

pressor and from gas transmission lines between the compressor and the condenser.

#### HUMIDITY CONTROL INSTRUMENTS

Control of relative humidity of air in buildings is accomplished by the use of instruments termed humidostats, hygrostats and psychrostats, or by the proper combination of a number of thermostats. Humidostats function in a manner similar to that of thermostats and may be used in connection with both electric and compressed air systems. The following are the most commonly used methods of automatically controlling the relative humidity of air:

1. A thermostat is located in or at the outlet of a spray-type air conditioner which maintains a constant saturation temperature of the air leaving the conditioner by varying the temperature of water entering the suction of the pump supplying the spray nozzles, or by varying the temperature of the air entering the conditioner, or both. The temperature of the air entering the conditioner may be varied by use of tempering heaters, or by the proper proportioning of supply and return air entering the conditioner. This thermostat is known as a dew-point thermostat, as it determines the dew-point temperature of the air introduced into the conditioned spaces. A second thermostat in the room, or in the path of the air leaving the room, maintains a constant dry-bulb temperature by varying the amount of sensible heat added to the air leaving the conditioner, or by varying the volume of air introduced into the conditioned spaces. These two thermostats, in combination, control the dry-bulb and dew-point temperatures, which accordingly fix the relative humidity.

2. A wet-bulb thermostat is located in the room, or in the path of the air leaving the room, to maintain a constant wet-bulb temperature by varying the saturation temperature at the air conditioner outlet. A dry-bulb thermostat is located in the room to maintain a constant dry-bulb temperature, which in combination with a constant wet-bulb temperature fixes the relative humidity.

3. A differential thermostat may be used to control relative humidity. This instrument consists of two thermostatic elements, one of which is in the path of the air leaving the conditioner, and the other under the influence of the dry-bulb temperature in the room. Instruments of this kind maintain a constant relative humidity by maintaining a constant difference between the dew-point temperature and dry-bulb temperature in the room.

4. A humidostat which responds directly to changes in humidity may be used to maintain a predetermined relative humidity with constant or with varying temperature. It may do this; by varying the dew-point temperature of air leaving a conditioner; by varying, with dampers, the proportion of moist and dry air; by varying the amount of moisture otherwise added to the air; or by varying the dry-bulb temperature.

#### Chapter 31

### CENTRAL FAN SYSTEMS

*Fan-Furnace Heating; Construction of Fan Furnaces; Ratings and Capacities; Arrangement of Heaters; Residence Type Fan Furnaces; Coal-Fired; Oil-Fired; Gas-Fired; Distributing Systems; Fan Steam Heating; Arrangement of Apparatus; Heating Units; Temperature Control; Design of Central Fan Systems.*

THE term *central fan system* as used in this chapter refers to any mechanical indirect system of heating, ventilating or air conditioning, in which air is heated or conditioned, and delivered by blowers through a system of ducts to the rooms or spaces for which it is intended. Such systems are adaptable and effective in buildings:

1. Too large for gravity distribution.
2. Where definite atmospheric conditions must be maintained.
3. Where the functions of heating and ventilating (or air conditioning) must be combined.

Much of the equipment used in central fan systems is the subject matter of other chapters. It is the purpose of this chapter to discuss the co-ordinated design. Central fan systems may be classified as: (1) direct fired (fan furnace) or (2) indirect (fan steam). Fan furnaces or the direct-fired type are made in large units for schools and public buildings and in small self-contained units in a single casing for residences and other small buildings. In the indirect type, steam is usually the medium by which heat is transferred from the boiler to the heating units. The heating units are enclosed in a casing which in turn is connected to one or more distributing ducts.

#### FAN FURNACE HEATING

Among the advantages of fan furnaces are:

1. Quick heating of heater surfaces with quick delivery of heat.
2. Variable air temperatures, quantities and velocities.
3. Simplicity of controls.

#### Construction of Fan Furnaces

Heaters for fan-furnace systems usually are made of cast iron or of steel. The cast-iron furnaces which are used mainly for large installations such as schools and public buildings, are made in sections which are cemented and then bolted together on the job. The steel furnaces are assembled with welded or riveted joints. Casings are of sheet-metal and angle-iron panel construction with sheet-metal and asbestos linings, or of brick with sheet-metal top deck, insulated. Access doors for inspection