

order to prevent flooding of the lower dehumidifiers. Where spray dehumidifiers are on the same level, equalizing lines between the pans may be required if a storage tank is not provided.

All of the various pieces of equipment from the outdoor air intake through the fan usually are connected together by sheet metal casings. Frequently the building structure or specially constructed walls or partitions may be used to form all or portion of the casing. In any case the casing or connection must be sufficiently sturdy for the required duty. Sheet metal work must be well braced not only to prevent bellying or vibration under pulsations in air flow but to withstand the abuse of normal usage. Casings should be adequately braced wherever access doors are installed and all large panels should be adequately reinforced by angle iron.

Each apparatus layout is to be made with accessibility in mind. Where cooling coils are used space for removing and repairing or replacing the coils should be provided. Adequate space is to be provided for the servicing and replacement of eliminators. Filters must be so located that the proper cleaning, replacement or routine servicing can be accomplished without difficulty. Free access to the bearings of all moving machinery is a necessity. Provisions should be made for the complete removal and replacement of any part of the system that is subject to wear, deterioration or damage, whether it may be filter, fan wheel, motor, rotor, pump impeller or heat transfer surface.

### DESIGN PROCEDURE

The customary design procedure is outlined herewith. For simplification the procedure is set up on the basis of a year 'round system. For summer only or winter only systems, the unrelated parts are to be omitted.

1. Selection of design conditions (inside and outside).
  - a. Summer.
  - b. Winter.
2. Determination of outside air requirements.
3. Determination of cooling load.
  - a. Room sensible heat gain.
  - b. Room latent heat gain.
  - c. Room total heat gain.
  - d. Grand total heat gain.
4. Determination of heating load.
  - a. Room sensible heat loss.
  - b. Room moisture loss.
  - c. Humidification requirement.
  - d. Total heating requirement.
5. Determination of apparatus dew-point and dehumidified or humidified air quantity.
  - a. Summer (full load and part load).
  - b. Winter.
6. Supply air temperature difference and quantity.
  - a. Summer.
  - b. Winter.
7. Equipment selection.
8. Equipment layout.

The foregoing steps are merely typical. Many applications will require at least a preliminary investigation of some of the latter steps before proceeding with the earlier steps.

## Chapter 22

### UNIT HEATERS, UNIT VENTILATORS, UNIT HUMIDIFIERS

*Unit Heaters, Centrifugal Housed Fan Type, Propeller Fan Type, Ratings, Boiler Capacity, Piping Connections, Unit Ventilators, Ratings, Applications, Air Vents, Window Ventilators, Unit Humidifiers, Types of Units*

**D**ESCRPTIONS of heating, cooling, ventilating, humidifying, and dehumidifying systems are given in other chapters. This chapter deals with unit heaters, unit ventilators, and unit humidifiers. Cooling units, unit air conditioners, and attic fans are described in Chapter 23.

In general a *unit* may be defined as a factory-made encased assembly of the functional elements indicated by its name, such as unit heater, unit ventilator, etc. These 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 may be complete in itself, employing its own direct means of air distribution and source of 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, as contrasted with the generally accepted term of a central station system constructed and assembled in the field.

Some advantages of unit equipment are lower cost per unit capacity, lower cost of installation, and flexibility and ease of installation. These units are also available in small capacities.

#### Definitions<sup>1</sup>

1. A *Heating Unit* is a specific air treating combination consisting of means for air circulation and heating within prescribed temperature limits.
2. A *Heating Air Conditioning Unit* is a specific air treating combination consisting of means for ventilation, air circulation, air cleaning and heat transfer with control means for heating and maintaining humidity within prescribed limits.
3. A *Humidifying Unit* adds water vapor to and circulates air in a space to be humidified.

<sup>1</sup>Standard Method of Rating and Testing Air Conditioning Equipment, prepared by a Joint Committee of the American Society of Refrigerating Engineers, AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS, Refrigerating Machinery Association, National Electrical Manufacturers' Association and Air Conditioning Manufacturers' Association.