

It may be desirable in some cases to utilize a condensation pump rather than a vacuum pump where the heaters are too close to, or must be below, the boiler water line. Fig. 6 illustrates an approved hook-up for such a condition though, of course, the apparatus may be used with a wet return as well as with the dry return shown. It will be noted that each heater has a trap.

When a condensation pump is used with a one-pipe system a false water line should be established so that the sealing of each dry return against the others, so important with one-pipe systems, shall be maintained. Sometimes, in this contingency, it is desirable to place a float trap on the end of each separate dry return connection to the pipe which supplies the pump-suction.

There are a number of meritorious proprietary types of steam, vacuum return line, differential, and vapor heating systems, which vary in certain particulars from the foregoing typical examples. These systems have been developed to meet the requirements of the newer architecture of modern building construction and are based on well established engineering principles of control for occupancy, wind and sun effect, zone demands, etc. Descriptions of these systems will be found in the catalog section of THE GUIDE.

TABLE 11. MAXIMUM ALLOWABLE CAPACITIES OF UP-FEED RISERS FOR TWO-PIPE LOW PRESSURE STEAM

Based on A. S. H. V. E. Research Laboratory Tests

| PIPE SIZE<br>INCHES | VELOCITY<br>FEET PER SECOND | PRESSURE DROP<br>OUNCES<br>PER 100 FT. | CAPACITY             |                 |                       |
|---------------------|-----------------------------|----------------------------------------|----------------------|-----------------|-----------------------|
|                     |                             |                                        | Sq. Ft.<br>Radiation | B.t.u. per Hour | Lb.<br>Steam per Hour |
| A                   | B                           | C                                      | D                    | E               | F                     |
| 3/4                 | 20                          | .....                                  | 40                   | 9550            | 10.0                  |
| 1                   | 23                          | 1.78                                   | 74                   | 17,900          | 18.45                 |
| 1 1/4               | 27                          | 1.57                                   | 151                  | 36,500          | 37.65                 |
| 1 1/2               | 30                          | 1.48                                   | 228                  | 55,200          | 57.0                  |
| 2                   | 35                          | 1.33                                   | 438                  | 106,100         | 109.5                 |
| 2 1/2               | 38                          | 1.16                                   | 678                  | 164,100         | 169.4                 |
| 3                   | 41                          | 0.95                                   | 1129                 | 273,500         | 282.2                 |
| 3 1/2               | 42                          | 0.81                                   | 1548                 | 375,500         | 387.0                 |
| 4                   | 43                          | 0.71                                   | 2042                 | 495,000         | 510.5                 |

#### INSTRUCTIONS FOR USING TABLE 11

1. The capacities given in this table should never be exceeded on two-pipe risers.
2. Capacities based on 1/4 lb. condensation per square foot equivalent radiation and actual diameter of standard pipe.
3. All pipe should be well reamed and free from constrictions. Fittings should be up to size. (See Tables 7 and 8).

TABLE 12. PIPE SIZES FOR TWO-PIPE, GRAVITY, VAPOR<sup>b</sup> SYSTEMS, WHERE EQUIVALENT LENGTH OF RUN FROM BOILER OR SOURCE OF SUPPLY TO FARTHEST RADIATOR DOES NOT EXCEED 200 FT.

Capacity in Sq. Ft. of Equivalent Radiation

Based on Total Pressure Drop of 1 oz. per 100 ft.

| PIPE<br>SIZE<br>INCHES | SUPPLY MAIN<br>DRIPPED AND<br>BRANCHES TO<br>RISERS<br>DRIPPED<br>Steam and Con-<br>densate flowing in<br>same direction. | SUPPLY RISERS<br>Up-Feed                                                                                                                                                                                                                                                            | BRANCHES TO SUPPLY<br>RISERS AND RADIATORS<br>NOT DRIPPED | RETURN<br>RISERS | WET<br>RETURN<br>MAIN | DRY<br>RETURN<br>MAIN |
|------------------------|---------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|------------------|-----------------------|-----------------------|
| A                      | B                                                                                                                         | C                                                                                                                                                                                                                                                                                   | D <sup>1</sup>                                            | E                | F                     | G                     |
| 3/4                    | 56                                                                                                                        | 30<br>56                                                                                                                                                                                                                                                                            | 26                                                        | 190<br>450       | 700                   | 320                   |
| 1 1/4<br>1 1/2         | 122<br>190                                                                                                                | 122<br>190                                                                                                                                                                                                                                                                          | 58<br>95                                                  | 990<br>1500      | 1200<br>1900          | 670<br>1058           |
| 2<br>2 1/2             | 386<br>635                                                                                                                | 386<br>635                                                                                                                                                                                                                                                                          | 195<br>395                                                | 3000<br>.....    | 4000<br>6700          | 2300<br>3800          |
| 3<br>3 1/2             | 1163<br>1737                                                                                                              | 1129<br>1548                                                                                                                                                                                                                                                                        | 700<br>1150                                               | .....<br>.....   | 10,700<br>.....       | 7000<br>10,000        |
| 4                      | 2457                                                                                                                      | 2042                                                                                                                                                                                                                                                                                | 1700                                                      | .....            | .....                 | .....                 |
| 5                      | 4546                                                                                                                      | .....                                                                                                                                                                                                                                                                               | 3150                                                      | .....            | .....                 | .....                 |
| 6                      | 7462                                                                                                                      | 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 connections to be of same size as valve and trap used. Return horizontal runout to be not less than 1/4 in. |                                                           |                  |                       |                       |

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#### INSTRUCTIONS FOR USING TABLE 12

1. Radiator branches more than 8 ft. in length should be one size larger than shown in Column D.
2. This table is for systems which are open to atmosphere or operate under slight pressure or partial vacuum without use of vacuum pumps.
3. These tables apply where pipes are properly reamed. No allowances for defective material or workmanship have been made. (Also see Tables 7 and 8).
4. Capacities based on 1/4 lb. condensation per square foot per hour equivalent radiation and actual diameter of standard pipe.
5. Extra length to be added to straight run of pipe for various fittings and valves to determine equivalent length. (See Table 4).
6. Where it is necessary to drip a supply main, supply riser or branch to a supply riser, same should be dripped separately into a wet return.<sup>a</sup> The drip for a vapor or vacuum system may be taken into a dry return through a steam trap.
7. Pitch of mains should be not less than 1/4 in. in 10 ft.; on horizontal branches to radiators and risers at least 1/2 in. in 10 ft.
8. In general it is desirable not to have a supply main smaller than 2 in. in diameter. When the supply main is larger than 2 1/2 in. at the beginning, it is desirable that it shall not be smaller than 2 1/2 in. at the end.