

receiver, is shown in Fig. 6. The traps must pass air and condensate rapidly to keep the return piping partially full of water.

Since unit heaters are often constructed with sufficient strength, the use of high pressure steam in them is a common practice. As shown in Fig. 7 the condensate and air reach the return overhead through traps, and check valves are located in the return piping. It is, however, preferable to locate the high pressure return below the heater.

For two-pipe closed gravity return systems, the return from each unit should be fitted with a heavy duty or blast trap, and an automatic air valve should be connected into the return header of each unit heater. Provisions must be made to compensate for the pressure drop by elevating the unit heater above the water line of the boiler or of the receiver.

In pump and receiver systems the air may be eliminated by individual

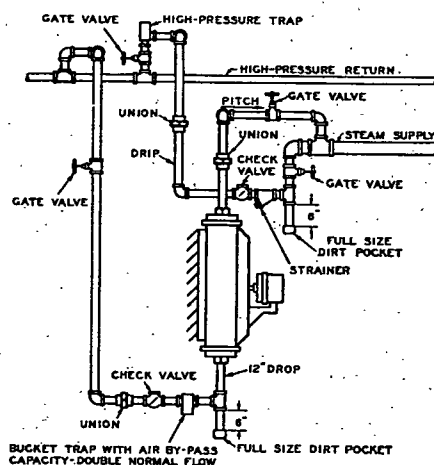


FIG. 7. METHOD OF CONNECTING UNIT HEATER TO HIGH PRESSURE SYSTEM

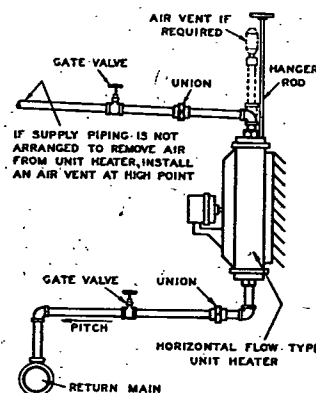


FIG. 8. METHOD OF CONNECTING UNIT HEATER TO HOT WATER SYSTEM

air valves on the heaters, or it may be carried into the returns as in vacuum systems and the entire return system be free-vented to the atmosphere, provided all units, drip points, and radiation are properly trapped to prevent steam entering the returns.

On vacuum or open vent systems the return from each unit should be fitted with a large capacity trap to discharge the water of condensation and with a thermostatic air valve for eliminating the air, or with a heavy-duty trap for handling both the condensation and the air, provided the air finally can be eliminated at some other point in the return system.

For high pressure systems the same kind of traps may be used as with vacuum systems, except that they must be constructed for the pressure used. If the air is to be eliminated at the return header of the unit, a high pressure air valve can be used; otherwise the air may be passed with the condensate through the high-pressure return trap, with its elimination at some other point in the system.

Fig. 8 represents the connections to a hot water heating system. The

air vent is not required if main is above heater and air can be eliminated through the piping system.

BOILER CAPACITY FOR STEAM UNIT HEATERS

The capacity of the boiler should be based on the rated capacity of the unit heaters at the lowest entering air temperature and highest fan speed that will occur, plus an allowance for pipe line losses. It is unwise to install a single unit heater as the sole load on any boiler, particularly if the unit heater motor is started and stopped by thermostatic control. The wide and sudden fluctuations of load that occur under such conditions would require closer attention to the boiler than is usually possible in a small installation. Where oil or gas is used to fire the boiler, it is possible by means of a pressurestat to control the boiler, in response to this rapid fluctuation. In most cases, and particularly where the boiler is coal-fired, it is advisable to use two or more smaller unit heaters instead of one large unit.

Steam pressures below 5 lb can be used with safety for recirculating unit heaters when their heating surfaces are designed for those pressures, and when proper provision is made for returning the condensate. If units admit air that may be at a temperature below freezing, a steam pressure of not less than 5 lb should be maintained on the heating element, or a corresponding differential in pressure between the supply and returns should be maintained by means of a vacuum.

UNIT VENTILATORS

Unit ventilators are similar in principle to unit heaters, except that they are provided with an arrangement of dampers for introducing outdoor and recirculated air in varying quantities. In general, they are obtainable only in the steam type, but unit heaters of all types may be adapted to the unit ventilator principle by the addition of outdoor air and recirculating dampers. Unit ventilators are used to supply air with a discharge temperature at or slightly higher than room temperature. Also they are provided with an arrangement for introducing outdoor and recirculated air in varying quantities. If the unit is only used for circulating air, then radiators or some other equipment must be provided for heating the room. Unit ventilators are intended primarily for schools, offices, and semi-commercial establishments. Unit ventilators may be of the radiator controlled or damper controlled type and of the blow-through or draw-through type as illustrated in Fig. 9. A roof ventilator used for exhausting air is sometimes termed a unit ventilator. For information on roof ventilators, see Chapter 9.

Ratings

Unit ventilators of the steam type are customarily cataloged with two ratings, one the input and the other the output capacity. The first is the heat input to the unit which is determined by measuring the temperature and quantity of condensate and the pressure and quality of the steam. The second is the heat output of the unit which is determined by measuring the quantity of air delivered and the temperature of the air to and from the unit. Table 4 shows the air handling capacities by the two methods of rating⁶ and also the approximate heating data. In accordance with the A.S.H.V.E. Standard Code for Testing and Rating Steam