TABLE 15. PIPE SIZES FOR VACUUM PUMP SYSTEMS, WHERE EQUIVALENT LENGTH OF RUN FROM BOILER OR SOURCE OF SUPPLY TO FARTHEST RADIATOR Exceeds 200 FT.

Capacity in Sq. Ft. of Equivalent Radiation

PIPE SIZE INCHES	EQUIVALENT LENGTH OF PIPE FROM BOILER TO FARTHEST RADIATOR, INCLUDING MAIN AND RISER. (See *Note 4.*) Supply Main Dripped and Branches to Risers Dripped—Steam and Condensate flowing in same direction. BASED ON 4 OZ. TOTAL PRESSURE DROP**						MAXIMUM CAPACITIES	
	100 Ft.	200 Ft.	300 Ft.	400 Ft.	500 Ft.	600 Ft.	Supply Risers Up-Feed	Branches to Supply Risers and Radiators Not Dripped
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I**
¾	.....	.....	.....	.....	.....	.....	.....	.....
1	111	79	65	56	49	46	56	26
1¼	245	173	141	122	110	100	122	58
1½	380	269	220	190	165	155	190	95
2	771	546	446	386	345	315	386	195
2½	1270	898	734	635	568	518	635	395
3	2326	1645	1342	1163	1040	948	1129	700
3½	3474	2457	2006	1737	1552	1419	1548	1150
4	4914	3475	2828	2457	2196	2011	2042	1700
5	9092	6429	5250	4546	4062	3712		3150
6	14,924	10,553	8618	7462	6669	6094	.....	.....
8	31,066	21,967	17,935	15,533	13,880	12,682	.....	.....
10	56,689	40,085	32,730	28,345	25,334	23,144	.....	.....
12	90,985	64,336	52,530	45,492	40,660	37,145	.....	.....

PIPE SIZE INCHES		RETURN MAINS AND RISERS					
Riser	Main	100 Ft.	200 Ft.	300 Ft.	400 Ft.	500 Ft.	600 Ft.
J	*K*	*L*	*M*	*N*	*O*	*P*	*Q*
....	¾	800	568	462	400	358	326
¾	1	1400	994	810	700	626	570
1	1¼	2400	1704	1387	1200	1073	976
1¼	1½	3800	2696	2195	1900	1698	1547
1½	2	8000	5680	4622	4000	3575	3256
2	2½	13,400	9510	7745	6700	5990	5453
2½	3	21,400	15,190	12,360	10,700	9565	8710
3	3½	32,000	22,710	18,490	16,000	14,300	13,020
3½	4	44,000	31,220	25,430	22,000	19,660	17,910

Different makes of supply and return valves, steam traps and other specialties vary as to capacity, therefore use size as recommended for any particular make. Vertical connection to be of same size as valve and trap used. Return horizontal runout to be no less than ¾ in.

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*Radiator branches more than 8 ft. in length should be *one* size larger than shown in Column *I*.

**It is not generally considered good practice to greatly exceed 1 oz. drop in pressure in each 100 ft. equivalent length of run nor to exceed 1 lb. total pressure drop in any system.

Note 1.—These tables apply where pipes are properly reamed. No allowances for defective material or workmanship have been made. (Also see Tables 18, 19 and 20).

Note 2.—Capacities based on ¼ lb. condensation per square foot equivalent radiation and actual diameter of standard pipe.

Note 3.—Extra length to be added to straight run of pipe, for various fittings and valves to determine equivalent length. (See Table 6).

Note 4.—Mains are to be proportioned according to the equivalent length of run from the boiler or source of supply to the farthest radiators supplied by the main.

Determine equivalent length of run then use figures in corresponding Column (*B* to *G*) for sizing the entire run.

Supply risers are to be proportioned according to the equivalent length of run from the boiler or source of supply to the farthest radiator on each riser. Determine the distance to the farthest radiator then use figures in that corresponding Column (*B* to *G*) for sizing each riser; providing the amount of radiation for that riser does not exceed amounts shown in Column *H*. Where riser capacities are found to be in excess of amounts shown in Column *H*, step up to necessary size indicated in that column.

Note 5.—Return mains and risers are to be proportioned according to the equivalent distance in feet, from farthest radiator to the vacuum pump; using capacities in that corresponding Column (*L* to *Q*) for sizing entire return riser (Column *J*) and return main (Column *K*). *The return pipe sizes are conservative and are subject to revision upon the completion of pending research investigations.*

Note 6.—Where it is necessary to drip a supply main, supply riser or branch to a supply riser, same should be dripped separately through a steam trap into vacuum return. Never drip a supply riser into a vacuum return except through a steam trap.

Note 7.—Lift fittings. (See page 184).

Note 8.—Pitch of pipe should be not less than ¼ in. in 10 ft.; on horizontal branches to radiators, at least ½ in. in 10 ft.

TABLE 16. PIPE SIZES FOR VACUUM PUMP SYSTEMS, WHERE EQUIVALENT LENGTH OF RUN FROM BOILER OR SOURCE OF SUPPLY TO FARTHEST RADIATOR Exceeds 200 FT.

Capacity in Sq. Ft. of Equivalent Radiation

PIPE SIZE IN.	EQUIVALENT LENGTH OF PIPE FROM BOILER TO FARTHEST RADIATOR, INCLUDING MAIN AND RISER. (See *Note 4.*) Supply Main Dripped and Branches to Risers Dripped—Steam and Condensate flowing in same direction. BASED ON 8 OZ. TOTAL PRESSURE DROP**									MAXIMUM CAPACITIES	
	100 Ft.	200 Ft.	300 Ft.	400 Ft.	500 Ft.	600 Ft.	800 Ft.	1000 Ft.	1200 Ft.	Supply Risers Up-Feed	Branches to Supply Risers and Radiators Not Dripped
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*K*	*L**
1	157	111	92	79	70	65	56	49	46	56	26
1¼	346	245	200	173	154	141	122	110	100	122	58
1½	538	380	310	269	240	220	190	165	155	190	95
2	1091	771	630	546	487	446	386	345	315	386	195
2½	1797	1270	1036	898	803	734	635	568	518	635	395
3	3289	2326	1896	1645	1470	1342	1163	1040	948	1129	700
3½	4913	3474	2838	2457	2196	2006	1737	1552	1419	1548	1150
4	6950	4914	4022	3475	3106	2828	2457	2196	2011	2042	1700
5	12,858	9092	7424	6429	5747	5250	4546	4062	3712	.....	3150
6	21,105	14,924	12,168	10,553	9433	8618	7462	6669	6084	.....	.....
8	43,934	31,066	25,364	21,967	19,638	17,935	15,533	13,880	12,682	.....	.....
10	80,171	56,689	46,288	40,085	35,836	32,730	28,345	25,334	23,144	.....	.....
12	128,672	90,985	74,290	64,336	57,516	52,530	45,492	40,660	37,145	.....	.....
16	240,245	169,879	138,381	121,012	107,389	98,500	84,849	75,917	69,671	.....	.....

PIPE SIZE INCHES		RETURN MAINS AND RISERS								
Riser	Main	100 Ft.	200 Ft.	300 Ft.	400 Ft.	500 Ft.	600 Ft.	800 Ft.	1000 Ft.	1200 Ft.
M	*N*	*O*	*P*	*Q*	*R*	*S*	*T*	*U*	*V*	*W*
....	¾	1130	800	653	568	505	462	400	358	326
¾	1	1977	1400	1143	994	884	810	700	626	570
1	1¼	3390	2400	1960	1704	1515	1387	1200	1073	976
1¼	1½	5370	3800	3103	2696	2400	2195	1900	1698	1547
1½	2	11,300	8000	6533	5680	5050	4622	4000	3575	3256
2	2½	18,925	13,400	10,940	9,510	8460	7745	6700	5990	5453
2½	3	30,230	21,400	17,460	15,190	13,510	12,360	10,700	9,565	8,710
3	3½	45,200	32,000	26,130	22,710	20,200	18,490	16,000	14,300	13,020
3½	4	62,180	44,000	35,950	31,220	27,800	25,430	22,000	19,660	17,910
4	5	109,300	77,400	63,200	54,920	48,800	44,720	38,700	34,600	31,500
5	6	175,100	124,000	101,200	88,000	78,200	71,700	62,000	55,410	50,450

Different makes of supply and return valves, steam traps and other specialties vary as to capacity, therefore use size as recommended for any particular make. Vertical connection to be of same size as valve and trap used. Return horizontal runout to be not less than ¾ in.

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*Radiator branches more than 8 ft. in length should be *one* size larger than shown in Column *L*.

**It is not generally considered good practice to greatly exceed 1 oz. drop in pressure in each 100 ft. equivalent length of run nor to exceed 1 lb. total pressure drop in any system.

Note 1.—These tables apply where pipes are properly reamed. No allowances for defective material or workmanship have been made. (Also see Tables 18, 19 and 20).

Note 2.—Capacities based on ¼ lb. condensation per square foot equivalent radiation and actual diameter of standard pipe.

Note 3.—Extra length to be added to straight run of pipe, for various fittings and valves to determine equivalent length. (See Table 6).

Note 4.—Mains are to be proportioned according to the equivalent length of run from the boiler or source of supply to the farthest radiators supplied by the main.

Determine equivalent length of run then use figures in corresponding Column (*B* to *J*) for sizing the entire run.

Supply risers are to be proportioned according to the equivalent length of run from the boiler or source of supply to the farthest radiator on each particular riser. Determine the distance to the farthest radiator then use figures in that corresponding Column (*B* to *J*) for sizing each riser; providing the amount of radiation for that riser does not exceed amounts shown in Column *K*. Where riser capacities are found to be in excess of amounts shown in Column *K*, step up to necessary size indicated in that column.

Note 5.—Return mains and risers are to be proportioned according to the equivalent distance in feet, from farthest radiator to the vacuum pump; using capacities in that corresponding Column (*O* to *W*) for sizing entire return riser (Column *M*) and return main (Column *N*) *The return pipe sizes are conservative and are subject to revision upon the completion of pending research investigations.*

Note 6.—Where it is necessary to drip a supply main, supply riser or branch to a supply riser, same should be dripped separately through a steam trap into vacuum return. Never drip a supply riser into a vacuum return except through a steam trap.

Note 7.—Lift fittings. (See page 184).

Note 8.—Pitch of pipe should be not less than ¼ in. in 10 ft.; on horizontal branches to radiators, at least ½ in. in 10 ft.