

SECTION .95

INSULATION SPECS

UTILITIES

ENVIRONMENTAL CONTROL

DISTRIBUTION

X.95 Insulation

Insulation is provided on vessels, equipment, and piping for heat conservation, process stability, prevention of condensation, and personnel protection. Preformed polyurethane is used to reduce heat leak in cold service; calcium silicate is used in high temperature service. In temperature ranges from +25F to 150F mineral wool, foam glass, and "K-Kote" Mastic are used. Mineral wool is also used as fire protection over polyurethane on vessels and equipment.

Design K values for these materials are shown in Figure 1.

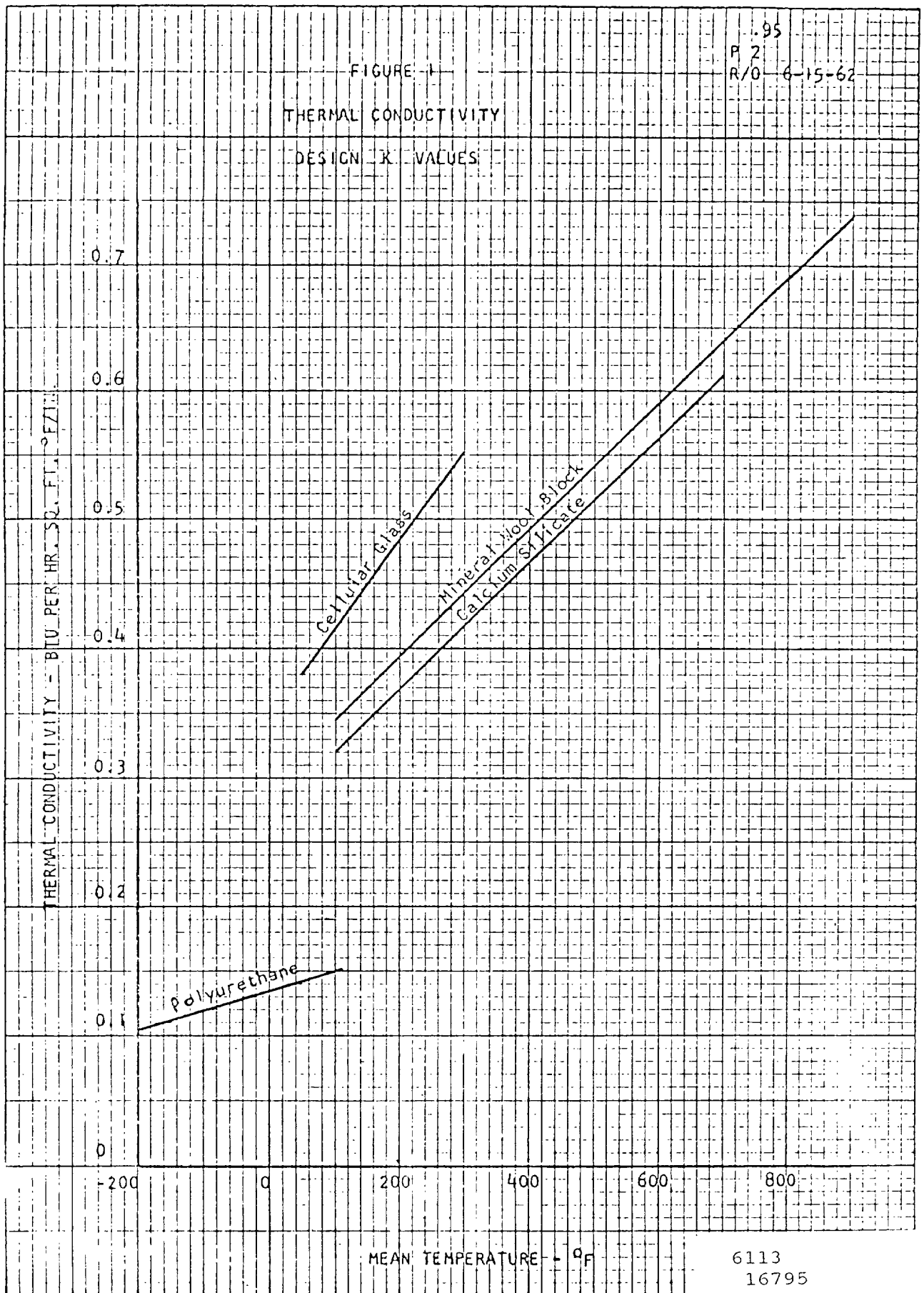
High temperature insulation to 1200F is preformed Kaylo, a calcium silicate material by Owens-Corning Fiberglass Corporation. For temperatures above 1200F, Kaylo 20 High Temperature Insulation is used. Insulation thicknesses for equipment and piping appear in Figures 2 and 3, respectively. Multiple layers are provided for the higher temperature ranges. The insulation system is completed by accessories including insulation filler, caulking mastic, reinforcing membrane of glass fiber, and Lion Oil Seal Perm weather coating. In battery limits, aluminum sheet is used for protective jacketing on piping while asbestos roofing felt is used off battery limits. Expansion joint spacing is approximately 18 ft on piping.

Low temperature insulation is Type U-200 preformed, fire retardant, rigid polyester polyurethane, foamed with Freon 11, by Union Asbestos & Rubber Company. On vessels and equipment, polyurethane insulation is fireproofed with two inches of mineral wool block. Figures 4 and 5 show polyurethane thicknesses for equipment and piping. Piping expansion joint spacing is shown in Figure 6. Accessory materials to form a complete insulation system include lagging adhesive, joint sealer, caulking mastic, glass fiber reinforcing membrane, interior and exterior vapor barriers, and aluminum protective jacketing.

Insulating materials and thicknesses used for temperatures between +25F and 150F appear in Figure 7. Moisture seals have been provided for temperatures below 80F. Mineral wool block is "PV Supertemp" by Eagle-Picher Company; foam glass block is preformed cellular glass block, 9 to 11 pound density, by Pittsburgh-Corning Corporation; and insulating mastic is "K-Kote", a cork filled asphaltic mastic by Lion Oil Company.

Measures have been taken to avoid frost on appurtenances attached to cold equipment. Wood blocks are used to isolate foundations, ladders, platforms, and similar items from low temperature services. Tapered insulation is employed where required on instrument runs, safety valve inlets, and similar connections.

Insulation summaries are included in this section showing size, configuration, and insulation codes for major items of equipment.



X .95
p 3
R/O 6-15-62

FIGURE 2

HOT VESSEL & EQUIPMENT INSULATION

Code Number	101	151	201	251	301	302	352	402	452	Special
Temperature Range	200 & below	201 300	301 400	401 500	501 600	601 900	901 1000	1001 1100	1101 1200	Over 1200
Thickness Single Layer	1"	1½"	2"	2½"	3"					Required insulation to be specified for individual equipment.
Thickness Double Layer						3"	3½"	4"	4½"	

FIGURE 3

X .95
p 4
R/O 6-15-62

HOT PIPING INSULATION

THICKNESS IN INCHES

Code	R	S	T	U	V	W	X
Temperature Range °F	151 to 450	451 to 600	601 to 750	751 to 900	901 to 1050	1051 to 1200	1201 to 1800
1" & Under	1"	1"	1½"	2"	2"	2½"	
1½"	1"	1½"	1½"	2"	2"	2½"	
2"	1"	1½"	1½"	2"	2½"	2½"	
3"	1"	1½"	1½"	2"	2½"	3"	
4"	1½"	1½"	2"	2"	2½"	3"	
6"	1½"	2"	2"	2½"	3"	3"	
8"	1½"	2"	2"	2½"	3"	3½"	
10"	1½"	2"	2½"	2½"	3"	3½"	
12"	1½"	2"	2½"	2½"	3"	3½"	
14"	1½"	2"	2½"	2½"	3"	3½"	
16"	1½"	2"	2½"	3"	3"	3½"	
18"	1½"	2"	2½"	3"	3"	3½"	
20"	1½"	2"	2½"	3"	3"	3½"	
24"	1½"	2"	2½"	3"	3"	4"	

FOR INSULATION OF PIPING, VESSELS AND
EQUIPMENT WITHIN THE RANGE OF +1201 THRU
+1800F, SEE INSTRUCTIONS FOR SPECIFIC ITEMS

Over 24" as specified on the drawings

SINGLE LAYER

DOUBLE LAYER

NOTE: Double layer insulation required for 3" IPS and less,
above 750F and for piping 4" IPS and larger, above
600F.

LAM021325

FIGURE 4

K .95
P 5
R/O 6-15-62

LOW TEMPERATURE INSULATION FOR VESSELS AND EQUIPMENT

THICKNESS IN INCHES

Insulation Code No.	30	35	40	45	50	55	60
Temperature Range	from +25	-45	-85	-125	-165	-210	-255
	to -44	-84	-124	-164	-209	-254	-300
External Layer (Mineral Wood)	2"	2"	2"	2"	2"	2"	2"
Polyurethane	1"	1½"	2"	2½"	3"	3½"	4"
Approx. Total Thickness	3"	3½"	4"	4½"	5"	5½"	6"

Single Layer of Polyurethane

Two Layers of Poly-
urethane

LAM021326

X.95
p 6
R/O 6-15-62

FIGURE 5

LOW TEMPERATURE INSULATION FOR PIPING
(POLYURETHANE PREFORMED PIPE INSULATION)

Insulation Code	A	B	C	D	E	F	G	H
Temp. Range °F	+70 +26	+25 -10	-11 -50	-51 -100	-101 -150	-151 -200	-201 -250	-251 -300
Pipe Size	(Thickness in Inches)							
1" & Smaller	3/4"	1"	1 1/2"	1 1/2"	2"	2"	2 1/2"	2 1/2"
1 1/2"	3/4"	1"	1 1/2"	1 1/2"	2"	2"	2 1/2"	2 1/2"
2"	3/4"	1"	1 1/2"	2"	2"	2 1/2"	2 1/2"	3"
3"	3/4"	1 1/2"	1 1/2"	2"	2 1/2"	2 1/2"	3"	3"
4"	3/4"	1 1/2"	1 1/2"	2"	2 1/2"	3"	3"	3 1/2"
6"	3/4"	1 1/2"	2"	2 1/2"	2 1/2"	3"	3 1/2"	3 1/2"
8"	1"	1 1/2"	2"	2 1/2"	2 1/2"	3"	3 1/2"	4"
10"	1"	1 1/2"	2"	2 1/2"	3"	3 1/2"	3 1/2"	4"
12"	1"	1 1/2"	2"	2 1/2"	3"	3 1/2"	3 1/2"	4"
14" & Over	1 1/2"	1 1/2"	2"	2 1/2"	3"	3 1/2"	4"	4 1/2"

Use two layers for
insulation over 3"

X .95
P 7
R/O 6-15-62

FIGURE 6

SPACING BETWEEN 1" EXPANSION JOINTS FOR COLD PIPING INSULATION

<u>Operating Temperature °F</u>	<u>Maximum Spacing</u>
-50 and above	35.0 ft
-100	25.0 ft
-150	20.0 ft
-200	16.0 ft
-250	14.0 ft
-300	12.5 ft

X.95
P 8
R/O 6-15-62

FIGURE 7

THICKNESS OF INSULATION

Temperature Range	+26 to +40	+41 to +55	+56 to +80	+80 to +150
Thickness, Inches	2	1½	1	½
Code - Min Wool Block	20	15	10	*k
Code - Foam Glass	20f	15f	10f	*k
Code - K-Kote	-	-	-	5

* NOTE: One-inch blocks, Coods 10 or 10f may be used in this range if circumstances make it desirable. Mastic, (Code 5) shall not be used on large vessels or columns.