TABLE 7. RETURN PIPE CAPACITIES

Capacity Expressed in Square Feet of Equivalent Direct Radiation

(Reference to this table will be by column letter *M* through *EE*)

This table is based on pipe size data developed through the research investigations of the AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS.

CAPACITY OF RETURN MAINS AND RISERS

MAINS

Pipe Size Inches	1/32 Lb or 1/16 Oz Drop per 100 Ft			1/16 Lb or 1/8 Oz Drop per 100 Ft			1/8 Lb or 2 Oz Drop per 100 Ft			1/4 Lb or 4 Oz Drop per 100 Ft			1/2 Lb or 8 Oz Drop per 100 Ft		
	Wet	Dry	Vac.	Wet	Dry	Vac.	Wet	Dry	Vac.	Wet	Dry	Vac.	Wet	Dry	Vac.
M	*N*	*O*	*P*	*Q*	*R*	*S*	*T*	*U*	*V*	*W*	*X*	*Y*	*Z*	*AA*	*BB*	*CC*	*DD*	*EE*
¾	.....	.....	.....	.....	.....	326	.....	.....	400	.....	.....	568	.....	.....	800	.....	.....	1,130
1	500	248	.....	580	285	570	700	320	700	1,000	412	994	1,400	460	1,400	.....	.....	1,977
1¼	850	520	.....	990	595	976	1,200	670	1,200	1,700	868	1,704	2,400	962	2,400	.....	.....	3,390
1½	1,350	822	.....	1,570	943	1,547	1,900	1,058	1,900	2,700	1,362	2,696	3,800	1,512	3,800	.....	.....	5,370
2	2,800	1,880	.....	3,240	2,140	3,256	4,000	2,300	4,000	5,600	2,960	5,680	8,000	3,300	8,000	.....	.....	11,300
2½	4,700	3,040	.....	5,300	3,470	5,453	6,700	3,800	6,700	9,400	4,900	9,510	13,400	5,450	13,400	.....	.....	18,925
3	7,500	5,840	.....	8,500	6,250	8,710	10,700	7,000	10,700	15,000	9,000	15,190	21,400	10,000	21,400	.....	.....	30,230
3½	11,000	7,880	.....	13,200	8,800	13,020	16,000	10,000	16,000	22,000	12,900	22,710	32,000	14,300	32,000	.....	.....	45,200
4	15,500	11,700	.....	18,300	13,400	17,910	22,000	15,000	22,000	31,000	19,300	31,220	44,000	21,500	44,000	.....	.....	62,180
5	.....	.....	.....	.....	.....	31,500	.....	.....	38,700	.....	.....	54,920	.....	.....	77,400	.....	.....	109,300
6	.....	.....	.....	.....	.....	50,450	.....	.....	62,000	.....	.....	88,000	.....	.....	124,000	.....	.....	175,100

RISERS

¾	.....	190	.....	.....	190	570	.....	190	700	.....	190	994	.....	190	1,400	.....	.....	1,977
1	.....	450	.....	.....	450	976	.....	450	1,200	.....	450	1,704	.....	450	2,400	.....	.....	3,390
1¼	.....	990	.....	.....	990	1,547	.....	990	1,900	.....	990	2,696	.....	990	3,800	.....	.....	5,370
1½	1,500	.....	.....	.....	1,500	3,256	.....	1,500	4,000	.....	1,500	5,680	.....	1,500	8,000	.....	.....	11,300
2	3,000	.....	.....	.....	3,000	5,453	.....	3,000	6,700	.....	3,000	9,510	.....	3,000	13,400	.....	.....	18,925
2½	.....	.....	.....	.....	.....	8,710	.....	.....	10,700	.....	.....	15,910	.....	.....	21,400	.....	.....	30,230
3	.....	.....	.....	.....	.....	13,020	.....	.....	16,000	.....	.....	22,710	.....	.....	32,000	.....	.....	45,200
3½	.....	.....	.....	.....	.....	17,910	.....	.....	22,000	.....	.....	31,220	.....	.....	44,000	.....	.....	62,180
4	.....	.....	.....	.....	.....	31,500	.....	.....	38,700	.....	.....	54,920	.....	.....	77,400	.....	.....	109,300
5	.....	.....	.....	.....	.....	50,450	.....	.....	62,000	.....	.....	88,000	.....	.....	124,000	.....	.....	175,100

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Equivalent Length of Run

All tables for the flow of steam in pipes, based on pressure drop, must allow for the friction offered by the pipe as well as for the additional resistance of the fittings and valves. These resistances generally are stated in terms of straight pipe; in other words, a certain fitting will produce a drop in pressure equivalent to so many feet of straight run of the same size of pipe. Table 5 gives the number of feet of straight pipe usually allowed for the more common types of fittings and valves. In all pipe sizing tables in this chapter the *length of run* refers to the *equivalent length of run* as distinguished from the *actual length* of pipe in feet. The length of run is not usually known at the outset; hence it is necessary to assume some pipe size at the start. Such an assumption frequently is considerably in error and a more common and practical method is to assume the length of run and to check this assumption after the pipes are sized. For this purpose the length of run usually is taken as double the actual length of pipe.

TABLES FOR PIPE SIZING[2]

Factors determining the size of a steam pipe and its allowable limit of capacity are the direction of the flow of condensate, whether against or with the steam.

Tables 6 and 7 are based on the actual inside diameters of the pipe and the condensation of ¼ lb (4 oz) of steam per square foot of equivalent direct radiation[3] (*abbreviated EDR*) per hour. The drops indicated are drops in pressure per 100 ft of equivalent length of run. The pipe is assumed to be well reamed without unusual or noticeable defects.

Table 6 may be used for sizing piping for steam heating systems by determining the allowable or desired pressure drop per 100 equivalent feet of run and reading from the column for that particular pressure drop. This applies to all steam mains on both one-pipe and two-pipe systems, vapor systems, and vacuum systems. Columns *B* to *G*, inclusive, are used where the steam and condensation flow in the same direction, while Columns *H* and *I* are for cases where the steam and condensation flow in opposite directions, as in risers and runouts that are not dripped. Columns *J*, *K*, and *L* are for one-pipe systems and cover riser, radiator valve, and vertical connection sizes, and radiator and runout sizes, all of which are based on the critical velocities of the steam to permit the counter flow of condensation without noise.

Sizing of return piping may be done with the aid of Table 7 where pipe capacities for wet, dry, and vacuum return lines are shown for the pressure drops per 100 ft corresponding to the drops in Table 6. *It is customary to use the same pressure drop on both the steam and return sides of a system.*

[2]Pipe size tables in this chapter have been compiled in simplified and condensed form for the convenience of the user; at the same time all of the information contained in previous editions of THE GUIDE has been retained. Values of pressure drops, formerly expressed in ounces, are now expressed in fractions of a pound.

[3]As steam system design has materially changed in recent years so that 240 Btu no longer expresses the heat of condensation from a square foot of radiator surface per hour, and as present day heating units have different characteristics from older forms of radiation, it is the purpose of THE GUIDE to gradually eliminate the empirical expression *square foot of equivalent direct radiation, EDR*, and to substitute a logical unit based on the Btu. The new terms to express the equivalent of 1000 Btu (Mb), and 1000 Btu per hour (Mbh), have been approved by the A.S.H.V.E.