

HEATING VENTILATING AIR CONDITIONING GUIDE 1938

TABLE 4. HEAT LOSS FROM HORIZONTAL TARNISHED COPPER PIPE

Expressed in Btu per linear foot per degree Fahrenheit between the pipe and surrounding still air at 70 F

NOMINAL PIPE SIZE (INCHES)	Hot Water (Type K Copper Tube)				STEAM (Standard Pipe Size Pipe)		
	120 F	150 F	180 F	210 F	227.1 F (5 Lb)	297.7 F (50 Lb)	337.9 F (100 Lb)
	TEMPERATURE DIFFERENCE						
	50 F	80 F	110 F	140 F	157.1 F	227.7 F	267.9 F
1/2	0.250	0.287	0.300	0.321	0.433	0.500	0.530
3/4	0.340	0.381	0.409	0.429	0.533	0.543	0.654
1	0.440	0.475	0.509	0.536	0.636	0.746	0.803
1 1/4	0.500	0.559	0.618	0.622	0.764	0.878	0.934
1 1/2	0.580	0.656	0.710	0.750	0.904	1.053	1.120
2	0.730	0.825	0.890	0.957	1.101	1.273	1.364
2 1/2	0.880	1.000	1.091	1.143	1.305	1.490	1.605
3	1.040	1.175	1.272	1.343	1.560	1.800	1.940
3 1/2	1.180	1.350	1.454	1.535	1.750	2.020	2.170
4	1.460	1.500	1.635	1.715	1.941	2.240	2.430
4 1/2					2.131	2.465	2.650
5	1.600	1.812	1.980	2.071	2.387	2.770	2.990
6	1.840	2.125	2.270	2.430	2.740	3.210	3.440
8	2.400	2.685	2.910	3.110	3.310	4.050	4.370

linear foot of pipe. Table 5 gives these areas for various standard pipe sizes, and Table 6 for copper tubing, while Table 7 gives the area in square feet for flanges and fittings for various standard pipe sizes.

Very often, when pipes are insulated, flanges and fittings are left bare due to the belief that the losses from these parts are not large. However, the fact that a pair of 8 in. standard flanges having an area of 2.41 sq ft

TABLE 5. RADIATING SURFACE PER LINEAR FOOT OF PIPE

NOMINAL PIPE SIZE (INCHES)	SURFACE AREA (Sq Ft)	NOMINAL PIPE SIZE (INCHES)	SURFACE AREA (Sq Ft)	NOMINAL PIPE SIZE (INCHES)	SURFACE AREA (Sq Ft)
1/2	0.22	2	0.622	5	1.456
3/4	0.275	2 1/2	0.753	6	1.734
1	0.344	3	0.917	8	2.257
1 1/4	0.435	3 1/2	1.047	10	2.817
1 1/2	0.498	4	1.178	12	3.338

TABLE 6. RADIATING SURFACE PER LINEAR FOOT OF COPPER TUBING

TUBE SIZE (INCHES)	SURFACE AREA (Sq Ft)	TUBE SIZE (INCHES)	SURFACE AREA (Sq Ft)	TUBE SIZE (INCHES)	SURFACE AREA (Sq Ft)
1/2	0.164	2	0.556	5	1.342
3/4	0.229	2 1/2	0.687	6	1.604
1	0.295	3	0.818	8	2.128
1 1/4	0.360	3 1/2	0.949	..	..
1 1/2	0.426	4	1.080	..	..

CHAPTER 39. PIPING AND DUCT INSULATION

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.

would lose, at 100 lb steam pressure, an amount of heat equivalent to more than a ton of coal per year shows the necessity for insulating such surfaces.

HEAT LOSSES FROM INSULATED PIPES

The conductivities of various materials used for insulating steam and hot water pipes are given in Table 8. In this table the conductivities are given as functions of the mean temperatures or the mean of the inner and outer surface temperatures of the insulations. This method of stating conductivities makes it possible to readily calculate the heat loss through single or compound sections. It should be emphasized that the conductivities given in Table 8 for the various insulations are the average of

TABLE 8. CONDUCTIVITIES (k) OF VARIOUS TYPES OF INSULATING MATERIALS FOR MEDIUM AND HIGH TEMPERATURE PIPES^a

TYPES OF INSULATING MATERIALS	MEAN TEMPERATURE				
	100 F	200 F	300 F	400 F	500 F
85 per cent Magnesia Type	0.425	0.465	0.505	0.550	0.590
Corrugated Asbestos Type (4 Plies per 1 in. thick)	0.530	0.650	0.770	0.890	
Corrugated Asbestos Type (8 Plies per 1 in. thick)	0.480	0.555	0.630	0.705	
Laminated Asbestos Type (30-40 Laminations per 1 in. thick)	0.360	0.415	0.470	0.525	0.585
Laminated Asbestos Type (20 Laminations per 1 in. thick)	0.545	0.605	0.665	0.725	0.785
Rock Wool Type	0.350	0.410	0.470	0.530	0.590
High Temperature Type (Diatomaceous Earth and Asbestos)	0.515	0.545	0.575	0.605	0.635
Brown Asbestos Type (Felted Fibre)	0.600	0.640	0.675	0.715	0.750

^aR. H. Heilman. *Mechanical Engineering*, Vol. 46 (1924), p. 593.