3-½" IPS x 2"	SHOP PRE-FAB	18 USSWG (.0478") x TYPE 304 SS SOFT ANNEAL	½" WIDE x .020" THICK x TYPE 304 SS	GLASS FABRIC 10 x 10 MESH / STARCH BINDER	VIMASCO WC-1 OR BENJAMIN-FOSTER SEALFAS "C"	PALM
½		3-½	2	¾" IPS x 1-½"		3-½" IPS x 2"						
1		3-½	2	1" IPS x 1-½"		4" IPS x 2"						
1-½		4	2	1-½" IPS x 2"		5" IPS x 2"						
2		4	2	2" IPS x 2"		5" IPS x 2"						
2-½		4-½	2	2-½" IPS x 2"		6" IPS x 2-½"						
3		4-½	2	3" IPS x 2"		7" IPS x 2-½"						
3-½		4-½	2	3-½" IPS x 2"		8" IPS x 2-½"						
4		4-½	2	4" IPS x 2"		8" IPS x 2-½"						
6		6	2	6" IPS x 2-½"		10" IPS x 2-½"						
8		5-½	3	8" IPS x 1-½"	11" IPS x 2"	16" IPS x 2"						
10		6-½	3	10" IPS x 1-½"	14" IPS x 2"	18" IPS x 2"						
12		6-½	3	12" IPS x 1-½"	15" IPS x 2"	20" IPS x 2"						
14		6-½	3	14" IPS x 1-½"	17" IPS x 2"	21" IPS x 2"	SEE FABRICATION MANUAL	SEE DWG. #D-383300 (PAGE 40) FOR SPACING	SEE DWG. #D-383300 (PAGE 40) FOR SPACING		SEE GENERAL NOTE #5	SEE GENERAL NOTE #6
16		6	3	15" IPS x 2"	20" IPS x 2"	24" IPS x 2"						
18		6	3	18" IPS x 2"	22" IPS x 2"	26" IPS x 2"						
20		6	3	20" IPS x 2"	24" IPS x 2"	28" IPS x 2"						
22		6	3	22" IPS x 2"	26" IPS x 2"	30" IPS x 2"						
24		6	3	24" IPS x 2"	28" IPS x 2"	32" IPS x 2"						
26		6-½	3	26" IPS x 2"	30" IPS x 2"	34" IPS x 2-½"	SEE GENERAL NOTE #3					
28		6-½	3	28" IPS x 2"	32" IPS x 2"	36" IPS x 2-½"						
30		6-½	3	30" IPS x 2"	34" IPS x 2"	2-½"						
32		6-½	3	32" IPS x 2"	35" IPS x 2"	2-½"						
34		7	3	34" IPS x 2"	2-½"	2-½"						
36		7	3	36" IPS x 2"	2-½"	2-½"						
EQUIPMENT (FLAT OR OVER 36")		7-½	3	2-½"	2-½"	2-½"	CUT FOR SIZE REQ'D. (FAB. MAN.)	SEE DWG. #D-383301 (PAGE 41) AND GENERAL NOTE #4 FOR SPACING AND DETAILS				

EQUIPMENT AND PIPING ACCESSORIES:

a) Clips—½" double pronged Type 304 SS, A. J. Gerrard or approved alternate.
b) Adhesive Cement—Miracle Adhesive Type H or approved alternate.
c) Fabricating Cement—Hot (180 °F) Asphalt or approved alternate.
d) Anti-Abrasion Coating—Vinyl, Vimasco #49 or approved alternate.
e) Joint Sealer—Vinyl asphalt, Vimasco #49 or approved alternate.
f) Caulking Mastic—Vimasco Caulking Compound or approved alternate.
g) Valve Sealer—Lion Oil Co. "Nokorode Low Temp" or approved alternate.
h) Non-Setting Sealer—Benjamin Foster #30-73 or approved alternate.

EQUIPMENT ACCESSORIES ONLY:

a) Cushioning Blanket—1½ lb. density Aerowrap P-308, Fine Fyber Felt, Ultralite, Superfine or approved alternate.
b) Die Cut Strap—¾" wide x .023" thick x Type 304 SS, 2" fingers on 9" centers, A. J. Gerrard or approved alternate.
c) Expansion Strap—¾" wide x .023" thick x Type 304 SS, A. J. Gerrard "Expand-R-Strap" or approved alternate.

PIPING ACCESSORIES ONLY:

a) Cushioning Blanket—1½ lb. density Aerowrap P-308, Fine Fyber Felt, Ultralite, Superfine, or approved alternate. (To be used on piping only where excessive vibration is likely to occur.)

UCC 003416

SERVICE: ALL COLD TEMPERATURE SERVICE (EXCEPT ETHYLENE OXIDE)

INSULATION SPECIFICATION NO.: 10-L **MINIMUM TEMP. FOR THIS SHEET: DOWN TO —148 °F (—100 °C)**

LINE SIZE (IN.)	INSULATION MATERIAL	TOTAL THICKNESS (IN.)	NO. LAYERS	LAYER DATA			VA., FIT. & FLG. COVER	WIRE (INNER & MIDDLE LAY.)	BAND (OUTER LAYER)	REINF. MESH.	WEATHER-COATING MAT'L.	WEATHER-COATING APPL.
				INNER	MIDDLE	OUTER						
¼	CELLULAR GLASS	3-½	2	½" IPS x 1-½"	NONE	3-½" IPS x 2"	SHOP PRE-FAB	18 USSWG (.0475") x TYPE 304 SS SOFT ANNEAL	½" WIDE x .020" THICK x TYPE 304 SS	GLASS FABRIC 10 x 10 MESH / STARCH BINDER	VIMASCO WC-1 OR BENJAMIN-FOSTER SEALFAS "C"	PALM
¾		4	2	¾" IPS x 2"		4-½" IPS x 2"						
1		4	2	1" IPS x 2"		5" IPS x 2"						
1-½		4-½	2	1-½" IPS x 2"		5" IPS x 2½"						
2		4-½	2	2" IPS x 2"		6" IPS x 2-½"						
2-½		4-½	2	2-½" IPS x 2"		6" IPS x 2-½"						
3		5	2	3" IPS x 2-½"		8" IPS x 2-½"						
3-½		5	2	3-½" IPS x 2-½"		9" IPS x 2-½"						
4		5	2	4" IPS x 2-½"		9" IPS x 2-½"						
6		5-½	3	6" IPS x 1-½"	9" IPS x 2"	14" IPS x 2"						
8		6	3	8" IPS x 2"	12" IPS x 2"	17" IPS x 2"						
10		6	3	10" IPS x 2"	15" IPS x 2"	19" IPS x 2"						
12		6-½	3	12" IPS x 2"	17" IPS x 2"	21" IPS x 2-½"						
14		6-½	3	14" IPS x 2"	18" IPS x 2"	22" IPS x 2-½"						
16		6-½	3	16" IPS x 2"	20" IPS x 2"	24" IPS x 2-½"						
18		6-½	3	18" IPS x 2"	22" IPS x 2"	26" IPS x 2-½"						
20		7	3	20" IPS x 2"	24" IPS x 2-½"	29" IPS x 2-½"						
22		7	3	22" IPS x 2"	26" IPS x 2-½"	31" IPS x 2-½"						
24		7	3	24" IPS x 2"	28" IPS x 2-½"	33" IPS x 2-½"						
26		7	3	26" IPS x 2"	30" IPS x 2-½"	35" IPS x 2-½"						
28		7	3	28" IPS x 2"	32" IPS x 2-½"	2-½"						
30		7-½	3	30" IPS x 2-½"	35 "IPS x 2-½"	2-½"						
32		7-½	3	32" IPS x 2-½"	2-½"	2-½"						
34		7-½	3	34" IPS x 2-½"	2-½"	2-½"						
36		7-½	3	36" IPS x 2-½"	2-½"	2-½"						
EQUIPMENT (FLAT OR OVER 36")		8	3	2-½"	3"	3"	CUT FOR SIZE REQ'D. (FAB. MAN.)	SEE DWG. #D-383301 (PAGE 41) AND GENERAL NOTE #4 FOR SPACING AND DETAILS				

SEE FABRICATION MANUAL

SEE GENERAL NOTE #3

SEE DWG. #D-383300 (PAGE 40) FOR SPACING

SEE DWG. #D-383300 (PAGE 40) FOR SPACING

SEE GENERAL NOTE #6

SEE GENERAL NOTE #6

EQUIPMENT AND PIPING ACCESSORIES:

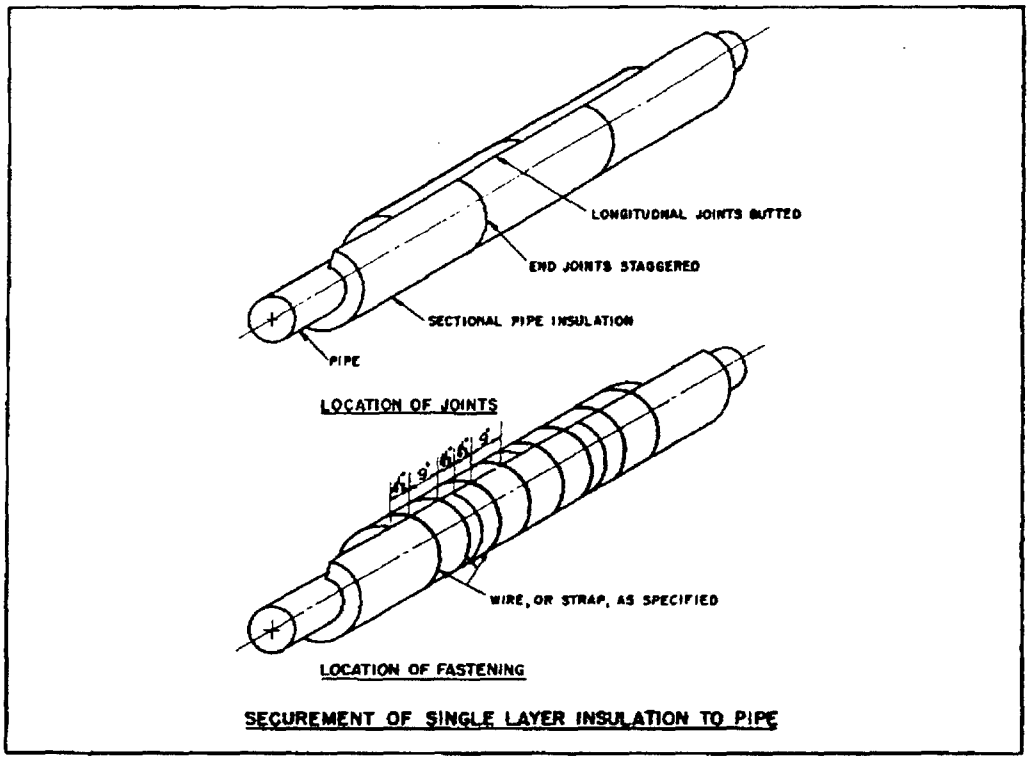
a) Clips—½" double pronged Type 304 SS, A. J. Gerrard or approved alternate.
b) Adhesive Cement—Miracle Adhesive Type H or approved alternate.
c) Fabricating Cement—Hot (180 °F) Asphalt or approved alternate.
d) Anti-Abrasion Coating—Vinyl, Vimasco #49 or approved alternate.
e) Joint Sealer—Vinyl asphalt, Vimasco #49 or approved alternate.
f) *Caulking Mastic—Vimasco Caulking Compound or approved alternate.*
g) Valve Sealer—Lion Oil Co. "Nokorode Low Temp" or approved alternate.
h) Non-Setting Sealer—Benjamin Foster #30-73 or approved alternate.

EQUIPMENT ACCESSORIES ONLY:

a) Cushioning Blanket—1½ lb. density Aerowrap P-308, Fine Fyber Felt, Ultralite, Superfine or approved alternate.
b) Die Cut Strap—¾" wide x .023" thick x Type 304 SS, 2" fingers on 9" centers, A. J. Gerrard or approved alternate.
c) Expansion Strap—¾" wide x .023" thick x Type 304 SS, A. J. Gerrard "Expand-R-Strap" or approved alternate.

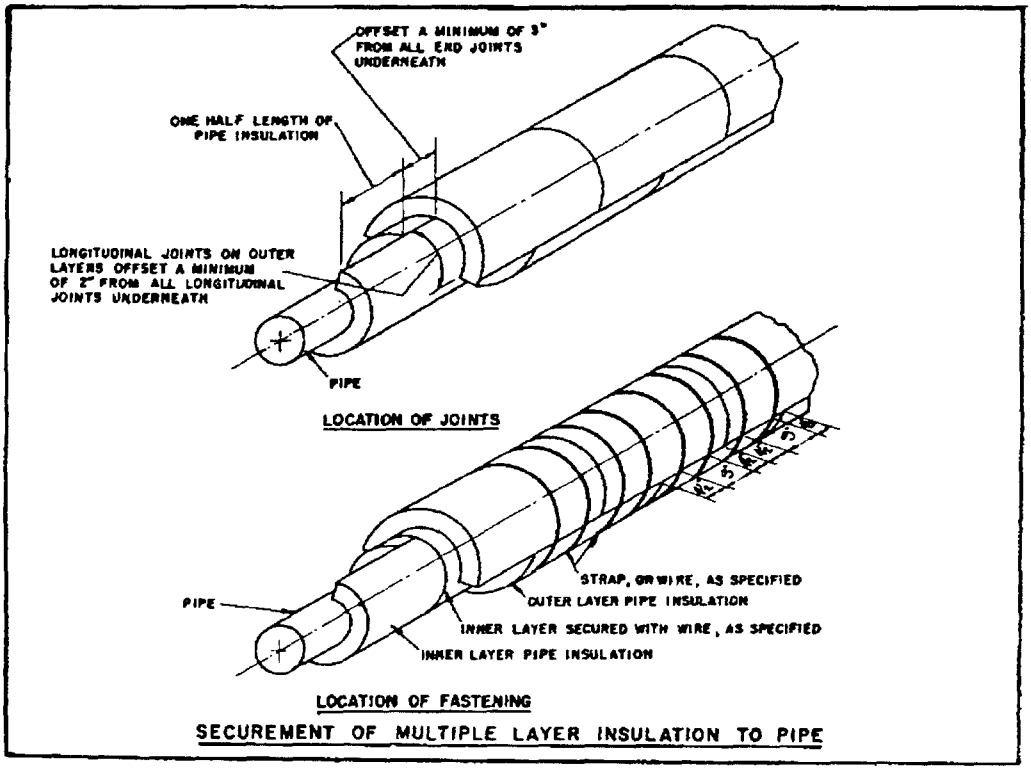
PIPING ACCESSORIES ONLY:

a) Cushioning Blanket—1½ lb. density Aerowrap P-308, Fine Fyber Felt, Ultralite, Superfine, or approved alternate. (To be used on piping only where excessive vibration is likely to occur.)



SECUREMENT OF SINGLE LAYER INSULATION TO PIPE

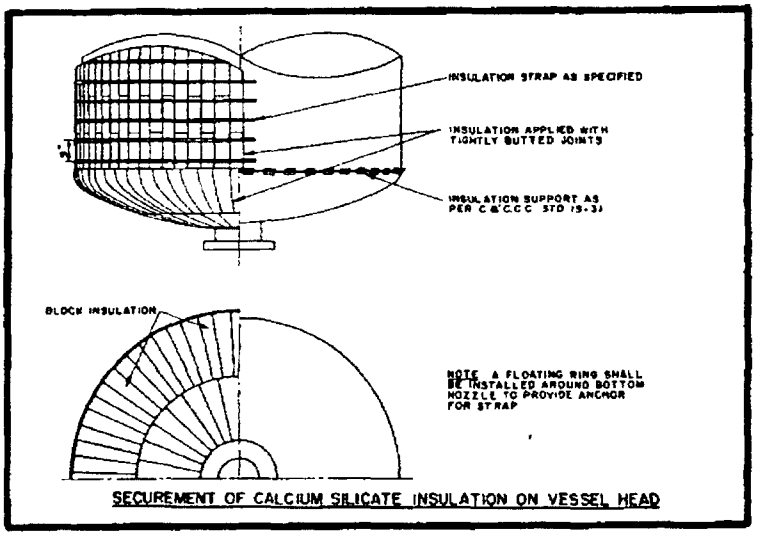
FIGURE 1



SECUREMENT OF MULTIPLE LAYER INSULATION TO PIPE

FIGURE 2

WIRE AND BAND SPACING FOR PIPE INSULATION
D-383300

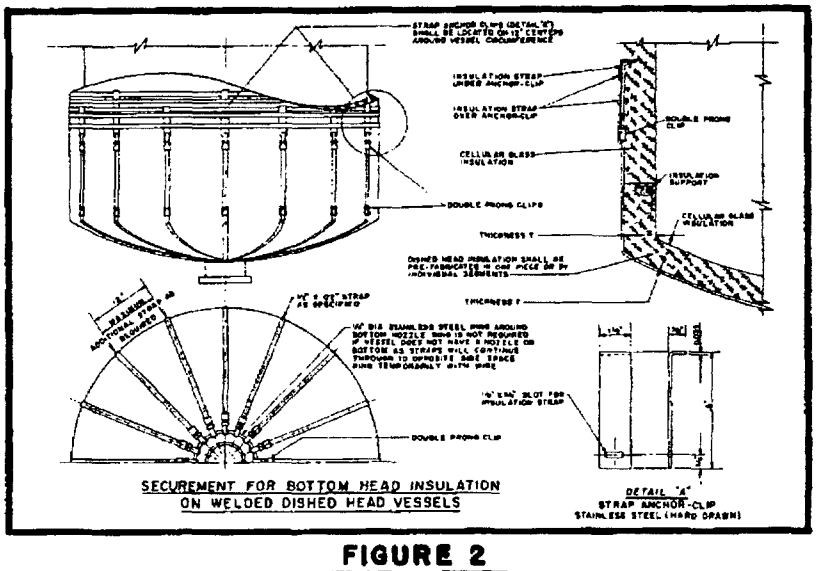


SECUREMENT OF CALCIUM SILICATE INSULATION ON VESSEL HEAD

FIGURE 1

SPACING SHOWN IN FIGURE 1 APPLIES TO ALL INSULATION SPECIFICATIONS IN THIS MANUAL

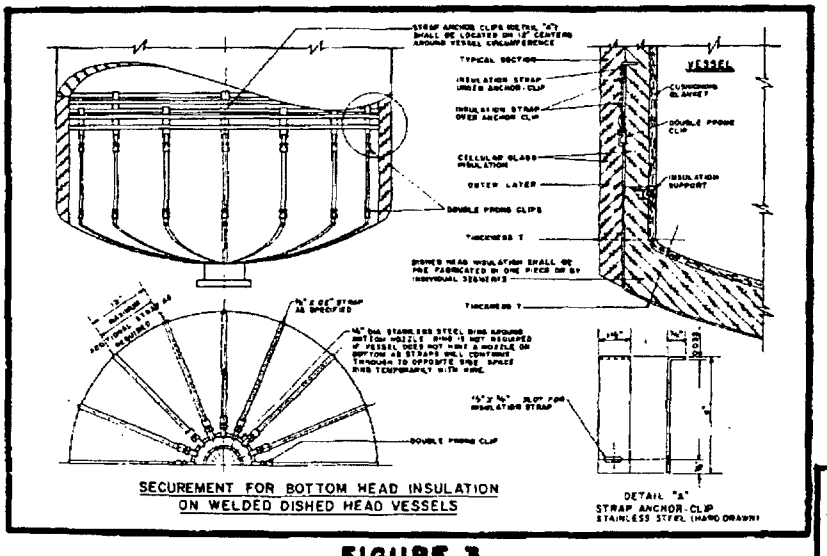
DETAILS SHOWN IN FIGURE 2 APPLIES TO INSULATION SPECIFICATION 10-J ONLY



SECUREMENT FOR BOTTOM HEAD INSULATION ON WELDED DISHED HEAD VESSELS

DETAIL "A" STRAP ANCHOR-CLIP STAINLESS STEEL (HARD DRAWN)

FIGURE 2



SECUREMENT FOR BOTTOM HEAD INSULATION ON WELDED DISHED HEAD VESSELS

DETAIL "A" STRAP ANCHOR-CLIP STAINLESS STEEL (HARD DRAWN)

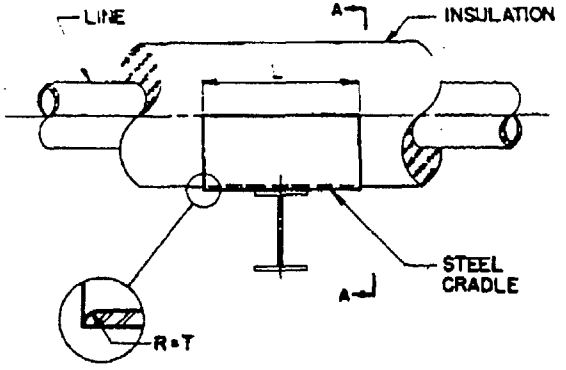
FIGURE 3

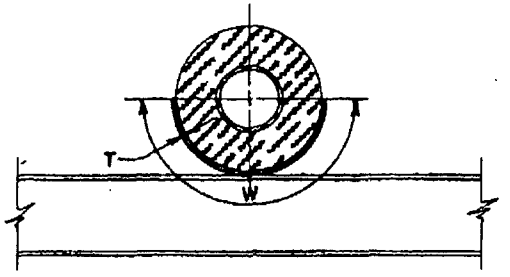
DETAILS SHOWN IN FIGURE 3 APPLIES TO INSULATION SPECIFICATIONS 10-H AND 10-L

BAND SPACING AND INSULATION SECUREMENT DETAILS FOR VESSELS D-383301

NOMINAL PIPE SIZE	INSULATION THICKNESS	T, CRADLE THICKNESS	L, LENGTH OF CRADLE				
			10-FT SPAN	12-FT SPAN	15-FT SPAN	18-FT SPAN	20-FT SPAN
1/2 & 3/4	1 TO 2	14 GA	10	-	-	-	-
	2-1/2 TO 4	1/8	10	-	-	-	-
	4-1/2 & 5	3/16	10	-	-	-	-
1 TO 1-1/2	1 TO 2	14 GA	10	10	-	-	-
	2-1/2 TO 4	1/8	10	10	-	-	-
	4-1/2 TO 6	3/16	10	10	-	-	-
2 TO 3-1/2	1 & 1-1/2	14 GA	10	10	10	-	-
	2 TO 3	1/8	10	10	10	-	-
	3-1/2 TO 5	3/16	10	10	10	-	-
	5-1/2 & 6	1/4	10	10	10	-	-
4 & 5	1 TO 2	1/8	10	10	10	12	-
	2-1/2 TO 4	3/16	10	10	10	12	-
	5 TO 7	1/4	10	10	10	12	-
6 & 8	1-1/2 & 2	3/16	10	12	16	16	20
	2-1/2 & 3	3/16	10	12	16	16	20
	3-1/2 TO 5-1/2	1/4	10	12	16	16	20
	6 TO 7	5/16	10	12	16	16	20
10 & 12	1-1/2 TO 3-1/2	1/4	12	16	20	24	24
	4 TO 6	5/16	12	16	20	24	24
	6-1/2 TO 8	3/8	12	16	20	24	24
14 & 16	1-1/2 TO 2-1/2	1/4	16	20	24	36	36
	3 TO 4	5/16	16	20	24	36	36
	4-1/2 TO 7	3/8	16	20	24	36	36
	7-1/2 & 8	7/16	16	20	24	36	36
18 & 20	1-1/2 TO 2-1/2	5/16	20	24	30	36	36
	3 TO 5	3/8	20	24	30	36	36
	5-1/2 TO 7-1/2	7/16	20	24	30	36	36
	8	1/2	20	24	30	36	36
24	1-1/2 TO 3	3/8	24	30	36	42	42
	3-1/2 TO 5-1/2	7/16	24	30	36	42	42
	6 TO 8	1/2	24	30	36	42	42
30	1-1/2 TO 4-1/2	1/2	30	36	42	48	54
	5 TO 9	5/8	30	36	42	48	54
36	1-1/2 TO 6-1/2	5/8	36	42	48	54	60
	7 TO 9	3/4	36	42	48	54	60

ALL DIMENSIONS GIVEN IN INCHES EXCEPT AS OTHERWISE INDICATED





SECTION "A-A"

NOTE: W = WIDTH OF SADDLE BEFORE FORMING = OD OF INSULATION X 1.57

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STANDARD CRADLES FOR SEMI-RIGID PIPE INSULATION

No. IS-19

CLASSIFICATION: DETAIL

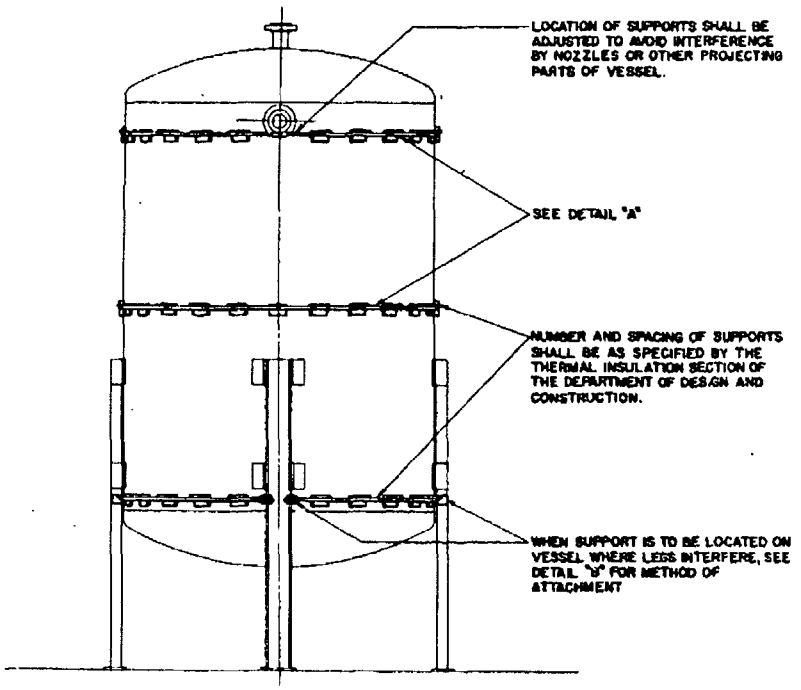
SPONSOR: 936 BY: R.J.S. DATE: 1-16-57

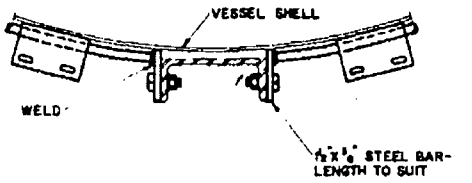
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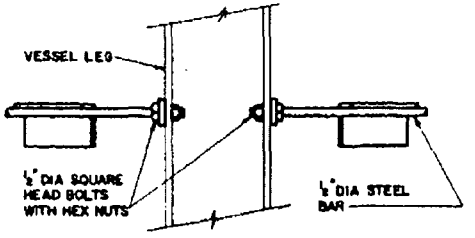
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IS-19

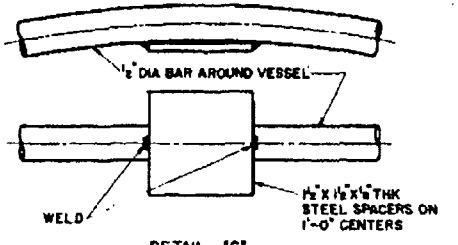
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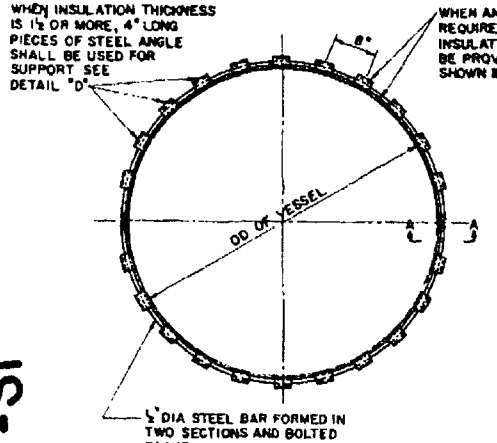
DETAIL "B"



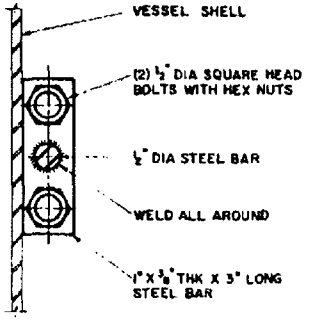
DETAIL "C"

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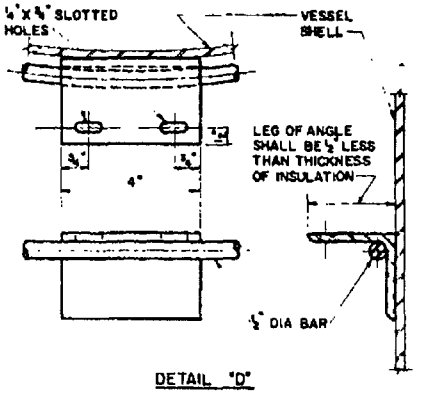
INSULATION SUPPORTS IN ACCORDANCE WITH THIS STANDARD (STD 13-31) SHALL BE FURNISHED FOR ALL HIGH AND LOW TEMPERATURE SERVICE VERTICAL VESSELS



DETAIL "A"



SECTION "A-A"



DETAIL "D"

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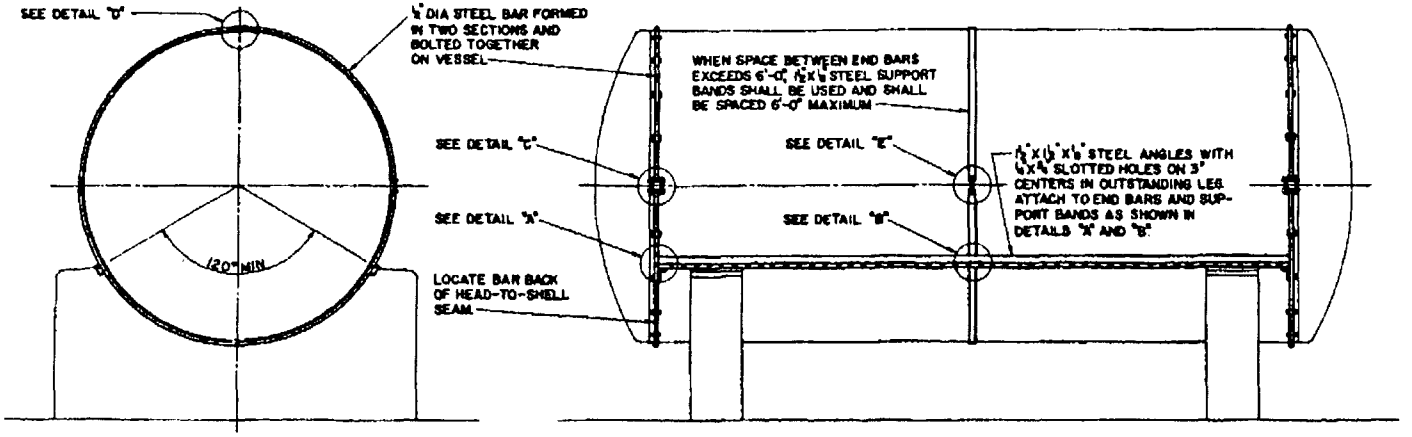
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STANDARD INSULATION SUPPORTS-VERTICAL VESSELS	Nº IS-31
CLASSIFICATION: DETAIL	
SPONSOR 936 BY	DATE
APPROVED	DATE

IS-31

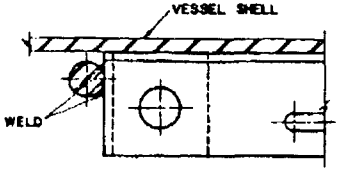
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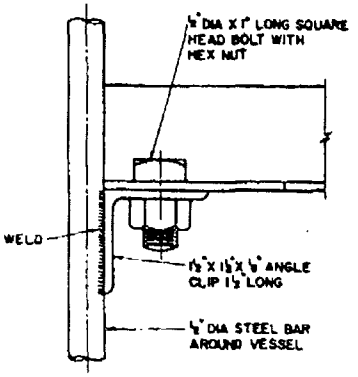
UCC 003421



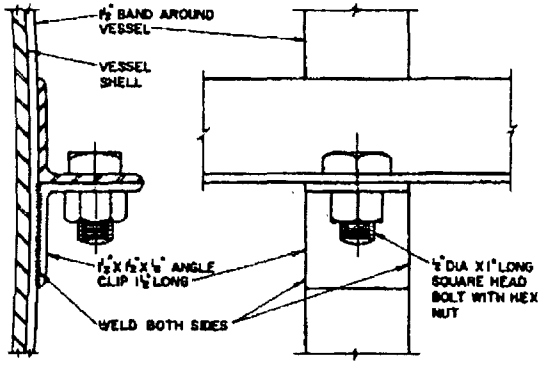
NOTE:

INSULATION SUPPORTS IN ACCORDANCE WITH THIS STANDARD (STD IS-36) SHALL BE FURNISHED FOR ALL HIGH AND LOW TEMPERATURE SERVICE HORIZONTAL VESSELS 4'-0" DIAMETER AND LARGER.

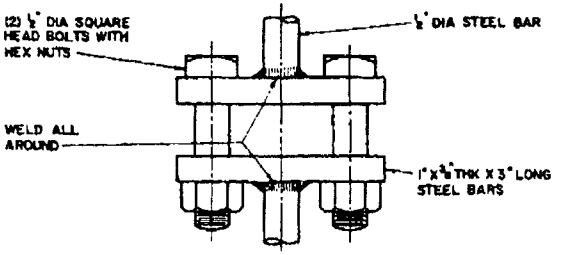




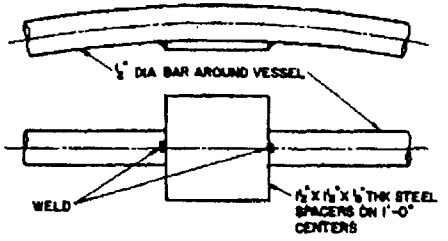
DETAIL "A"



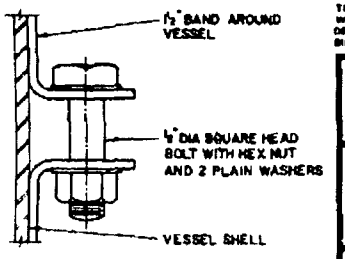
DETAIL "B"



DETAIL "C"



DETAIL "D"



DETAIL "E"

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STANDARD INSULATION SUPPORTS-HORIZONTAL VESSELS	No. IS-36

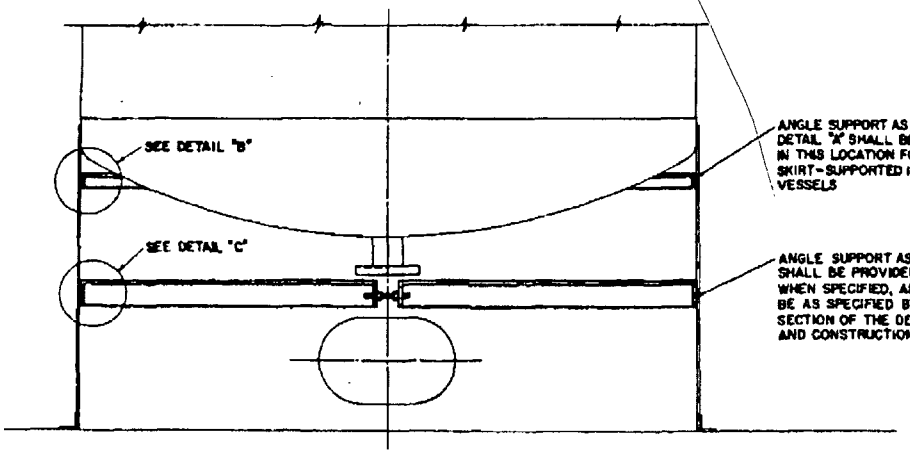
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APPROVED: [illegible] DATE: 9-26-56

IS-36
REVISED

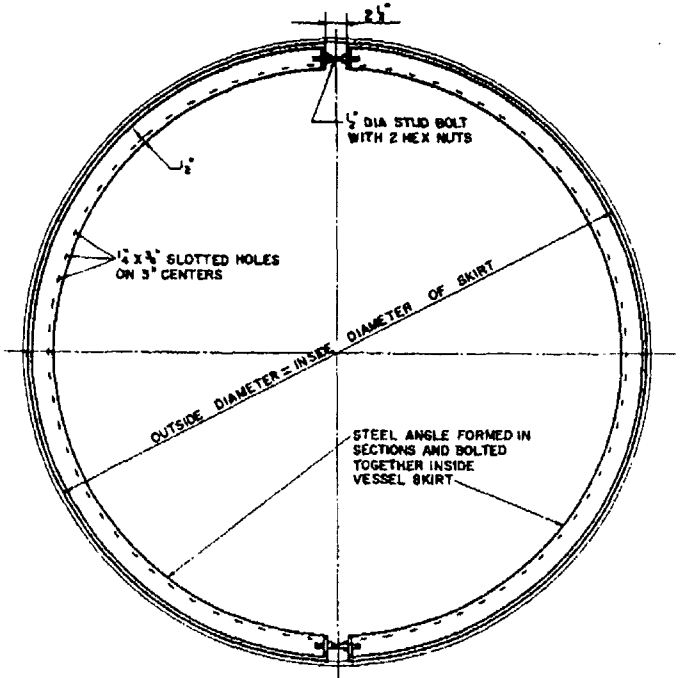
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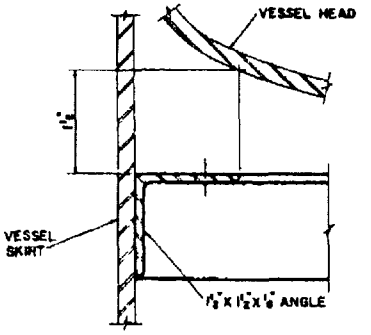
INSULATION SUPPORT ANGLES INSIDE OF VESSEL SKIRT

NOTE:

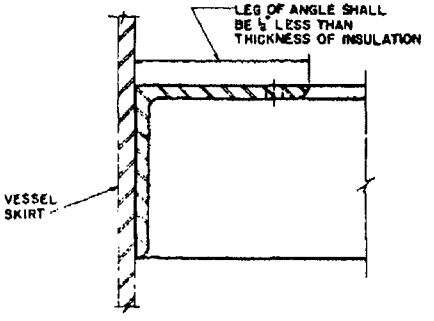
INSULATION SUPPORTS IN ACCORDANCE WITH THIS STANDARD (STD IS-42) SHALL BE FURNISHED FOR ALL SKIRT-SUPPORTED HIGH OR LOW TEMPERATURE SERVICE VESSELS.



BOTTOM VIEW
DETAIL "A"



DETAIL "B"



DETAIL "C"

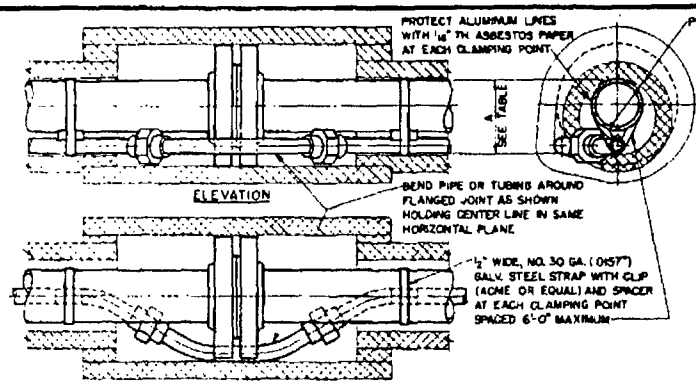
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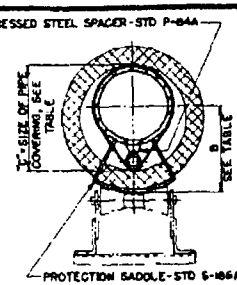
STANDARD INSULATION SUPPORTS INSIDE OF VESSEL SKIRT	No. IS-42
CLASSIFICATION DETAIL	
SPONSOR 936 BY	DATE
APPROVED	DATE

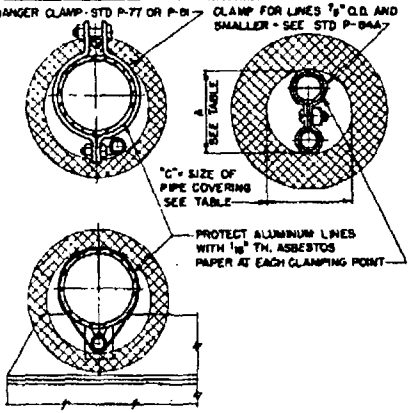
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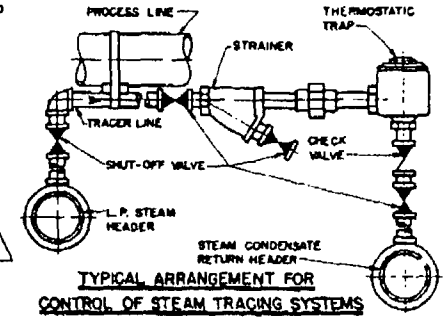


TYPICAL DETAIL FOR STEAM TRACED LINES AT FLANGED JOINT





METHODS FOR CLAMPING, HANGING AND SUPPORTING STEAM TRACED LINES



TYPICAL ARRANGEMENT FOR CONTROL OF STEAM TRACING SYSTEMS

TABLE NO 1 - OVERALL DIMENSIONS OF TRACER AND PROCESS LINE ASSEMBLY, SIZE OF INSULATION REQUIRED[3]

PROCESS LINE SIZE	TRACER LINE SIZE 3/8 O.D. A	B	C	1/2 O.D. A	B	C	5/8 O.D. A	B	C	3/4 O.D. A	B	C	1 O.D. A	B	C	1	A	B	C	1 1/4 O.D. A	B	C	1 1/2 O.D. A	B	C
3/8	1 5/8		1 1/2	2 1/4		2																			
1/2 O.D.	1 3/4		1 1/2	2 1/4		2																			
1/2	2 1/8		2	2 3/8		2	2 3/8		2	2 5/8		2 1/2													
5/8 O.D.	1 5/8		1 1/2	2 1/8		2	2 3/8		2	2 5/8		2 1/2													
3/4 O.D.	2		1 1/2	2 3/8		2	2 1/4		2	2 1/2		2 1/2	2 5/8	2 1/2	2 1/2	2 5/8	2 1/2	2 1/2							
3/4	1 5/8		1 1/2	2		1 1/2	2 5/8		2	2 3/8		2	2 3/8		2	2 3/8		2							
7/8 O.D.	2 1/8		2	2 1/4	2.00	2	2 3/8		2	2 1/2		2 1/2	2 5/8		2 1/2	2 5/8		2 1/2							
1 O.D.	1 5/8		1 1/2	2 1/4		1 1/2	1 5/8		1 1/2	2 3/8		2	2 1/8		2	2 3/8		2	2 1/8		2	2 3/8		2 1/2	2 5/8	
1	1 5/8		1 1/2	2 3/8		2	2 1/4		2	2 1/2		2 1/2	2 5/8		2 1/2	2 5/8		2 1/2	2 5/8		2 1/2	2 5/8		3	3 1/8	
1 1/8 O.D.	1 3/4		1 1/2	2 1/8	2.00	2	2.00	2 1/4	2	2 3/8		2	2 1/2	2.00	2 1/2	2 5/8		2 1/2	2 5/8		2 1/2	3		3	3 1/8	3.00
1 1/4 O.D.	1 5/8		1 1/2	2 1/4		2	2 3/8		2	2 1/8		2.00	2 1/4		2 1/2	2 5/8		2 1/2	3		3.00	3 1/8		3	3 1/4	
1 1/4	2 1/8		2	2 1/4		2	2 1/8		2	2 1/8		2.00	2 1/4		2 1/2	2 5/8		2 1/2	3		3.00	3 1/8		3	3 1/4	
1 1/2 O.D.	2		2.00	2 3/8		2	2 3/8		2	2 1/8		2 1/2	2 3/8		2 1/2	2 5/8		2 1/2	3		3.00	3 1/8		3	3 1/4	
1 1/2	2 1/8		2	2 3/8		2	2 1/8		2	2 1/8		2 1/2	2 3/8		2 1/2	2 5/8		2 1/2	3		3	3 1/8		3	3 1/4	
1 5/8 O.D.	2 1/8		2	2 3/8		2	2 1/8		2	2 1/8		2 1/2	2 3/8		2 1/2	2 5/8		2 1/2	3		3.00	3 1/8		3	3 1/4	
1 1/2 O.D.	2 1/8		2	2 3/8		2	2 1/8		2	2 1/8		2 1/2	2 3/8		2 1/2	2 5/8		2 1/2	3		3.00	3 1/8		3	3 1/4	
1 1/2	2 1/8		2	2 3/8		2	2 1/8		2	2 1/8		2 1/2	2 3/8		2 1/2	2 5/8		2 1/2	3		3	3 1/8		3	3 1/4	
1 5/8 O.D.	2 1/8		2	2 3/8		2	2 1/8		2	2 1/8		2 1/2	2 3/8		2 1/2	2 5/8		2 1/2	3		3.00	3 1/8		3	3 1/4	
1 1/2 O.D.	2 1/8		2	2 3/8		2	2 1/8		2	2 1/8		2 1/2	2 3/8		2 1/2	2 5/8		2 1/2	3		3.00	3 1/8		3	3 1/4	
1 1/2	2 1/8		2	2 3/8		2	2 1/8		2	2 1/8		2 1/2	2 3/8		2 1/2	2 5/8		2 1/2	3		3	3 1/8		3	3 1/4	
1 5/8 O.D.	2 1/8		2	2 3/8		2	2 1/8		2	2 1/8		2 1/2	2 3/8		2 1/2	2 5/8		2 1/2	3		3.00	3 1/8		3	3 1/4	
2 OD	2 1/8	3	2 1/2	3 1/4	3	3.00	3	3	3.00	3 1/4	4 1/8	3	3 1/8	4 1/8	3	3 1/8	4 1/8	3	3 1/8	4 1/8	3	3 1/8	4 1/8	3	3 1/8	4 1/8	3
2	3 1/8	3 5/8	3	3 1/2	3 5/8	3	3 1/8	3 5/8	3	3 1/8	4 1/8	3 1/2	3 1/2	4 1/8	3 1/2	3 1/2	4 1/8	3 1/2	3 1/2	4 1/8	3 1/2	3 1/2	4 1/8	3 1/2	3 1/2	4 1/8	3 1/2
2 1/2 OD	2 1/8	3 1/2	2 1/2	3 1/4	3 1/2	3	3	3 1/2	3	3 1/8	4 1/8	3	3 1/8	4 1/8	3	3 1/8	4 1/8	3	3 1/8	4 1/8	3	3 1/8	4 1/8	3	3 1/8	4 1/8	3
2 1/2 OD	3 1/4	3 5/8	3	3 1/4	3 5/8	3	3 1/8	3 5/8	3	3 1/8	4 1/8	3	3 1/8	4 1/8	3	3 1/8	4 1/8	3	3 1/8	4 1/8	3	3 1/8	4 1/8	3	3 1/8	4 1/8	3
2 1/2	3 1/4	3 5/8	3 1/2	4	3 5/8	3 1/2	3 1/8	3 5/8	3 1/2	3 1/8	4 1/8	4	4	4 1/8	4	4	4 1/8	4	4	4 1/8	4	4	4 1/8	4	4	4 1/8	4
3 OD	3 1/4	3 5/8	3 1/2	4 1/8	4	4	4	3 1/2	3 1/2	4 1/8	4 1/8	4	4	4 1/8	4	4	4 1/8	4	4	4 1/8	4	4	4 1/8	4	4	4 1/8	4
3	4 1/8	4	4	4 5/8	4	4	4 1/8	4	4	4 1/8	5.00	4	4 1/8	5.00	4	4 1/8	5.00	4	4 1/8	5.00	4	4 1/8	5.00	4	4 1/8	5.00	4
4 OD	4 1/8	4 5/8	5.00	5 1/8	4 5/8	5.00	5 1/8	4 5/8	5.00	5 1/8	5 1/8	5	5 1/8	5 1/8	5	5 1/8	5 1/8	5	5 1/8	5 1/8	5	5 1/8	5 1/8	5	5 1/8	5 1/8	5
4	5 1/8	4 5/8	5	5 1/8	4 5/8	5	5 1/8	4 5/8	6.00	5 1/8	5 1/8	6	6 1/8	5 1/8	6	6 1/8	5 1/8	6	6 1/8	5 1/8	6	6 1/8	5 1/8	6	6 1/8	5 1/8	6
5 OD	5 1/8	4 5/8	5.00	6 1/8	5 1/8	6	6 1/8	4 5/8	6.00	6 1/8	5 1/8	6	6 1/8	5 1/8	6	6 1/8	5 1/8	6	6 1/8	5 1/8	6	6 1/8	5 1/8	7.00	6 1/8	5 1/8	7.00
6 OD	6 1/8	5 1/8	6	7 1/8	5 1/8	7.00	7 1/8	5 1/8	7.00	7 1/8	6 1/8	7	7 1/8	6 1/8	7	7 1/8	6 1/8	7	7 1/8	6 1/8	8.00	7 1/8	6 1/8	8.00	7 1/8	6 1/8	8
6	7 1/8	5 1/8	7	7 1/8	5 1/8	8.00	7 1/8	5 1/8	7	7 1/8	5 1/8	8.00	8	5 1/8	8.00	8 1/8	6 1/8	8	8 1/8	6 1/8	8	8 1/8	6 1/8	9.00	8 1/8	6 1/8	9.00
8 OD	8 1/8	6 1/8	8	9 1/8	6 1/8	9.00	9 1/8	6 1/8	9.00	9 1/8	7 1/8	9	9 1/8	7 1/8	9	9 1/8	7 1/8	9	9 1/8	7 1/8	10.00	9 1/8	7 1/8	10.00	10 1/8	8 1/8	10
8	9 1/8	7	9	9 1/8	7	10.00	9 1/8	7	10.00	10 1/8	7	10.00	10 1/8	8 1/8	10	10 1/8	8 1/8	10	10 1/8	8 1/8	10	10 1/8	8 1/8	10	10 1/8	8 1/8	10
10 OD	10 1/8	7 1/8	10	11 1/8	8 1/8	12.00	11 1/8	8 1/8	12.00	11 1/8	8 1/8	12.00	11 1/8	8 1/8	12.00	11 1/8	8 1/8	12.00	11 1/8	8 1/8	12.00	12 1/8	8 1/8	12.00	12 1/8	8 1/8	12.00
10	11 1/8	7 1/8	12.00	11 1/8	7 1/8	12.00	11 1/8	7 1/8	12.00	12 1/8	7 1/8	12.00	12 1/8	7 1/8	12.00	12 1/8	9 1/8	12	12 1/8	9 1/8	12	12 1/8	9 1/8	12	12 1/8	9 1/8	12
12 OD	12 1/8	10	14	13 1/8	10	14	13 1/8	10	14	13 1/8	10	14	13 1/8	10	14	13 1/8	10	14	13 1/8	10	14	14 1/8	10	14	14 1/8	10	14
12	13 1/8	9 1/8	14	13 1/8	9 1/8	14	13 1/8	9 1/8	14	14 1/8	9 1/8	14	14 1/8	9 1/8	14	14 1/8	11 1/8	16	14 1/8	11 1/8	16	14 1/8	11 1/8	16	15	11 1/8	16	14 1/8	11 1/8	16

ALL DIMENSIONS GIVEN IN INCHES

NOTE:

IN GENERAL, THE PROCEDURE FOR DESIGNING STEAM TRACER LINES SHALL BE AS FOLLOWS:

THE DESIGN REPORT WILL SPECIFY WHICH PRODUCT LINES ARE STEAM TRACED AND THE PRODUCT TEMPERATURE TO BE MAINTAINED. THE JOB INSULATION SCHEDULE WILL SPECIFY THE INSULATION THICKNESS REQUIRED. FROM THE INSULATION THICKNESS, LENGTH OF TRACER LINE, AND TEMPERATURE REQUIREMENTS, THE CORRECT SIZE OF TRACER LINE MAY BE DETERMINED BY USE OF TABLE 2 OR 3 (SEE "EXAMPLE"). IN ORDER TO MAINTAIN SPECIFIED TEMPERATURE IN PRODUCT LINES OF CONSIDERABLE LENGTH, IT MAY BECOME NECESSARY TO DIVIDE THE TRACER LINE INTO TWO OR MORE SECTIONS WITH SEPARATE BRANCHES FROM THE HEADERS. IN CRITICAL SERVICES, SUCH AS BENZENE, SPECIAL CONSIDERATION SHALL BE GIVEN SUCH VARIABLE FACTORS AS CHANGES IN VELOCITY AND DIRECTION OF FLOW, EXTREME OUTSIDE TEMPERATURES, ETC.

UNLESS OTHERWISE SPECIFIED, ALL PIPE, VALVES AND FITTINGS FOR TRACER LINES SHALL BE IN ACCORDANCE WITH THE CHEMICAL UNIT VALVE AND PIPING SPECIFICATIONS NO. 2 FOR 25-LB STEAM. SPECIAL APPLICATIONS MAY REQUIRE HEATING MEDIA OTHER THAN 25-LB STEAM, THE USE OF WHICH SHALL BE SPECIFIED BY THE ENGINEERING DEPT ONLY, IN THE DESIGN REPORT. COPPER TUBING MAY BE USED FOR TRACER LINES WHEN INTRICATE INSTALLATIONS FOR VESSELS, VALVE MANIFOLDS, ETC. REQUIRE SPIRAL WINDING OR CLOSE BENDING. TABLES 2 AND 3 LIST SIZES OF STEEL PIPE AND O.D. COPPER TUBING WHICH WILL MAINTAIN APPROXIMATELY THE SAME TEMPERATURE LIMITS. ALL STEAM TRACER LINES SHALL RUN PARALLEL TO THE PRODUCT LINES ON BOTH HORIZONTAL AND VERTICAL RUNS. CARE SHALL BE TAKEN TO INSURE CONTINUOUS FLOW IN STEAM TRACER LINES. POCKETS AND CRITICAL POINTS SHALL BE ADEQUATELY TRAPPED. THE TRACER LINES SHALL DISCHARGE INTO A CLOSED HEADER. THE HEADER SYSTEM SHALL DISCHARGE STEAM TO THE ATMOSPHERE AND CONDENSATE TO THE SEWER. (SEE STD. EQ-149).

PRESSED STEEL SPACERS AND METAL STRAPS SHALL BE USED FOR ATTACHING TRACER LINE TO PROCESS LINE WHEN PROCESS LINE IS 1" O.D. OR LARGER. PRESSED STEEL CLAMPS SHALL BE USED FOR ATTACHING TRACER LINE TO PROCESS LINE WHEN PROCESS LINE IS 7/8" O.D. OR SMALLER.

LIMITATIONS FOR STEAM TRACED LINES USING STEAM AT 25 psi [1,2,3]

TABLE NO. 2 - INSULATION 1 IN. THICK

TRACER SIZE	PROCESS LINE SIZE	1	1 1/4	1 1/2	2	2 1/2	3	4	6	8	10	12
3/8 OD	TEMP OF PROCESS LINE, DEG. C	47	42	38	34	30	27	21	13	8	3	1
	MAX. LENGTH OF TRACER, FT.	60	53	54	51	49	47	44	41	39	38	37
3/8	TEMP OF PROCESS LINE, DEG. C	60	58	55	50	45	40	35	25	20	15	10
3/8 OD	MAX. LENGTH OF TRACER, FT.	180	170	160	150	140	130	120	110	107	105	100
1/2	TEMP OF PROCESS LINE, DEG. C	70	65	60	55	50	45	40	30	25	20	15
7/8 OD	MAX. LENGTH OF TRACER, FT.	290	260	250	230	220	200	190	170	160	150	150
3/4	TEMP OF PROCESS LINE, DEG. C	73	70	65	65	60	56	50	40	30	25	20
1 1/8 OD	MAX. LENGTH OF TRACER, FT.	500	470	450	425	400	370	350	300	290	280	260
1	TEMP OF PROCESS LINE, DEG. C	75	73	70	68	65	60	56	45	40	35	30
1 3/8 OD	MAX. LENGTH OF TRACER, FT.	780	730	700	640	580	570	560	500	470	440	420
1 1/4	TEMP OF PROCESS LINE, DEG. C	85	80	75	70	65	60	55	50	45	40	35
1 5/8 OD	MAX. LENGTH OF TRACER, FT.	1470	1360	1300	1180	1040	1000	940	830	770	740	720

TABLE NO. 3 - INSULATION 2 IN. THICK

TRACER SIZE	PROCESS LINE SIZE	1	1 1/4	1 1/2	2	2 1/2	3	4	6	8	10	12
3/8 OD	TEMP OF PROCESS LINE, DEG. C	59	52	50	46	42	39	33	24	18	14	10
	MAX. LENGTH OF TRACER, FT.	69	63	62	58	55	53	50	46	43	42	40
3/8	TEMP OF PROCESS LINE, DEG. C	76	70	68	65	60	50	45	40	33	28	25
3/8 OD	MAX. LENGTH OF TRACER, FT.	215	200	190	180	170	150	140	130	120	115	110
1/2	TEMP OF PROCESS LINE, DEG. C	80	76	74	70	65	60	55	45	40	35	30
7/8 OD	MAX. LENGTH OF TRACER, FT.	360	330	300	290	270	250	230	200	190	180	170
3/4	TEMP OF PROCESS LINE, DEG. C	85	80	78	74	70	65	60	50	46	40	35
1 1/8 OD	MAX. LENGTH OF TRACER, FT.	640	580	545	510	480	425	400	380	350	320	300
1	TEMP OF PROCESS LINE, DEG. C	86	83	83	80	77	74	70	65	55	50	45
1 3/8 OD	MAX. LENGTH OF TRACER, FT.	1000	940	870	800	720	700	670	630	570	530	500
1 1/4	TEMP OF PROCESS LINE, DEG. C	93	90	88	84	80	75	70	65	60	55	50
1 5/8 OD	MAX. LENGTH OF TRACER, FT.	1800	1650	1560	1460	1350	1250	1180	1100	980	920	880

1- FOR 50 psi STEAM, THE TEMPERATURE OF THE PROCESS LINE WILL BE INCREASED 1/4 TIMES THE TABULATED VALUES FOR THE SAME SIZE AND LENGTH OF TRACER.

2- BASED ON USE OF 85 % MAGNESIA PIPE COVERING.

3- FOR LINE SIZES DESIGNATED "OD", THE NOMINAL SIZE IS ALSO THE ACTUAL OUTSIDE DIAMETER, LINE SIZES NOT DESIGNATED "OD" ARE AMERICAN STANDARD PIPE SIZES.

EXAMPLE - USE OF TABLES 2 AND 3

GIVEN:

A. (FROM DESIGN REPORT), PRODUCT - ACETIC ACID, SERVICE TEMPERATURE RANGE - 22 C, MIN. - 113 C, MAX., LINE SIZE - 2".

B. (FROM PIPING LAYOUT DRAWING), LENGTH OF LINE - 148 FT.

C. (FROM JOB INSULATION SCHEDULE), INSULATION - 1" THICK.

THEN:

IN TABLE NO. 2, UNDER 2" PROCESS LINE SIZE, READ DOWN TO MAX. LENGTH OF TRACER - 150 FT. AND TEMPERATURE OF PROCESS LINE - 50 C WHICH IS WITHIN THE SPECIFIED RANGE. READ OVER TO SIZE OF TRACER WHICH IS 3/8" STEEL PIPE, OR, IF NECESSARY TO USE COPPER TUBING, 1/2" O.D. TUBING.

REFERENCES

PROTECTION SADDLES ---------- STD S-186A
HANGER CLAMPS FOR PIPE ---------- STD P-77
HANGER CLAMPS FOR OD TUBING ---- STD P-81
CLAMPS FOR LINES 7/8" OD AND SMALLER ---------- STD P-84A
INSULATION DETAILS ---------- STD IS-18

CARBIDE AND CARBON CHEMICALS CO.
ENGINEERING DEPT., SO. CHARLESTON, W. VA.

STANDARD DETAILS FOR STEAM TRACER LINES

No. P-84

CLASSIFICATION: DRAFTING

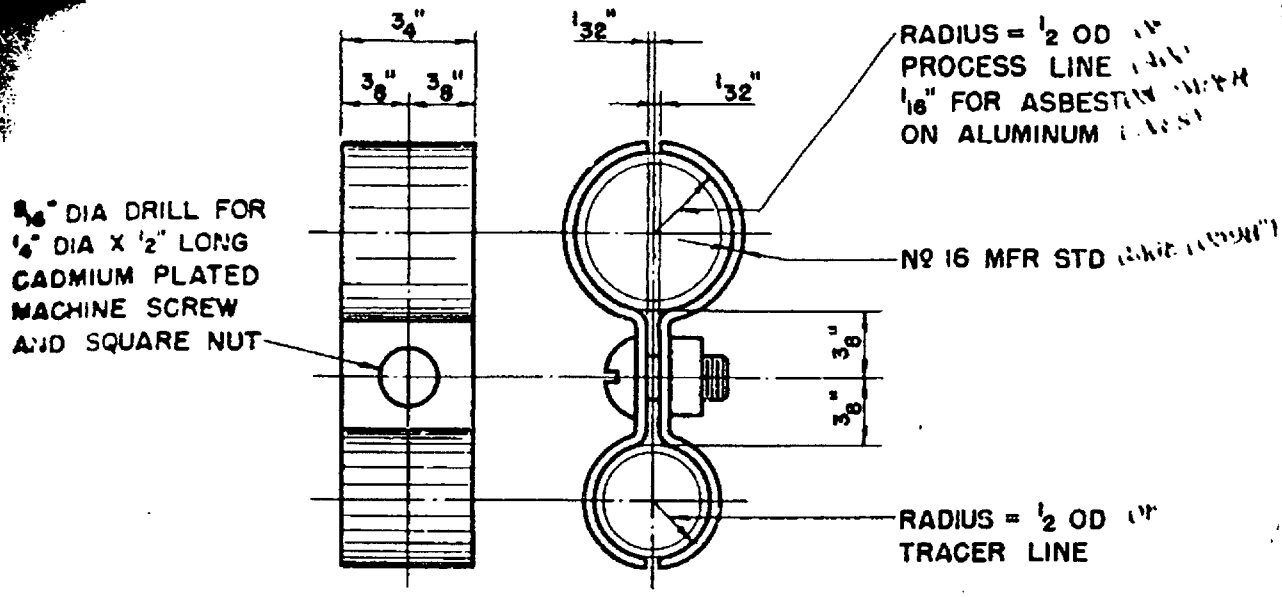
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APPROVED: [illegible] DATE: 4-15-47

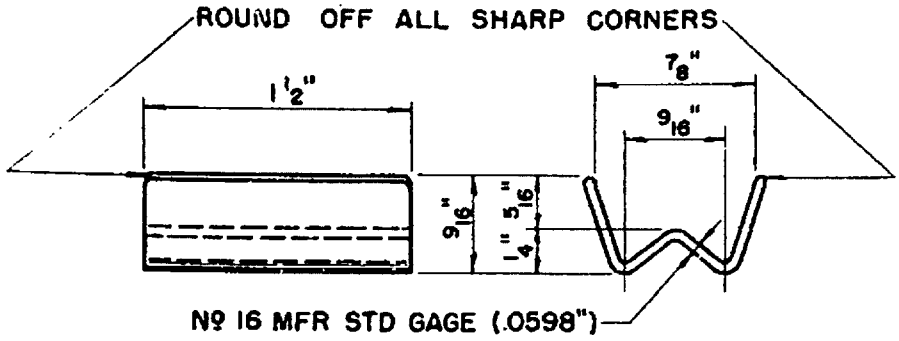
P-84

REVISED: 8-5-53

UCC 003424



PRESSED STEEL CLAMP FOR PROCESS LINES 7/8" OD AND SMALLER



PRESSED STEEL SPACER

NOTE:

MATERIAL SHALL BE ASTM A7 CARBON STEEL.

THIS STANDARD IS MANDATORY ONLY WHEN [illegible] WHOLLY OR WITH EXCEPTIONS, INTO [illegible] DESIGN DRAWINGS OR OTHER DESIGN [illegible] BILLS-OF-MATERIAL OR PURCHASE ORDERS.

ENGINEERING DEPARTMENT
CARBIDE AND CARBON CHEMICALS COMPANY
A DIVISION OF
UNION CARBIDE AND CARBON CORPORATION
SOUTH CHARLESTON, WEST VIRGINIA

STANDARD CLAMPS AND SPACERS FOR STEAM TRACED LINES	P-84A
CLASSIFICATION:	DETAIL
SPONSOR: H2B BY: [illegible]	DATE: [illegible]
APPROVED: [illegible]	DATE: 4-11-44

REVISED: 8-3-53

FORM A

THICKNESS OF INSULATION REQUIRED FOR ASBESTOS FIBER IN GENERAL SERVICE, CALCIUM SILICATE, AND CELLULAR GLASS (IN HOT SERVICE) TO MAINTAIN A SURFACE TEMPERATURE OF NOT OVER 130 °F

(Air Temperature at 90 °F and Air Movement at 0 M.P.H.)

PIPE SIZE	OPERATING TEMPERATURE °C																				
	100 TO 119	120 TO 139	140 TO 159	160 TO 179	180 TO 199	200 TO 219	220 TO 239	240 TO 259	260 TO 279	280 TO 299	300 TO 319	320 TO 339	340 TO 359	360 TO 379	380 TO 399	400 TO 419	420 TO 439	440 TO 459	460 TO 479	480 TO 499	500 TO 519	520 TO 539
½	1	1	1	1	1	1½	1½	1½	1½	1½	2	2	2	2	2½	2½	2½	2½	3	3	3	3
¾	1	1	1	1	1	1½	1½	1½	1½	2	2	2	2	2½	2½	2½	2½	3	3	3	3	3½
1	1	1	1	1	1	1½	1½	1½	1½	2	2	2	2½	2½	2½	2½	3	3	3	3	3½	3½
1½	1	1	1	1	1	1½	1½	1½	2	2	2	2½	2½	2½	3	3	3	3	3½	3½	3½	4
2	1	1	1	1	1	1½	1½	2	2	2	2	2½	2½	2½	3	3	3	3	3½	3½	4½	4
2½	1	1	1	1	1	1½	1½	2	2	2	2½	2½	2½	3	3	3	3½	3½	3½	4	4	4
3	1	1	1	1	1	1½	2	2	2	2½	2½	2½	3	3	3	3½	3½	3½	4	4	4	4½
3½	1	1	1	1	1	1½	2	2	2	2½	2½	2½	3	3	3	3½	3½	3½	4	4	4½	4½
4	1	1	1	1	1	1½	2	2	2	2½	2½	3	3	3	3½	3½	3½	4	4	4	4½	4½
6	1½	1½	1½	1½	1½	2	2	2	2½	2½	2½	3	3	3½	3½	3½	4	4	4½	4½	4½	5
8	1½	1½	1½	1½	1½	2	2	2	2½	2½	3	3	3	3½	3½	4	4	4	4½	4½	5	5
10	1½	1½	1½	1½	1½	2	2	2½	2½	2½	3	3	3½	3½	3½	4	4	4	4½	5	5	5½
12	1½	1½	1½	1½	1½	2	2	2½	2½	2½	3	3	3½	3½	4	4	4½	4	5	5	5½	5½
14	1½	1½	1½	1½	1½	2	2	2½	2½	2½	3	3	3½	3½	4	4	4½	4½	5	5	5½	5½
16	1½	1½	1½	1½	1½	2	2	2½	2½	3	3	3½	3½	3½	4	4	4½	4½	5	5	5½	6
18	1½	1½	1½	1½	1½	2	2	2½	2½	3	3	3½	3½	4	4	4½	4½	5	5	5½	5½	6
20	1½	1½	1½	1½	1½	2	2	2½	2½	3	3	3½	3½	4	4	4½	4½	5	5	5½	5½	6
22	1½	1½	1½	1½	1½	2	2	2½	2½	3	3	3½	3½	4	4	4½	4½	5	5	5½	5½	6
24	1½	1½	1½	1½	1½	2	2	2½	2½	3	3	3½	3½	4	4	4½	4½	5	5	5½	6	6
26	1½	1½	1½	1½	1½	2	2	2½	2½	3	3	3½	3½	4	4	4½	5	5	5½	5½	6	6
28	1½	1½	1½	1½	2	2	2½	2½	2½	3	3	3½	3½	4	4	4½	5	5	5½	5½	6	6½
30	1½	1½	1½	1½	2	2	2½	2½	2½	3	3	3½	3½	4	4	4½	5	5	5½	5½	6	6½
32	1½	1½	1½	1½	2	2	2½	2½	3	3	3½	3½	4	4	4½	4½	5	5	5½	5½	6	6½
34	1½	1½	1½	1½	2	2	2½	2½	3	3	3½	3½	4	4	4½	4½	5	5	5½	5½	6	6½
36	1½	1½	1½	1½	2	2	2½	2½	3	3	3½	3½	4	4	4½	4½	5	5	5½	6	6	6½
FLAT	1½	1½	1½	1½	2	2	2½	2½	3	3	3½	3½	4	4½	4½	5	5½	5½	6	6½	7	7½
	212 TO 247	248 TO 283	284 TO 319	320 TO 355	356 TO 391	392 TO 427	428 TO 463	464 TO 499	500 TO 535	536 TO 571	572 TO 607	608 TO 643	644 TO 679	680 TO 715	716 TO 751	752 TO 787	788 TO 823	824 TO 859	860 TO 895	896 TO 931	932 TO 967	968 TO 1003
	OPERATING TEMPERATURE °F																				

ASBESTOS FIBER:
Spec. 21-H

CALCIUM SILICATE
Spec. 20-H

CELLULAR GLASS:
Spec. 10-H
Spec. 10-J

NOTES:

A—This chart must not be used for temperatures in excess of 750 °F for Specs. 20-H and 21-H and 800 °F for Specs. 10-H and 10-J.

B—For determining thicknesses to be used on Dowtherm, or any other critical heat process, see page 51. For all other services requiring asbestos fiber use the chart at the left.

UCC 003426

THICKNESS OF INSULATION REQUIRED FOR ASBESTOS FIBER WHEN INSULATING DOWNTHERM [illegible] TEMPERATURE OF NOT OVER 1[illegible]

(Air Temperature [illegible])

PIPE SIZE	OPERATING TEMPERATURE °F																				
	100 TO 119	120 TO 139	140 TO 159	160 TO 179	180 TO 199	200 TO 219	220 TO 239	240 TO 259	260 TO 279	280 TO 299	300 TO 319	320 TO 339	340 TO 359	360 TO 379	380 TO 399	400 TO 419	420 TO 439	440 TO 459	460 TO 479	480 TO 499	500 TO 519
½	1	1	1	1	1½	1½	1½	1½	2	2	2	2½	2½	2½	2½	3	3	3	3½	3½	4
¾	1	1	1	1	1½	1½	1½	1½	2	2	2	2½	2½	2½	2½	3	3	3	3½	3½	4
1	1	1	1	1½	1½	1½	1½	2	2	2	2½	2½	3	3	3	3½	3½	3½	4	4	4½
1½	1	1	1	1½	1½	1½	2	2	2	2½	2½	3	3	3	3½	3½	3½	4	4	4½	4½
2	1	1	1½	1½	1½	1½	2	2	2	2½	2½	3	3	3½	3½	3½	4	4	4	4½	4½
2½	1	1	1½	1½	1½	2	2	2	2½	2½	2½	3	3	3½	3½	3½	4	4½	4½	4½	5
3	1	1	1½	1½	1½	2	2	2	2½	2½	3	3	3	3½	3½	4	4	4½	4½	5	5
3½	1	1	1½	1½	1½	2	2	2½	2½	2½	3	3	3	3½	3½	4	4	4½	4½	5	5
4	1	1	1½	1½	2	2	2	2½	2½	2½	3	3	3½	3½	4	4	4	4½	5	5	5½
6	1½	1½	1½	1½	2	2	2½	2½	2½	3	3	3½	3½	4	4	4	4½	5	5	5½	6
8	1½	1½	1½	1½	2	2	2½	2½	3	3	3	3½	3½	4	4	4½	5	5	5½	6	6
10	1½	1½	1½	1½	2	2	2½	2½	3	3	3½	3½	4	4	4½	4½	5	5½	5½	6	6½
12	1½	1½	1½	1½	2	2	2½	2½	3	3	3½	3½	4	4	4½	4½	5	5½	5½	6	6½
14	1½	1½	1½	1½	2	2	2½	2½	3	3	3½	3½	4	4	4½	4½	5	5½	5½	6	6½
16	1½	1½	1½	1½	2	2½	2½	2½	3	3½	3½	4	4	4½	4½	5	5	5½	6	6	6½
18	1½	1½	1½	2	2	2½	2½	2½	3	3½	3½	4	4	4½	4½	5	5½	5½	6	6½	6½
20	1½	1½	1½	2	2	2½	2½	3	3	3½	3½	4	4	4½	4½	5	5½	5½	6	6½	7
22	1½	1½	1½	2	2	2½	2½	3	3	3½	3½	4	4	4½	4½	5	5½	5½	6	6½	7
24	1½	1½	1½	2	2	2½	2½	3	3	3½	3½	4	4	4½	5	5	5½	6	6	6½	7
26	1½	1½	1½	2	2	2½	2½	3	3	3½	3½	4	4½	4½	5	5	5½	6	6	6½	7
28	1½	1½	1½	2	2	2½	2½	3	3	3½	3½	4	4½	4½	5	5	5½	6	6½	6½	7
30	1½	1½	1½	2	2	2½	2½	3	3	3½	3½	4	4½	4½	5	5	5½	6	6½	7	7
32	1½	1½	1½	2	2	2½	2½	3	3	3½	3½	4	4½	4½	5	5	5½	6	6½	7	7½
34	1½	1½	1½	2	2	2½	2½	3	3	3½	3½	4	4½	4½	5	5½	5½	6	6½	7	7½
36	1½	1½	1½	2	2	2½	2½	3	3	3½	3½	4	4½	4½	5	5½	6	6	6½	7	7½
FLAT	1½	1½	1½	2	2	2½	3	3	3½	3½	4	4½	5	5	5½	6	6½	7	7½	8	8½
	212 TO 247	248 TO 283	284 TO 319	320 TO 355	356 TO 391	392 TO 427	428 TO 463	464 TO 499	500 TO 535	536 TO 571	572 TO 607	608 TO 643	644 TO 679	680 TO 715	716 TO 751	752 TO 787	788 TO 823	824 TO 859	860 TO 895	896 TO 931	932 TO 967	968 TO 1003

OPERATING TEMPERATURE °F

[illegible]

[illegible] to be used [illegible] when determining thicknesses for use on Dowtherm, or where the heat [illegible] ess is critical. For all other applications of asbestos fiber see chart on page 50

UCC 003427

THICKNESS OF INSULATION REQUIRED FOR HIGH TEMP. HYDROUS CALCIUM SILICATE (KAYLO 20) TO MAINTAIN A SURFACE TEMP. OF NOT OVER 130 °F

(Air Temperature at 90 °F and Air Movement at 0 M.P.H.)

HYDROUS
Spec. 25-H
Spec. 32-H

PIPE SIZE	OPERATING TEMPERATURE °C																											
	UP TO 179	180 TO 199	200 TO 219	220 TO 239	240 TO 259	260 TO 279	280 TO 299	300 TO 319	320 TO 339	340 TO 359	360 TO 379	380 TO 399	400 TO 419	420 TO 439	440 TO 459	460 TO 479	480 TO 499	500 TO 519	520 TO 539	540 TO 559	560 TO 579	580 TO 599	600 TO 619	620 TO 639	640 TO 659	660 TO 679	680 TO 699	700 TO 719
½	1	1	1½	1½	1½	1½	1½	2	2	2	2	2½	2½	2½	2½	3	3	3	3	3	3½	3½	3½	3½	3½	3½	3½	3½
¾	1	1	1½	1½	1½	1½	2	2	2	2	2½	2½	2½	2½	3	3	3	3	3½	3½	3½	3½	3½	3½	3½	3½	3½	3½
1	1	1	1½	1½	1½	1½	2	2	2	2½	2½	2½	2½	3	3	3	3	3½	3½	3½	3½	3½	3½	3½	4	4	4	4
1½	1	1	1½	1½	1½	2	2	2	2½	2½	2½	3	3	3	3	3½	3½	3½	4	4	4	4	4	4	4	4	4	4
2	1	1	1½	1½	2	2	2	2	2½	2½	2½	3	3	3	3	3½	3½	3½	4	4	4	4	4	4	4½	4½	4½	4½
2½	1	1	1½	1½	2	2	2	2½	2½	2½	3	3	3	3½	3½	3½	4	4	4	4	4	4½	4½	4½	4½	4½	4½	4½
3	1	1	1½	2	2	2	2½	2½	2½	3	3	3	3½	3½	3½	4	4	4	4½	4½	4½	4½	4½	4½	4½	4½	5	5
3½	1	1	1½	2	2	2	2½	2½	2½	3	3	3	3½	3½	3½	4	4	4½	4½	4½	4½	4½	4½	4½	5	5	5	5
4	1	1	1½	2	2	2	2½	2½	3	3	3	3½	3½	3½	4	4	4	4½	4½	4½	4½	4½	5	5	5	5	5	5
6	1½	1½	2	2	2	2½	2½	2½	3	3	3½	3½	3½	4	4	4½	4½	4½	5	5	5	5	5	5	5½	5½	5½	5½
8	1½	1½	2	2	2	2½	2½	3	3	3	3½	3½	4	4	4	4½	4½	5	5	5	5	5½	5½	5½	5½	5½	5½	6
10	1½	1½	2	2	2½	2½	2½	3	3	3½	3½	3½	4	4	4	4½	5	5	5½	5½	5½	5½	5½	5½	6	6	6	6
12	1½	1½	2	2	2½	2½	2½	3	3	3½	3½	4	4	4½	4½	5	5	5½	5½	5½	5½	5½	5½	6	6	6	6	6
14	1½	1½	2	2	2½	2½	2½	3	3	3½	3½	4	4	4½	4½	5	5	5½	5½	5½	5½	6	6	6	6	6	6	6½
16	1½	1½	2	2	2½	2½	3	3	3½	3½	3½	4	4	4½	4½	5	5	5½	6	6	6	6	6	6	6	6½	6½	6½
18	1½	1½	2	2	2½	2½	3	3	3½	3½	4	4	4½	4½	5	5	5½	5½	6	6	6	6	6	6	6½	6½	6½	6½
20	1½	1½	2	2	2½	2½	3	3	3½	3½	4	4	4½	4½	5	5	5½	5½	6	6	6	6	6	6½	6½	6½	6½	7
22	1½	1½	2	2	2½	2½	3	3	3½	3½	4	4	4½	4½	5	5	5½	5½	6	6	6	6	6½	6½	6½	6½	7	7
24	1½	1½	2	2	2½	2½	3	3	3½	3½	4	4	4½	4½	5	5	5½	6	6	6	6	6	6½	6½	6½	7	7	7
26	1½	1½	2	2	2½	2½	3	3	3½	3½	4	4	4½	5	5	5½	5½	6	6	6	6	6½	6½	6½	6½	7	7	7
28	1½	2	2	2½	2½	2½	3	3	3½	3½	4	4	4½	5	5	5½	5½	6	6½	6½	6½	6½	6½	6½	7	7	7	7
30	1½	2	2	2½	2½	2½	3	3	3½	3½	4	4	4½	5	5	5½	5½	6	6½	6½	6½	6½	6½	7	7	7	7	7
32	1½	2	2	2½	2½	3	3	3½	3½	4	4	4½	4½	5	5	5½	5½	6	6½	6½	6½	6½	6½	7	7	7	7	7
34	1½	2	2	2½	2½	3	3	3½	3½	4	4	4½	4½	5	5	5½	5½	6	6½	6½	6½	6½	7	7	7	7	7	7
36	1½	2	2	2½	2½	3	3	3½	3½	4	4	4½	4½	5	5	5½	6	6	6½	6½	6½	6½	7	7	7	7	7½	
FLAT	1½	2	2	2½	2½	3	3	3½	3½	4	4½	4½	5	5½	5½	6	6½	7	7½	7½	7½	7½	7½	8	8	8	8½	
	UP TO 355	356 TO 391	392 TO 427	428 TO 463	464 TO 499	500 TO 535	536 TO 571	572 TO 607	608 TO 643	644 TO 679	680 TO 715	716 TO 751	752 TO 787	788 TO 823	824 TO 859	860 TO 895	896 TO 931	932 TO 967	968 TO 1003	1004 TO 1039	1040 TO 1075	1076 TO 1112	1113 TO 1147	1148 TO 1183	1184 TO 1219	1220 TO 1255	1256 TO 1291	1292 TO 1328	
	OPERATING TEMPERATURE °F																											

UCC 003428

THICKNESS OF INSULATION REQUIRED FOR CELLULAR GLASS (FOAMGLAS) IN COLD TEMPERATURE SERVICE TO MAINTAIN A SURFACE TEMPERATURE OF NOT OVER 83 °F

(Air Temperature at 90 °F and Air Movement at 0 M.P.H.)

PIPE SIZE	OPERATING TEMPERATURE °C																								
	30 TO 20	19 TO 10	10 TO 5	4 TO 0	-1 TO -5	-6 TO -10	-11 TO -15	-16 TO -20	-21 TO -25	-26 TO -30	-31 TO -35	-36 TO -40	-41 TO -45	-46 TO -50	-51 TO -55	-56 TO -60	-61 TO -65	-66 TO -70	-71 TO -75	-76 TO -80	-81 TO -85	-86 TO -90	-91 TO -95	-96 TO -100	-101 TO -105	-106 TO -110
½	1½	1½	1½	1½	1½	2	2	2	2	2½	2½	2½	2½	3	3	3	3	3	3	3½	3½	3½	3½	3½	3½	4
¾	1½	1½	1½	1½	1½	2	2	2	2½	2½	2½	2½	3	3	3	3	3	3½	3½	3½	3½	3½	4	4	4	4
1	1½	1½	1½	1½	2	2	2	2½	2½	2½	2½	3	3	3	3	3½	3½	3½	3½	3½	3½	4	4	4	4	4
1¼	1½	1½	1½	2	2	2	2	2½	2½	2½	3	3	3	3	3½	3½	3½	3½	4	4	4	4	4	4½	4½	4½
2	1½	1½	1½	2	2	2	2½	2½	2½	2½	3	3	3½	3½	3½	3½	3½	4	4	4	4	4½	4½	4½	4½	4½
2½	1½	1½	1½	2	2	2	2½	2½	2½	3	3	3	3½	3½	3½	4	4	4	4	4½	4½	4½	4½	4½	5	5
3	1½	1½	1½	2	2	2½	2½	2½	3	3	3	3½	3½	3½	4	4	4	4	4½	4½	4½	4½	5	5	5	5
3½	1½	1½	1½	2	2	2½	2½	3	3	3	3½	3½	3½	3½	4	4	4	4½	4½	4½	4½	5	5	5	5	5½
4	1½	1½	1½	2	2	2½	2½	3	3	3	3½	3½	3½	4	4	4	4½	4½	4½	4½	5	5	5	5	5½	5½
6	1½	1½	2	2	2½	2½	3	3	3	3½	3½	4	4	4	4½	4½	4½	5	5	5	5	5½	5½	5½	6	6
8	1½	1½	2	2	2½	2½	3	3	3½	3½	3½	4	4	4½	4½	4½	5	5	5	5½	5½	5½	6	6	6	6
10	1½	1½	2	2½	2½	2½	3	3	3½	3½	4	4	4	4½	4½	5	5	5	5½	5½	5½	6	6	6	6½	6½
12	1½	1½	2	2½	2½	2½	3	3½	3½	3½	4	4	4½	4½	4½	5	5	5½	5½	5½	6	6	6	6½	6½	6½
14	1½	1½	2	2½	2½	2½	3	3½	3½	3½	4	4	4½	4½	5	5	5	5½	5½	5½	6	6	6	6½	6½	6½
16	1½	1½	2	2½	2½	2½	3	3½	3½	3½	4	4	4½	4½	5	5	5	5½	5½	6	6	6	6½	6½	6½	7
18	1½	1½	2	2½	2½	3	3	3½	3½	4	4	4½	4½	4½	5	5	5½	5½	6	6	6	6½	6½	6½	7	7
20	1½	1½	2	2½	2½	3	3	3½	3½	4	4	4½	4½	5	5	5	5½	5½	6	6	6	6½	6½	7	7	7
22	1½	1½	2	2½	2½	3	3	3½	3½	4	4	4½	4½	5	5	5½	5½	6½	6	6	6½	6½	6½	7	7	7
24	1½	1½	2	2½	2½	3	3	3½	3½	4	4	4½	4½	5	5	5½	5½	6	6	6	6½	6½	7	7	7	7½
26	1½	1½	2	2½	2½	3	3	3½	4	4	4½	4½	5	5	5	5½	5½	6	6	6½	6½	6½	7	7	7½	7½
28	1½	1½	2	2½	2½	3	3	3½	4	4	4½	4½	5	5	5½	5½	5½	6	6½	6½	6½	7	7	7	7½	7½
30	1½	1½	2	2½	2½	3	3½	3½	4	4	4½	4½	5	5	5½	5½	6	6	6½	6½	7	7	7	7½	7½	7½
32	1½	1½	2	2½	2½	3	3½	3½	4	4	4½	4½	5	5	5½	5½	6	6	6½	6½	7	7	7½	7½	7½	8
34	1½	1½	2	2½	2½	3	3½	3½	4	4	4½	4½	5	5	5½	5½	6	6	6½	7	7	7	7½	7½	7½	8
36	1½	1½	2	2½	2½	3	3½	3½	4	4	4½	4½	5	5½	5½	6	6	6½	7	7	7	7½	7½	7½	8	8
FLAT	1½	1½	2	2½	3	3	3½	4	4	4½	5	5	5½	6	6	6½	6½	7	7½	7½	8	8	8½	8½	9	9
	86 TO 68	67 TO 50	49 TO 41	40 TO 32	31 TO 23	22 TO 14	13 TO 5	4 TO -4	-5 TO -13	-14 TO -22	-23 TO -31	-32 TO -40	-41 TO -49	-50 TO -58	-59 TO -67	-68 TO -76	-77 TO -85	-86 TO -94	-95 TO -103	-104 TO -112	-113 TO -121	-122 TO -130	-131 TO -139	-140 TO -148	-149 TO -157	-158 TO -166
	OPERATING TEMPERATURE °F																								

CELLULAR GLASS: Spec. 10-L

UCC 003429

BASIC DIMENSIONAL STANDARDS FOR HIGH TEMPERATURE PIPE INSULATION

(Standard Sizes and Thicknesses)

IRON PIPE SIZES—

NOMINAL PIPE SIZE	PIPE O. D.	1" NOMINAL		1½" NOMINAL		2" NOMINAL		2½" NOMINAL		3" NOMINAL		3½" NOMINAL		4" NOMINAL	
		THK.	O. D.	THK.	O. D.	THK.	O. D.	THK.	O. D.	THK.	O. D.	THK.	O. D.	THK.	O. D.
⅛"	.84	1.00	2.88	1.56	4.00	2.06	5.00	2.35	5.56	2.88	6.63				
¼"	1.05	.90	2.88	1.46	4.00	1.96	5.00	2.24	5.56	2.77	6.63				
1"	1.32	1.08	3.50	1.58	4.50	2.11	5.56	2.64	6.63	3.14	7.63				
1-1/4"	1.66	.90	3.50	1.40	4.50	1.94	5.56	2.47	6.63	2.97	7.63				
1-½"	1.90	1.03	4.00	1.58	5.00	1.82	5.56	2.35	6.63	2.85	7.63				
2"	2.38	1.03	4.50	1.56	5.56	2.09	6.63	2.59	7.63	3.09	8.63	3.59	9.63	4.16	10.75
2-½"	2.88	1.08	5.00	1.31	5.56	1.84	6.63	2.34	7.63	2.84	8.63	3.34	9.63	3.91	10.75
3"	3.50	1.00	5.56	1.53	6.63	2.03	7.63	2.53	8.63	3.03	9.63	3.59	10.75	4.09	11.75
3-½"	4.00	.75	5.56	1.28	6.63	1.78	7.63	2.28	8.63	2.78	9.63	3.34	10.75	3.84	11.75
4"	4.50	1.03	6.63	1.63	7.63	2.03	8.63	2.53	9.63	3.09	10.75	3.59	11.75	4.09	12.75
4-½"	5.00	.78	6.63	1.28	7.63	1.78	8.63	2.28	9.63	2.84	10.75	3.34	11.75	3.84	12.75
5"	5.56	1.00	7.63	1.50	8.63	2.00	9.63	2.56	10.75	3.06	11.75	3.56	12.75	4.13	14.00
6"	6.63	.94	8.63	1.44	9.63	2.00	10.75	2.50	11.75	3.00	12.75	3.63	14.00	4.13	15.00
7"	7.63			1.50	10.75	2.00	11.75	2.50	12.75	3.13	14.00	3.63	15.00	4.13	16.00
8"	8.63			1.50	11.75	2.00	12.75	2.63	14.00	3.13	15.00	3.63	16.00	4.13	17.00
9"	9.63			1.50	12.75	2.13	14.00	2.63	15.00	3.13	16.00	3.63	17.00	4.13	18.00
10"	10.75			1.56	14.00	2.06	15.00	2.56	16.00	3.06	17.00	3.56	18.00	4.06	19.00
11"	11.75			1.56	15.00	2.06	16.00	2.56	17.00	3.06	18.00	3.56	19.00	4.06	20.00
12"	12.75			1.55	16.00	2.05	17.00	2.55	18.00	3.05	19.00	3.55	20.00	4.05	21.00
14"	14.00			1.42	17.00	1.92	18.00	2.42	19.00	2.92	20.00	3.42	21.00	3.92	22.00
15"	15.00			1.42	18.00	1.92	19.00	2.42	20.00	2.92	21.00	3.42	22.00	3.92	23.00
16"	16.00			1.41	19.00	1.91	20.00	2.41	21.00	2.91	22.00	3.41	23.00	3.91	24.00
17"	17.00			1.41	20.00	1.91	21.00	2.41	22.00	2.91	23.00	3.41	24.00	3.91	25.00
18"	18.00			1.41	21.00	1.91	22.00	2.41	23.00	2.91	24.00	3.41	25.00	3.91	26.00
19"	19.00			1.41	22.00	1.91	23.00	2.41	24.00	2.91	25.00	3.41	26.00	3.91	27.00
20"	20.00			1.41	23.00	1.91	24.00	2.41	25.00	2.91	26.00	3.41	27.00	3.91	28.00
21"	21.00			1.41	24.00	1.91	25.00	2.41	26.00	2.91	27.00	3.41	28.00	3.91	29.00
22"	22.00			1.41	25.00	1.91	26.00	2.41	27.00	2.91	28.00	3.41	29.00	3.91	30.00
23"	23.00			1.41	26.00	1.91	27.00	2.41	28.00	2.91	29.00	3.41	30.00	3.91	31.00
24"	24.00			1.41	27.00	1.91	28.00	2.41	29.00	2.91	30.00	3.41	31.00	3.91	32.00
25"	25.00			1.41	28.00	1.91	29.00	2.41	30.00	2.91	31.00	3.41	32.00	3.91	33.00
26"	26.00			1.41	29.00	1.91	30.00	2.41	31.00	2.91	32.00	3.41	33.00	3.91	34.00
27"	27.00			1.41	30.00	1.91	31.00	2.41	32.00	2.91	33.00	3.41	34.00	3.91	35.00
28"	28.00			1.41	31.00	1.91	32.00	2.41	33.00	2.91	34.00	3.41	35.00	3.91	36.00
29"	29.00			1.41	32.00	1.91	33.00	2.41	34.00	2.91	35.00	3.41	36.00	3.91	37.00
30"	30.00			1.41	33.00	1.91	34.00	2.41	35.00	2.91	36.00	3.41	37.00	3.91	38.00
31"	31.00			1.41	34.00	1.91	35.00	2.41	36.00	2.91	37.00	3.41	38.00	3.91	39.00
32"	32.00			1.41	35.00	1.91	36.00	2.41	37.00	2.91	38.00	3.41	39.00	3.91	40.00
33"	33.00			1.41	36.00	1.91	37.00	2.41	38.00	2.91	39.00	3.41	40.00	3.91	41.00
34"	34.00			1.41	37.00	1.91	38.00	2.41	39.00	2.91	40.00	3.41	41.00	3.91	42.00
35"	35.00			1.41	38.00	1.91	39.00	2.41	40.00	2.91	41.00	3.41	42.00	3.91	43.00
36"	36.00			1.41	39.00	1.91	40.00	2.41	41.00	2.91	42.00	3.41	43.00	3.91	44.00
37"	37.00			1.41	40.00	1.91	41.00	2.41	42.00	2.91	43.00	3.41	44.00	3.91	45.00
38"	38.00			1.41	41.00	1.91	42.00	2.41	43.00	2.91	44.00	3.41	45.00	3.91	46.00
39"	39.00			1.41	42.00	1.91	43.00	2.41	44.00	2.91	45.00	3.41	46.00	3.91	47.00
40"	40.00			1.41	43.00	1.91	44.00	2.41	45.00	2.91	46.00	3.41	47.00	3.91	48.00
41"	41.00			1.41	44.00	1.91	45.00	2.41	46.00	2.91	47.00	3.41	48.00	3.91	49.00

This standard dimensional sheet covers the following insulation specifications:

A—Calcium Silicate ..... Spec. 20-H
B—Hydrous Calcium Silicate ..... Spec. 25-H & 32-H
C—Asbestos Fiber ..... Spec. 21-H

The blank spaces shown above indicate that the insulation is **not made** standard in the thicknesses for that particular line size.

UCC 003430

BASIC DIMENSIONAL STANDARDS FOR LOW TEMPERATURE PIPE INSULATION

(Standard Sizes and Thicknesses)

IRON PIPE SIZES —

NOMINAL PIPE SIZE	PIPE O. D.	I. D. OF INSUL.	1" NOMINAL		1½" NOMINAL		2" NOMINAL		2½" NOMINAL		3" NOMINAL		3½" NOMINAL		4" NOMINAL	
			THK.	O. D.	THK.	O. D.	THK.	O. D.	THK.	O. D.	THK.	O. D.	THK.	O. D.	THK.	O. D.
¼"	0.540	0.556	1.159	2.875	1.472	3.500	1.972	4.500	2.503	5.563	3.034	6.625	3.534	7.625	4.034	8.625
3/8"	0.675	0.691	1.097	2.875	1.663	4.000	2.163	5.000	2.440	5.563	2.972	6.625	3.472	7.625	3.972	8.625
½"	0.840	0.856	1.009	2.875	1.572	4.000	2.072	5.000	2.364	5.563	2.850	6.625	3.384	7.625	4.384	9.625
¾"	1.050	1.066	0.904	2.875	1.467	4.000	1.967	5.000	2.249	5.563	2.780	6.625	3.779	8.625	4.279	9.625
1"	1.315	1.331	1.034	3.500	1.584	4.500	2.118	5.563	2.665	6.625	3.147	7.625	3.647	8.625	4.147	9.625
1-¼"	1.660	1.676	0.904	3.500	1.400	4.500	1.944	5.563	2.493	6.625	2.974	7.625	3.474	8.625	3.974	9.625
1-½"	1.900	1.916	1.042	4.000	1.642	5.000	1.824	5.563	2.355	6.625	2.855	7.625	3.354	8.625	3.854	9.625
2"	2.375	2.406	1.047	4.500	1.578	5.563	2.109	6.625	2.609	7.625	3.109	8.625	3.609	9.625	4.172	10.750
2-½"	2.875	2.961	1.019	5.000	1.381	5.563	1.832	6.625	2.332	7.625	2.832	8.625	3.332	9.625	3.894	10.750
3"	3.500	3.531	1.016	5.563	1.547	6.625	2.047	7.625	2.547	8.625	3.047	9.625	3.610	10.750	4.109	11.750
3-½"	4.000	4.031	1.297	6.625	1.797	7.625	2.297	8.625	2.797	9.625	3.360	10.750	3.859	11.750	4.359	12.750
4"	4.500	4.531	1.047	6.625	1.547	7.625	2.047	8.625	2.547	9.625	3.109	10.750	3.618	11.750	4.109	12.850
4-½"	5.000	5.063	1.281	7.625	1.781	8.625	2.281	9.625	2.844	10.750	3.344	11.750	3.843	12.750	4.467	14.000
5"	5.563	5.638	0.994	7.625	1.494	8.625	1.994	9.625	2.557	10.750	3.057	11.750	3.557	12.750	4.182	14.000
6"	6.625	6.688	0.968	8.625	1.468	9.625	2.031	10.750	2.531	11.750	3.031	12.750	3.656	14.000	4.156	15.000
7"	7.625	7.688			1.531	10.750	2.031	11.750	2.531	12.750	3.156	14.000	3.656	15.000	4.156	16.000
8"	8.625	8.688			1.531	11.750	2.031	12.750	2.656	14.000	3.156	15.000	3.656	16.000	4.156	17.000
9"	9.625	9.688			1.531	12.750	2.156	14.000	2.656	15.000	3.056	16.000	3.656	17.000	4.156	18.000
10"	10.750	10.844			1.578	14.000	2.078	16.000	2.578	16.000	3.078	17.000	3.578	18.000	4.078	19.000
11"	11.750	11.844			1.578	15.000	2.078	16.000	2.578	17.000	3.078	18.000	3.578	19.000	4.078	20.000
12"	12.750	12.844			1.578	16.000	2.078	17.000	2.578	18.000	3.078	19.000	3.500	20.000	4.078	21.000
14"	14.000	14.094			1.500	17.094	2.000	18.094	2.500	19.094	3.000	20.094	3.500	21.094	4.000	22.094
15"	15.000	15.094			1.500	18.094	2.000	19.094	2.500	20.094	3.000	21.094	3.500	22.094	4.000	23.094
16"	16.000	16.094			1.500	19.094	2.000	20.094	2.500	21.094	3.000	22.094	3.500	23.094	4.000	24.094
17"	17.000	17.094			1.500	20.094	2.000	21.094	2.500	22.094	3.000	23.094	3.500	24.094	4.000	25.094
18"	18.000	18.094			1.500	21.094	2.000	22.094	2.500	23.094	3.000	24.094	3.500	25.094	4.000	26.094
19"	19.000	19.094			1.500	22.094	2.000	23.094	2.500	24.094	3.000	25.094	3.500	26.094	4.000	27.094
20"	20.000	20.125			1.500	23.125	2.000	24.125	2.500	25.125	3.000	26.125	3.500	27.125	4.000	28.125
21"	21.000	21.125			1.500	24.125	2.000	25.125	2.500	26.125	3.000	27.125	3.500	28.125	4.000	29.125
22"	22.000	22.125			1.500	25.125	2.000	26.125	2.500	27.125	3.000	28.125	3.500	29.125	4.000	30.125
23"	23.000	23.125			1.500	26.125	2.000	27.125	2.500	28.125	3.000	29.125	3.500	30.125	4.000	31.125
24"	24.000	24.125			1.500	27.125	2.000	28.125	2.500	29.125	3.000	30.125	3.500	31.125	4.000	32.125
25"	25.000	25.125			1.500	28.125	2.000	29.125	2.500	30.125	3.000	31.125	3.500	32.125	4.000	33.125
26"	26.000	26.125			1.500	29.125	2.000	30.125	2.500	31.125	3.000	32.125	3.500	33.125	4.000	34.125
27"	27.000	27.125			1.500	30.125	2.000	31.125	2.500	32.125	3.000	33.125	3.500	34.125	4.000	35.125
28"	28.000	28.125			1.500	31.125	2.000	32.125	2.500	33.125	3.000	34.125	3.500	35.125	4.000	36.125
29"	29.000	29.125			1.500	32.125	2.000	33.125	2.500	34.125	3.000	35.125	3.500	36.125	4.000	37.125
30"	30.000	30.125			1.500	33.125	2.000	34.125	2.500	35.125	3.000	36.125	3.500	37.125	4.000	38.125
31"	31.000	31.125			1.500	34.125	2.000	35.125	2.500	36.125	3.000	37.125	3.500	38.125	4.000	39.125
32"	32.000	32.125			1.500	35.125	2.000	36.125	2.500	37.125	3.000	38.125	3.500	39.125	4.000	40.125
33"	33.000	33.125			1.500	36.125	2.000	37.125	2.500	38.125	3.000	39.125	3.500	40.125	4.000	41.125
34"	34.000	34.125			1.500	37.125	2.000	38.125	2.500	39.125	3.000	40.125	3.500	41.125	4.000	42.125
35"	35.000	35.125			1.500	38.125	2.000	39.125	2.500	40.125	3.000	41.125	3.500	42.125	4.000	43.125
36"	36.000	36.125			1.500	39.125	2.000	40.125	2.500	41.125	3.000	42.125	3.500	43.125	4.000	44.125

This standard dimensional sheet covers the following insulation specifications:

Cellular Glass.....Spec. 10-H, 10-J, & 10-L

The blank spaces shown above indicate that the insulation is **not made** standard in the thicknesses for that particular line size.

UCC 003431

BASIC DIMENSIONAL STANDARDS FOR LOW TEMPERATURE PIPE INSULATION

(Standard Sizes and Thicknesses)

STANDARD TUBING SIZES —

NOMINAL TUBE SIZE	FRACT. O. D.	O. D.	1" NOMINAL		1¼" NOMINAL		2" NOMINAL		2½" NOMINAL		3" NOMINAL		3½" NOMINAL		4" NOMINAL	
			THK.	O. D.	THK.	O. D.	THK.	O. D.	THK.	O. D.	THK.	O. D.	THK.	O. D.	THK.	O. D.
1/4"	1/4	0.250	1.31	2.88	1.62	3.50	2.12	4.50	2.66	5.56	3.19	6.63	3.69	7.63	4.19	8.63
1/4"	3/8	0.375	1.25	2.88	1.56	3.50	2.06	4.50	2.59	5.56	3.12	6.63	3.62	7.63	4.12	8.63
1/2"	1/2	0.500	1.19	2.88	1.50	3.50	2.00	4.50	2.53	5.56	3.06	6.63	3.56	7.63	4.06	8.63
1/2"	5/8	0.625	1.12	2.88	1.44	3.50	1.94	4.50	2.47	5.56	3.00	6.63	3.50	7.63	4.00	8.63
3/4"	3/4	0.750	1.06	2.88	1.62	4.00	2.12	5.00	2.40	5.56	3.44	7.63	3.94	8.63	4.44	9.63
3/4"	7/8	0.875	1.36	3.50	1.56	4.00	2.06	5.00	2.34	5.56	3.37	7.63	3.87	8.63	4.37	9.63
1"	1	1.000	1.25	3.50	1.50	4.00	2.00	5.00	2.81	6.63	3.31	7.63	3.81	8.63	4.31	9.63
1"	1-1/8	1.125	1.24	3.50	1.44	4.00	1.94	5.00	2.75	6.63	3.25	7.63	3.75	8.63	4.25	9.63
1-1/4"	1-1/4	1.250	1.12	3.50	1.62	4.50	2.18	5.56	2.87	6.63	3.19	7.63	3.69	8.63	4.19	9.63
1-1/4"	1-3/8	1.375	1.11	3.50	1.56	4.50	2.09	5.56	2.62	6.63	3.12	7.63	3.62	8.63	4.12	9.63
1-1/2"	1-1/2	1.500	1.25	4.00	1.50	4.50	2.03	5.56	2.56	6.63	3.06	7.63	3.56	8.63	4.06	9.63
1-1/2"	1-5/8	1.625	1.19	4.00	1.44	4.50	1.97	5.56	2.50	6.63	3.00	7.63	3.50	8.63	4.00	9.63
2"	2	2.000	1.00	4.00	1.50	5.00	2.31	6.63	2.81	7.63	3.31	8.63	3.81	9.63	4.37	10.75
2"	2-1/8	2.125	1.19	4.50	1.44	5.00	2.25	6.63	2.75	7.63	3.25	8.63	3.75	9.63	4.31	10.75
2-1/2"	2-1/2	2.500	1.00	4.50	1.53	5.56	2.06	6.63	2.56	7.63	3.06	8.63	3.56	9.63	4.12	10.75
2-1/2"	2-5/8	2.625	1.19	5.00	1.47	5.56	2.00	6.63	2.50	7.63	3.00	8.63	3.50	9.63	4.06	10.75
3"	3	3.000	1.00	5.00	1.81	6.63	2.31	7.63	2.81	8.63	3.31	9.63	3.87	10.75	4.37	11.75
3"	3-1/8	3.125	1.22	5.56	1.75	6.63	2.25	7.63	2.75	8.63	3.25	9.63	3.82	10.75	4.32	11.75
3-1/2"	3-5/8	3.625	0.97	5.56	1.50	6.63	2.00	7.63	2.50	8.63	3.50	9.63	3.56	10.75	4.06	11.75
4"	4	4.000	1.31	6.63	1.81	7.63	2.31	8.63	2.81	9.63	3.37	10.75	3.87	11.75	4.37	12.75
4"	4-1/8	4.125	1.25	6.63	1.75	7.63	2.25	8.63	2.75	9.63	3.31	10.75	3.81	11.75	4.31	12.75
5"	5	5.000	1.31	7.63	1.81	8.63	2.31	9.63	2.82	10.75	3.37	11.75	3.87	12.75	4.50	14.00
5"	5-1/8	5.125	1.25	7.63	1.75	8.63	2.25	9.63	2.81	10.75	3.31	11.75	3.81	12.75	4.43	14.00
6"	6	6.000	1.25	8.63	1.81	9.63	2.37	10.75	2.87	11.75	3.37	12.75	4.00	14.00	4.50	15.00
6"	6-1/8	6.125	1.25	8.63	1.75	9.63	2.31	10.75	2.81	11.75	3.31	12.75	3.93	14.00	4.43	15.00
8"	8	8.000			1.82	11.75	2.32	12.75	2.99	14.00	3.48	15.00	3.98	16.00	4.48	17.00
8"	8-1/8	8.125			1.81	11.75	2.31	12.75	2.94	14.00	3.44	15.00	3.98	16.00	4.44	17.00
10"	10	10.000			1.38	12.75	1.99	14.00	2.49	15.00	2.99	16.00	3.49	17.00	3.99	18.00
10"	10-1/8	10.125			1.31	12.75	1.94	14.00	2.44	15.00	2.94	17.00	3.44	17.00	3.94	18.00
12"	12-1/8	12.125			1.44	15.00	1.99	16.00	2.44	17.00	3.00	18.09	3.44	19.09	3.99	20.09

This standard dimensional sheet covers the following insulation specifications:

Cellular Glass..... Spec. 10-H, 10-J, & 10-L

The blank spaces shown above indicate that the insulation is not made standard in the thicknesses for that particular tubing size.

UCC 003432

EXTERNAL AREAS OF TANKS

TANK DIAMETER	FLAT HEAD AREA (SQ. FT.)	DISHED HEAD AREA (SQ. FT.)	AREA PER L. F. OF CYL. (SQ. FT.)
1'-0"	.79	.84	3.14
1'-6"	1.77	1.89	4.71
2'-0"	3.14	3.37	6.28
2'-6"	4.91	5.21	7.85
3'-0"	7.07	7.56	9.43
3'-6"	9.62	10.30	11.00
4'-0"	12.57	13.45	12.57
4'-6"	15.90	17.05	14.14
5'-0"	19.64	21.10	15.71
5'-6"	23.76	25.50	17.28
6'-0"	28.27	30.20	18.85
6'-6"	33.17	35.60	20.42
7'-0"	38.49	41.30	21.99
7'-6"	44.16	47.50	23.56
8'-0"	50.27	53.85	25.13
8'-6"	56.75	60.65	26.70
9'-0"	63.62	68.10	28.27
9'-6"	70.88	76.00	29.85
10'-0"	78.54	84.15	31.42
10'-6"	86.59	92.71	32.99
11'-0"	95.03	101.89	34.56
11'-6"	103.87	111.22	36.13

TANK DIAMETER	FLAT HEAD AREA (SQ. FT.)	DISHED HEAD AREA (SQ. FT.)	AREA PER L. F. OF CYL. (SQ. FT.)
12'-0"	113.10	121.18	37.70
12'-6"	122.72	131.49	39.27
13'-0"	132.73	142.22	40.84
13'-6"	143.14	153.36	42.41
14'-0"	153.94	164.94	43.98
14'-6"	165.13	176.93	45.55
15'-0"	176.31	189.34	47.12
15'-6"	188.69	202.18	48.70
16'-0"	201.06	215.43	50.27
16'-6"	213.83	..	51.84
17'-0"	226.98	..	53.41
17'-6"	240.53	..	54.98
18'-0"	254.47	..	56.55
18'-6"	268.80	..	58.12
19'-0"	283.53	..	59.69
19'-6"	298.65	..	61.26
20'-0"	314.16	..	62.83
21'-0"	346.36	..	65.97
22'-0"	380.13	..	69.11
23'-0"	415.58	..	72.26
24'-0"	450.79	..	75.40
25'-0"	490.86	..	78.54

NOTE: Areas listed above are approximate and should be used accordingly.

UCC 003433

EXTERNAL AREAS OF INSULATED FLANGES

(Square Feet Per Flange)

NOM. PIPE SIZE (INCHES)	O. D. FLANGE (INCHES)	INSULATION THICKNESS										
		1	1-½	2	2-½	3	3-½	4	4-½	5	5-½	6
½	3-½	1.1	1.3	1.5	2.2	2.5	2.7	3.8	4.1	4.4	5.7	6.1
¾	3-⅞	1.2	1.3	1.5	2.3	2.6	2.8	3.9	4.2	4.5	5.8	6.2
1	4-¼	1.2	1.4	2.2	2.4	2.7	3.7	4.0	4.3	5.6	6.0	6.4
1-¼	4-⅝	1.3	1.5	2.3	2.5	2.8	3.8	4.2	4.5	5.7	6.1	6.5
1-½	5	1.4	2.1	2.4	2.6	3.6	3.9	4.3	5.5	5.9	6.3	7.8
2	6	1.6	2.4	2.6	2.9	3.9	4.2	4.6	5.9	6.3	6.7	8.3
2-½	7	2.4	2.6	2.9	3.9	4.2	4.6	5.9	6.3	6.7	8.2	8.7
3	7-½	2.5	2.8	3.0	4.1	4.4	4.8	6.1	6.5	6.9	8.5	8.9
3-½	8-½	2.8	3.0	3.3	4.4	4.8	6.1	6.5	6.9	8.5	8.9	9.4
4	9	2.9	3.1	4.2	4.6	4.9	6.3	6.7	7.1	8.7	9.2	9.6
5	10	3.1	3.4	4.6	4.9	5.2	6.7	7.1	7.4	9.2	9.6	10.1
6	11	3.4	3.7	5.0	5.3	5.6	7.1	7.4	7.9	9.6	10.1	10.5
8	13-½	4.1	5.4	5.7	6.1	7.7	8.1	8.5	10.3	10.8	11.2	13.4
10	16	4.7	6.2	6.5	6.9	8.6	9.0	9.4	11.5	11.9	12.4	14.7
12	19	6.9	7.2	7.5	9.4	9.8	10.2	12.4	12.8	13.3	15.7	16.2
14	21	7.5	7.9	8.2	10.2	10.6	11.1	13.3	13.7	14.2	16.8	17.3
16	23-½	8.4	8.7	10.8	11.2	11.6	14.0	14.4	14.9	17.5	18.1	18.6
18	25	8.8	11.0	11.4	11.8	14.2	14.7	15.1	17.8	18.3	18.8	21.8
20	27-½	9.7	12.0	12.4	12.8	15.4	15.8	16.2	19.1	19.6	20.2	23.2
24	32	13.4	13.7	14.1	17.0	17.4	17.9	21.0	21.6	22.0	25.3	25.9

NOTE: Areas listed above are approximate and should be used accordingly.

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EXTERNAL AREAS OF INSULATED FITTINGS

(Square Feet Per Fitting)

NOM. PIPE SIZE (INCHES)	INSULATION THICKNESS										
	1	1-½	2	2-½	3	3-½	4	4-½	5	5-½	6
½	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.3	0.4	0.4
¾	0.1	0.2	0.2	0.2	0.3	0.3	0.4	0.4	0.4	0.5	0.5
1	0.2	0.2	0.3	0.3	0.4	0.4	0.5	0.5	0.6	0.6	0.7
1-¼	0.2	0.3	0.4	0.4	0.5	0.6	0.6	0.7	0.7	0.8	0.9
1-½	0.3	0.4	0.5	0.5	0.6	0.7	0.8	0.8	0.9	1.0	1.1
2	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5
2-½	0.6	0.8	0.9	1.0	1.1	1.3	1.4	1.5	1.6	1.8	1.9
3	0.8	1.0	1.2	1.3	1.5	1.6	1.8	1.9	2.1	2.2	2.4
3-½	1.1	1.3	1.4	1.6	1.8	2.0	2.1	2.3	2.5	2.7	2.9
4	1.3	1.5	1.7	1.9	2.1	2.3	2.6	2.8	3.0	3.2	3.4
4-½	1.6	1.8	2.1	2.3	2.5	2.8	3.0	3.2	3.4	3.7	3.9
5	1.9	2.2	2.5	2.7	3.0	3.2	3.5	3.7	4.0	4.2	4.5
6	2.6	3.0	3.3	3.6	3.9	4.2	4.5	4.8	5.1	5.4	5.7
7	3.4	3.8	4.2	4.5	4.9	5.2	5.6	5.9	6.3	6.7	7.0
8	4.3	4.8	5.2	5.6	6.0	6.4	6.8	7.2	7.6	8.0	8.4
9	5.3	5.8	6.3	6.7	7.2	7.6	8.1	8.6	9.0	9.5	9.9
10	6.5	7.0	7.5	8.0	8.5	9.1	9.6	10.1	10.6	11.1	11.6
12	9.0	9.7	10.3	10.9	11.5	12.1	12.7	13.3	13.9	14.6	15.2
14	11.4	12.1	12.9	13.6	14.3	15.0	15.7	16.4	17.2	17.9	18.6
16	14.7	15.5	16.3	17.1	18.0	18.8	19.6	20.4	21.2	22.0	22.8
18	18.4	19.3	20.2	21.1	22.0	23.0	23.9	24.8	25.7	26.6	27.5
20	22.4	23.5	24.5	25.5	26.5	27.6	28.6	29.6	30.6	31.6	32.6
22	27.0	28.1	29.2	30.3	31.4	32.6	33.7	34.8	35.9	37.0	38.1
24	31.8	33.0	34.2	35.5	36.7	38.0	39.2	40.4	41.7	42.9	44.1

NOTE: Areas listed above are approximate and should be used accordingly.

EXTERNAL AREA OF INSULATED PIPE

(Square Feet Per Lineal Foot)

NOM. PIPE SIZE (INCHES)	AREA OF BARE PIPE PER L. P. (SQ. FT.)	INSULATION THICKNESS																
		1	1-½	2	2-½	3	3-½	4	4-½	5	5-½	6	6-½	7	7-½	8	8-½	9
⅛	.106	0.7	0.9	1.2	1.5	1.7	2.0	2.2	2.5	2.8	3.0	3.3	3.5	3.8	4.1	4.3	4.6	4.9
¼	.141	0.7	1.0	1.2	1.5	1.8	2.0	2.3	2.5	2.8	3.1	3.3	3.6	3.9	4.1	4.3	4.6	4.9
⅜	.177	0.7	1.0	1.3	1.5	1.8	2.0	2.3	2.6	2.8	3.1	3.4	3.6	3.9	4.2	4.4	4.7	4.9
½	.220	0.8	1.0	1.3	1.6	1.8	2.1	2.4	2.6	2.9	3.1	3.4	3.7	3.9	4.2	4.4	4.7	5.0
¾	.275	0.8	1.1	1.4	1.6	1.9	2.1	2.4	2.7	2.9	3.2	3.5	3.7	4.0	4.2	4.5	4.8	5.0
1	.344	0.9	1.2	1.4	1.7	2.0	2.2	2.5	2.7	3.0	3.3	3.5	3.8	4.0	4.3	4.6	4.8	5.1
1-¼	.435	1.0	1.3	1.5	1.8	2.0	2.3	2.6	2.8	3.1	3.4	3.6	3.9	4.1	4.4	4.7	4.9	5.2
1-½	.498	1.1	1.3	1.6	1.8	2.1	2.4	2.6	2.9	3.2	3.4	3.7	3.9	4.2	4.5	4.7	5.0	5.2
2	.622	1.2	1.4	1.7	2.0	2.2	2.5	2.8	3.0	3.3	3.5	3.8	4.1	4.3	4.6	4.8	5.1	5.4
2-½	.753	1.3	1.6	1.8	2.1	2.4	2.6	2.9	3.1	3.4	3.7	3.9	4.2	4.5	4.7	5.0	5.2	5.5
3	.917	1.5	1.7	2.0	2.3	2.5	2.8	3.0	3.3	3.6	3.8	4.1	4.4	4.6	4.9	5.1	5.4	5.7
3-½	1.047	1.6	1.9	2.1	2.4	2.7	2.9	3.2	3.4	3.7	4.0	4.2	4.5	4.8	5.0	5.3	5.6	5.8
4	1.178	1.7	2.0	2.3	2.5	2.8	3.0	3.3	3.6	3.8	4.1	4.4	4.6	4.9	5.1	5.4	5.7	5.9
4-½	1.389	1.9	2.1	2.4	2.7	2.9	3.2	3.4	3.7	4.0	4.2	4.5	4.8	5.0	5.3	5.5	5.8	6.1
5	1.456	2.0	2.3	2.5	2.8	3.1	3.3	3.6	3.8	4.1	4.4	4.7	4.9	5.2	5.4	5.7	5.9	6.2
6	1.734	2.3	2.6	2.8	3.1	3.3	3.6	3.9	4.1	4.4	4.7	4.9	5.2	5.4	5.7	6.0	6.2	6.5
7	1.996	2.6	2.8	3.1	3.3	3.6	3.9	4.1	4.4	4.7	4.9	5.2	5.4	5.7	6.0	6.2	6.5	6.7
8	2.257	2.8	3.1	3.3	3.6	3.9	4.1	4.4	4.7	4.9	5.2	5.4	5.7	6.0	6.2	6.5	6.7	7.0
9	2.519	3.1	3.4	3.6	3.9	4.1	4.4	4.7	4.9	5.2	5.4	5.7	6.0	6.2	6.5	6.7	7.0	7.3
10	2.817	3.4	3.6	3.9	4.1	4.4	4.7	4.9	5.2	5.4	5.7	6.0	6.3	6.5	6.7	7.0	7.3	7.6
11	3.973	3.6	3.9	4.1	4.4	4.7	4.9	5.2	5.4	5.7	6.0	6.3	6.5	6.7	7.0	7.3	7.6	7.8
12	3.337	3.9	4.2	4.4	4.7	4.9	5.2	5.4	5.7	6.0	6.3	6.5	6.7	7.0	7.3	7.6	7.8	8.1
14	3.663	4.2	4.5	4.8	5.0	5.3	5.5	5.8	6.1	6.3	6.6	6.8	7.1	7.4	7.6	7.9	8.2	8.4
16	4.188	4.8	5.0	5.3	5.5	5.8	6.1	6.3	6.6	6.8	7.1	7.4	7.6	7.9	8.2	8.4	8.7	8.9
18	4.716	5.3	5.5	5.8	6.1	6.3	6.6	6.8	7.1	7.4	7.6	7.9	8.2	8.4	8.7	8.9	9.2	9.5
20	5.235	5.8	6.1	6.3	6.6	6.8	7.1	7.4	7.6	7.9	8.2	8.4	8.7	8.9	9.2	9.5	9.7	10.0
22	5.747	6.3	6.6	6.8	7.1	7.4	7.6	7.9	8.2	8.4	8.7	8.9	9.2	9.5	9.7	10.0	10.2	10.5
24	6.286	6.8	7.1	7.4	7.6	7.9	8.2	8.4	8.7	8.9	9.2	9.5	9.7	10.0	10.2	10.5	10.8	11.0
26	6.807	7.4	7.6	7.9	8.2	8.4	8.7	8.9	9.2	9.5	9.7	10.0	10.2	10.5	10.8	11.0	11.3	11.6
28	7.331	7.9	8.2	8.4	8.7	8.9	9.2	9.5	9.7	10.0	10.2	10.5	10.8	11.0	11.3	11.6	11.8	12.1
30	7.854	8.4	8.7	8.9	9.2	9.5	9.7	10.0	10.2	10.5	10.8	11.0	11.3	11.6	11.8	12.1	12.3	12.6
36	9.425	10.0	10.2	10.5	10.8	11.0	11.3	11.6	11.8	12.1	12.3	12.6	12.9	13.1	13.4	13.7	13.9	14.2

NOTE: Areas listed above are approximate and should be used accordingly.

CIRCUMFERENCES OF INSULATED LINES

(In Lineal Feet)

LINE SIZE (IN.)	INSULATION THICKNESS																
	1	1½	2	2½	3	3½	4	4½	5	5½	6	6½	7	7½	8	8½	9
½	.74	1.0	1.3	1.5	1.8	2.1	2.3	2.6	2.8	3.1	3.4	3.6	3.9	4.2	4.4	4.7	4.9
¾	.80	1.1	1.3	1.6	1.9	2.1	2.4	2.7	2.9	3.2	3.4	3.7	4.0	4.2	4.5	4.8	5.0
1	.90	1.1	1.4	1.7	1.9	2.2	2.4	2.7	3.0	3.2	3.5	3.7	4.0	4.3	4.5	4.8	5.1
1½	1.0	1.3	1.5	1.8	2.1	2.3	2.6	2.9	3.1	3.4	3.6	3.9	4.2	4.4	4.7	4.9	5.2
2	1.1	1.4	1.7	1.9	2.2	2.5	2.7	3.0	3.2	3.5	3.8	4.0	4.3	4.6	4.8	5.1	5.4
2½	1.3	1.5	1.8	2.1	2.3	2.6	2.9	3.1	3.4	3.6	3.9	4.2	4.4	4.7	4.9	5.2	5.5
3	1.4	1.7	2.0	2.2	2.5	2.8	3.0	3.3	3.5	3.8	4.1	4.3	4.6	4.8	5.1	5.4	5.6
3½	1.6	1.8	2.1	2.4	2.6	2.9	3.1	3.4	3.7	3.9	4.2	4.4	4.7	5.0	5.2	5.5	5.8
4	1.7	2.0	2.2	2.5	2.8	3.0	3.3	3.5	3.8	4.1	4.3	4.6	4.8	5.1	5.4	5.6	5.9
6	2.3	2.5	2.8	3.0	3.3	3.6	3.8	4.1	4.4	4.6	4.9	5.1	5.4	5.7	5.9	6.2	6.5
8	2.8	3.0	3.3	3.6	3.8	4.1	4.4	4.6	4.9	5.1	5.4	5.7	5.9	6.2	6.5	6.7	7.0
10	3.3	3.6	3.9	4.1	4.4	4.7	4.9	5.2	5.4	5.7	6.0	6.2	6.5	6.7	7.0	7.3	7.5
12	3.9	4.1	4.4	4.7	4.9	5.2	5.4	5.7	5.9	6.2	6.5	6.7	7.0	7.3	7.5	7.8	8.0
14	4.2	4.5	4.7	5.0	5.2	5.5	5.8	6.0	6.3	6.5	6.8	7.1	7.3	7.6	7.9	8.1	8.4
16	4.7	5.0	5.2	5.5	5.8	6.0	6.3	6.6	6.8	7.1	7.3	7.6	7.8	8.1	8.4	8.7	8.9
18	5.2	5.5	5.8	6.0	6.3	6.5	6.8	7.1	7.3	7.6	7.9	8.1	8.4	8.7	8.9	9.2	9.4
20	5.8	6.0	6.3	6.6	6.8	7.1	7.3	7.6	7.9	8.1	8.4	8.6	8.9	9.2	9.4	9.7	9.9
22	6.3	6.6	6.8	7.1	7.3	7.6	7.9	8.1	8.4	8.6	8.9	9.2	9.4	9.7	9.9	10.2	10.4
24	6.8	7.1	7.3	7.6	7.9	8.1	8.4	8.6	8.9	9.2	9.4	9.7	9.9	10.2	10.4	10.7	11.0
26	7.3	7.6	7.9	8.1	8.4	8.6	8.9	9.2	9.4	9.7	9.9	10.2	10.4	10.7	11.0	11.3	11.5
28	7.9	8.1	8.4	8.6	8.9	9.2	9.4	9.7	9.9	10.2	10.4	10.7	11.0	11.3	11.5	11.8	12.0
30	8.4	8.6	8.9	9.2	9.4	9.7	9.9	10.2	10.4	10.7	11.0	11.3	11.5	11.8	12.0	12.3	12.6
32	8.9	9.2	9.4	9.7	9.9	10.2	10.4	10.7	11.0	11.3	11.5	11.8	12.0	12.3	12.6	12.8	13.1
34	9.4	9.7	9.9	10.2	10.4	10.7	11.0	11.3	11.5	11.8	12.0	12.3	12.6	12.8	13.1	13.3	13.6
36	9.9	10.2	10.4	10.7	11.0	11.3	11.5	11.8	12.0	12.3	12.6	12.8	13.1	13.3	13.6	13.9	14.2

NOTE: The circumferences listed above are approximate and should be used accordingly.

GENERAL NOTES

1 - On all exposed water lines which are being coated to prevent drip, use cork filled Vimasco WC-1 or cork filled Benjamin-Foster #30-70. Apply wet coat approximately 1/4" thick to a clean dry surface that has been properly primed with Red Lead or Arco "Synite Chromate" Primer. This coat will cure out approximately 3/16" thick.

2 - All underground (buried) lines in water, oil, chemical or gas service are to be coated with two layers of Bitumastic #50. Each layer to be applied at a rate of 55-70 square feet per gallon. Total dry film thickness to be approximately 1/32" (approximately 30 mils). For additional information refer to Koppers Company Bulletin #TP-05-107-R4-39.

3 - All valve, flange, and fitting coverings are to be shop pre-fabricated whenever practical. On routine maintenance jobs it is not normally practical to pre-fabricate small screwed valve and fitting coverings. These should be either field fabricated or insulating cement applied instead of insulation material. For information on valve, flange, and fitting coverings larger than 24 inch pipe size and which are not shown in the Fabrication Manual, please contact the Works Engineering Department - attention of W. H. Onks.

4 - On vessels larger than twenty (20) feet in diameter, use 3/4" wide x .020" thick x Type 304 SS bands. When banding a piece of equipment (tank or other) a single piece of band should never exceed fifteen (15) feet in length. If the circumference exceeds fifteen (15) feet the band must be put on in two pieces, etc.

5 - Weathercoating material listed has a polyvinyl acetate base and freezing when applied will ruin their usefulness. In no case should they be applied in freezing weather unless they are adequately protected from freezing for a minimum of twelve (12) hours from the time of application. Also, these polyvinyl acetate weathercoating materials are subject to "washing" when exposed to direct rainfall. They must be protected from direct rainfall for a minimum of two (2) hours from the time of application. These polyvinyl acetate materials must not be stored where they would be subject to freezing and during freezing weather should never be delivered to a job site and left exposed to freezing temperature while awaiting application.

These polyvinyl acetate weathercoating materials are to be applied approximately 3/32" thick over reinforcing mesh and will "cure out" approximately 1/16" thick. The average coverage when applied as above is approximately seventeen (17) square feet per gallon.

5 - (Continued)

These polyvinyl acetate weathercoating materials come in any color that may be desired for the specific job and care should be taken to order the proper color for the finished job. Painting is not required regardless of the color used. However, to date a satisfactory red pigment has not been found for this material. Red will fade in a rather short interval of time.

6 - On lines larger than from ten (10) to twelve (12) inches in diameter (outside of insulation), spraying, brushing, troweling, or palming may be used as applicable for the particular weathercoating application. On lines smaller than from ten (10) to twelve (12) inches in diameter (outside of insulation), palming is the preferred method of application. Spraying is not practical except where a fairly large area is to be coated - say a group of lines, a large single line, or a fairly large piece of equipment. Care should be taken when spraying so that overspray will not coat surrounding surfaces that are not to be weathercoated.

The preferred spray gun for applying these polyvinyl acetate weathercoating materials is as follows:

Make:	Grace
Spray Gun Model:	204000
Series of Gun:	5A5
Spray Head:	1/4" Grace #160-224

7 - Disregard all sections of the Master Specifications that refer to indoor finishes. The Institute Plant will use polyvinyl acetate material as the external coating on all insulation for all services both indoors and outdoors.

8 - Please contact the Works Engineering Department - attention W. H. Onks - for permission to use any alternate i.e. any material not called for in the specifications.