PLAINTIFF'S EXHIBIT

UC-2365

SPECIFICATIONS
THERMAL INSULATION

SOUTH CHARLESTON PLANT

UCC 003346

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Temperature Conversion

−459.4 to 0			1 to 60			61 to 290			300 to 890			900 to 3000		
C	C / F	F	C	C / F	F	C	C / F	F	C	C / F	F	C	C / F	F
−273	−459.4		−17.2	1	33.8	16.1	61	141.8	149	300	572	482	900	1652
−268	−450		−16.7	2	35.6	16.7	62	143.6	154	310	590	488	910	1670
−262	−440		−16.1	3	37.4	17.2	63	145.4	160	320	608	493	920	1688
−257	−430		−15.6	4	39.2	17.8	64	147.2	166	330	626	499	930	1706
−251	−420		−15.0	5	41.0	18.3	65	149.0	171	340	644	504	940	1724
−246	−410		−14.4	6	42.8	18.9	66	150.8	177	350	662	510	950	1742
−240	−400		−13.9	7	44.6	19.4	67	152.6	182	360	680	516	960	1760
−234	−390		−13.3	8	46.4	20.0	68	154.4	188	370	698	521	970	1778
−229	−380		−12.8	9	48.2	20.6	69	156.2	193	380	716	527	980	1796
−223	−370		−12.2	10	50.0	21.1	70	158.0	199	390	734	532	990	1814
−218	−360		−11.7	11	51.8	21.7	71	159.8	204	400	752	538	1000	1832
−212	−350		−11.1	12	53.6	22.2	72	161.6	210	410	770	549	1020	1868
−207	−340		−10.6	13	55.4	22.8	73	163.4	216	420	788	560	1040	1904
−201	−330		−10.0	14	57.2	23.3	74	165.2	221	430	806	571	1060	1940
−196	−320		− 9.4	15	59.0	23.9	75	167.0	227	440	824	582	1080	1976
−190	−310		− 8.9	16	60.8	24.4	76	168.8	232	450	842	593	1100	2012
−184	−300		− 8.3	17	62.6	25.0	77	170.6	238	460	860	604	1120	2048
−179	−290		− 7.8	18	64.4	25.6	78	172.4	243	470	878	616	1140	2084
−173	−280		− 7.2	19	66.2	26.1	79	174.2	249	480	896	627	1160	2120
−169	−273	−459.4	− 6.7	20	68.0	26.7	80	176.0	254	490	914	638	1180	2156
−168	−270	−454	− 6.1	21	69.8	27.2	81	177.8	260	500	932	649	1200	2192
−162	−260	−436	− 5.6	22	71.6	27.8	82	179.6	266	510	950	660	1220	2228
−157	−250	−418	− 5.0	23	73.4	28.3	83	181.4	271	520	968	671	1240	2264
−151	−240	−400	− 4.4	24	75.2	28.9	84	183.2	277	530	986	682	1260	2300
−146	−230	−382	− 3.9	25	77.0	29.4	85	185.0	282	540	1004	693	1280	2336
−140	−220	−364	− 3.3	26	78.8	30.0	86	186.8	288	550	1022	704	1300	2372
−134	−210	−346	− 2.8	27	80.6	30.6	87	188.6	293	560	1040	732	1350	2462
−129	−200	−328	− 2.2	28	82.4	31.1	88	190.4	299	570	1058	760	1400	2552
−123	−190	−310	− 1.7	29	84.2	31.7	89	192.2	304	580	1076	788	1450	2642
−118	−180	−292	− 1.1	30	86.0	32.2	90	194.0	310	590	1094	816	1500	2732
−112	−170	−274	− .6	31	87.8	32.8	91	195.8	316	600	1112	843	1550	2822
−107	−160	−256	0	32	89.6	33.3	92	197.6	321	610	1130	871	1600	2912
−101	−150	−238	.6	33	91.4	33.9	93	199.4	327	620	1148	899	1650	3002
− 96	−140	−220	1.1	34	93.2	34.4	94	201.2	332	630	1166	927	1700	3092
− 90	−130	−202	1.7	35	95.0	35.0	95	203.0	338	640	1184	954	1750	3182
− 84	−120	−184	2.2	36	96.8	35.6	96	204.8	343	650	1202	982	1800	3272
− 79	−110	−166	2.8	37	98.6	36.1	97	206.6	349	660	1220	1010	1850	3362
− 73	−100	−148	3.3	38	100.4	36.7	98	208.4	354	670	1238	1038	1900	3452
− 68	− 90	−130	3.9	39	102.2	37.2	99	210.2	360	680	1256	1066	1950	3542
− 62	− 80	−112	4.4	40	104.0	37.8	100	212.0	366	690	1274	1093	2000	3632
− 57	− 70	− 94	5.0	41	105.8	43	110	230	371	700	1292	1121	2050	3722
− 51	− 60	− 76	5.6	42	107.6	49	120	248	377	710	1310	1149	2100	3812
− 46	− 50	− 58	6.1	43	109.4	54	130	266	382	720	1328	1177	2150	3902
− 40	− 40	− 40	6.7	44	111.2	60	140	284	388	730	1346	1204	2200	3992
− 34	− 30	− 22	7.2	45	113.0	66	150	302	393	740	1364	1232	2250	4082
− 29	− 20	− 4	7.8	46	114.8	71	160	320	399	750	1382	1260	2300	4172
− 23	− 10	14	8.3	47	116.6	77	170	338	404	760	1400	1288	2350	4262
− 17.8	0	32	8.9	48	118.4	82	180	356	410	770	1418	1316	2400	4352
			9.4	49	120.2	88	190	374	416	780	1436	1343	2450	4441
			10.0	50	122.0	93	200	392	421	790	1454	1371	2500	4532
			10.6	51	123.8	99	210	410	427	800	1472	1399	2550	4622
			11.1	52	125.6	100	212	413.6	432	810	1490	1427	2600	4712
			11.7	53	127.4	104	220	428	438	820	1508	1454	2650	4802
			12.2	54	129.2	110	230	446	443	830	1526	1482	2700	4892
			12.8	55	131.0	116	240	464	449	840	1544	1510	2750	4982
			13.3	56	132.8	121	250	482	454	850	1562	1538	2800	5072
			13.9	57	134.6	127	260	500	460	860	1580	1566	2850	5162
			14.4	58	136.4	131	270	518	466	870	1598	1593	2900	5252
			15.0	59	138.2	138	280	536	471	880	1616	1621	2950	5342
			15.6	60	140.0	143	290	554	477	890	1634	1649	3000	5432

Locate temperature in middle column. If in degrees Centigrade, read Fahrenheit equivalent in right hand column; if in degrees Fahrenheit, read Centigrade equivalent in left hand column.

Abstracted from "Bethlehem Alloy Steels". (Albert Sauveur type of table. Values revised.) Courtesy Bethlehem Steel Company.

UCC 003347

INTERNAL CORRESPONDENCE

CARBIDE AND CARBON CHEMICALS COMPANY

A DIVISION OF
UNION CARBIDE AND CARBON CORPORATION

LOCATION 514 – SOUTH CHARLESTON 3, W. VA.

TO

LOCATION

DATE October 9, 1956

ANSWERING LETTER DATE

ATTENTION

COPIES TO

SUBJECT Thermal Insulation Specifications

Originating Dept.: Works Engineering

Dear Sir:

Attached you will find a copy of the tentative Thermal Insulation Specifications for the South Charleston Plant. These specifications have been made up so that insulation in this plant can be installed in a uniform manner, using material available in Stores. Stores stock of insulating materials, cements, etc. is being changed to accommodate these new specifications. All necessary new materials will be added to the Stores stock.

Please understand that this does not constitute a formal issue of this book because it is incomplete in its present form. However, these specifications are complete enough, in their present form, so that the information can be used to advantage while the specifications are being put in their final form for formal issue. These specifications should be complete by December 1, 1956 and at that time will be issued formally.

If you have any questions regarding any of the foregoing, please contact the writer.

Very truly yours,

A. R. Giles

A. R. Giles.

ARG/ra

Attachment

UCC 003348

INSTITUTE PLANT

THERMAL INSULATION SPECIFICATIONS

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Union Carbide trial exhibit UC-2365: Thermal Insulation Specifications for the South Charleston Plant, with A. R. Gil... Published by AsbestosClaims.Law
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Service	Minimum Temp.°F	Insulation Specification	Page No.
All Cold Temperature Service, Chemicals and Gas, Except Ethylene Oxide			
A - Down to 32°F (0°C)	32	10-L	25
B - Down to -4°F (-20°C)	-4	10-L	26
C - Down to -40°F (-40°C)	-40	10-L	27
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THERMAL INSULATION SPECIFICATIONS

MATERIALS AND APPLICATION SPECIFICATIONS

IN NUMERICAL ORDER

I - ALL MATERIALS:

General Specifications

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 800°F and a cushioning blanket is required. 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 800°F and a cushioning blanket is not required. 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 thaw-out service up to 400°F. It is applicable to both indoor and outdoor service.

III - CALCIUM SILICATE, STANDARD:

20-H - Material and Application Specification for standard 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 - Spec. 21-H covers piping only. For equipment requiring insulation use Spec. 20-H.

V - CALCIUM SILICATE, HIGH TEMPERATURE:

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.

VI - CALCIUM SILICATE, HIGH TEMPERATURE:

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.

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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	Standard 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 Ruberied	Calcium Silicate Thermobestos Kaytherm Tri-Calite Kayle 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 #750	32 32	750 750
	Calcium Silicate (Block Covering Only)	Calcium silicate same as Spec. 20-H above.	See Spec. 20 above	See Spec. 20-H above		
28-H 28-H	High Temperature 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	Kayle - 20	100	2000

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ALL BOILER WATER & SHUT GATE MAINS - UNDERGROUND SERVICE UP TO 850 °F

INSULATION SPECIFICATION NO.: 20-H

MAXIMUM PIPE TEMP. FOR THIS SPEC.: 850 °F

PIPE SIZE (IN.)	INSULATION MATERIAL	THICKNESS (IN.)	NO. LAYERS	FINISH	WIRE	BAND	REINF.	MAINTENANCE	JACKET
1/2	CALCIUM SILICATE (STD.)	1	1	FLD. FAB. or INS. CONT.	18 (0.048") 19 TYPE 304 S.S. SOFT ANNEALED	NONE	GLASS FABRIC (1 x 10 MESH)	VINYLITE MOLD OR EQUAL	FALP
3/4		1	1						
1		1	1						
1-1/2		1	1						
2		1	1	SHOP PRE-FAB	SEE GENERAL SPECIFICATION, PAGES [illegible] AND [illegible] FOR SPACING				
2-1/2		1	1						
3		1	1						
3-1/2		1	1						
4		1	1		NONE	1/2" WIDE x .020" THICK x TYPE 304 SS			
5		1-1/2	1						
6		1-1/2	1						
8		1-1/2	1						
10		1-1/2	1						
12		1-1/2	1						
14		1-1/2	1						
16		1-1/2	1						
18		1-1/2	1						
20		1-1/2	1						
22		1-1/2	1						
24		1-1/2	1						
26		1-1/2	1						
28		1-1/2	1						
30		1-1/2	1						
32		1-1/2	1						
34		1-1/2	1						
36		1-1/2	1						
[illegible]	[illegible]	1-1/2	1	CUT FOR SIZE "Extra" (See "AA")	See SPEC. 20-H, PAGE A, FOR CLASS "A"	See SPEC. 20-H, PAGE A, FOR CLASS "A"			

EQUIPMENT AND PIPING ACCESSORIES:

a) Clips - 1/2" double pronged Type 304 SS, A. J. Garrard or approved alternate.
b) Fabricating Cement - North American Refractories Co., "Narcoset", A. P. Green Fire Brick Co. "Insulation Adhesive", J. E. 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 - Block, 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 - Block, 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 ga.e, galvanized after weaving.
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)

INSUL. N Specification No.: 20-H
Page N. Insul. N. This Sheet: 391 97

1/2	CALCIUM SILICATE (STD.)	1	1	FLD. FAB. or INS. CONT.	[illegible] TYPE 304 SS SOFT ANNEALED	NONE			SALT
3/4		1	1						
1		1	1						
1-1/2		1	1						
2		1	1		SEE GENERAL SPECIFICATION, PAGES [illegible] AND [illegible] FOR SPACING				
2-1/2		1	1	SHOP PRE-FAB					
3		1	1						
3-1/2		1	1						
4		1	1		NONE	1/2" WIDE x .020" THICK x TYPE 304 SS			
5		1-1/2	1						
6		1-1/2	1						
7		1-1/2	1						
12		1-1/2	1						
14		1-1/2	1						
16		1-1/2	1						
18		1-1/2	1	SEE [illegible]					
20		1-1/2	1						
22		1-1/2	1						
24		1-1/2	1						
26		1-1/2	1						
28		2	1						
30		2	1	SEE GENERAL NOTE [illegible]					
32		2	1						
34		2	1						
36		2	1						
EQUIPMENT (FLAT or [illegible]		2	1	CUT FOR SIZE REQ'D. (FAB. MAN.)	SEE SPEC. 20-H, PAGE #, FOR CLARITY	SEE SPEC. 20-H, PAGE #, and GEN. NOTE [illegible]			

EQUIPMENT AND PIPING ACCESSORIES:

a) Clips - 1/2"double pronged Type 304 SS, A. J. Garrard or approved alternate.
b) Fabricating Cement - North American Refractories Co. "Narcoset", A. P. Green Fire Brick Co. "Insulation Adhesive", J. E. Pranes Co. "Pranset", or approved alternate.
c) Insulating Cement - Hydraulic setting, Baldwin-Hill "Powerhouse", Eagle-Picher "One-Coat", or approved alternate.
d) Heat Resistant Sealer - Benjamin-Foster #30-41 or approved alternate.

EQUIPMENT ACCESSORIES ONLY:

a) Mineral Wool Blanket - Blank, 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 - Blank, 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, galvanized after weaving.
d) Finishing Cement - Hard surface, Eagle-Picher #106, J.M. #678, or approved alternate.

PIPING ACCESSORIES ONLY:

a) Finishing Cement - J.M. #852 or approved alternate. (For pipe patching)

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

INSULATION Specification No.: 20-G

Max. Design Temp. This Service: 406 °F

Pipe Size (In.)	Insulation Material	Thickness (In.)	No. Layers	Jacket	Wire	Band	Lagging	Weather Barrier	Finish
1/2	CALCIUM SILICATE (STD.)	1-1/2	1	FLD. FAB. 2 INS. CEM.					SALT
3/4		1-1/2	1	SHOP PRE-FAB					
1		1-1/2	1						
1-1/2		2	1						
2		2	1		NONE	1/2" WIDE x .020" THICK x TYPE 304 S.S.			
2-1/2		2	1						
3		2	1						
3-1/2		2	1						
4		2	1						
6		2	1						
8		2	1						
10		2-1/2	1						
12		2-1/2	1						
14		2-1/2	1						
16		2-1/2	1						
18		2-1/2	1						
20		2-1/2	1						
22		2-1/2	1						
24		2-1/2	1						
26		2-1/2	1						
28		2-1/2	1						
30		2-1/2	1						
32		2-1/2	1						
34		2-1/2	1						
36		2-1/2	1						
EQUIPMENT (FLAT or [illegible])		2-1/2	1	CUT FOR SIZE REQ'D. (MAS. MAN.)	See Spec. 20-H, Page 9, FOR CLARITY	See Spec., 20-H, Page 9, and GEN. NOTE #4			

EQUIPMENT AND PIPING ACCESSORIES:

a) Clips - 1/2" double pronged type 304 SS, A. J. Gerrard or approved alternate.
b) Fabricating Cement - North American Refractories Co. "Narocoset", A. P. Green Fire Brick Co. "Insulation Adhesive", J. M. 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, galvanized after weaving.
d) Finishing Cement - Hard surface, Eagle-Picher #106, J. M. #678 or approved alternate.

PIPING ACCESSORIES ONLY:

a) Finishing Cement - J.F. #852 or approved alternate. (For pipe patching)

UCC 003357

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SERVICE: 400 PSI STEAM

INSULATION SPECIFICATION NO. 20-H

MAXIMUM TEMP. FOR THIS SPEC. 643 °F

LINE SIZE (NOM. I.D.)	INSULATION MATERIAL	THICKNESS REQ'D.	NO. LAYERS	LAYER DATA INNER	LAYER DATA OUTER	VAP. PROOF & FINISH COAT	WIRE (INNER LAYER)	BAND (OUTER LAYER)	REINF. FELT	WIRE MESH REINF.	WIRE MESH REINF.
1/2	CALCIUM SILICATE (STD.)	2	1	NONE	1/2" IPS x 2"	FLD. PAB. or INS. CEM.	18 USSWG(.0475") x TYPE 304 S.S. SOFT ANNEALED	NONE	GLASS FABRIC-10 x 10 MESH/SQ. INCH	WIRASCO MC-1 or EQUIV. POSITIVE LOCK	GALV.
3/4		2	1		3/4" IPS x 2"	SHOP PRE-PAB					
1		2	1		1" IPS x 2"						
1-1/2		2-1/2	1		1-1/2" IPS x 2-1/2"		NONE	1/2" WIDE x .020" THICK x TYPE 304 S.S.			
2		2-1/2	1		2" IPS x 2-1/2"						
2-1/2		2-1/2	1		2-1/2" IPS x 2-1/2"						
3		2-1/2	1		3" IPS x 2-1/2"						
3-1/2		2-1/2	1		3-1/2" IPS x 2-1/2"						
4		3	2	4" IPS x 1-1/2"	4" IPS x 1-1/2"		18 USSWG(.0475") x TYPE 304 S.S. SOFT ANNEALED				
6		3	2	6" IPS x 1-1/2"	6" IPS x 1-1/2"						
8		3	2	8" IPS x 1-1/2"	8" IPS x 1-1/2"						
10		3	2	10" IPS x 1-1/2"	10" IPS x 1-1/2"						
12		3	2	12" IPS x 1-1/2"	12" IPS x 1-1/2"						
14		3	2	14" IPS x 1-1/2"	14" IPS x 1-1/2"						
16		3-1/2	2	16" IPS x 1-1/2"	16" IPS x 2"						
18		3-1/2	2	18" IPS x 1-1/2"	18" IPS x 2"						
20		3-1/2	2	20" IPS x 1-1/2"	20" IPS x 2"						
22		3-1/2	2	22" IPS x 1-1/2"	22" IPS x 2"						
24		3-1/2	2	24" IPS x 1-1/2"	24" IPS x 2"						
26		3-1/2	2	26" IPS x 1-1/2"	26" IPS x 2"						
28		3-1/2	2	28" IPS x 1-1/2"	28" IPS x 2"						
30		3-1/2	2	30" IPS x 1-1/2"	30" IPS x 2"						
32		3-1/2	2	32" IPS x 1-1/2"	32" IPS x 2"						
34		3-1/2	2	34" IPS x 1-1/2"	34" IPS x 2"						
36		3-1/2	2	36" IPS x 1-1/2"	36" IPS x 2"						
[illegible] FLAT or [illegible]		3-1/2	2	1-1/2"	2"	CUT FOR SIZE REQ'D. (FAB. PAN.	SEE SPEC. 20-H, PAGE 5, FOR CLARITY	SEE SPEC. 20-H, PAGE 5, and GEN. NOTE #4			

SEE GENERAL SPECIFICATION, PAGES [illegible] FOR SPACING

SEE GENERAL SPECIFICATION, PAGE [illegible] FOR SPACING

SEE FABRICATION MANUAL

SEE GENERAL NOTE #3

SEE GENERAL NOTE #5

EQUIPMENT AND PIPING & DUCT SURFACES:

a) Clips - 1/2" double pronged Type 304 SS, A. J. Garrard or approved alternate.
b) Fabricating Cement - North American Refractories Co. "Harcoset", 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 - 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, galvanized after weaving.
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)

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SERVICE: 100 PSI SUPERHEATED STEAM AT 820

INSULATION SPECIFICATION NO. 8 SS-H

MAXIMUM TEMP. FOR THIS SERVICE 1200 °F

PIPE SIZE (IN.)	INSULATION MATERIAL	THICKNESS (IN.)	NO. LAYERS	LAYER DATA: INNER	LAYER DATA: MIDDLE	LAYER DATA: OUTER	WIRE & FIT. & FLG. COVER	WIRE (INNER & MIDDLE LAY.)	BAND (OUTER LAYER)	BLANKET MESH	WEATHER-PROOFING MATL.	WEATHER-PROOFING APPL.
1/2	CALCIUM SILICATE (H.T.)	3-1/2	2	1/2" IPS x 1-1/2"	NONE	3-1/2" IPS x 2"	SHOP PRE-FAB	18 USS#0 (.0475") x TYPE 304 SS SOFT ANNEAL	1/2" WIDE x .020" THK. x TYPE 304 SS	GLASS FABRIC - 1C x 1C MESH / STARCH BINDER	VIMASCO MC-1 or BENJAMIN-FOSTER #80-97C	PALP.
3/4		3-1/2	2	3/4" IPS x 1-1/2"		3-1/2" IPS x 2"						
1		4	2	1" IPS x 2"		3" IPS x 2"						
1-1/2		4	2	1-1/2" IPS x 2"		3" IPS x 2"						
2		4-1/2	2	2" IPS x 2"		3" IPS x 2-1/2"						
2-1/2		4-1/2	2	2-1/2" IPS x 2"		3" IPS x 2-1/2"						
3		4-1/2	2	3" IPS x 2"		4" IPS x 2-1/2"						
3-1/2		5	2	3-1/2" IPS x 2-1/2"		5" IPS x 2-1/2"						
4		5	2	4" IPS x 2-1/2"		5" IPS x 2-1/2"						
6		5-1/2	3	6" IPS x 1-1/2"	8" IPS x 2"	14" IPS x 2"						
8		5-1/2	3	8" IPS x 1-1/2"	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"						
16		6	3	16" IPS x 2"	20" IPS x 2"	24" IPS x 2"						
18		6-1/2	3	18" IPS x 2"	22" IPS x 2"	26" IPS x 2-1/2"						
20		6-1/2	3	20" IPS x 2"	24" IPS x 2"	28" IPS x 2-1/2"						
22		6-1/2	3	22" IPS x 2"	26" IPS x 2"	30" IPS x 2-1/2"						
24		6-1/2	3	24" IPS x 2"	28" IPS x 2"	32" IPS x 2-1/2"						
26		6-1/2	3	26" IPS x 2"	30" IPS x 2"	34" IPS x 2-1/2"						
28		6-1/2	3	28" IPS x 2"	32" IPS x 2"	36" IPS x 2-1/2"						
30		7	3	30" IPS x 2"	34" IPS x 2"	39" IPS x 2-1/2"						
32		7	3	32" IPS x 2"	36" IPS x 2-1/2"	41" IPS x 2-1/2"						
34		7	3	34" IPS x 2"	38" IPS x 2-1/2"	2-1/2"						
36		7	3	36" IPS x 2"	40" IPS x 2-1/2"	2-1/2"						
EQUIPMENT (FLAT or OVER 36")		8	3	2-1/2"	2-1/2"	3"	CUT FOR SIZE REQ'D.	SEE SPEC. 25-H, PAGE 6, PAR. CLARITY	SEE SPEC. 25-H, PAGE 7, and GEN. NOTE #4			

SEE FABRICATION MANUAL

SEE GENERAL NOTE #3

SEE GENERAL SPECIFICATION, PAGES AND , FOR SPACING

SEE GENERAL SPECIFICATION, PAGES AND , FOR SPACING

SEE GENERAL NOTE #5

SEE GENERAL NOTE #6

EQUIPMENT AND PIPING ACCESSORIES:

a) Clips - 1/2" double pronged Type 304 SS, A. J. Garrard or approved alternate.
b) Fabricating Cement - A. P. Green Fire Brick Co. "Insulation Adhesive", J. M. France Co. "Franset" or approved alternate.
c) Insulating Cement - Hydraulic setting, Baldwin-Hill "Superpowerhouse", 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 matting 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 matting on both sides. (To be used on very irregular shapes where metal lath type is not satisfactory.)
c) Wire Matting - One inch, hexagonal mesh, #20 gage, galvanized after weaving.
d) Finishing Cement - Hard surface, Eagle-Picher #116, J.M. #678, or approved alternate.

PIPING ACCESSORIES ONLY:

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

UCC 003359

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SECTION: DOWNTHERM

INSULATION SPECIFICATION NO.: 21-A

MAXIMUM TEMP. FOR THIS SHEET: 715 °F

NOTE:

The temperature at which the downtherm 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. Downtherm 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-64, page 44 of this book. Clamp and spacer details are per Engineering Standard 1-644, page 45 of this book. For information on other sizes of tracers see Engineering Standard P-64.

LINE SIZE (IPS)	INSULATION MATERIAL	THICKNESS (INCHES)	NO. LAYERS	TRACER SIZE	INSULATION DATA: INNER LAYER	INSULATION DATA: OUTER LAYER	VALVE, FITTING & FLG. COVER	WIRE (INNER	BAND (OUTER LAYER)	REINF. FABRIC	WEATHER-PROOFING MATERIAL	WEATHER-PROOFING FINISH
1/2	ASBESTOS FIBER	2-1/2	1	3/8" O.D.	NONE	2" IPS x 2-1/2"	FLD. FAB. SEE INS. SPEC.	18 USS-G (.0475") S TYPE 304 SS SO. ANN.	NONE	GLASS FABRIC-16 x 10 MESH/ STARCH BINDER	WIMASCO MC-1 or BENJAMIN-FOSTER #31-72	PAINT
3/4		2-1/2	1	3/8" O.D.		2-1/4" IPS x 2-1/2"						
1		2-1/2	1	3/8" O.D.		2-1/2" IPS x 2-1/2"	SHOP PRE-FAB					
1-1/2		3	2	3/8" O.D.	2-1/2" IPS x 1-1/2"	5" IPS x 1-1/2"			3/4" WIRE x .062" THICK x 304 SS			
2		3	2	3/8" O.D.	3" IPS x 1-1/2"	6" IPS x 1-1/2"						
2-1/2		3-1/2	2	3/8" O.D.	3-1/2" IPS x 1-1/2"	6" IPS x 2"						
3		3-1/2	2	3/8" O.D.	4" IPS x 1-1/2"	7" IPS x 2"	SEE FABRICATION MANUAL	SEE GENERAL SPECIFICATION, PAGES AND , FOR SPACING	SEE GENERAL SPECIFICATION, PAGES AND , FOR SPACING		SEE GENERAL NOTE #5	
4		3-1/2	2	3/8" O.D.	5" IPS x 1-1/2"	8" IPS x 2"						
6		4	2	3/8" O.D.	7" IPS x 2"	11" IPS x 2"						
8		4	2	3/8" O.D.	10" O.D. x 2"	13" IPS x 2"						
10		4	2	3/8" O.D.	12" O.D. x 2"	17" IPS x 2"						
12		4	2	3/8" O.D.	14" IPS x 2"	18" IPS x 2"						SEE GENERAL NOTE #5
EQUIPMENT (FLAT OR OVAL)	CALCIUM SILICATE (STD)	3	2	—	2-1/2"	3-1/2"	CUT FOR SIZE REQ'D. (FAB. MAN.)	SEE SPEC. PAGE FOR CLARITY	SEE SPEC. PAGE & and GEN. NOTE #5			

EQUIPMENT AND PIPING ACCESSORIES:

a) Clips - 1/2" double pronged Type 304 SS, A. J. Garrard 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 #[illegible] or approved alternate.

EQUIPMENT ACCESSORIES ONLY:

a) Mineral Wool Blanket - Blank, 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 - Blank, 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 gauge, galvanized after weaving.
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)

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SERVICE: TETRALIN

INSULATION SPECIFICATION NO.: 20-H

MAXIMUM TEMP. FOR THIS SERVICE: 535 °F

LINE SIZE (NOM.)	INS. LAYER NO. 1 MATL.	INS. LAYER NO. 2 MATL.	NO. LAYERS	LAYER DATA INNER	LAYER DATA OUTER	VAR. FIT & FLANGE DETAIL	WIRE (INNER LAYER)	BAND (OUTER LAYER)	REINF. FABRIC	WEATHERPROOFING FINISH	WEATHERPROOFING BAND
1/2	CALCIUM SILICATE (STD)	2	1	NONE	1/2" IPS x 2"	FLD. FAB. OR INS. CONT.	18 USSWG (.0478") x TYPE 304 SS SOFT ANNEALED	NONE	GLASS FABRIC 10 x 10 MESH STARCH BINDER	VIMASCO WP-1 or BENJAMIN FOSTER #30-41	PAINT
3/4		2	1		3/4" IPS x 2"	SHOP PRE-FAB					
1		2	1		1" IPS x 2"						
1-1/2		2	1		1-1/2" IPS x 2"						
2		2	1		2" IPS x 2"						
2-1/2		2-1/2	1		2-1/2 IPS x 2-1/2"		NONE	1/2" WIDE X .020" THICK x TYPE 304 SS			
3		2-1/2	1		3" IPS x 2-1/2"						
3-1/2		2-1/2	1		3-1/2" IPS x 2-1/2"						
4		2-1/2	1		4" IPS x 2-1/2"						
6		2-1/2	1		6" IPS x 2-1/2"						
8		3	2	8" IPS x 1-1/2"	11" IPS x 1-1/2"		18 USSWG (.0478") x TYPE 304 SS SOFT ANNEALED				
10		3	2	10" IPS x 1-1/2"	14" IPS x 1-1/2"						
12		3	2	12" IPS x 1-1/2"	16" IPS x 1-1/2"						
14		3	2	14" IPS x 1-1/2"	17" IPS x 1-1/2"						
16		3	2	16" IPS x 1-1/2"	19" IPS x 1-1/2"						
18		3	2	18" IPS x 1-1/2"	21" IPS 1-1/2"						
20		3	2	20" IPS x 1-1/2"	23" IPS x 1-1/2"						
22		3	2	22" IPS x 1-1/2"	25" IPS x 1-1/2"						
24		3	2	24" IPS x 1-1/2"	27" IPS x 1-1/2"						
26		3	2	26" IPS x 1-1/2"	29" IPS x 1-1/2"						
28		3	2	28" IPS x 1-1/2"	31" IPS x 1-1/2"						
30		3	2	30" IPS x 1-1/2"	33" IPS x 1-1/2"						
32		3	2	32" IPS x 1-1/2"	35" IPS x 1-1/2"						
34		3	2	34" IPS x 1-1/2"	37" IPS x 1-1/2"						
36		3	2	36" IPS x 1-1/2"	39" IPS x 1-1/2"						
4-1/2 MIN. FLAT or OVER 36		3-1/2	2	1-1/2"	2"	CUT ON SIZE WELD. (FAB. MAN.)	SEE SPEC. 20-H, PAGE 4, FOR CLARITY	SEE SPEC. 20-H, PAGE 8, and GEN. NOTE #4			

SEE GENERAL SPECIFICATION, PAGES AND , FOR SPACING

SEE GENERAL SPECIFICATION, PAGES AND , FOR SPACING

SEE GENERAL NOTE #5

SEE GENERAL NOTE #5

EQUIPMENT AND PIPING & TANK JACKETS

a) Clips - 1/2" double pronged Type 304 SS, A. J. Garrard or approved alternate.
b) Fabricating Cement - North American Refractories Co. "Narecast", A. P. Green Fire Brick Co. "Insulation Adhesive", J. H. France Co. "Francast", or approved alternate.
c) Insulating Cement - Hydraulic setting, Baldwin-Hill "Powerhouse", Eagle-Picher "One-Coat", or approved alternate.
d) Heat Resistant Sealer - Benjamin-Foster #30-41 or approved alternate.

EQUIPMENT ACCESSORIES ONLY:

a) Mineral Wool Blanket - Block, 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 - Block, 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, galvanized after weaving.
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)

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SERVICE: OIL AND PASTE LINES AT 825

INSULATION SPECIFICATION NO.: 20-H

MAXIMUM TEMP. FOR THIS SPLIT: 750 °F

LINE SIZE (INCHES)	1ST LAYER MATERIAL	OUTSIDE DIA. (INCHES)	NO. LAYERS	LAYER DATA INNER	LAYER DATA OUTER	No., SIZE & TYPE STUDS	PIPE (INNER LAYER)	BAND (OUTER LAYER)	PAINT, FINISH	WEATHERPROOFING MATERIAL	JACKETING MATERIAL
1/2	CALCIUM SILICATE (STD.)	3-1/2	1	NONE	1/2" IPS x 2-1/2"	SHOP PRE-PAD	18 GAGE(.0475") x TYPE 304 SS SOFT ANNEALED	NONE	GLASS FABRIC-1 x 1 FINISH/ STARCH ENAMEL	VIMASCO MC-1 or EQUIVALENT POSITIVE PROTECTION	PAINT
3/4		3-1/2	1		3/4" IPS x 2-1/2"						
1		3-1/2	1		1" IPS x 2-1/2"						
1-1/2		3	2	1-1/2" IPS x 1-1/2"	1-1/2" IPS x 1-1/2"			1/2" WIDE x .020" THICK x TYPE 304 SS			
2		3	2	2" IPS x 1-1/2"	2" IPS x 1-1/2"						
2-1/2		3	2	2-1/2" IPS x 1-1/2"	2" IPS x 1-1/2"						
3		3	2	3" IPS x 1-1/2"	3" IPS x 1-1/2"						
3-1/2		3	2	3-1/2" IPS x 1-1/2"	3" IPS x 1-1/2"						
4		3-1/2	2	4" IPS x 1-1/2"	4" IPS x 2"						
5		3-1/2	2	5" IPS x 1-1/2"	5" IPS x 2"						
6		3-1/2	2	6" IPS x 1-1/2"	6" IPS x 2"						
8		3-1/2	2	8" IPS x 1-1/2"	8" IPS x 2"						
10		3-1/2	2	10" IPS x 1-1/2"	10" IPS x 2"						
12		4	2	12" IPS x 2"	12" IPS x 2"						
14		4	2	14" IPS x 2"	14" IPS x 2"						
16		4	2	16" IPS x 2"	16" IPS x 2"						
18		4	2	18" IPS x 2"	18" IPS x 2"						
20		4	2	20" IPS x 2"	20" IPS x 2"						
22		4	2	22" IPS x 2"	22" IPS x 2"						
24		4	2	24" IPS x 2"	24" IPS x 2"						
26		4	2	26" IPS x 2"	26" IPS x 2"						
28		4	2	28" IPS x 2"	28" IPS x 2"						
30		4	2	30" IPS x 2"	30" IPS x 2"						
32		4-1/2	2	32" IPS x 2"	32" IPS x 2-1/2"						
34		4-1/2	2	34" IPS x 2"	34" IPS x 2-1/2"						
36		4-1/2	2	36" IPS x 2"	36" IPS x 2-1/2"						
SPECIAL EQUIPMENT FLAT or CURVED		4-1/2	2	8"	8-1/2"	SEE SHOP PRE-PAD SIZE & LOCATION MANUAL (FAB. MAN.)	SEE SPEC. 20-H, PAGE 9, FOR CLARITY	SEE SPEC. 20-H, PAGE 9, and GEN. NOTE #4		SEE GENERAL NOTE #5	SEE GENERAL NOTE #6

SEE GENERAL SPECIFICATION, PAGES AND , FOR SPACING

SEE GENERAL SPECIFICATION, PAGES AND , FOR SPACING

EQUIPMENT AND PIPING ACCESSORIES:

a) Clips - 1/2" double pronged Type 304 SS, A. J. Garrard or approved alternate.
b) Fabricating Cement - North American Refractories Co. "Karocoat", A. P. Green Fire Brick Co. "Insulation Adhesive", J. H. Prance Co. "Pranset", 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, galvanized after weaving.
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 003362

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SERVICE: [illegible]

INSULATION SPECIFICATION NO.: 28-H

MAXIMUM TEMP. FOR THIS SPEC.: 1000 °F

PIPE SIZE (IN.)	INSULATION MATERIAL	THICKNESS (IN.)	NO. LAYERS	LAYER DATA: INNER	LAYER DATA: MIDDLE	LAYER DATA: OUTER	VALVE FITTING & FLANGE COVER	WIRE (INNER & MIDDLE LAY.)	BAND (OUTER LAYER)	REINF. MESH	WEATHER-PROOFING MASTIC	WEATHER-PROOFING APPL.
1/2	CALCIUM SILICATE (H.T.)	3	2	1/2" IPS x 1-1/2"	NONE	3-1/2" IPS x 3-1/2"	SHOP PRE-FAB	18 USSWG (.0475") x TYPE 304 SS SOFT ANNEAL	1/2" WIDE x .020" THK x TYPE 304 SS	GLASS FABRIC - 10 x 10 MESH / STARCH BINDER	VIMASCO MC-1 or BENJAMIN-FOSTER 836-70	PALM
3/4		3-1/2	2	3/4" IPS x 1-1/2"		3-1/2" IPS x 2"						
1		3-1/2	2	1" IPS x 1-1/2"		4" IPS x 2"						
1-1/2		4	2	1-1/2" IPS x 2"		5" IPS x 2"						
2		4	2	2" IPS x 2"		6" IPS x 2"						
2-1/2		4	2	2-1/2" IPS x 2"		6" IPS x 2"						
3		4-1/2	2	3" IPS x 2"		7" IPS x 2-1/2"						
3-1/2		4-1/2	2	3-1/2" IPS x 2"		7" IPS x 2-1/2"						
4		4-1/2	2	4" IPS x 2"		8" IPS x 2-1/2"						
5		5	2	5" IPS x 2-1/2"		11" IPS x 2-1/2"						
6		5	2	6" IPS x 2-1/2"		14" IPS x 2-1/2"						
10		5-1/2	3	10" IPS x 1-1/2"	14" IPS x 2"	18" IPS x 2"	SEE FABRICATION MANUAL	SEE GENERAL SPECIFICATION, PAGES AND , FOR SPACING	SEE GENERAL SPECIFICATION, PAGES AND , FOR SPACING		SEE GENERAL NOTE #5	SEE GENERAL NOTE #5
12		5-1/2	3	12" IPS x 1-1/2"	16" IPS x 2"	20" IPS x 2"						
14		5-1/2	3	14" IPS x 1-1/2"	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 x22"	32" IPS x 2"						
26		6	3	26" IPS x 2"	30" IPS x 2"	34" IPS x 2"						
28		6-1/2	3	28" IPS x 2"	32" IPS x 2"	36" IPS x 2-1/2"	SEE GENERAL NOTE #3					
30		6-1/2	3	30" IPS x 2"	34" IPS x 2"	38" IPS x 2-1/2"						
32		6-1/2	3	32" IPS x 2"	36" IPS x 2"	40" IPS x 2-1/2"						
34		6-1/2	3	34" IPS x 2"	38" IPS x 2"	2-1/2"						
36		6-1/2	3	36" IPS x 2"	40" IPS x 2"	2-1/2"						
EQUIPMENT (FLAT or OVER 36")		7-1/2	3	2-1/2"	2-1/2"	2-1/2"	CUT FOR SIZE REQ'D. (FAB. MAN.)	SEE SPEC. 25-H, PAGE #, FOR CLARITY	SEE SPEC. 25-H, PAGE #, and GEN. NOTE #4			

EQUIPMENT AND PIPING ACCESSORIES:

a) Clips - 1/2" double pronged Type 304 SS, A. J. Garrard or approved alternate.
b) Fabricating Cement - A. P. Green Fire Brick Co. "Insulation Adhesive", J. H. Pranse Co. "Pranset" or approved alternate.
c) Insulating Cement - Hydraulic setting, Baldwin-Hill "Superpowerhouse", 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, galvanized after weaving.
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 003363

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INSULATION SPECIFICATION No. 32-H

MAXIMUM TEMP. FOR THIS SPEC'N PIPING: 838 °F EQUIPMENT: 427 °F

LINE SIZE (I.D.)	INSULATION MATERIAL	BLOCK (No.)	No. LAYERS	LAYER DATA INNER	LAYER DATA OUTER	VAP. PROOF FINISH	WIRE	BAND (BOTH LAYERS)	REINF. MAT'L	MASTIC OR CEMENT	BLANKET
1/2	CALCIUM SILICATE (H.T.)	2	2	1/2" IPS x 1"	2-1/2" IPS x 1"	SHOP PRE-FAB	NONE	1/2" WIDE x .020" THICK x TYPE 304 SS	GLASS FABRIC-10 x 10 MESH/ STARCH BINDER	VIMASCO MC-1 or equiv. POSITIVE	FELT
3/4		2	2	3/4" IPS x 1"	2-1/2" IPS x 1"						
1		2	2	1" IPS x 1"	3" IPS x 1"						
1-1/2		2	2	1-1/2" IPS x 1"	3-1/2" IPS x 1"						
2		2	2	2" IPS x 1"	4" IPS x 1"						
2-1/2		2	2	2-1/2" IPS x 1"	4-1/2" IPS x 1"						
3		2	2	3" IPS x 1"	5" IPS x 1"						
3-1/2		2	2	3-1/2" IPS x 1"	5" IPS x 1"						
4		2	2	4" IPS x 1"	6" IPS x 1"						
6		2-1/2	2	6" IPS x 1"	8" IPS x 1-1/2"						
8		3	2	8" IPS x 1-1/2"	11" IPS x 1-1/2"						
10		3	2	10" IPS x 1-1/2"	14" IPS x 1-1/2"						
12		3	2	12" IPS x 1-1/2"	16" IPS x 1-1/2"						
14		3	2	14" IPS x 1-1/2"	17" IPS x 1-1/2"						
16		3	2	16" IPS x 1-1/2"	19" IPS x 1-1/2"						
18		3	2	18" IPS x 1-1/2"	21" IPS x 1-1/2"						
20		3	2	20" IPS x 1-1/2"	23" IPS x 1-1/2"						
22		3	2	22" IPS x 1-1/2"	25" IPS x 1-1/2"						
24		3	2	24" IPS x 1-1/2"	27" IPS x 1-1/2"						
26		3	2	26" IPS x 1-1/2"	29" IPS x 1-1/2"						
28		3	2	28" IPS x 1-1/2"	31" IPS x 1-1/2"						
30		3	2	30" IPS x 1-1/2"	33" IPS x 1-1/2"						
32		3	2	32" IPS x 1-1/2"	35" IPS x 1-1/2"						
34		3	2	34" IPS x 1-1/2"	37" IPS x 1-1/2"						
36		3	2	36" IPS x 1-1/2"	39" IPS x 1-1/2"						
EQUIPMENT (FLAT or CYL. 36")		2	2	1"	1"	CUT FOR SIZE REQ'D. (FAB. MAN.	SEE SPEC. 32-H, PAGE 9, FOR CLARITY	SEE SPEC. 32-H, PAGE 9, and GEN. NOTE #4			

SEE GENERAL NOTE #3

SEE FABRICATION MANUAL

SEE GENERAL SPECIFICATION, PAGES 4 AND 5, FOR SPACING

SEE GENERAL NOTE #5

SEE GENERAL NOTE #6

EQUIPMENT AND PIPING ACCESSORIES:

a) Clips - 1/2" double pronged Type 304 SS, A. J. Garrard or approved alternate.
b) Fabricating Cement - J. H. Prance Co. "Transet" or approved alternate.
c) Insulating Cement - Hydraulic setting, Baldwin-Hill "Superpowerhouse", 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 - Blask, 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 - Blask, 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, galvanized after weaving.
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)

NOTE:

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

UCC 003364

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SERVICE: CARBOMAX

INSULATION SPECIFICATION NO.: 10-J

MAXIMUM TEMP. FOR THIS SERVICE: 855 °F

LINE SIZE (IN.)	INSULATION MATERIAL	THICKNESS (IN.)	NO. LAYERS	JACKET	MIN	BAND	RAIN PROOF	WEATHER-PROOF	STAINLESS STEEL
1/2	CELLULAR GLASS	1	1	SHOP PRE-FAB	1" [illegible] TYPE 304 S.S. SOFT ANNEALED	BAND	GLASS FABRIC 10 x 10 MASH / [illegible] MIN. EA.	VIMASCO WC-1 or BENJAMIN FOSTER [illegible]-70	FAB
1/4		1	1						
1		1	1		SEE GENERAL SPECIFICATION, PAGES AND , FOR SPACING				
1-1/2		1	1						
2		1	1						
2-1/2		1	1						
3		1	1						
3-1/2		1	1						
4		1	1		NONE	1/2" WIDE x .020" THICK x TYPE 304 SS			
6		1-1/2	1						
8		1-1/2	1	SEE FABRICATION MANUAL					
10		1-1/2	1						
12		1-1/2	1			SEE GENERAL SPECIFICATION, PAGES AND , FOR SPACING		SEE GENERAL NOTE #5	
14		1-1/2	1						
16		1-1/2	1						
18		1-1/2	1						
20		1-1/2	1						
22		1-1/2	1						
24		1-1/2	1						
26		1-1/2	1						
28		1-1/2	1						
30		1-1/2	1	SEE GENERAL NOTE #3					
32		1-1/2	1						
34		1-1/2	1						
36		1-1/2	1						SEE GENERAL NOTE #6
EQUIPMENT (FLAT or OVER 36")		1-1/2	1	CUT FOR SIZE REQ'D. (PAS. MAN.)	SEE SPEC. 10-J, PAGE # , FOR CLARITY	SEE SPEC. 10-J, PAGE # , and GEN. NOTE #4			

EQUIPMENT AND PIPING ACCESSORIES

a) Clips - 1/2" double pronged Type 304 SS, A. J. Garrard or approved alternate.
b) Fabricating Cement - Mirasle Adhesive HT-100 up to 500 °F , HTR cement above 500 °F, or approved alternate.
c) Anti-Abrasive Coating - Vinyl, Carlon #500-H up to 400 °F, HTR cement above 400 °F, or approved alternate.
d) Heat Resistant Sealer - Benjamin-Foster #30-43 or approved alternate.
e) Adhesive Cement - Mirasle Adhesive Type H or approved alternate.

EQUIPMENT ACCESSORIES ONLY:

a) Die Cut Strap - 1/4" wide x .020" thick x Type 304 SS 3" finger on 9" centers, A. J. Garrard or approved alternate.

NOTE:

All chemical lines and the 2"-200 PSI steam supply line to the neutralizer jet at the Carbomax 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.

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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 44 of this book. Clamps and spacer details are per Engineering Standard P-844, page 45 of this book. For other sizes see Engineering Standard P-84.

LINE SIZE (IPS)	INSULATION MATERIAL	THICKNESS (IN.)	NO. LAYERS	INSULATION & TRACER DATA: 1/2" O.D. TRACER (PROCESS LINE TEMP.)	3/4" O.D. TRACER (PROCESS LINE TEMP.)	1" O.D. TRACER (PROCESS LINE TEMP.)	VALVE FITTING & FLG. COVER	WIRE	BAND	REINF. MESH	WEATHER-PROOFING MATL.	WEATHER-PROOFING APPLY.
1/2	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 SO. ANN.	NONE	GLASS FABRIC 10 x 10 MESH/ STARCH BINDER	WIMASCO WC-1 or BENJAMIN FOSTER 493-70	PAINT
3/4		1	1	1-1/4" IPS x 1" THK. (141 °F)	1-1/2" IPS x 1" THK. (170 °F)	2" IPS x 1" THK. (193 °F)						
1		1	1	1-1/2" IPS x 1" THK. (136 °F)	2" IPS x 1" THK. (166 °F)	2-1/2" IPS x 1" THK. (188 °F)						
1-1/2		1	1	2-1/2" IPS x 1" THK. (119 °F)	3" O.D. x 1" THK. (154 °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)	3-1/2" IPS x 1" THK. (154 °F)						
2-1/2		1	1	3-1/2" IPS x 1" THK. (99 °F)	3-1/2" IPS x 1" THK. (133 °F)	4" IPS x 1" THK. (144 °F)						
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)	5" IPS x 1" THK. (111 °F)	6" O.D. x 1" THK. (122 °F)		NONE	1/2" WIDE x .020" THK. x TYPE 304 SS			
6		1-1/2	1	7" IPS x 1-1/2" THK. (73 °F)	7" IPS x 1-1/2" THK (106 °F)	8" O.D. x 1-1/2" THK. (122 °F)						
8		1-1/2	1	9" IPS x 1-1/2" THK. (81 °F)	10" O.D. x 1-1/2" THK. (97 °F)	10" O.D. x 1-1/2" THK. (106 °F)						
10		1-1/2	1	12" O.D. x 1-1/2" THK. (52 °F)	12" O.D. x 1-1/2" THK. (82 °F)	12" O.D. x 1-1/2" THK. (95 °F)						
12		1-1/2	1	14" IPS x 1-1/2" THK. (46 °F)	14" IPS x 1-1/2" THK. (79 °F)	14" IPS x 1-1/2 THK. (82 °F)						
EQUIPMENT (FLAT or OTHER)	CALCIUM SILICATE (STD.)	2	1	2"	2"	2"	CUT FOR FIELD FAB'D. (FAB. MAN.)	SEE SPEC. 20-H, PAGE 9, FOR CLARITY	SEE SPEC. 20-H, PAGE 8, and GEN. NOTE #4			

SEE FABRICATION MANUAL

SEE GENERAL SPECIFICATION, PAGES AND , FOR SPACING

SEE GENERAL SPECIFICATION, PAGES AND , FOR SPACING

SEE GENERAL NOTE #5

SEE GENERAL NOTE #6

EQUIPMENT AND PIPING ACCESSORIES:
a) Clips - 1/2" double pronged Type 304 SS, A.J. Carrard of 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 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, galvanized after weaving.
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 003366

INSULATION SPECIFICATION No. 10-L

MINIMUM TEMP. FOR THIS SHEET: DOWN TO 32 °F (0 °C)

LINE SIZE (IN.)	END SEAL MATERIAL & FINISH	INSUL. THK. (IN.)	No. LAYERS	VAPOR SEAL & FINISH	WIRE	BAND	REINF. FELT	WEATHER-PROOFING FINISH	WEATHER-PROOFING FINISH
1/2	CELLULAR GLASS	1-1/2	1	SHOP PRE-FAB	18 USSWG (.0475" ø) TYPE 304 S.S. SOFT ANNEALED	NONE	GLASS FABRIC 10 x 10 MESH / SILICONE BINDER	VIMASCO WC-1 OR APPROVED EQUAL	PAINT
3/4		1-1/2	1						
1		1-1/2	1						
1-1/2		2	1						
2		2	1		NONE	1/2" WIDE x .020" THICK x TYPE 304 SS			
2-1/2		2	1						
3		2	1						
3-1/2		2	1						
4		2	1						
5		2	1						
6		2	1						
10		2-1/2	1						
12		2-1/2	1						
14		2-1/2	1						
16		2-1/2	1						
18		2-1/2	1						
20		2-1/2	1						
22		2-1/2	1						
24		2-1/2	1						
26		2-1/2	1						
28		2-1/2	1						
30		2-1/2	1						
32		2-1/2	1						
34		2-1/2	1						
36		2-1/2	1						
EQUIPMENT (FLAT or CURVED)		2-1/2	1	CUT FOR SIZE REQ'D. (PAR. 3.2)	See Sec. 10-L, PAGE 2, FOR CLARITY	See Sec. 10-L, PAGE 2, and GEN. NOTE #4			

EQUIPMENT AND PIPING ACCESSORIES:

a) Clips - 1/2" double pronged Type 304 SS, A. J. Garrard or approved alternate.
b) Fabricating Cement - Miracle Adhesive Type H, or approved alternate.
c) Anti-Abrasion Coating - Vinyl, Carlon #500, Insul-Mastic #601, or approved alternate.
d) Joint Sealer - Vinyl asphalt, Carlon #49 or approved alternate.
e) Caulking Mastic - Vinyl mastic, Vimasco WC-1, Benjamin-Foster #30-70 or approved alternate.
f) Valve Sealer - Lion Oil Co. "Nokorode Low Temp" or approved alternate.

EQUIPMENT ACCESSORIES ONLY:

a) Cushioning Blanket - 1-1/2 lb. density Aerowrap F-308, Fine Fyber Felt, Ultralite, Superfine, or approved alternate
b) Die Cut Strap - 3/4" wide x .023" thick x Ty e 304 SS, 2" finger on 9" centers, A.J.Garrard or approved alternate.
c) Expansion Strap - 3/4" wide x .023" thick x Type 304 SS, A. J. Garrard "Expand-R-Strap" or approved alternate.

PIPING ACCESSORIES ONLY:

a) Cushioning Blanket - 1-1/2 lb. density Aerowrap F-308, Fine Fyber Felt, Ultralite, Superfine, or approved alternate (To be used on piping only where excessive vibration is likely to occur.)

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COLD TEMPERATURE SERVICE (EXCEPT ETHYLENE OXIDE)

INSULATION SPECIFICATION NO. 2 10-L

MINIMUM TEMP. FOR THIS SPEC. -4 °F (-20 °C)

LINE SIZE (INS.)	INSULATION (MATERIAL)	THICK. (INS.)	NO. LAYERS	LAYER DATA INNER	LAYER DATA OUTER	VAP. PROOF (YES OR NO)	WIRE (INNER LAYER)	BAND (OUTER LAYER)	PAINT. FINISH	WEATHERPROOFING (MATERIAL)	WEATHERPROOFING (METAL)
1/2	CELLULAR GLASS	2	1	NONE	1/2" IPS x 2"	SHOP PRE-FAB	18 USSWG(.0475") x TYPE 304 SS SOFT ANNEALED	NONE	GLASS FABRIC-10 x 10 MESH/ STARCH BINDER	VIMASCO MC-1 or BENJAMIN FOSTER #30-70	PAINT
3/4		2	1		3/4" IPS x 2"						
1		2-1/2	1		1" IPS x 2-1/2"		NONE	1/2" WIDE x .020" THICK x TYPE 304 S.S.			
1-1/2		2-1/2	1		1-1/2" IPS x 2-1/2"						
2		2-1/2	1		2" IPS x 2-1/2"						
2-1/2		2-1/2	1		2-1/2" IPS x 2-1/2"						
3		2-1/2	1		3" IPS x 2-1/2"						
3-1/2		3	2	3-1/2" IPS x 1-1/2"	3" IPS x 1-1/2"		18 USSWG(.0475") x TYPE 304 SS SOFT ANNEALED				
4		3	2	4" IPS x 1-1/2"	4" IPS x 1-1/2"						
6		3	2	6" IPS x 1-1/2"	6" IPS x 1-1/2"						
8		3	2	8" IPS x 1-1/2"	8" IPS x 1-1/2"						
10		3	2	10" IPS x 1-1/2"	10" IPS x 1-1/2"						
12		3-1/2	2	12" IPS x 1-1/2"	12" IPS x 2"	SEE FABRICATION MANUAL	SEE GENERAL SPECIFICATION, PAGES AND , FOR SPACING	SEE GENERAL SPECIFICATION, PAGES AND , FOR SPACING		SEE GENERAL NOTE #5	SEE GENERAL NOTE #6
14		3-1/2	2	14" IPS x 1-1/2"	14" IPS x 2"						
16		3-1/2	2	16" IPS x 1-1/2"	16" IPS x 2"						
18		3-1/2	2	18" IPS x 1-1/2"	18" IPS x 2"						
20		3-1/2	2	20" IPS x 1-1/2"	20" IPS x 2"						
22		3-1/2	2	22" IPS x 1-1/2"	22" IPS x 2"						
24		3-1/2	2	24" IPS x 1-1/2"	24" IPS x 2"						
26		3-1/2	2	26" IPS x 1-1/2"	26" IPS x 2"						
28		3-1/2	2	28" IPS x 1-1/2"	28" IPS x 2"						
30		3-1/2	2	30" IPS x 1-1/2"	30" IPS x 2"	SEE GENERAL NOTE #3					
32		3-1/2	2	32" IPS x 1-1/2"	32" IPS x 2"						
34		3-1/2	2	34" IPS x 1-1/2"	34" IPS x 2"						
36		3-1/2	2	36" IPS x 1-1/2"	36" IPS x 2"						
EQUIPMENT (FLAT or CURVED 36")		4	2	3"	3"	CUT FOR SIZE REQ'D. (FAB. MAN.	SEE SPEC. 10-L , PAGE # , FOR CLARITY	SEE SPEC. 10-L , PAGE # , AND GEN. NOTE #4			

EQUIPMENT AND PIPING ACCESSORIES:

a) Clips - 1/2" double pronged Type 304 SS, A. J. Garrard or approved alternate.
b) Fabricating Cement - Mirasol Adhesive Type K, or approved alternate.
c) Anti-Abrasion Coating - Vinyl, Carlon #500, Insul-Mastic #601 or approved alternate.
d) Joint Sealer - Vinyl asphalt, Carlon #49 or approved alternate.
e) Caulking Mastic - Vinyl mastic, Vimasco MC-1, Benjamin-Foster #30-70 or approved alternate.
f) Valve Sealer - Lisk Oil Co. "Mokorode Low Temp" or approved alternate.

EQUIPMENT ACCESSORIES ONLY:

a) Cushioning Blanket - 1-1/2 lb. density Aerowrap P-308, Fine Fyber Felt, Ultralite, Superfine, or approved alternate.
b) Die Cut Strap - 3/4" wide x .023" thick x Type 304 SS 3" finger on 9" centers, A. J. Garrard or approved alternate.
c) Expansion Strap - 3/4" wide x .023" thick x Type 304 SS, A. J. Garrard "Expand-A-Strap" or approved alternate.

PIPING ACCESSORIES ONLY:

a) Cushioning Blanket - 1-1/2 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.)

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...AND COLD TEMPERATURE SERVICE (EXCEPT ETHYLENE OXIDE)

INSULATION SPECIFICATION NO.: 10-L

MINIMUM TEMP. FOR THIS SPEC. 70 DOWN TO -40 °F (-40 °C)

LINE SIZE (NPS)	INSULATION MATERIAL	THICKNESS (INCHES)	NO. LAYERS	BAND DATA: INNER	BAND DATA: OUTER	WIRE & PIN SPACING	WIRE (INNER LAYER)	BAND (OUTER LAYER)	PAINT. PAINT	WEATHERPROOFING MATERIAL	WEATHERPROOFING MATERIAL
1/2	CELLULAR GLASS	2-1/2	1	NONE	1/2" IPS x 2-1/2"	SHOP PRE-FAB	18 USSWG(.0475") x TYPE 304 SS SOFT ANNEALED	NONE	GLASS FABRIC-10 oz. MARBLE/STARCH FINISH	VIMASCO MC-1 or BENJAMIN FOSTER #30-70	PAINT
3/4		2-1/2	1		3/4" IPS x 2-1/2"						
1		3	2	1" IPS x 1-1/2"	1" IPS x 1-1/2"			1/2" WIDE x .020" THICK x TYPE 304 SS			
1-1/2		3	2	1-1/2" IPS x 1-1/2"	1-1/2" IPS x 1-1/2"						
2		3	2	1-1/2" IPS x 1-1/2"	2" IPS x 1-1/2"						
2-1/2		3	2	2-1/2" IPS x 1-1/2"	2" IPS x 1-1/2"						
3		3-1/2	2	3" IPS x 1-1/2"	3" IPS x 2"						
3-1/2		3-1/2	2	3-1/2" IPS x 1-1/2"	4" IPS x 2"						
4		3-1/2	2	4" IPS x 1-1/2"	4" IPS x 2"						
5		4	2	5" IPS x 2"	5" IPS x 2"						
6		4	2	6" IPS x 2"	6" IPS x 2"						
8		4	2	8" IPS x 2"	8" IPS x 2"						
10		4	2	10" IPS x 2"	10" IPS x 2"						
12		4	2	12" IPS x 2"	12" IPS x 2"						
14		4	2	14" IPS x 2"	14" IPS x 2"						
16		4	2	16" IPS x 2"	16" IPS x 2"						
18		4-1/2	2	18" IPS x 2"	18" IPS x 2"						
20		4-1/2	2	20" IPS x 2"	20" IPS x 2"						
22		4-1/2	2	22" IPS x 2"	22" IPS x 2"						
24		4-1/2	2	24" IPS x 2"	24" IPS x 2"						
26		4-1/2	2	26" IPS x 2"	26" IPS x 2"						
28		4-1/2	2	28" IPS x 2"	28" IPS x 2"						
30		4-1/2	2	30" IPS x 2"	30" IPS x 2"						
32		4-1/2	2	32" IPS x 2"	32" IPS x 2"						
34		4-1/2	2	34" IPS x 2"	34" IPS x 2"						
36		4-1/2	2	36" IPS x 2"	36" IPS x 2"						
EQUIPMENT (FLAT or [illegible])		5	2	38" IPS x 2"	38" IPS x 2"						
				40" IPS x 2"	40" IPS x 2"						
				42" IPS x 2"	42" IPS x 2"						
				44" IPS x 2"	44" IPS x 2"						
				46" IPS x 2"	46" IPS x 2"						
				48" IPS x 2"	48" IPS x 2"						
				50" IPS x 2"	50" IPS x 2"						
				52" IPS x 2"	52" IPS x 2"						
				54" IPS x 2"	54" IPS x 2"						
				56" IPS x 2"	56" IPS x 2"						
				58" IPS x 2"	58" IPS x 2"						
				60" IPS x 2"	60" IPS x 2"						
				62" IPS x 2"	62" IPS x 2"						
				64" IPS x 2"	64" IPS x 2"						
				66" IPS x 2"	66" IPS x 2"						
				68" IPS x 2"	68" IPS x 2"						
				70" IPS x 2"	70" IPS x 2"						
				72" IPS x 2"	72" IPS x 2"						
				74" IPS x 2"	74" IPS x 2"						
				76" IPS x 2"	76" IPS x 2"						
				78" IPS x 2"	78" IPS x 2"						
				80" IPS x 2"	80" IPS x 2"						
				82" IPS x 2"	82" IPS x 2"						
				84" IPS x 2"	84" IPS x 2"						
				86" IPS x 2"	86" IPS x 2"						
				88" IPS x 2"	88" IPS x 2"						
				90" IPS x 2"	90" IPS x 2"						
				92" IPS x 2"	92" IPS x 2"						
				94" IPS x 2"	94" IPS x 2"						
				96" IPS x 2"	96" IPS x 2"						
				98" IPS x 2"	98" IPS x 2"						
				100" IPS x 2"	100" IPS x 2"						
				102" IPS x 2"	102" IPS x 2"						
				104" IPS x 2"	104" IPS x 2"						
				106" IPS x 2"	106" IPS x 2"						
				108" IPS x 2"	108" IPS x 2"						
				110" IPS x 2"	110" IPS x 2"						
				112" IPS x 2"	112" IPS x 2"						
				114" IPS x 2"	114" IPS x 2"						
				116" IPS x 2"	116" IPS x 2"						
				118" IPS x 2"	118" IPS x 2"						
				120" IPS x 2"	120" IPS x 2"						
		5	2	2-1/2"	2-1/2"	CUT FOR SIZE BASIC. (PAR. PAR.	SEE SPEC. 10-L, PAGE 6, FOR CLARITY	SEE SPEC. 10-L, PAGE 6, and GEN. NOTE #4			

SEE GENERAL SPECIFICATION, PAGES AND , FOR SPACING

SEE GENERAL NOTE #4

EQUIPMENT AND PIPING ACCESSORIES:

a) Clips - 1/2" double pronged Type 304 SS, A. J. Garrard or approved alternate.
b) Fabricating Cement - Miracle Adhesive Type M, or approved alternate.
c) Anti-Abrasion Coating - Vinyl, Carlon #500, Insul-Mastic #601, or approved alternate.
d) Joint Sealer - Vinyl asphalt, Carlon #49 or approved alternate.
e) Caulking Mastic - Vinyl mastic, Vimasco MC-1, Benjamin-Foster #30-70 or approved alternate.
f) Valve Sealer - Lion Oil Co. "Nokorode Low Temp" or approved alternate.

EQUIPMENT ACCESSORIES ONLY:

a) Cushioning Blanket - 1-1/2 lb. density Aerowrap F-308, Fine Fyber Felt, Ultralite, Superfine, or approved alternate.
b) Die Cut Strap - 1/4" wide x .023" thick x Type 304 SS, 2" finger on 9" centers, A. J. Garrard or approved alternate.
c) Expansion Strap - 1/4" wide x .023" thick x Type 304 SS, A. J. Garrard "Expand-A-Strap" or approved alternate.

PIPING ACCESSORIES ONLY:

a) Cushioning Blanket - 1-1/2 lb. density Aerowrap F-308, Fine Fyber Felt, Ultralite, Superfine, or approved alternate. (To be used on piping only where excessive vibration is likely to occur.)

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...AND COLD TEMPERATURE SERVICE (EXCEPT ETHYLENE OXIDE)

INSULATION SPECIFICATION W-8 10-L

MINIMUM TEMP. FOR THIS SPEC. DOWN TO -112 °F (-80 °C)

PIPE SIZE (IPS)	INSULATION MATERIAL	Thickness (Inches)	No. LAYERS	LAYER DATA — INNER	MIDDLE	OUTER	VALVE FITTINGS & FLANGES	JACKET (INNER & MIDDLE LAYER)	JACKET (OUTER LAYER)	BAND MATERIAL	FINISH	WEATHER-PROOFING LAYER
1/2	CELLULAR GLASS	3-1/2	2	1/2" IPS x 1-1/2"	NONE	3-1/2" IPS x 2"	SHOP PRE-FAB	18 USS/G (.0485") x TYPE 304 SS 5 4T ANNEAL	1/2" WIDE x .020" THK x TYPE 304 SS	GLASS FABRIC - 10 x 10 MESH / STARCH BINDER	VIMASCO WC-1 or BENJAMIN-FOSTER #30-70	PAPR
3/4		3-1/2	2	3/4" IPS x 1-1/2"		3-1/2" IPS x 2"						
1		3-1/2	2	1" IPS x 1-1/2"		4" IPS x 2"						
1-1/2		4	2	1-1/2" IPS x 2"		5" IPS x 2"						
2		4	2	2" IPS x 2"		6" IPS x 2"						
2-1/2		4-1/2	2	2-1/2" IPS x 2"		6" IPS x 2-1/2"						
3		4-1/2	2	3" IPS x 2"		7" IPS x 2-1/2"						
3-1/2		4-1/2	2	3-1/2" IPS x 2"		8" IPS x 2-1/2"						
4		4-1/2	2	4" IPS x 2"		8" IPS x 2-1/2"						
6		5	2	6" IPS x 2-1/2"		10" IPS x 2-1/2"						
8		5-1/2	3	8" IPS x 1-1/2"	1" IPS x 2"	16" IPS x 2"	SEE FABRICATION MANUAL	SEE GENERAL SPECIFICATION, PAGES AND , FOR SPACING	SEE GENERAL SPECIFICATION, PAGES AND , FOR SPACING		SEE GENERAL NOTE #	SEE GENERAL NOTE #
10		5-1/2	3	10" IPS x 1-1/2"	4" IPS x 2"	18" IPS x 2"						
12		5-1/2	3	12" IPS x 1-1/2"	6" IPS x 2"	20" IPS x 2"						
14		5-1/2	3	14" IPS x 1-1/2"	7" IPS x 2"	21" IPS x 2"						
16		6	3	16" IPS x 2"	8" 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		6-1/2	3	26" IPS x 2"	30" IPS x 2"	34" IPS x 2-1/2"						
28		6-1/2	3	28" IPS x 2"	32" IPS x 2"	36" IPS x 2-1/2"						
30		6-1/2	3	30" IPS x 2"	34" IPS x 2"	2-1/2"	SEE GENERAL NOTE #3					
32		6-1/2	3	32" IPS x 2"	36" IPS x 2"	2-1/2"						
34		7	3	34" IPS x 2"	2-1/2"	2-1/2"						
36		7	3	36" IPS x 2"	2-1/2"	2-1/2"						
EQUIP-MENT (FLAT or OVER 36")		7-1/2	3	2-1/2"	2-1/2"	2-1/2"	CUT FOR SIZE REQ'D. (Ref. MAN.)	SEE SPEC. 10-L, PAGE , FOR CLARITY	SEE SPEC. 10-L, PAGE , and SEW WITH #			

EQUIPMENT AND PIPING ACCESSORIES:

a) Clips - 1/2" double pronged Type 304 SS, A. J. Garrard or approved alternate.
b) Fabricating Cement - Miracle Adhesive Type H, or approved alternate.
c) Anti-Abrasion Coating - Vinyl, Carlon #500, Insul-Mastic #601, or approved alternate.
d) Joint Sealer - Vinyl asphalt, Carlon #49 or approved alternate.
e) Caulking Mastic - Vinyl mastic, Vimasco WC-1, Benjamin-Foster #30-70 or approved alternate.
f) Valve Sealer - Lion Oil Co. "Nokorode Low Temp" or approved alternate.

EQUIPMENT ACCESSORIES ONLY:

a) Cushioning Blanket - 1-1/2 lb. density Aerowrap P-308, Fine Fyber Felt, Ultralite, Superfine, or approved alternate.
b) Die Cut Strap - 3/4" wide x .023" thick x Type 304 SS, 2" finger on 8" centers, A. J. Garrard or approved alternate.
c) Expansion Strap - 3/4" wide x .023" thick x Type 304 SS, A. J. Garrard "Expand-A-Strap" or approved alternate.

PIPING ACCESSORIES ONLY:

a) Cushioning Blanket - 1-1/2 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 003370

INSULATION SPECIFICATION NO. 8 10-L

MINIMUM TEMP. FOR THIS SYSTEM DOWN TO -148 °F (-100 °C)

PIPE SIZE (I.P.S.)	INSULATION MATERIAL	THICKNESS (INCHES)	No. LAYERS	LAYER DATA			VAPOR SEAL & FINISH COVER	WIRE (INNER & MIDDLE LAYER)	BAND (OUTER LAYER)	REINFORCING MESH	STABILIZATION COATING	WEATHERPROOFING JACKET
				INNER	MIDDLE	OUTER						
1/2	CELLULAR GLASS	3-1/2	2	1/2" IPS x 1-1/2"	NONE	3-1/2" IPS x 2"	SHOP PRE-FAB	18 USSWG (.0475") x TYPE 304 SS SOFT ANNEAL	1/2" WIDE x .020" THK x TYPE 304 SS	GLASS FABRIC - 10 x 10 MESH / STARCH BINDER	VIMASCO WC-1 or BENJAMIN-FOSTER #30-70	PALP
3/4		4	2	3/4" IPS x 2"		4-1/2" IPS x 2"						
1		4	2	1" IPS x 2"		5" IPS x 2"						
1-1/2		4-1/2	2	1-1/2" IPS x 2"		5" IPS x 2-1/2"						
2		4-1/2	2	2" IPS x 2"		6" IPS x 2-1/2"						
2-1/2		4-1/2	2	2-1/2" IPS x 2"		6" IPS x 2-1/2"						
3		5	2	3" IPS x 2-1/2"		8" IPS x 2-1/2"						
3-1/2		5	2	3-1/2" IPS x 2-1/2"		9" IPS x 2-1/2"						
4		5	2	4" IPS x 2-1/2"		9" IPS x 2-1/2"						
6		5-1/2	3	6" IPS x 2-1/2"	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		6-1/2	3	12" IPS x 2"	17" IPS x 2"	21" IPS x 2-1/2"	SEE FABRICATION MANUAL	SEE GENERAL SPECIFICATIONS, PAGES AND , FOR SPACING	SEE GENERAL SPECIFICATION, PAGES AND , FOR SPACING		SEE GENERAL NOTE #5	SEE GENERAL NOTE #6
14		6-1/2	3	14" IPS x 2"	18" IPS x 2"	22" IPS x 2-1/2"						
16		6-1/2	3	16" IPS x 2"	20" IPS x 2"	24" IPS x 2-1/2"						
18		6-1/2	3	18" IPS x 2"	22" IPS x 2"	26" IPS x 2-1/2"						
20		7	3	20" IPS x 2"	24" IPS x 2-1/2"	29" IPS x 2-1/2"						
22		7	3	22" IPS x 2"	26" IPS x 2-1/2"	31" IPS x 2-1/2"						
24		7	3	24" IPS x 2"	28" IPS x 2-1/2"	33" IPS x 2-1/2"						
26		7	3	26" IPS x 2"	30" IPS x 2-1/2"	35" IPS x 2-1/2"						
28		7	3	28" IPS x 2"	32" IPS x 2-1/2"	8-1/2"						
30		7-1/2	3	30" IPS x 2-1/2"	35" IPS x 2-1/2"	2-1/2"	SEE GENERAL NOTE #5					
32		7-1/2	3	32" IPS x 2-1/2"	2-1/2"	2-1/2"						
34		7-1/2	3	34" IPS x 2-1/2"	2-1/2"	2-1/2"						
36		7-1/2	3	36" IPS x 2-1/2"	2-1/2"	2-1/2"						
EQUIPMENT (FLAT or OVER 36")		8-1/2	3	2-1/2"	3"	3"	CUT FOR SIZE REQ'D. (FAB. MAN.)	SEE SPEC. 10-L, PAGE , FOR CLARITY	SEE SPEC. 10-L, PAGE , and GEN. NOTE #4			

EQUIPMENT AND PIPING ACCESSORIES:

a) Clips - 1/2" double pronged Type 304 SS, A. J. Garrard or approved alternate.
b) Fabricating Cement - Miracle Adhesive Type H or approved alternate.
c) Anti-Abrasion Coating - Vinyl, Carlon #500, Insul-Mastic #601 or approved alternate.
d) Joint Sealer - Vinyl asphalt, Carlon #49 or approved alternate.
e) Caulking Mastic - Vinyl mastic, Vimasco WC-1, Benjamin-Foster #30-70 or approved alternate.
f) Valve Sealer - Lisk Oil Co. "Nakorode Low Temp" or approved alternate.

EQUIPMENT ACCESSORIES ONLY:

a) Cushioning Blanket - 1-1/2 lb. density Aerowrap F-308, Fine Fyber Felt, Ultralite, Superfine, or approved alternate.
b) Die Cut Strap - 3/4" wide x .023" thick x Type 304 SS, 2" finger on 9" centers, A. J. Garrard or approved alternate.
c) Expansion Strap - 3/4" wide x .023" thick x Type 304 SS, A. J. Garrard "Expand-A-Strap" or approved alternate.

PIPING ACCESSORIES ONLY:

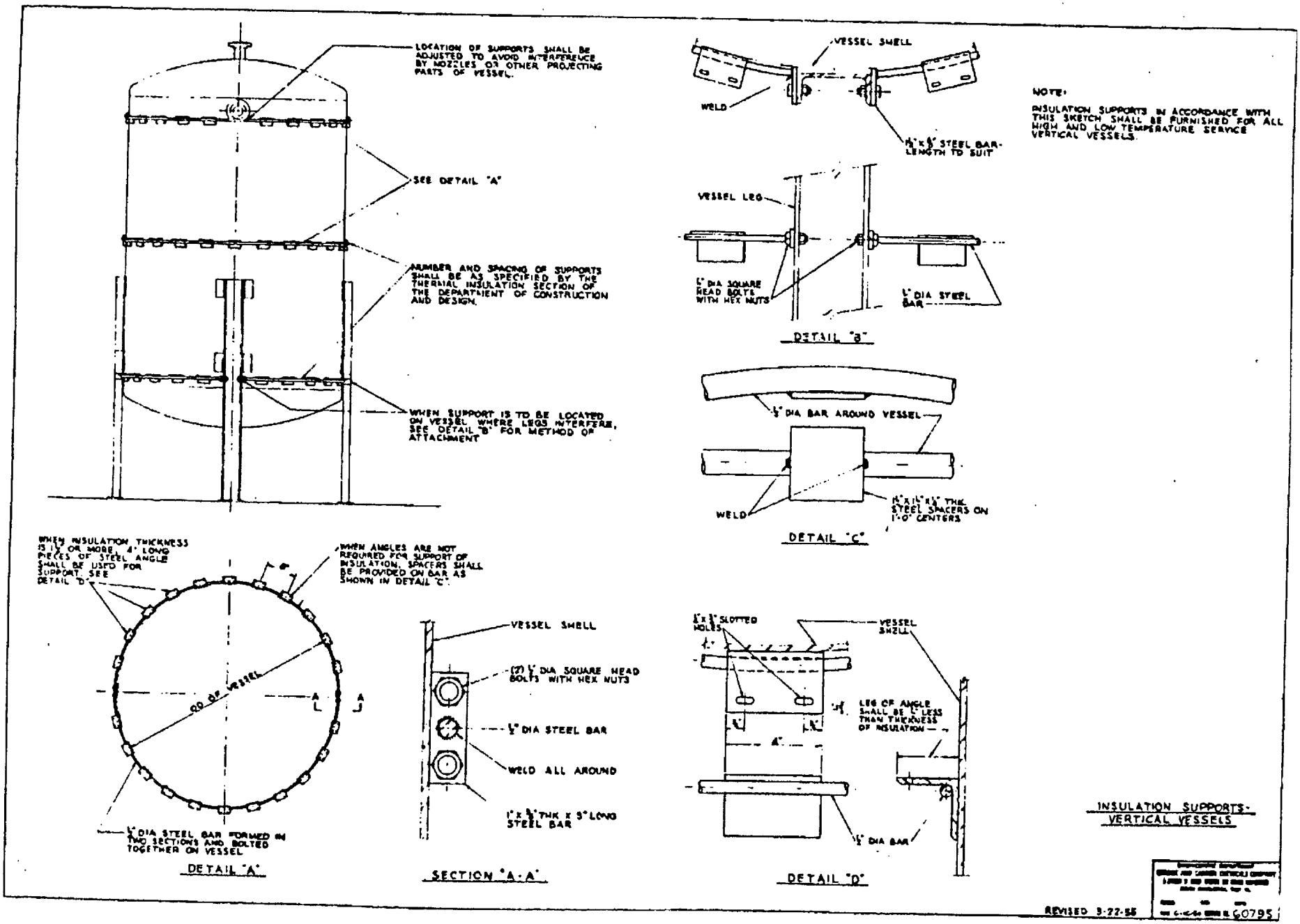
a) Cushioning Blanket - 1-1/2 lb. density Aerowrap F-308, Fine Fyber Felt, Ultralite, Superfine, or approved alternate. (To be used on piping only where excessive vibration is likely to occur.)

UCC 003371

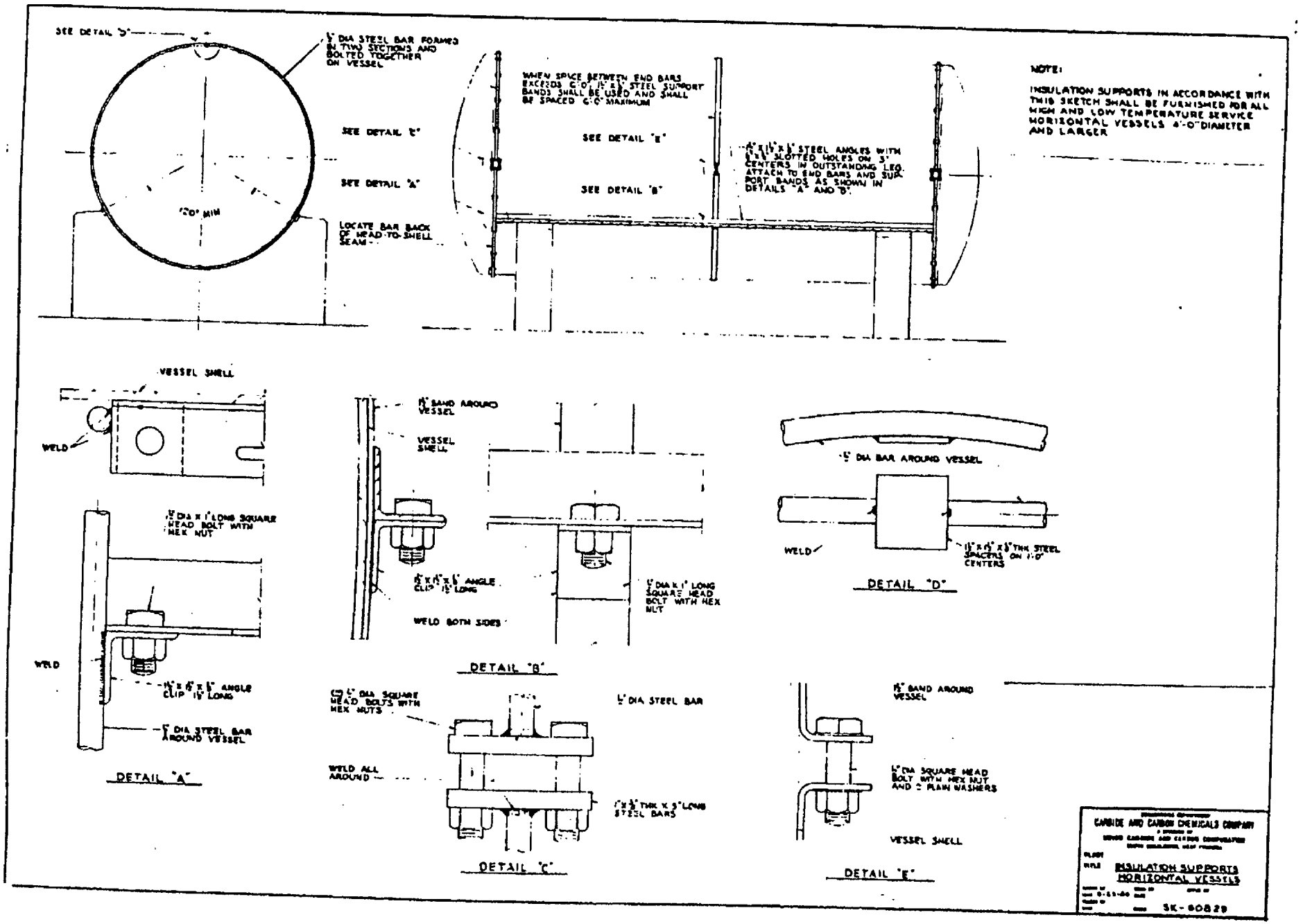
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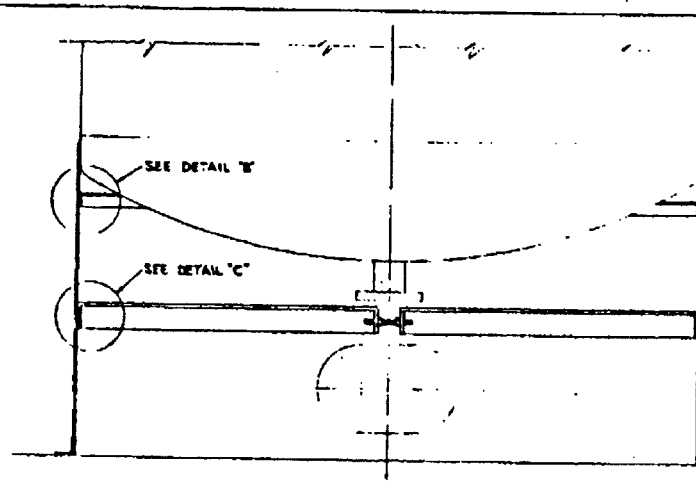
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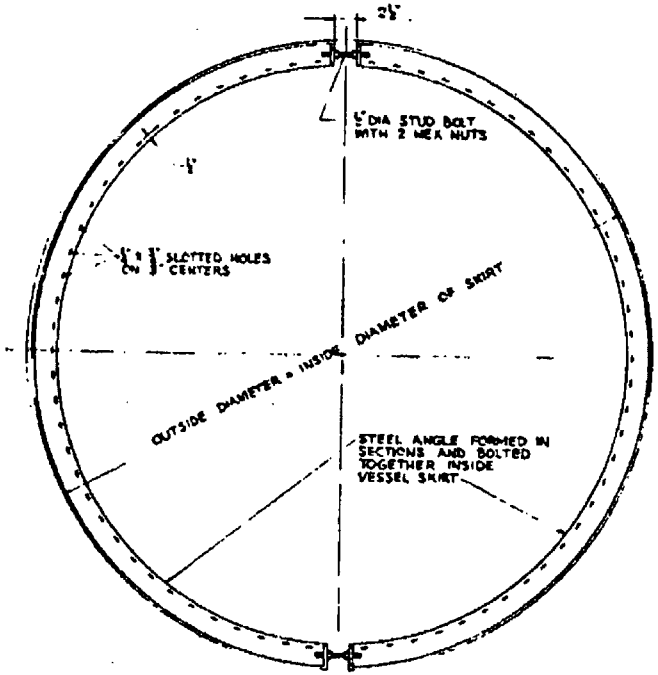


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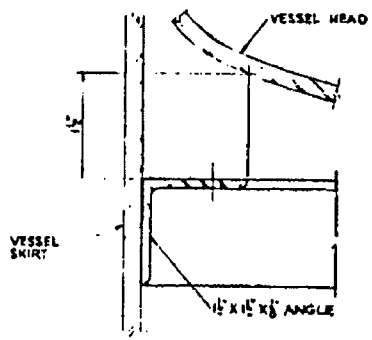


INSULATION SUPPORT ANGLES INSIDE OF VESSEL SKIRT

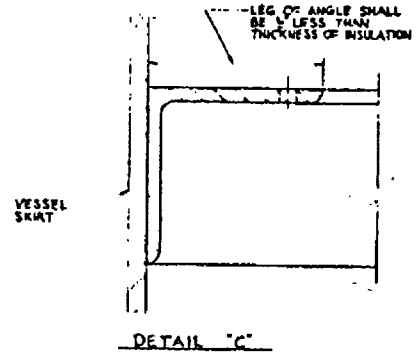
NOTE:
INSULATION SUPPORTS IN ACCORDANCE WITH THIS SKETCH SHALL BE FURNISHED FOR ALL SKIRT-SUPPORTED HIGH OR LOW TEMPERATURE SERVICE VESSELS.



BOTTOM VIEW
DETAIL "A"



DETAIL "B"

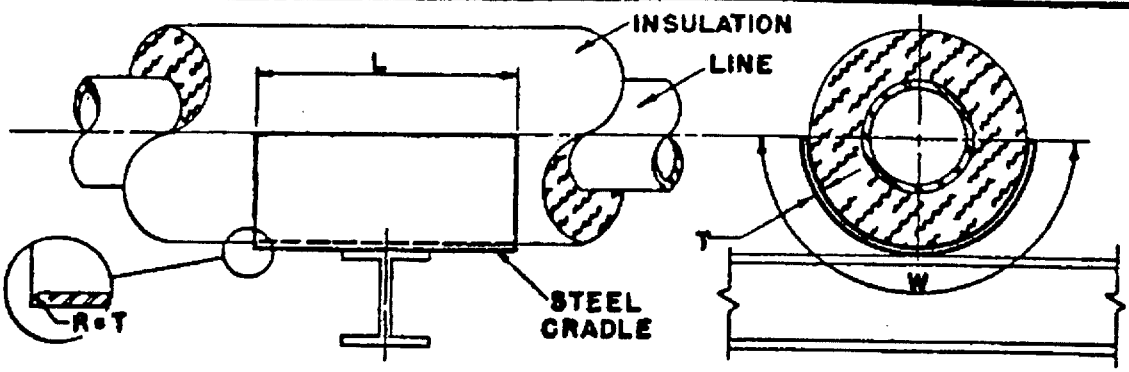


DETAIL "C"

INSULATION SUPPORTS - INSIDE OF VESSEL SKIRT

REVISED: 5-10-56

60830



Pipe Size Nominal - in.	Insulation Thickness - in.	T - Cradle Thickness - in.	L- Length of Cradle - in.				
			10' Span	12' Span	15' Span	18' Span	20' Span
1/2 & 3/4	1-1/2 & 2	14 Ga	10	-	-	-	-
	2-1/2 to 4	1/8	10	-	-	-	-
	4-1/2 & 5	3/16	10	-	-	-	-
1 to 1-1/2	1-1/2 & 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	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	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	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	2-1/2 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	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	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	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	To 5	1/2	30	36	42	48	54
	5 to 9	5/8	30	36	42	48	54
36	To 7	5/8	36	42	48	54	60
	7 to 9	3/4	36	42	48	54	60

NOTE

W = WIDTH OF SADDLE BEFORE FORMING = O.D. OF INSULATION X 1.57.

PIPING DESIGN DRAWINGS SHALL REFER TO THIS STANDARD, IS-19, FOR ALL SEMI-RIGID PIPE INSULATION, TO WHICH SERVICE THIS STANDARD IS LIMITED.

REVISED: 4-28-53

FORM A

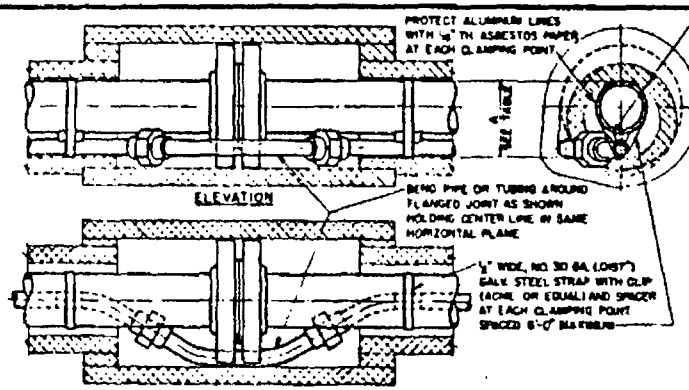
ENGINEERING DEPARTMENT
CARBIDE AND CARBON CHEMICALS DIVISION
UNION CARBIDE AND CARBON CORPORATION
SOUTH CHARLESTON, WEST VIRGINIA

STANDARD CRADLES FOR SEMI-RIGID PIPE INSULATION	Nº IS-19
CLASSIFICATION: DETAIL	
SPONSOR: H2B BY: OVE	DATE: 5/25/51
APPROVED:	DATE: 5-25-51

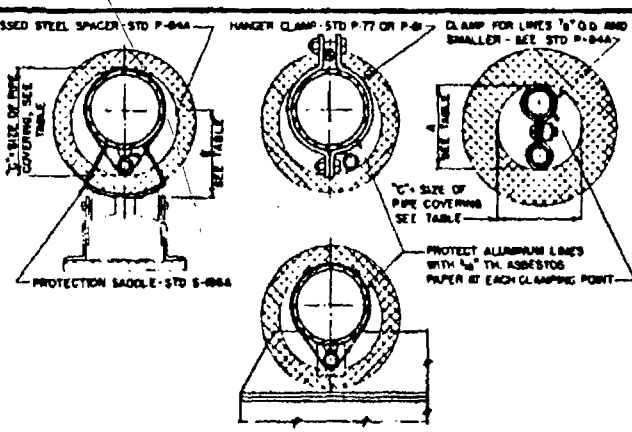
UCC 003375

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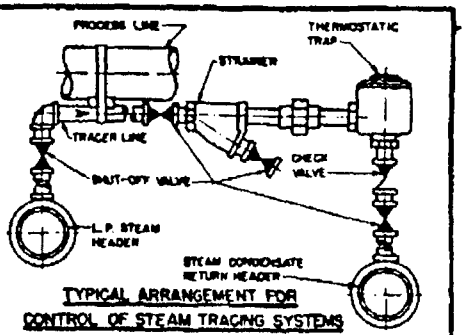
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ACL Doc 17353 · Page 31 of 47
UCC 003376
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TYPICAL DETAIL FOR STEAM TRACED LINES AT FLANGED JOINT



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*

PROCESS LINE SIZE	TRACER LINE SIZE ½" O.D. A	B	C	¾" O.D. A	B	C	1" O.D. A	B	C	1¼" O.D. A	B	C	1½" O.D. A	B	C	2" O.D. A	B	C	2½" O.D. A	B	C	3" O.D. A	B	C	4" O.D. A	B	C
½	1½			2½			2																				
¾	2			2½			2			2½																	
1	2			2½			2			2½			2½														
1¼	2½			2½			2½			2½			2½			3											
1½	2½			2½			2½			2½			2½			3			3								
2	2½			2½			2½			2½			2½			3			3			3½					
2½	3			3			3			3			3			3			3			3½			4		
3	3½			3½			3½			3½			3½			3½			3½			3½			4		
4	4			4			4			4			4			4			4			4			4		
5	5			5			5			5			5			5			5			5			5		
6	6			6			6			6			6			6			6			6			6		
8	8			8			8			8			8			8			8			8			8		
10	10			10			10			10			10			10			10			10			10		
12	12			12			12			12			12			12			12			12			12		

ALL DIMENSIONS GIVEN IN INCHES

LIMITATIONS FOR STEAM TRACED LINES USING STEAM AT 25 psi I.P.S

TABLE NO. 2 - INSULATION 1 IN. THICK

TRACER SIZE	PROCESS LINE SIZE	1	1¼	1½	2	2½	3	4	6	8	10	12
½ O.D.	TEMP OF PROCESS LINE, DEG C	47	42	39	34	30	27	21	13	8	3	1
	MAX LENGTH OF TRACER, FT	60	55	54	51	49	47	44	41	39	38	37
¾ O.D.	TEMP OF PROCESS LINE, DEG C	60	58	56	50	45	40	35	29	20	15	10
	MAX LENGTH OF TRACER, FT	180	170	160	150	140	130	120	110	107	105	100
1 O.D.	TEMP OF PROCESS LINE, DEG C	70	65	60	55	50	45	40	35	25	20	15
	MAX LENGTH OF TRACER, FT	290	260	250	230	220	200	190	170	160	158	150
1¼ O.D.	TEMP OF PROCESS LINE, DEG C	73	70	65	63	60	55	50	40	30	25	20
	MAX LENGTH OF TRACER, FT	500	470	450	425	400	370	350	300	290	280	260
1½ O.D.	TEMP OF PROCESS LINE, DEG C	75	73	70	68	65	60	55	45	40	35	30
	MAX LENGTH OF TRACER, FT	780	730	700	640	580	570	560	500	470	460	420
2 O.D.	TEMP OF PROCESS LINE, DEG C	85	80	75	70	65	60	55	50	45	40	35
	MAX LENGTH OF TRACER, FT	1470	1360	1300	1180	1080	1000	940	830	770	740	720

TABLE NO 3 - INSULATION 2 IN. THICK

TRACER SIZE	PROCESS LINE SIZE	1	1¼	1½	2	2½	3	4	6	8	10	12
½ O.D.	TEMP OF PROCESS LINE, DEG C	59	52	50	46	42	39	33	24	18	14	10
	MAX LENGTH OF TRACER, FT	69	65	62	58	55	53	50	46	43	42	40
¾ O.D.	TEMP OF PROCESS LINE, DEG C	75	70	68	65	60	50	46	40	33	28	23
	MAX LENGTH OF TRACER, FT	215	200	190	180	170	160	140	130	120	115	110
1 O.D.	TEMP OF PROCESS LINE, DEG C	80	75	74	70	65	60	55	45	40	35	30
	MAX LENGTH OF TRACER, FT	360	330	300	290	270	250	230	200	190	180	170
1¼ O.D.	TEMP OF PROCESS LINE, DEG C	93	90	78	74	70	65	60	50	45	40	35
	MAX LENGTH OF TRACER, FT	640	580	545	540	460	425	400	380	350	320	300
1½ O.D.	TEMP OF PROCESS LINE, DEG C	96	95	93	80	77	78	70	65	55	50	45
	MAX LENGTH OF TRACER, FT	1000	940	870	800	720	700	670	630	570	530	500
2 O.D.	TEMP OF PROCESS LINE, DEG C	93	90	88	84	80	75	70	65	60	55	50
	MAX LENGTH OF TRACER, FT	1500	1450	1390	1290	1250	1160	1000	950	920	880	

* FOR 50 psi STEAM, THE TEMPERATURE OF THE PROCESS LINE WILL BE INCREASED 1.14 TIMES THE TABULATED VALUES FOR THE SAME SIZE AND LENGTH OF TRACER.
1 BASED ON USE OF 85 % MAGNESIA PIPE COVERING
2 FOR LINE SIZES DESIGNATED "OD", THE NOMINAL SIZE IS ALSO THE ACTUAL OUTSIDE DIAMETER; LINE SIZES NOT DESIGNATED "OD" ARE AMERICAN STANDARD PIPE SIZES.

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 ¾" O.D. OR SMALLER.

EXAMPLE - USE OF TABLES 2 AND 3

GIVEN:
A (FROM DESIGN REPORT), PRODUCT - ACETIC ACID, SERVICE TEMPERATURE RANGE - 22 C, MIN - 43 C, MAX.; LINE SIZE - 8".
B (FROM PIPING LAYOUT DRAWING), LENGTH OF LINE - 1410 FT.
C (FROM JOB INSULATION SCHEDULE), INSULATION - 1" THICK.

THEN:
IN TABLE NO. 2, UNDER 8" 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 ¾" STEEL PIPE, OR, IF NECESSARY TO USE COPPER TUBING, ⅞" 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 ⅞" OD AND SMALLER	STD P-84A
INSULATION DETAILS	STD 13-18

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

STANDARD DETAILS FOR STEAM TRACER LINES

No. P-84

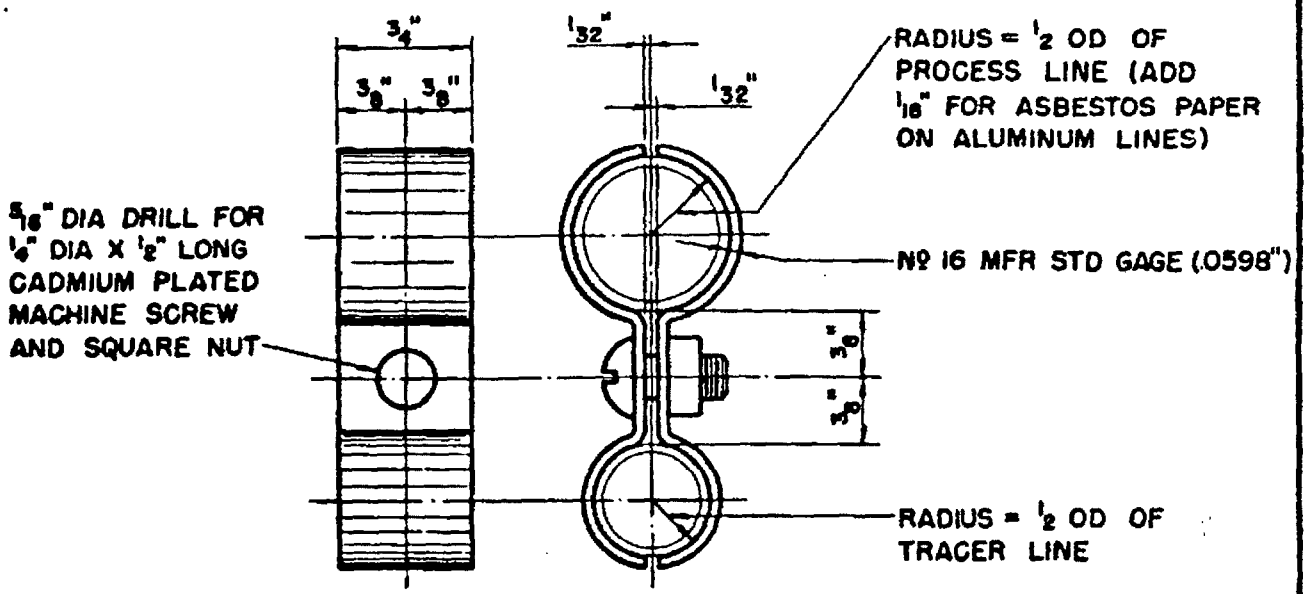
CLASSIFICATION: DRAFTING

SPONSOR H2B BY [signature] DATE 4-15-47

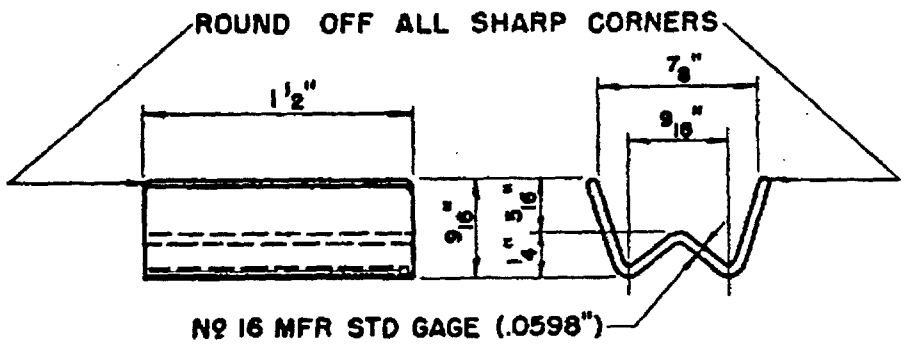
APPROVED: [signature] DATE 4-15-47

P-84

REVISED 8-6-53



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



PRESSED STEEL SPACER

THIS STANDARD IS MANDATORY ONLY WHEN INCORPORATED, WHOLLY OR WITH EXCEPTIONS, INTO DESIGN REPORTS, DESIGN DRAWINGS OR OTHER DESIGN DATA, OR INTO BILLS-OF-MATERIAL OR PURCHASE ORDERS.

NOTE:

MATERIAL SHALL BE ASTM A7 CARBON STEEL.

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	Nº P-84A
CLASSIFICATION: DETAIL	
SPONSOR: H2B BY: BTE	DATE: 8/7/53
APPROVED: [signature]	DATE: 4-17-47

REVISED: 8-3-53

FORM A

UCC 003377

Union Carbide trial exhibit UC-2365: Thermal Insulation Specifications for the South Charleston Plant, with A. R. G...
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ACL Doc 17353 · Page 32 of 47
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THICKNESS OF INSULATION REQUIRED FOR ASBESTOS FIBER IN GENERAL SERVICE, STANDARD 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	-	-	-	-	-	1½	1½	1½	1½	1½	2	2	2	2	2½	2½	2½	3	3	3	3	3								
¾	-	-	-	-	-	1½	1½	1½	1½	2	2	2	2	2½	2½	2½	2½	3	3	3	3	3½								
1	-	-	-	-	-	1½	1½	1½	2	2	2	2	2½	2½	2½	2½	3	3	3	3	3½	3½								
1½	-	-	-	-	-	1½	1½	2	2	2	2	2½	2½	2½	3	3	3	3	3½	3½	3½	4								
2	-	-	-	-	-	1½	2	2	2	2	2	2½	2½	2½	3	3	3	3½	4	4	4½	4								
2½	-	-	-	-	-	1½	2	2	2	2	2	2½	2½	3	3	3	3½	3½	4	4	4½	4½								
3	-	-	-	-	-	2	2	2	2	2½	2½	3	3	3	3½	3½	3½	4	4	4	4½	4½								
3½	-	-	-	-	-	2	2	2	2	2½	2½	3	3	3	3½	3½	3½	4	4	4	4½	4½								
4	-	-	-	-	-	2	2	2	2	2½	2½	3	3	3	3½	3½	3½	4	4	4	4½	5								
6	½	½	½	½	½	2	2	2	2½	2½	3	3	3	3½	3½	4	4	4	4½	4½	5	5								
8	½	½	½	½	½	2	2	2	2½	2½	3	3	3½	3½	4	4	4	4½	4½	5	5	5½								
10	½	½	½	½	2	2	2	2½	2½	3	3	3	3½	3½	4	4	4	4½	5	5	5½	5½								
12	½	½	½	½	2	2	2	2½	2½	3	3	3	3½	3½	4	4	4½	4½	5	5	5½	5½								
14	½	½	½	½	2	2	2	2½	2½	3	3	3½	3½	4	4	4½	4½	5	5	5½	5½	6								
16	½	½	½	½	2	2	2½	2½	3	3	3	3½	3½	4	4	4½	4½	5	5	5½	5½	6								
18	½	½	½	½	2	2	2½	2½	3	3	3	3½	3½	4	4	4½	4½	5	5	5½	5½	6								
20	½	½	½	½	2	2	2½	2½	3	3	3	3½	3½	4	4	4½	4½	5	5	5½	5½	6								
22	½	½	½	½	2	2	2½	2½	3	3	3	3½	3½	4	4	4½	4½	5	5	5½	5½	6								
24	½	½	½	½	2	2	2½	2½	3	3	3	3½	3½	4	4	4½	4½	5	5	5½	5½	6								
26	½	½	½	½	2	2	2½	2½	3	3	3	3½	3½	4	4	4½	5	5	5½	5½	6	6								
28	½	½	½	½	2	2	2½	2½	3	3	3	3½	3½	4	4	4½	5	5	5½	5½	6	6								
30	½	½	½	½	2	2	2½	2½	3	3	3	3½	3½	4	4	4½	5	5	5½	5½	6	6½								
32	½	½	½	½	2	2	2½	2½	3	3	3½	3½	4	4	4½	4½	5	5	5½	5½	6	6½								
34	½	½	½	½	2	2	2½	2½	3	3	3½	3½	4	4	4½	4½	5	5	5½	5½	6	6½								
36	½	½	½	½	2	2	2½	2½	3	3	3½	3½	4	4	4½	4½	5	5	5½	5½	6	6½								
FLAT	½	½	½	½	2	2	2½	2½	3	3	3½	3½	4	4	4½	4½	5	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, STD

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 Spec. 20-H and 21-H and 800 °F for Specs. 10-H and 10-J.

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

UCC 003378

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Union Carbide trial exhibit UC-2365: Thermal Insulation Specifications for the South Charleston Plant, with A. R. G...
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THICKNESS OF INSULATION REQUIRED FOR ASBESTOS FIBER WHEN INSULATING DOWTHERM, OR WHERE THE HEAT PROCESS IS CRITICAL, TO MAINTAIN A SURFACE TEMPERATURE OF NOT OVER 125 °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
1/2	1	1	1	1	1 1/2	1 1/2	1 1/2	1 1/2	2	2	2	2 1/2	2 1/2	2 1/2	2 1/2	3	3	3	3	3 1/2	3 1/2	4
3/4	1	1	1	1	1 1/2	1 1/2	1 1/2	1 1/2	2	2	2	2 1/2	2 1/2	2 1/2	2 1/2	3	3	3	3 1/2	3 1/2	4	4
1	1	1	1	1 1/2	1 1/2	1 1/2	1 1/2	2	2	2	2 1/2	2 1/2	2 1/2	2 1/2	3	3	3	3 1/2	3 1/2	3 1/2	4	4 1/2
1 1/2	1	1	1	1 1/2	1 1/2	1 1/2	2	2	2	2 1/2	2 1/2	2 1/2	3	3	3	3 1/2	3 1/2	3 1/2	4	4	4 1/2	4 1/2
2	1	1	1 1/2	1 1/2	1 1/2	1 1/2	2	2	2	2 1/2	2 1/2	3	3	3	3 1/2	3 1/2	3 1/2	4	4	4 1/2	4 1/2	5
2 1/2	1	1	1 1/2	1 1/2	1 1/2	2	2	2	2 1/2	2 1/2	2 1/2	3	3	3 1/2	3 1/2	3 1/2	4	4	4	4 1/2	4 1/2	5
3	1	1	1 1/2	1 1/2	1 1/2	2	2	2	2 1/2	2 1/2	3	3	3	3 1/2	3 1/2	3 1/2	4	4 1/2	4 1/2	4 1/2	5	5
3 1/2	1	1	1 1/2	1 1/2	1 1/2	2	2	2 1/2	2 1/2	2 1/2	3	3	3	3 1/2	3 1/2	4	4	4 1/2	4 1/2	5	5	5 1/2
4	1	1	1 1/2	1 1/2	2	2	2	2 1/2	2 1/2	2 1/2	3	3	3 1/2	3 1/2	3 1/2	4	4	4 1/2	4 1/2	5	5	5 1/2
6	1 1/2	1 1/2	1 1/2	1 1/2	2	2	2 1/2	2 1/2	2 1/2	3	3	3 1/2	3 1/2	4	4	4	4 1/2	5	5	5 1/2	5 1/2	6
8	1 1/2	1 1/2	1 1/2	1 1/2	2	2	2 1/2	2 1/2	3	3	3	3 1/2	3 1/2	4	4	4 1/2	4 1/2	5	5	5 1/2	6	6
10	1 1/2	1 1/2	1 1/2	1 1/2	2	2	2 1/2	2 1/2	3	3	3 1/2	3 1/2	4	4	4 1/2	4 1/2	5	5	5 1/2	6	6	6 1/2
12	1 1/2	1 1/2	1 1/2	1 1/2	2	2	2 1/2	2 1/2	3	3	3 1/2	3 1/2	4	4	4 1/2	4 1/2	5	5 1/2	5 1/2	6	6 1/2	6 1/2
14	1 1/2	1 1/2	1 1/2	1 1/2	2	2	2 1/2	2 1/2	3	3	3 1/2	3 1/2	4	4	4 1/2	4 1/2	5	5 1/2	5 1/2	6	6 1/2	7
16	1 1/2	1 1/2	1 1/2	1 1/2	2	2 1/2	2 1/2	2 1/2	3	3 1/2	3 1/2	4	4	4 1/2	4 1/2	5	5	5 1/2	6	6	6 1/2	7
18	1 1/2	1 1/2	1 1/2	2	2	2 1/2	2 1/2	2 1/2	3	3 1/2	3 1/2	4	4	4 1/2	4 1/2	5	5 1/2	5 1/2	6	6 1/2	6 1/2	7
20	1 1/2	1 1/2	1 1/2	2	2	2 1/2	2 1/2	3	3	3 1/2	3 1/2	4	4	4 1/2	4 1/2	5	5 1/2	5 1/2	6	6 1/2	7	7
22	1 1/2	1 1/2	1 1/2	2	2	2 1/2	2 1/2	3	3	3 1/2	3 1/2	4	4	4 1/2	4 1/2	5	5 1/2	5 1/2	6	6 1/2	7	7 1/2
24	1 1/2	1 1/2	1 1/2	2	2	2 1/2	2 1/2	3	3	3 1/2	3 1/2	4	4	4 1/2	5	5	5 1/2	6	6	6 1/2	7	7 1/2
26	1 1/2	1 1/2	1 1/2	2	2	2 1/2	2 1/2	3	3	3 1/2	3 1/2	4	4 1/2	4 1/2	5	5	5 1/2	6	6	6 1/2	7	7 1/2
28	1 1/2	1 1/2	1 1/2	2	2	2 1/2	2 1/2	3	3	3 1/2	3 1/2	4	4 1/2	4 1/2	5	5	5 1/2	6	6 1/2	6 1/2	7	7 1/2
30	1 1/2	1 1/2	1 1/2	2	2	2 1/2	2 1/2	3	3	3 1/2	3 1/2	4	4 1/2	4 1/2	5	5	5 1/2	6	6 1/2	7	7	7 1/2
32	1 1/2	1 1/2	1 1/2	2	2	2 1/2	2 1/2	3	3	3 1/2	3 1/2	4	4 1/2	4 1/2	5	5	5 1/2	6	6 1/2	7	7 1/2	7 1/2
34	1 1/2	1 1/2	1 1/2	2	2	2 1/2	2 1/2	3	3	3 1/2	3 1/2	4	4 1/2	4 1/2	5	5 1/2	5 1/2	6	6 1/2	7	7 1/2	7 1/2
36	1 1/2	1 1/2	1 1/2	2	2	2 1/2	2 1/2	3	3	3 1/2	3 1/2	4	4 1/2	4 1/2	5	5 1/2	6	6	6 1/2	7	7 1/2	8
FLAT	1 1/2	1 1/2	1 1/2	2	2	2 1/2	3	3	3 1/2	3 1/2	4	4 1/2	5	5	5 1/2	6	6 1/2	7	7 1/2	8	8 1/2	9
	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

NOTES:

A-This chart must not be used for temperatures in excess of 750 °F -- the upper limit of Spec. 21-H.

B-The chart at the lef is to be used only when determining thicknesses for use on Dowtherm, or wher the heat process is critical. For all other applications of asbestos fiber see chart on page 50

UCC 003379

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Union Carbide trial exhibit UC-2365: Thermal Insulation Specifications for the South Charleston Plant, with A. R. G...
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UCC 003380

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

(AIR TEMPERATURE AT 90° F. AND AIR MOVEMENT AT 0 M.P.H.)

HIGH TEMPERATUR
CALCIUM SILICAT

Spec. 25-H
Spec. 32-H

PIPE SIZE	OPERATING TEMPERATURE °C.																												
	UP TO 176	180 TO 195	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
1/2	1	1	1-1/2	1-1/2	1-1/2	1-1/2	1-1/2	2	2	2	2	2-1/2	2-1/2	2-1/2	2-1/2	3	3	3	3	3	3-1/2	3-1/2	3-1/2	3-1/2	3-1/2	3-1/2	3-1/2	3-1/2
3/4	1	1	1-1/2	1-1/2	1-1/2	1-1/2	2	2	2	2	2-1/2	2-1/2	2-1/2	2-1/2	3	3	3	3	3-1/2	3-1/2	3-1/2	3-1/2	3-1/2	3-1/2	3-1/2	3-1/2	3-1/2	3-1/2
1	1	1	1-1/2	1-1/2	1-1/2	1-1/2	2	2	2	2-1/2	2-1/2	2-1/2	3	3	3	3	3	3-1/2	3-1/2	3-1/2	3-1/2	3-1/2	3-1/2	3-1/2	4	4	4	4
1-1/2	1	1	1-1/2	1-1/2	1-1/2	2	2	2	2-1/2	2-1/2	2-1/2	3	3	3	3	3-1/2	3-1/2	3-1/2	4	4	4	4	4	4	4	4	4	4
2	1	1	1-1/2	1-1/2	2	2	2	2	2-1/2	2-1/2	2-1/2	3	3	3	3	3-1/2	3-1/2	3-1/2	4	4	4	4	4	4	4-1/2	4-1/2	4-1/2	4-1/2
2-1/2	1	1	1-1/2	1-1/2	2	2	2	2-1/2	2-1/2	2-1/2	3	3	3	3-1/2	3-1/2	3-1/2	4	4	4	4	4	4-1/2	4-1/2	4-1/2	4-1/2	4-1/2	4-1/2	4-1/2
3	1	1	1-1/2	2	2	2	2-1/2	2-1/2	2-1/2	3	3	3	3-1/2	3-1/2	3-1/2	4	4	4	4-1/2	4-1/2	4-1/2	4-1/2	4-1/2	4-1/2	4-1/2	4-1/2	5	5
3-1/2	1	1	1-1/2	2	2	2	2-1/2	2-1/2	2-1/2	3	3	3	3-1/2	3-1/2	3-1/2	4	4	4-1/2	4-1/2	4-1/2	4-1/2	4-1/2	4-1/2	4-1/2	5	5	5	5
4	1	1	1-1/2	2	2	2	2-1/2	2-1/2	3	3	3	3-1/2	3-1/2	3-1/2	4	4	4	4-1/2	4-1/2	4-1/2	4-1/2	5	5	5	5	6	6	6
5	1-1/2	1-1/2	2	2	2	2-1/2	2-1/2	2-1/2	3	3	3-1/2	3-1/2	3-1/2	4	4	4-1/2	4-1/2	4-1/2	5	5	5	5	5	5	5-1/2	5-1/2	5-1/2	5-1/2
6	1-1/2	1-1/2	2	2	2	2-1/2	2-1/2	2-1/2	3	3	3-1/2	3-1/2	3-1/2	4	4	4-1/2	4-1/2	4-1/2	5	5	5	5	5	5	5-1/2	5-1/2	5-1/2	5-1/2
8	1-1/2	1-1/2	2	2	2	2-1/2	2-1/2	3	3	3	3-1/2	3-1/2	4	4	4	4-1/2	4-1/2	5	5	5	5	5-1/2	5-1/2	5-1/2	5-1/2	5-1/2	6	6
10	1-1/2	1-1/2	2	2	2-1/2	2-1/2	2-1/2	3	3	3-1/2	3-1/2	3-1/2	4	4	4	4-1/2	5	5	5-1/2	5-1/2	5-1/2	5-1/2	5-1/2	6	6	6	6	6
12	1-1/2	1-1/2	2	2	2-1/2	2-1/2	2-1/2	3	3	3-1/2	3-1/2	4	4	4-1/2	4-1/2	5	5	5-1/2	5-1/2	5-1/2	5-1/2	5-1/2	6	6	6	6	6	6
14	1-1/2	1-1/2	2	2	2-1/2	2-1/2	2-1/2	3	3	3-1/2	3-1/2	4	4	4-1/2	4-1/2	5	5	5-1/2	5-1/2	5-1/2	5-1/2	6	6	6	6	6	6	6-1/2
16	1-1/2	1-1/2	2	2	2-1/2	2-1/2	3	3	3-1/2	3-1/2	3-1/2	4	4	4-1/2	4-1/2	5	5	5-1/2	6	6	6	6	6	6	6	6-1/2	6-1/2	6-1/2
18	1-1/2	1-1/2	2	2	2-1/2	2-1/2	3	3	3-1/2	3-1/2	4	4	4-1/2	4-1/2	5	5	5-1/2	5-1/2	6	6	6	6	6	6	6-1/2	6-1/2	6-1/2	6-1/2
20	1-1/2	1-1/2	2	2	2-1/2	2-1/2	3	3	3-1/2	3-1/2	4	4	4-1/2	4-1/2	5	5	5-1/2	5-1/2	6	6	6	6	6	6-1/2	6-1/2	6-1/2	6-1/2	7
22	1-1/2	1-1/2	2	2	2-1/2	2-1/2	3	3	3-1/2	3-1/2	4	4	4-1/2	4-1/2	5	5	5-1/2	5-1/2	6	6	6	6	6-1/2	6-1/2	6-1/2	6-1/2	7	7
24	1-1/2	1-1/2	2	2	2-1/2	2-1/2	3	3	3-1/2	3-1/2	4	4	4-1/2	4-1/2	5	5	5-1/2	6	6	6	6	6	6-1/2	6-1/2	6-1/2	6-1/2	7	7
26	1-1/2	1-1/2	2	2	2-1/2	2-1/2	3	3	3-1/2	3-1/2	4	4	4-1/2	5	5	5-1/2	5-1/2	6	6	6	6	6-1/2	6-1/2	6-1/2	6-1/2	7	7	7
28	1-1/2	2	2	2-1/2	2-1/2	2-1/2	3	3	3-1/2	3-1/2	4	4	4-1/2	5	5	5-1/2	5-1/2	6	6-1/2	6-1/2	6-1/2	6-1/2	6-1/2	6-1/2	6-1/2	7	7	7
30	1-1/2	2	2	2-1/2	2-1/2	2-1/2	3	3	3-1/2	3-1/2	4	4	4-1/2	5	5	5-1/2	6-1/2	6	6-1/2	6-1/2	6-1/2	6-1/2	6-1/2	6-1/2	7	7	7	7
32	1-1/2	2	2	2-1/2	2-1/2	3	3	3-1/2	3-1/2	4	4	4-1/2	4-1/2	5	5	5-1/2	6-1/2	6	6-1/2	6-1/2	6-1/2	6-1/2	6-1/2	7	7	7	7	7
34	1-1/2	2	2	2-1/2	2-1/2	3	3	3-1/2	3-1/2	4	4	4-1/2	4-1/2	5	5	5-1/2	6-1/2	6	6-1/2	6-1/2	6-1/2	6-1/2	6-1/2	7	7	7	7	7
36	1-1/2	2	2	2-1/2	2-1/2	3	3	3-1/2	3-1/2	4	4-1/2	4-1/2	5	5-1/2	5-1/2	6	7	7-1/2	7-1/2	7-1/2	7-1/2	7-1/2	7-1/2	8	8	8	8	8-1/2
	UP TO 358	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 1318
	OPERATING TEMPERATURE °F																											

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.
1/2"	.84	1.00	2.88	1.56	4.00	2.06	5.00	2.35	5.56	2.88	6.63				
3/4"	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				
1-1/2"	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
2-1/2"	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
3-1/2"	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	1.53	7.63	2.03	8.63	2.53	9.63	3.09	10.75	3.59	11.75	4.09	12.75
4-1/2"	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	4.19	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	1.92	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, Standard - - - - - - - - - - Spec. 20-H
B - Calcium Silicate, High Temperature - - - - - - 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.

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CELLULAR GLASS

Spec. 10-L

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	9 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
1½	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	5½	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
OPERATING TEMPERATURE °F	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

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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.
1/4"	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	0.681	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
1/2"	0.840	0.856	1.009	2.875	1.572	4.000	2.072	5.000	2.354	5.563	2.890	6.625	3.384	7.625	4.384	9.625
3/4"	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	1.084	3.500	1.584	4.500	2.115	5.563	2.665	6.625	3.147	7.625	3.647	8.625	4.147	9.625
1-1/4"	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
1-1/2"	1.900	1.916	1.042	4.000	1.542	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
2-1/2"	2.875	2.961	1.019	5.000	1.301	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
3-1/2"	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	3.610	11.750	4.109	12.850
4-1/2"	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	5.636	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			1.576	14.000	2.078	15.000	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	42.129
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 - - - - - - - - Specs. 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.

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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		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.
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	2.15	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 - - - - - - - - - Specs. 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 003384

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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	7.58	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	84.18	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	153.38	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	215.42	50.27
16'-6"	213.82	-	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"	415.48	-	72.26
24'-0"	452.39	-	75.40
25'-0"	490.86	-	78.54

NOTE:

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EXTERNAL AREAS OF INSULATED FLANGES

(Square Feet Per Flange)

NOM. PIPE SIZE (INCHES)	O.D. FLANGE (INCHES)	INSULATION THICKNESS										
		1"	1-1/2"	2"	2-1/2"	3"	3-1/2"	4"	4-1/2"	5"	5-1/2"	6"
1/2	3-1/2	1.1	1.3	1.5	1.7	1.9	2.1	2.3	2.5	2.8	3.0	3.2
3/4	3-7/8	1.2	1.3	1.5	1.7	1.9	2.1	2.3	2.5	2.8	3.0	3.2
1	4-1/4	1.2	1.4	1.6	1.8	2.0	2.2	2.4	2.7	2.9	3.1	3.3
1-1/4	4-5/8	1.3	1.5	1.7	1.9	2.1	2.3	2.5	2.8	3.0	3.2	3.4
1-1/2	5	1.4	1.6	1.8	2.0	2.2	2.4	2.6	2.9	3.1	3.3	3.5
2	6	1.6	1.8	2.0	2.2	2.4	2.6	2.8	3.1	3.3	3.5	3.7
2-1/2	7	1.8	2.0	2.2	2.4	2.6	2.8	3.0	3.3	3.5	3.7	3.9
3	7-1/2	1.9	2.1	2.3	2.5	2.7	2.9	3.1	3.4	3.6	3.8	4.0
3-1/2	8-1/2	2.0	2.2	2.4	2.6	2.8	3.0	3.2	3.5	3.7	3.9	4.1
4	9	2.1	2.3	2.5	2.7	2.9	3.1	3.3	3.6	3.8	4.0	4.2
5	10	2.3	2.5	2.7	2.9	3.1	3.3	3.5	3.8	4.0	4.2	4.4
6	11	2.4	2.6	2.8	3.0	3.2	3.4	3.6	3.9	4.1	4.3	4.5
8	13-1/2	2.7	2.9	3.1	3.3	3.5	3.7	3.9	4.2	4.4	4.6	4.8
10	16	3.0	3.2	3.4	3.6	3.8	4.0	4.2	4.5	4.7	4.9	5.1
12	19	3.2	3.4	3.6	3.8	4.0	4.2	4.4	4.7	4.9	5.1	5.3
14	21	3.4	3.6	3.8	4.0	4.2	4.4	4.6	4.9	5.1	5.3	5.5
16	23-1/2	3.6	3.8	4.0	4.2	4.4	4.6	4.8	5.1	5.3	5.5	5.7
18	25	3.8	4.0	4.2	4.4	4.6	4.8	5.0	5.3	5.5	5.7	5.9
20	27-1/2	3.9	4.1	4.3	4.5	4.7	4.9	5.1	5.4	5.6	5.8	6.0
24	32	4.2	4.4	4.6	4.8	5.0	5.2	5.4	5.7	5.9	6.1	6.3

NOTE

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EXTERNAL AREAS OF INSULATED FITTINGS

(Square Feet Per Fitting)

NOM. PIPE SIZE (INCHES)	INSULATION THICKNESS										
	1	1-1/2	2	2-1/2	3	3-1/2	4	4-1/2	5	5-1/2	6
1/2	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.3	0.4	0.4
3/4	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
1-1/4	0.2	0.3	0.4	0.4	0.5	0.6	0.6	0.7	0.7	0.8	0.9
1-1/2	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
2-1/2	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
3-1/2	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
4-1/2	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	28.2	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:

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EXTERNAL AREA OF INSULATED PIPE

(Square Feet Per Lineal Foot)

NOM. PIPE SIZE (INCHES)	AREA OF BARE PIPE PER L. F. (SQ. FT.)	INSULATION THICKNESS																
		1	1-1/2	2	2-1/2	3	3-1/2	4	4-1/2	5	5-1/2	6	6-1/2	7	7-1/2	8	8-1/2	9
1/8	.106	0.7	0.9	1.2	1.3	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.
1/4	.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.
3/8	.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.
1/2	.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.
3/4	.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.
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	4.5	4.8	5.
1-1/4	.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.
1-1/2	.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	.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.
2-1/2	.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.
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	4.8	5.1	5.4	5.
3-1/2	1.047	1.6	1.8	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.
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.
4-1/2	1.309	1.9	2.1	2.3	2.6	2.8	3.2	3.4	3.7	4.0	4.2	4.5	4.8	5.0	5.3	5.5	5.8	6.
5	1.456	2.0	2.2	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.
6	1.734	2.2	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.
7	1.996	2.6	2.7	3.1	3.3	3.6	3.9	4.1	4.4	4.7	4.9	5.2	5.5	5.7	6.0	6.2	6.5	6.
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.
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.
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.
11	3.073	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.
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.
14	3.668	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.
16	3.188	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.
18	4.718	5.3	5.5	5.8	6.1	6.3	6.6	6.8	7.1	7.4	7.6	7.8	8.2	8.4	8.7	8.9	9.2	9.
20	5.235	5.8	6.1	6.3	6.6	6.8	7.1	7.4	7.6	7.8	8.2	8.4	8.7	8.9	9.2	9.5	9.7	10.
22	5.747	6.1	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.
24	6.286	6.8	7.1	7.4	7.8	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.
26	6.807	7.4	7.6	7.8	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.
28	7.331	7.8	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.
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.
36	9.425	10.0	10.2	10.5	10.8	11.0	11.3	11.6	11.9	12.1	12.3	12.6	12.9	13.1	13.4	13.7	13.9	14.

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CIRCUMFERENCES OF INSULATED LINES
(In Lineal Feet)

LINE SIZE (Inches)	INSULATION THICKNESS																
	1	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2	5	5 1/2	6	6 1/2	7	7 1/2	8	8 1/2	9
1/2	.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
3/4	.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
1 1/2	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	5.3
2 1/2	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
3 1/2	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 for estimating purposes only when determining hand and wire requirements.

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FIG. UA-1

UCC 003390

UCC 003391

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NOTE: SINGLE LAYER INSULATION
UP TO 1½" O.D. PIPE SIZE AS SPECIFIED
INSULATION.
LOCATION OF FASTENING
WIRE, OR STRAP, AS SPECIFIED
LOCATION OF JOINTS
ENDS OF SECTIONS BUTTED TOGETHER
INSULATION
PIPE
E-40

UCC 003392