

TABLE 7. AREAS OF FLANGED FITTINGS, SQUARE FEET^a

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	2.68	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

^aIncluding areas of accompanying flanges bolted to the fitting.

insulations given in Table 8 can be obtained by multiplying the losses obtained from Figs. 1, 2, or 3 by the factors given in Table 9.

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 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 three or four calculations performed as a series of approximations in which assumptions of thickness and mean temperature are adjusted as indicated.

The rate of heat loss from a surface maintained at constant temperature is greatly increased by air circulation over the surface. In the case of well-insulated surfaces, the increases in losses due to air velocity are very small as compared with increases from bare surfaces, because of the fact

TABLE 8. THERMAL CONDUCTIVITY (*k*) OF VARIOUS TYPE PIPE INSULATIONS FOR MEDIUM AND HIGH TEMPERATURE PIPE^a

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

TYPES OF INSULATING MATERIALS	DENSITY LB/CU FT	TEMP. RANGE OF ACCEPTED USE	MEAN TEMPERATURE, DEG F				
			100	200	300	400	500
85% Magnesite—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

^aAverage values from various laboratories for insulating materials of various manufacturers.

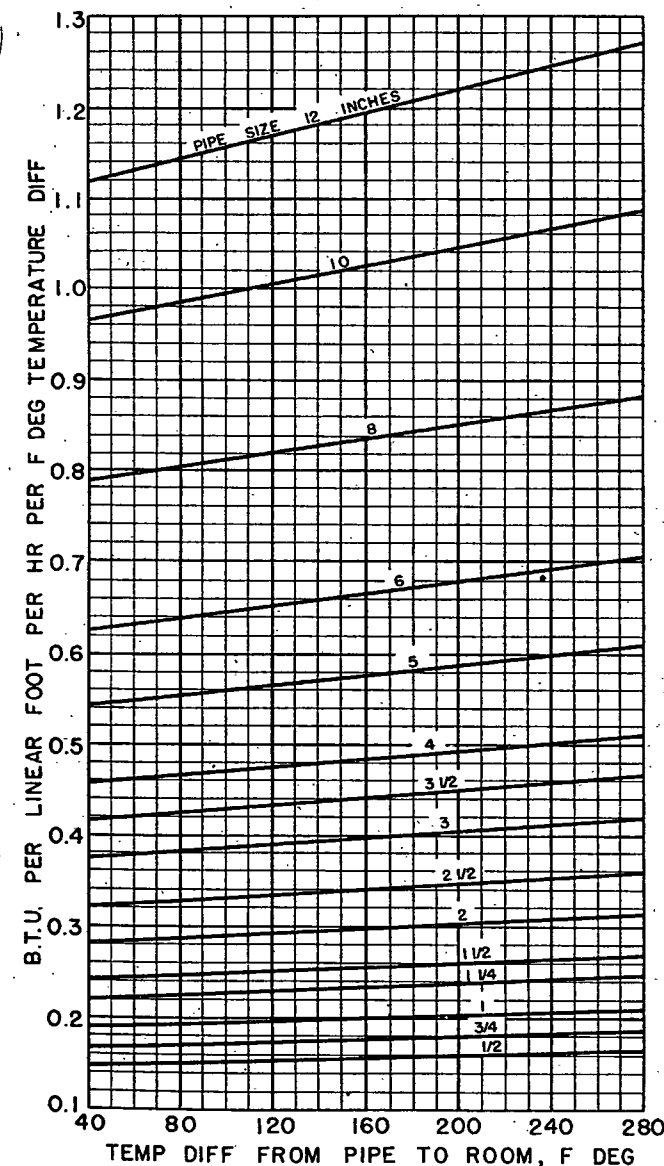


FIG. 1. HEAT LOSS THROUGH 1 IN. THICK 85 PER CENT MAGNESITE TYPE COVERING

that air flowing over the surface of the insulation can increase only the conductance of heat from surface to air, and cannot change the internal conductance of the insulation itself. The maximum increase in heat loss due to air velocity ranges from about 15 per cent in the case of 1-in. thick