

TABLE 5. AREAS OF FLANGED FITTINGS, SQUARE FEET*

NOMINAL PIPE SIZE (INCHES)	FLANGED COUPLING		90 DEG ELL		LONG RADIUS ELL		TEE		CROSS	
	Standard	Extra Heavy	Standard	Extra Heavy	Standard	Extra Heavy	Standard	Extra Heavy	Standard	Extra Heavy
1	0.320	0.438	0.795	1.015	0.892	1.083	1.235	1.575	1.622	2.07
1 1/4	0.383	0.510	0.957	1.098	1.084	1.340	1.481	1.925	1.943	2.53
1 1/2	0.477	0.727	1.174	1.332	1.337	1.874	1.815	2.68	2.38	3.54
2	0.672	0.848	1.65	2.01	1.84	2.16	2.54	3.09	3.32	4.06
2 1/2	0.841	1.107	2.09	2.57	2.32	2.76	3.21	4.05	4.19	5.17
3	0.945	1.484	2.38	3.49	2.63	3.74	3.66	5.33	4.77	6.95
3 1/2	1.122	1.644	2.98	3.96	3.28	4.28	4.48	6.04	5.83	7.89
4	1.344	1.914	3.53	4.64	3.96	4.99	5.41	7.07	7.03	9.24
4 1/2	1.474	2.04	3.95	5.02	4.43	5.46	6.07	7.72	7.87	10.07
5	1.622	2.18	4.44	5.47	5.00	6.02	6.81	8.52	8.82	10.97
6	1.82	2.78	5.13	6.99	5.99	7.76	7.84	10.64	10.08	13.75
8	2.41	3.77	6.98	9.76	8.56	11.09	10.55	14.74	13.44	18.97
10	3.43	5.20	10.18	13.58	12.35	15.60	15.41	20.41	19.58	26.26
12	4.41	6.71	13.08	17.73	16.35	18.76	19.67	26.65	24.87	34.11

*Including areas of accompanying flanges bolted to the fitting.

each type of material, also, that in the use of *conductivity* all variables due to differences in thickness, pipe sizes, and air conditions are eliminated. Individual manufacturer's materials will, of course, vary in conductivity to some extent from these values.

The heat losses through 1, 1 1/2, and 2-in. thick 85 per cent magnesia type of insulation for temperature differences between the pipe and the surrounding atmosphere up to 280 F are shown in Figs. 1, 2, and 3. Standard thicknesses of 85 per cent magnesia pipe covering are not exactly 1 in. However, the loss through any given thickness of insulation can be obtained by interpolation. Also, the losses through any of the insulations given in Table 6 can be obtained by multiplying the losses obtained from Figs. 1, 2, or 3 by the factors given in Table 7.

Pipes operating at high temperatures are frequently insulated to the best advantage by combining a high temperature insulation near the pipe with a moderate or low temperature insulation around it as an outer

TABLE 6. THERMAL CONDUCTIVITY (*k*) OF VARIOUS TYPE PIPE INSULATIONS FOR MEDIUM AND HIGH TEMPERATURE PIPE*

Expressed in Btu per (hour) (square foot) (Fahrenheit degree temperature difference per inch)

TYPES OF INSULATING MATERIALS	DENSITY LB/CU FT	TEMP. RANGE OF ACCEPTED USE	MEAN TEMPERATURE, F DEG				
			100	200	300	400	500
85% Magnesia—Type.....	13-15	Up to 600 F	0.41	0.45	0.48	0.52	
Corrugated Asbestos—Type							
4 Ply per 1 in.....	11-13	Up to 300 F	0.57	0.68	0.80		
6 Ply per 1 in.....	15-17	Up to 300 F	0.51	0.59	0.69		
8 Ply per 1 in.....	18-20	Up to 300 F	0.49	0.57	0.65		
Laminated Asbestos—Type							
(35-40 laminations per 1 in.).....	30-35	Up to 700 F	0.39	0.44	0.49	0.54	
Mineral Wool—Type.....	10-15	Up to 800 F	0.40	0.45	0.50	0.55	
Diatomaceous Silica—Type.....	25-30	Up to 1900 F	0.63	0.66	0.69	0.72	0.75
Brown Asbestos Fiber—Type.....	13-15	Up to 1200 F	0.34	0.39	0.44	0.49	0.54

*Average values from various laboratories for insulating materials of various manufacturers.

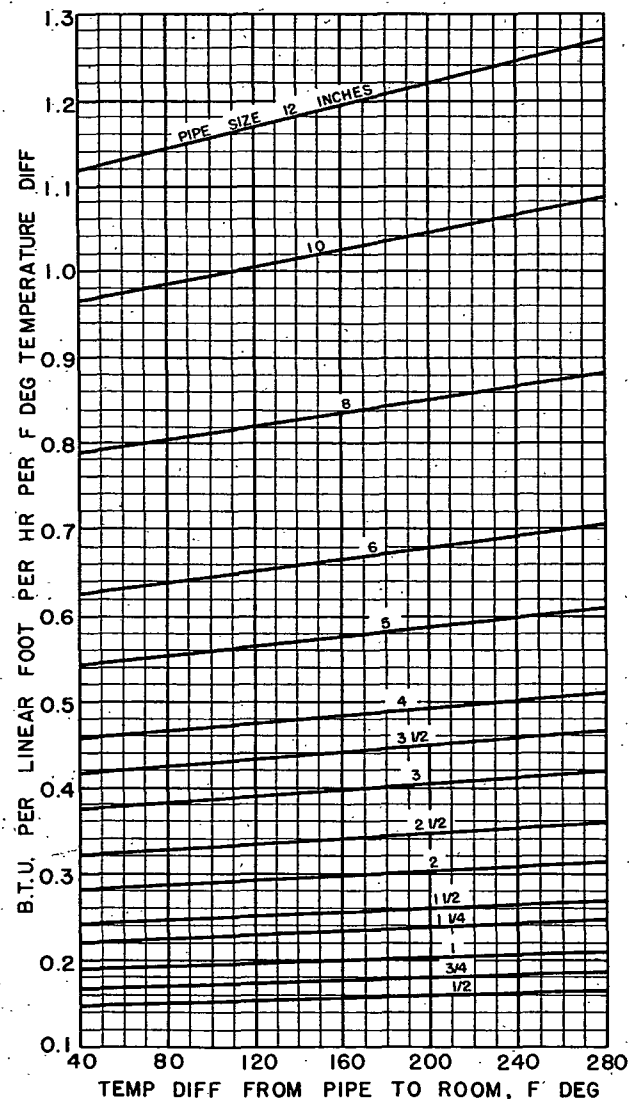


FIG. 1. HEAT LOSS THROUGH 1 IN. THICK 85 PER CENT MAGNESIA TYPE COVERING

layer. By this method an efficient material may be used for each of the two temperature ranges encountered. In calculating the heat loss through such a combination the mean temperature of each layer must be determined along with the thickness of each. This is readily done in