4 ● Why do cooling towers give best results when the humidity of the air is low?

The cooling of water by dropping it through air depends mostly upon the evaporation of the water. If the relative humidity of the air is low, the water vapor will be readily absorbed and carried away, while if the humidity of the air is high, its capacity to pick up water vapor is less and the water is cooled less with the same exposure to air.

5 ● What performance tests should be given air washers?

a. Capacity.
b. Resistance.
c. Visible entrainment of free moisture.
d. Humidifying efficiency.
e. Cleaning effect.

6 ● What are the several different types of water-cooling towers?

a. Those with forced draft.
b. Those with natural draft open to the atmosphere.
c. Those with natural draft closed to the atmosphere.
d. Those with combined natural and forced draft.

7 ● What are the different types of air washers?

a. Spray. *b.* Wet scrubber. *c.* Combination spray and scrubber.

8 ● What is the saturation efficiency for an air washer with the common variations in spray arrangement?

For three banks, two up-stream and one down-stream	100%
For two banks, both up-stream	95%
For two banks, one up-stream and one down-stream	85%
For one bank, up-stream	80%
For one bank, down-stream	65%

9 ● Upon what air velocity are air washers usually rated?

500 fpm, through the area above the tank.

10 ● What wet-bulb temperature for the outside air is usually selected in air conditioning design when cooling is to be accomplished?

One which is not exceeded more than 5 to 8 per cent of the time in the locality where the plant is to be situated.

11 ● Where should the suction connection be placed in a cooling pond?

As far below the surface as possible and as far away from the discharge as practicable.

12 ● What chemical is used to kill algae formations in spray ponds?

Potassium permanganate.

13 ● What is the usual amount of spray water delivered to a cooling pond per square foot of pond area?

From 0.1 gpm on small sizes to 0.8 gpm on large sizes.

14 ● What is the usual amount of water delivered in cooling towers per square foot of area?

From 0.6 to 1.5 gpm.

15 ● About how much water is lost by evaporation in atmospheric cooling?

About 1 gal per 1000 gal for each degree of cooling range.

16 ● How is freezing obviated in cooling pond sprays?

The pressure and quantity of water is lowered so that the drops become of increased size and do not freeze so readily.

Chapter 12

UNIT HEATERS, VENTILATORS, COOLERS, AND AIR CONDITIONERS

Classification of Unitary Equipment and Related Systems, Advantages, Uses, Functions, Types of Construction, Locations, Capacities, and 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 that has been used to make these the complete systems. The success of such completely engineered, heating, cooling, and air conditioning systems has inevitably lead 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, unit coolers, and unit conditioners 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 so-called *central station* system. The various industrial codes have thus found it necessary to describe a *unit* as a factory-made encased assembly, 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. These units consist of assemblies of functional elements indicated by their names, such as *Air Conditioning Unit, Room Cooling Unit, Humidifying Unit*, etc.

A unit such as defined 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 system. 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 distinction to the generally accepted term of a field fabricated central station system. The manufacturer of the unit is responsible for the output and performance of the unit under rated conditions, whereas the contractor installing the complete unitary system is normally held responsible for the complete performance of the system.