

HEATING VENTILATING AIR CONDITIONING GUIDE 1943

TABLE 1. HEAT-CARRYING CAPACITY OF STANDARD BLACK PIPES
WITH TEMPERATURE DROP OF 20 F°

Nominal Pipe Sizes $\frac{3}{8}$ in. to 12 in., and Friction Heads 4 to 800 milinches per foot (A = Capacity, Mbh. B = Velocity, inches per second) (One milinch equals 0.001 in.)

MILINCH FRICTION LOSS PER FOOT OF PIPE		NOMINAL PIPE SIZE, INCHES													
		$\frac{3}{8}$	$\frac{1}{2}$	$\frac{3}{4}$	1	1 $\frac{1}{4}$	1 $\frac{1}{2}$	2	2 $\frac{1}{2}$	3	3 $\frac{1}{2}$	4	5	6	8
4	A	0.75	1.35	2.85	5.4	11.3	17.0	33.0	53.1	95	141	197	363	596	1250
	B	1.5	1.7	2.1	2.4	2.9	3.2	3.8	4.3	5.0	5.5	6.0	7.0	7.9	9.6
6	A	0.9	1.7	3.6	6.75	14.0	21.2	41.3	66.4	119	176	248	456	748	1570
	B	1.8	2.1	2.6	3.0	3.6	4.0	4.7	5.3	6.2	6.9	7.5	8.8	10	12
8	A	1.05	2.0	4.2	7.9	16.4	24.8	48.4	77.9	140	207	291	535	879	1850
	B	2.1	2.5	3.0	3.5	4.2	4.7	5.6	6.3	7.3	8.0	8.8	10	12	14
10	A	1.2	2.2	4.7	8.9	18.6	28.0	54.7	88.1	158	234	329	605	997	2100
	B	2.4	2.8	3.4	4.0	4.8	5.3	6.3	7.1	8.2	9.1	9.9	12	13	16
12	A	1.35	2.45	5.2	9.8	20.5	31.0	60.4	97.4	175	259	364	671	1100	2320
	B	2.7	3.1	3.7	4.4	5.3	5.9	6.9	7.8	9.1	10	11	13	15	18
14	A	1.45	2.65	5.65	10.7	22.3	33.7	65.8	106	190	282	397	731	1200	2530
	B	2.9	3.4	4.1	4.8	5.7	6.4	7.6	8.5	9.9	11	12	14	16	20
16	A	1.55	2.85	6.05	11.5	24.0	36.3	70.8	114	205	303	428	787	1300	2730
	B	3.1	3.6	4.4	5.1	6.2	6.9	8.1	9.7	11	12	13	15	17	21
20	A	1.75	3.25	6.85	13.0	27.1	41.0	80.0	129	232	344	484	892	1470	3100
	B	3.5	4.1	4.9	5.8	7.0	7.7	9.2	10	12	13	15	17	20	24
25	A	2.0	3.65	7.75	14.7	30.6	46.3	90.5	146	263	389	548	1010	1670	3510
	B	4.0	4.6	5.6	6.5	7.9	8.8	10	12	14	15	17	19	22	27
30	A	2.2	4.0	8.55	16.2	33.8	51.2	100	162	290	430	607	1120	1850	3900
	B	4.4	5.1	6.1	7.2	8.7	9.7	11	13	15	17	18	22	25	30
35	A	2.35	4.4	9.3	17.6	36.8	55.7	109	176	316	469	661	1220	2010	4250
	B	4.7	5.5	6.7	7.9	9.5	11	13	14	16	18	20	23	27	33
40	A	2.55	4.7	10.0	18.9	39.6	59.9	117	189	341	505	712	1320	2170	4580
	B	5.1	5.9	7.2	8.4	10	11	13	15	18	20	22	25	29	35
50	A	2.85	5.3	11.3	21.4	44.7	67.7	133	214	386	572	807	1490	2460	5190
	B	5.7	6.7	8.1	9.5	12	13	15	17	20	22	24	29	33	40
60	A	3.15	5.85	12.4	23.6	49.4	74.9	147	238	427	633	893	1650	2730	5760
	B	6.3	7.4	8.9	11	13	14	17	19	22	25	27	32	36	44
70	A	3.45	6.35	13.5	25.7	53.8	81.4	160	258	465	690	973	1800	2970	6280
	B	6.9	8.0	9.7	11	14	15	18	21	24	27	29	35	40	48
80	A	3.7	6.8	14.5	27.6	57.9	87.6	172	278	500	743	1050	1940	3200	6770
	B	7.4	8.6	10	12	15	17	20	22	26	29	32	37	43	52
100	A	4.15	7.7	16.4	31.1	65.4	99.0	194	314	566	840	1190	2200	3630	7680
	B	8.3	9.7	12	14	17	19	22	25	30	33	36	42	48	59
150	A	5.2	9.6	20.4	38.8	81.6	124	243	393	709	1050	1490	2760	4560	9650
	B	10	12	15	17	21	23	28	32	37	41	45	53	61	74
200	A	6.05	11.2	23.9	45.4	95.5	145	285	461	832	1240	1750	3240	5360	11350
	B	12	14	17	20	25	27	33	37	43	48	53	62	71	87
300	A	7.5	13.9	29.7	56.6	119	181	356	577	1040	1550	2190	4060	6730	14270
	B	15	18	21	25	31	34	41	46	54	60	66	78	90	110
400	A	8.75	16.2	34.7	66.2	140	212	417	676	1220	1820	2570	4780	7910	16790
	B	18	21	26	30	36	40	48	54	64	71	78	92	105	129
500	A	9.85	18.3	39.2	74.8	158	239	471	765	1380	2060	2910	5410	8970	19040
	B	20	23	28	33	41	45	54	62	72	80	88	104	119	147
600	A	10.9	20.2	43.2	82.5	174	264	521	846	1530	2280	3220	5990	9930	21100
	B	22	26	32	37	45	50	60	68	80	89	97	115	132	162
800	A	12.7	23.6	50.5	96.5	204	310	610	992	1790	2670	3780	7030	11670	24820
	B	25	30	37	43	52	59	70	80	94	104	114	135	155	191

For other temperature drops the pipe capacities may be changed correspondingly. For example, with a temperature drop of 30 F, the capacities shown in this table are to be multiplied by 1.5.

CHAPTER 16. HOT WATER HEATING SYSTEMS AND PIPING

TABLE 2. HEAT-CARRYING CAPACITY OF TYPE L COPPER TUBING
WITH TEMPERATURE DROP OF 20 F°

Nominal Tube Sizes $\frac{3}{8}$ in. to 4 in., and Friction Heads 60 to 720 milinches per foot. (A = Capacity, Mbh. B = Velocity, inches per second) (One milinch equals 0.001 in.)

NOMINAL TUBE SIZE, IN.		MILINCH FRICTION LOSS PER FOOT OF TUBE											
		720	600	480	360	300	240	180	150	120	90	75	60
$\frac{3}{8}$	A	10	9	8	6.8	6.2	5.4	4.6	4	3.6	3	2.8	2.4
	B	27	24	21	18	16.5	14	13	11	10	8.5	8	7
$\frac{1}{2}$	A	20	18	16	13.5	12	10.8	9	8	7	6	5.4	4.7
	B	35	30	25	21	19	17	15	13	12	10	9	8
$\frac{3}{4}$	A	36	30	26	22.1	20	17.8	15	13.1	11.8	9.9	9	7.9
	B	37	34	30	24	21	19	17	15	13	11	10	9
1	A	51	46	40	34	31	28	23.2	20.5	18.1	15.3	13.9	12.1
	B	42	38	33	27	24	21	19	17	14	12	11.5	10
1 $\frac{1}{4}$	A	104	94	82	70	63	56	47	42	37	32	28	25
	B	48	45	39	34	30	25	22	19	17	14.5	13	12
1 $\frac{1}{2}$	A	185	169	149	125	112	100	84	75	66	56	50	44
	B	55	51	45	39	35	30	25	22	19	17	15	13
2	A	300	270	235	200	180	160	134	120	105	90	81	71
	B	62	57	51	43	39	35	30	25	22	19	17	15
2 $\frac{1}{2}$	A	625	560	495	420	375	335	280	250	200	188	170	150
	B	76	68	60	51	47	42	36	32	27	22	20	18
3	A	1130	1010	890	750	680	600	500	450	395	335	305	270
	B	90	80	69	58	49	47	42	37	33	26	23	21
3 $\frac{1}{2}$	A	1840	1650	1450	1210	1100	980	820	740	650	550	490	420
	B	98	90	80	66	59	52	47	42	36	30	27	23
4	A	2750	2480	2170	1840	1650	1450	1210	1100	980	820	740	650
	B	110	100	89	75	66	57	51	45	40	35	30	26
	A	3900	3505	3100	2600	2350	2090	1760	1580	1390	1180	1080	950
	B	120	108	96	83	73	63	55	49	44	37	34	29

For other temperature drops the pipe capacities may be changed correspondingly. For example, with temperature drop of 30 F, the capacities shown in this table are to be multiplied by 1.5.

TABLE 3. IRON AND COPPER ELBOW EQUIVALENTS^a

FITTING	IRON PIPE	COPPER TUBING
Elbow, 90-deg.	1.0	1.0
Elbow, 45-deg.	0.7	0.7
Elbow, 90-deg long turn	0.5	0.5
Elbow, welded, 90-deg	0.5	0.5
Reducing coupling	0.4	0.4
Open return band	1.0	1.0
Open gate valve	0.5	0.7
Open globe valve	12.0	17.0
Angle radiator valve	2.0	3.0
Radiator or convactor	3.0	4.0
Boiler or heater	3.0	4.0
Tee, per cent flowing through branch:		
100	1.8	1.2
50	4.0	4.0
25	16.0	20.0

^aThe friction head in one 90 deg standard elbow is approximately equal to the friction of a length of straight pipe of the same nominal size and 25 diam long. Hence one elbow equivalent equals 25 D divided by 12 feet of straight pipe or tubing.