materials, so that it is not possible to recirculate or exhaust all of the air mechanically. If the conditioned space is practically air tight, 90 per cent of the air can be recirculated, but in ordinary construction it is better not to assume more than 80 per cent. On the same basis exhaust fans are sized for 75 to 80 per cent of the supply fan capacity, where recirculation is not used.

In some localities, the cooling is accomplished by evaporative cooling without any mechanical refrigeration or dehumidifying equipment. This is practical where the outside air dry-bulb is high and the relative humidity is low, as the washer temperature will tend to equalize at the outside wet-bulb temperature and will deliver saturated air at this temperature for cooling. There is no change in the wet-bulb temperature of the air going through the conditioner and therefore no change in the total heat, but the rapid circulation of the cold, moist air is often considered sufficient for comfort. These systems do not use recirculation.

In making the selection between spray and surface dehumidifiers, certain characteristics of each should be considered. A spray dehumidifier, (i.e., a 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 directly installed 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.

Surface coil dehumidifiers seldom deliver saturated air. Most comfort conditioning systems require that the air be delivered at low dew-point and relatively high temperatures. It is often simpler to produce this condition with a so-called dry coil than with an air washer. Surface coils can be used with cold water in the tubes or with direct-expansion refrigerant. When dehumidifying, the coil surface is wet due to the condensed moisture, and this water has some small cleaning effect and does absorb some gases and odors. These coils must be kept clean, however, as the water condensed is not sufficient to wash off the accumulations of dirt, and in the course of time a stale odor may be continuously added to the air stream from dirty coils.

The relationship between sensible and latent heat is given in Table 1 for typical classes of comfort conditioning and the required entering air condition. Unfortunately, there is yet no uniform practice in the statement of this ratio, and hence in Table 1 several ways of stating the load ratio are given. Examples of the solution of a typical problem of treating air to produce the room conditions of 80 F dry-bulb and 50 per cent relative humidity are presented in Table 2. In these examples it is assumed that as the air is discharged into the room and diffuses with the room air, it will absorb the sensible and latent heat in the ratio indicated and thus arrive at the designed condition. These are grille or outlet conditions which will not be the same as the condition leaving the dehumidifier.

The heating coils may be selected as indicated in Chapter 24. It is customary to use heating coils of convenient shape to fit the balance of the conditioning equipment, using 1, 2, or 3 rows of coils as needed.

On comfort cooling installations, the 4-row cooling coil is most widely used although some installations use 3-row coils and some 5 rows or more, depending upon sensible-latent ratio, air quantity and refrigerant temperature. With any given face velocity, the resistance to air flow increases with the number of rows of depth of coil. (See Chapter 24).

If a system using an air washer is selected, the washer is designed to fit the permissible space both as to width, height and length. Refer to Chapter 25.

If the surface coil system is used, winter humidifying may be accom-

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 are used.

TABLE 2. DRY-BULB TEMPERATURE OF AIR AT ROOM INLETS

To Maintain Typical Room Conditions of 80 F Dry-bulb, 50 per cent Relative Humidity

SENSIBLE HEAT / TOTAL HEAT	1.00	0.90	0.80	0.70	0.60
Air entering saturated[a]	60.0	58.6	56.5	53.0	35.0
Air entering with 4 F wet-bulb depression	66.5	65.4	64.1	61.8	56.0
Air entering with 8 F wet-bulb depression	72.6	72.1	71.6	70.5	68.0

[a]Typical air conditions leaving the central conditioner are: With spray dehumidifier, 0 to 2 F wet-bulb depression. With surface-type dehumidifier, 1 to 6 F wet-bulb depression. With by-pass or reheat, 4 to 10 F wet-bulb depression.