6 ● What methods may be used to raise the dry-bulb temperature of the air after it leaves the dehumidifying air washer and before it enters the room?

a. Sensible heat may be added by a reheating method from a source outside the air stream. This method passes all or part of the cold, dehumidified air over steam or hot water coils at the central conditioner or in the ducts, or over electric grids or similar devices. Any available source of sensible heat can be used.

b. A mixing method using sensible heat already in the air stream. In this method the cold, dehumidified air is mixed with air at a higher dry-bulb temperature and the dry-bulb temperature of the resulting mixture is higher than that of the air when it left the conditioner. The air at high dry-bulb temperature is obtained by not passing it through the dehumidifying washer. The mixing may take place at a central conditioner or in the rooms themselves.

c. Combinations of these methods.

7 ● What are the advantages of using counter flow of air and water in surface coolers?

Counter flow results in a higher mean temperature difference than does parallel flow for the same range of air and water temperatures, which means that less cooling surface is required. Counter flow permits higher initial water temperatures and also allows a greater temperature rise for the water. These factors combine to reduce the cost of circulating and refrigerating the cooling water.

Chapter 23

UNIT HEATERS, VENTILATORS, AIR CONDITIONING, COOLING UNITS

Classification of Unitary Equipment and Related Systems, Unit Heaters, Heating Medium, Estimating Heat Losses, Air Temperatures, Output of Heaters, Direction of Discharge, Boiler Capacity, Quietness, Piping Connections, Unit Ventilators, Split and Combined Systems, Vents, Cooling Units, Air Conditioning Units, Heating, Humidifying and Dehumidification, Filtering, Location of Units, Air Distribution, Residential Central System Units, Capacities, Costs, Accessories to Unitary Equipment

IN other chapters, complete descriptions have been given of heating, cooling, ventilating, humidifying, and dehumidifying systems. These descriptions have covered the detailed principles of each and have, in general, described the assembled equipment included in the complete systems. The success of such completely engineered, heating, cooling, and air conditioning systems has inevitably led to the production of smaller factory-assembled equipment employing a majority of the principles of these complete systems. As a result, present day practice involves the use of this unitary equipment in the majority of smaller installations where capacity demands are within the limits of such units. Thus, unit heaters, unit ventilators, cooling units and air conditioning units have come to occupy a place of their own in the industry.

With the growth of this unitary industry, it becomes increasingly evident that there is no sharp line of demarcation, on the basis of capacity, between a *unit* and a *central station* system. Definitions contained in a code, Standard Method of Rating and Testing Air Conditioning Equipment[1], have helped to clarify and identify the various types available.

A *unit* is a factory-made encased assembly of the functional elements indicated by its name, such as air conditioning unit, room cooling unit, humidifying unit, etc. Such units are shipped substantially complete or built and shipped in sections so that the only field work necessary is the assembling together of the sections, without resorting to any field fabrication. A unit of this type may be complete in itself, employing its own direct means of air distribution and sources of refrigeration or heating, in which case, it thus represents a complete self-contained unit. Or it may be coupled with separate means of air distribution such as duct work and outlets, in which case, it will still be considered as a unit system, in dis-

[1]Proposed code prepared by Joint Committee of *American Society of Refrigerating Engineers*, AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS, *Refrigerating Machinery Association, National Electric Manufacturers Association* and *Air Conditioning Manufacturers' Association.*