Maximum temperature of rooms surrounding walls and ceilings, 90 F. Floor is on ground. Room has a vestibule entrance. Four lights of 100 watts each will be burning part of the time. No occupants in room except at infrequent intervals. Brine available at a minimum temperature of 10 F.

Size of Room: 25 ft long by 20 ft wide by 9 ft high.
Walls: 6-in. concrete, 4-in. cork and ½-in. plaster finish.
Ceiling: 4-in. concrete, 4-in. cork and ½-in. plaster finish.
Floor: Cinder fill, 6-in. concrete, 4-in. cork, 2-in. concrete.

Solution. The cooling load will be the sum of the following items:

Sun effect	none
Lights: $4 \times 100 \times \frac{3.4}{4}$ (25 per cent use assumed)	340
Cooling unit motor, ½ hp	1260
Transmission	
Walls: $90 \times 9 \times (90 - 20) \times 0.066$	3742
Ceiling: $20 \times 25 \times (90 - 20) \times 0.067$	2345
Floor: $20 \times 25 \times (70 - 20) \times 0.065$	1625
Infiltration	
$\frac{4500 \times (90 - 20)}{8 \text{ hr} \times 55.2}$	713
Product Load	
None	
Total	10025
Safety factor (10 per cent)	1002
Total sensible heat load	11027 Btu per hour
Dehumidification Load	
Air at 90 F and 50 per cent rel. hum. 217.6 grs × 50 per cent	108.8
Air at 20 F and 50 per cent rel. hum. 15.01 grs × 50 per cent	7.50
Grains per lb to be removed	101.3
Pounds of air per 8 hr: 4500/14 or 321 lb	
Pounds of air per hr: 321/8 or 40⅛ lb	
Grains per hr: 101.3 × 40⅛ or 4064.6 grs	
Pounds of moisture: 4064.6/7000 or 0.580 lb, 0.58 × 1057 Btu	613
Grand Total	11,640
Tonnage, 11,640/12,000	0.96 tons

Air Temperature and Volume

The drop in temperature of the air through a cooling unit is comparatively small, while the volume handled is large. This feature permits of greater heat transfer per unit of surface and a minimum moisture precipitation. Consequently, the temperature difference between the room and the delivered air is small, making it of little consequence whether the intake of the unit is located at the floor or at the ceiling.

RATINGS AND CAPACITIES

It is standard practice to rate unit air conditioners for heating in Btu per hour and to rate cooling units in Btu per hour at a given dry- and wet-

bulb temperature of air entering the unit with a given refrigerant temperature, maintained within the cooling coil, a certain relationship between sensible and latent heat being designated. In any event the refrigeration unit must have sufficient capacity to care for all of the sensible heat to be absorbed plus the latent heat due to dehumidifying which in some cases may amount to a very substantial part of the load.

At present there is no uniform standard for rating air conditioning units but manufacturers generally have a definite rating for each unit with respect to its air volume or different air volumes, but judgment must be exercised in the selection of equipment so that the component parts are in proper ratio to each other.

LOCATION OF UNITS

The following considerations govern the location of units in a room to be conditioned:

1. Arrangement of product within a space.
2. Location of people within a room.
3. Number and location of units.
4. Air distribution.
5. Convenience of piping and wiring connections.
6. Location of outside air cooling and heating sources.

Most important of these is air distribution and units should be so located as to secure equal distribution to all parts of the room, whether the application is for comfort conditioning or processing. The discharge of cooled air in general should be from a high point and the air traveling back to the inlet of the unit should be at low velocities.

Cold Storage

Air conditioning with unit equipment plays an important role in the cold storage of food. Temperature and humidity control is of prime importance in order to retard bacterial development and retain as much as possible of the original moisture in meats, fish, fruits, vegetables and eggs. Spoilage and shrinkage during long storage periods result in costly losses and may be prevented with proper application and control of air conditions within specified limits. To maintain the high relative humidities generally required, units embodying the features of central plants are considered most suitable. The units are placed to discharge the moist cool air horizontally just below the ceiling so that distribution over the stored product will be uniform and rapid. For economic service 80 per cent relative humidity is the practical upper limit that can be carried. The higher the relative humidity requirement the larger the unit capacity needed.

The control methods and devices used for unit conditioners are discussed in Chapter 14.

TYPES OF EQUIPMENT

Ceiling Units: The types and designs of air conditioning units in production are legion and but a few typical arrangements are shown. New