

TABLE 15—LOSSES FROM HORIZONTAL BARE-IRON STEAM PIPES*

From 100 Linear Ft. of Pipe per Month of 30 Days with Steam in Pipes 24 Hr. per Day. Coal at \$4.00 per Ton of 2000 Lb.

GAGE PRESS. TEMP.	PIPE SIZE	HOT WATER		10 LB.		80 LB.		120 LB.		160 LB.		200 LB.		200 LB. AND 100 DEG. FAHR. SUPERHEAT.		275 LB. AND 250 DEG. FAHR. SUPERHEAT.	
		180 deg. fahr.		239.4 deg. fahr.		324.0 deg. fahr.		350.0 deg. fahr.		370.7 deg. fahr.		387.9 deg. fahr.		487.9 deg. fahr.		604.3 deg. fahr.	
		Pounds Coal	Dollars Loss	Pounds Coal	Dollars Loss	Pounds Coal	Dollars Loss	Pounds Coal	Dollars Loss	Pounds Coal	Dollars Loss	Pounds Coal	Dollars Loss	Pounds Coal	Dollars Loss	Pounds Coal	Dollars Loss
		B.t.u. per lineal ft. per deg. fahr.	diff. per hr.	B.t.u. per lineal ft. per deg. fahr.	diff. per hr.	B.t.u. per lineal ft. per deg. fahr.	diff. per hr.	B.t.u. per lineal ft. per deg. fahr.	diff. per hr.	B.t.u. per lineal ft. per deg. fahr.	diff. per hr.	B.t.u. per lineal ft. per deg. fahr.	diff. per hr.	B.t.u. per lineal ft. per deg. fahr.	diff. per hr.	B.t.u. per lineal ft. per deg. fahr.	diff. per hr.
1/2"		1.32	528	897	670	1568	770	1805	815	2010	846	2210	875	3440	1,040	1815	1,375
1"		1.91	763	1305	973	2280	1138	2601	1178	2727	1242	3230	1,260	5026	1,520	3035	2,300
1 1/2"		2.65	1060	1815	1,357	3190	1,586	3710	1,678	4165	1,741	4550	1,804	7175	2,170	4230	3,250
2"		3.24	1297	2142	1,600	3910	1,843	4549	2,052	5100	2,141	5590	2,220	8825	2,670	5220	3,990
2 1/2"		3.86	1545	2560	1,984	4660	2,320	5460	2,464	6100	2,544	6690	2,650	10,650	3,220	6180	4,700
3"		4.56	1824	3292	2,400	5550	2,760	6450	2,910	7210	3,030	7945	3,150	12,640	3,820	7200	5,470
3 1/2"		5.18	2070	3854	2,855	6325	3,145	7325	3,305	8200	3,450	9040	3,580	14,360	4,345	8200	6,170
4"		6.78	2305	3950	3,260	7075	3,520	8200	3,705	9145	3,842	10,060	3,980	16,040	4,850	9200	6,960
4 1/2"		8.35	2780	4780	3,975	8500	4,232	9850	4,450	11,120	4,600	12,420	4,805	17,620	5,328	10,240	7,780
5"		9.95	3260	5680	4,685	10,110	5,024	11,720	5,285	13,120	5,522	14,420	5,715	19,740	5,990	11,260	8,580
6"		11.62	3760	6730	5,400	11,630	5,732	13,450	6,007	15,040	6,324	16,650	6,560	22,560	6,855	12,280	9,500
7"		13.36	4290	7930	6,115	13,300	6,445	15,340	6,700	17,180	7,015	18,920	7,250	25,360	7,515	13,300	10,100
8"		15.16	4850	9280	6,830	15,100	7,160	17,500	7,440	19,600	7,805	21,400	8,065	28,360	8,280	14,320	10,700
10"		21.00	6400	12,580	9,580	20,800	10,340	24,000	10,920	27,000	11,360	29,800	11,760	39,000	12,510	19,300	14,440
12"		26.50	8000	15,560	12,120	26,000	13,120	30,000	14,000	33,000	14,880	36,000	15,760	47,000	15,510	24,000	18,180
14"		32.00	9600	18,540	14,140	31,000	15,700	35,000	16,560	38,000	17,440	41,000	18,320	53,000	18,260	29,000	21,800
16"		37.50	11200	21,520	16,160	36,000	18,280	40,000	19,440	43,000	20,320	46,000	21,200	60,000	21,200	34,000	25,300

*In this table coal has been figured at \$4.00 per ton of 2000 lb., 13,000 B.t.u. per lb. of coal; labor, boiler-room expense, etc., taken at \$1.00 per ton, making total value of coal fired at \$5.00 per ton. Boiler efficiency taken at 70 per cent; air temp. 70 deg. fahr. Experimental data obtained at the Mellon Institute.



apparatus, 70 per cent boiler efficiency, and 13,000 B.t.u. per lb. The "dollars" column represents the money value of the coal used per 100 sq. ft. per month assuming coal at \$4.00 per ton and boiler room expense at \$1.00 per ton.

TABLE 53. HEAT LOSS FROM UNINSULATED SURFACES

	Temperature Deg. Fahr.	Heat Loss* B.t.u.	Lbs. Coal per 100 Sq. Ft. per Month	Dollars per 100 Sq. Ft. per Month
Hot Air.....	120	1.95	770	1.92
Hot Water.....	180	2.04	1780	4.45
Steam, 10-lb. gage.....	239	2.29	3065	7.65
" 80 " ".....	324	2.76	5545	13.86
" 120 " ".....	350	2.92	6480	16.22
" 160 " ".....	371	3.05	7250	18.13
" 200 " ".....	388	3.15	7950	19.87
" 200 " " and 100° fahr. superheat	488	3.88	12,830	32.05

*B.t.u. per sq. ft. per deg. fahr. temp. difference per hour.

CONDUCTIVITY OF INSULATING MATERIALS

The conductivities in B.t.u. per square feet per hour per inch thick per degree fahr. temperature difference of the various insulating materials are given in Table 54. It should be emphasized that in this table all variables due to differences in thickness, different pipe sizes, and different air conditions, are eliminated.

TABLE 54. CONDUCTIVITIES OF VARIOUS INSULATING MATERIALS

	Density lb. per Cu. Ft.	Con- ductivity	Temp. Diff. which Conductivity was Determined	Authority	Year
Asbestos Sponge Felted	23.80	0.468	300 deg. fahr.	Vol. 37, Trans. A. S. M. E., p. 968	1915
Wool Felt.....	16.24	0.521	300 " "	" " " " " " " "	1915
85% Magnesia.....	17.20	0.54	300 " "	Vol. 40, Trans. A. S. M. E., p. 667	1918
Carocel.....	21.70	0.54	300 " "	Vol. 37, Trans. A. S. M. E., p. 968	1915
Nonpareil H. P.	17.43	0.543	300 " "	" " " " " " " "	1915
Plastic, 85% Magnesia		0.587	300 " "	" " " " " " " "	1915
Asbestocel.....	12.16	0.596	300 " "	" " " " " " " "	1915
Expanded Asbestos.....	22.49	0.598	300 " "	" " " " " " " "	1915
Indented.....	21.24	0.686	300 " "	" " " " " " " "	1915
Molded Asbestos.....	29.86	0.778	300 " "	" " " " " " " "	1915
Air Cell.....	11.70	0.802	300 " "	" " " " " " " "	1915
Vitribestos.....	29.73	1.087	300 " "	" " " " " " " "	1915
Asbestos Fire Felt.....	26.59	1.093	300 " "	" " " " " " " "	1915
Corkboard.....	9.90	0.304	36 " "	Vol. 26 A. S. H. & V. E. JOURNAL, p. 625	1920
Hair Felt.....	17.00	0.246	36 " "	" " " " " " " "	1920

HEAT LOSS FROM INSULATED SURFACES

Fig. 51 gives the heat loss per square foot of pipe per hour of piping where the pipe is covered with 1 in. thick covering. Inasmuch as the heat loss per square foot of insulated pipe is somewhat dependent upon the pipe size it cannot be said that the data given by this figure is exact