have a temperature drop of only 10 deg as follows: Sections *AB* and *KA* supply 275 sq ft of equivalent heating surface and hence carry 66,000 Btu with a temperature drop of 10 deg; if the temperature drop were 20 deg these sections would (with the same velocity and the same friction head) carry 132,000 Btu. Hence, refer to Fig. 4 for 132,000 Btu and a unit friction head of 100 milinches, and note that the correct size would be about half way between a 1½-in. and a 2-in. pipe. Therefore, select a 1½-in. pipe for Section *AB* and a 2-in. pipe for Section *KA*. The pipe sizes for the remaining eight sections and for the radiator connections can be selected in the same manner and recorded on the pipe diagram as shown.

The circulating pump for the system should be one which has its highest efficiency when it is delivering 13.2 gpm against a head of 2 ft.

TABLE 2. CAPACITIES OF PIPES IN EQUIVALENT SQUARE FEET OF HEATING SURFACE,[a] *and in 1000 Btu,* **and Velocities of Water in Pipes in Inches Per Second** FOR FORCED CIRCULATION SYSTEMS WITH A TOTAL FRICTION HEAD OF 2 FT AND FOR A MAXIMUM TEMPERATURE DROP OF 10 DEG[b]

1	2	3	4	5	6	7	8	9
PIPE SIZE (INCHES)	EQUIVALENT LENGTH OF PIPE (FEET[c])	EQUIVALENT TOTAL LENGTH OF PIPE IN FEET IN LONGEST CIRCUIT						
		100	150	200	250	300	350	400
		UNIT FRICTION HEAD, IN MILINCHES						
		240	160	120	96	80	69	60
½	1	26 *6.2* **15**	20 *4.8* **12**	17 *4.1* **10**	14 *3.4* **9**	12 *2.9* **8**	11 *2.6* **7.5**	10 *2.4* **7**
¾	2	55 *13.2* **18**	43 *10.3* **14**	36 *8.6* **12**	31 *7.3* **11**	26 *6.2* **10**	25 *6.0* **9**	23 *5.5* **8.5**
1	2.3	104 *25.0* **22**	80 *19.2* **17**	68 *16.3* **15**	60 *14.4* **13**	52 *12.5* **12**	50 *12.0* **11**	46 *11.1* **10.5**
1¼	3.0	220 *52.8* **27**	170 *40.8* **21**	145 *34.8* **18**	130 *31.2* **16**	116 *27.8* **15**	110 *26.4* **14**	100 *24.0* **13**
1½	3.5	330 *79.2* **30**	253 *60.7* **23**	213 *51.2* **20**	190 *45.6* **18**	170 *40.8* **16**	167 *40.0* **15**	150 *36.0* **14**
2	4.0	640 *153.8* **36**	500 *120.0* **28**	425 *104.0* **24**	390 *93.5* **22**	360 *86.4* **20**	340 *81.5* **18**	308 *73.8* **17**
2½	6.0	1040 *250.0* **41**	800 *192.0* **32**	685 *164.5* **28**	620 *149.0* **25**	580 *139.2* **22**	565 *135.8* **21**	510 *122.5* **19**
3	6.5	1850 *444.0* **48**	1450 *348.0* **37**	1225 *294.0* **32**	1124 *270.0* **29**	1060 *254.0* **26**	1000 *240.0* **24**	930 *223.0* **22**

[a] Based on 240 Btu per square foot.

[b] For other temperature drops the capacities of pipes are to be changed correspondingly. For example, for a temperature drop of 30 deg, the capacities shown in this table are to be multiplied by 3. The velocities remain unchanged.

[c] Approximate length of pipe in feet equivalent to one elbow in friction head. This value varies with the velocity.

Pipe Size Tables

If a number of heating systems are to be designed for similar conditions, *i.e.*, for a total friction head of 2 ft and a temperature drop through the radiators of 10 deg when the maximum quantity of heat is being delivered to the building, a table such as Table 2 may be prepared from the data of Fig. 4. Having this table, the pipe sizes for the system of Example 1 can be easily selected. For example, for Sections *BC* and *JK*, each supplying 225 sq ft (54,000 Btu), the equivalent pipe length of the system is 227 ft.

TABLE 3. CAPACITIES OF PIPES IN EQUIVALENT SQUARE FEET OF HEATING SURFACE[a] *and in 1000 Btu,* **and Velocities of Water in Pipes in Inches Per Second** FOR FORCED CIRCULATION SYSTEMS WITH A TOTAL FRICTION HEAD OF 6 FT AND FOR A MAXIMUM TEMPERATURE DROP OF 10 DEG[b]

1	2	3	4	5	6	7	8
PIPE SIZE (INCHES)	EQUIVALENT LENGTH OF PIPE (FEET[c])	EQUIVALENT TOTAL LENGTH OF PIPE IN FEET IN LONGEST CIRCUIT					
		200	300	400	600	800	1000
		UNIT FRICTION HEAD, IN MILINCHES					
		360	240	180	120	90	72
½	1	31 *7.4* **18**	25 *6.0* **15**	21 *5.0* **13**	16 *3.8* **10**	14 *3.4* **9**	13 *3.1* **7.5**
¾	2	66 *15.8* **22**	53 *12.7* **18**	45 *10.8* **16**	35 *8.4* **12**	32 *7.7* **11**	28 *6.7* **9**
1	2.5	125 *30.0* **27**	100 *24.0* **22**	85 *20.4* **19**	66 *15.8* **15**	58 *13.9* **13**	52 *12.5* **11**
1¼	3.3	270 *64.8* **33**	218 *52.5* **26**	185 *44.4* **23**	140 *33.6* **18**	125 *30.0* **16**	112 *26.8* **14**
1½	4.0	400 *96.0* **37**	320 *76.8* **31**	270 *64.8* **26**	210 *50.1* **20**	187 *44.7* **18**	170 *40.8* **15**
2	5.0	800 *192.0* **44**	640 *153.0* **36**	540 *130.0* **30**	420 *100.1* **24**	375 *90.0* **21**	330 *78.0* **18**
2½	6.0	1250 *300.0* **50**	1020 *244.0* **41**	860 *206.0* **35**	670 *161.0* **26**	600 *144.0* **24**	540 *130.0* **21**
3	7.5	2300 *550.0* **58**	1820 *436.0* **48**	1540 *368.0* **42**	1200 *287.0* **32**	1040 *249.0* **27**	950 *228.0* **24**

[a] Based on 240 Btu per square foot.

[b] For other temperature drops the capacities of pipes are to be changed correspondingly. For example, for a temperature drop of 30 deg, the capacities shown in this table are to be multiplied by 3. The velocities remain unchanged.

[c] Approximate length of pipe in feet equivalent to one elbow in friction head. This value varies with the velocity.