SELECTION OF EQUIPMENT

The type of system to be used is controlled by the existing load conditions, the degree of perfection expected from the system, and the designer's knowledge of the operating characteristics of the various types of equipment. Information about equipment is available in other chapters and in the *Catalog Data Section*.

It is considered good practice to provide for total recirculation in order to reduce operating costs during unoccupied periods. And it is also less expensive to use all outdoor air for cooling when the outdoor wet-bulb temperature is lower than that of the return air.

The process of evaporative cooling may, in some localities, provide interior conditions which are adequate for certain occupancies. Outdoor air is drawn through a spray of recirculated water which is not mechanically cooled. The equilibrium temperature for heat exchange is the wet-bulb temperature of the entering air. In actual washers (see Chapter 26), the dry-bulb temperature does not fall to the wet-bulb temperature but only approaches it. To get much cooling effect, it is necessary to have a large differential between dry- and wet-bulb temperatures of outdoor air. Hence, this method is only feasible in those sections where the air temperature is high and the relative humidity is low. Also because the wet-bulb temperature of the air does not change in passing through the spray, this method is not recommended for cooling loads with a high proportion of latent heat.

In making the selection between spray and surface dehumidifiers, certain characteristics of each should be considered. A spray dehumidifier, (*i.e.*, dehumidifying air washer) will deliver practically saturated air, the temperature of which is determined by the temperature of the air washer water. The control in this case is the control of the water temperature and cooling effect can be accomplished by an external water cooler, a natural cold water supply, or coils installed directly in the washer. The washer system is used in the winter time for humidifying in the same way; that is, by controlling the water temperature, water can be evaporated into the air. This may require preheating the air before entering the washer, or the use of an external water heater, or steam coils directly in the washer. Air washers also have the ability to eliminate certain kinds of dirt and dissolved gases and some odors.

In common practice, the air leaving a cooling coil is not saturated. But as most comfort-conditioning systems require some differential between delivery dry-bulb and dew-point temperatures, it frequently happens that by careful selection the right combination can be produced by the coil, eliminating the need of reheating. Strictly speaking, the desired performances will be obtained only at full load, there being some fluctuation in room relative humidity at light loads. Such variation is usually within the allowable limits for comfort work. It is essential that a good filter be placed ahead of a cooling coil, otherwise sufficient dust will soon adhere to the wet coil to completely block the air passage.

The relation between sensible and latent heat is of great importance in the performance of cooling coils. Unfortunately, no uniformity exists at present in stating this ratio; and the several possible methods are given in Table 1 together with typical values for various occupancies. It must be remembered that these values are typical and should in no case be arbitrarily assumed to be correct for any given problem.

The procedure for selecting both heating and cooling coils is given in Chapter 25, and coil performance tables may be found in the manufacturers' catalogs. Some manufacturers have standardized on 4-row cooling coils and offer them at lower prices per square foot of surface than for other depths. By changing face velocity within permissible limits, 4-row coils can be adapted to many cooling jobs.

The characteristics of washers are discussed in Chapter 26. Dimensions will be found in manufacturers' catalogs.

Table 1. Room Heat Load Ratios for Typical Summer Comfort Conditioning

Room Heat Load Ratios[a]	Typical Classes of Room Service or Load				
	No. Occupants or Sources of Vapor	Private Office or Residence	Restaurant or Crowded Office	Auditorium at Capacity or Crowded Restaurant	Ballroom at Capacity
Sensible Heat / Total Heat	1.00	0.90	0.80	0.70	0.60
Total Heat / Sensible Heat	1.00	1.11	1.25	1.43	1.67
Latent Heat / Total Heat	0	0.10	0.20	0.30	0.40
Total Heat / Latent Heat	....	10.00	5.00	3.33	2.50
Sensible Heat / Latent Heat	....	9.00	4.00	2.33	1.50
Latent Heat / Sensible Heat	0	0.11	0.25	0.43	0.67

[a]The overall heat load ratio for the dehumidifier will be different from the heat load ratio for the room. The extent of the difference will depend on the quantity and condition of the outside air used, upon the magnitude of the duct losses, and upon whether or not reheat or by-pass is used.

If coils are used, humidification may be accomplished in winter by use of a separate humidifier. On small installations, the simplest method is to use a warm water spray through atomizing nozzles, using a pressure of 15 to 25 lb and sufficient nozzles to atomize about twice the amount of water needed for humidifying. The grains of moisture to be added to the incoming air at outside design temperature to bring it up to the required room dew-point are calculated. This is converted to total pounds of water per hour for the system and sprays designed for twice this amount. Cold water will not vaporize as completely as warm water, and water temperatures from 120 to 150 F are commonly used. Another method is to install a water tank in the air stream with a steam coil submerged in the tank, the humidification being accomplished by the steam boiling the water into vapor, which in turn will be absorbed by the passing air. In both of these systems there is a tendency to deposit lime and other impurities on any surface the water touches, and this scale should be