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CHAPTER 43

Central Systems for Comfort Air Conditioning

Types of Systems for Ventilating, Heating, Air Conditioning, Factors Involved in Use and Design of Systems, Design Procedure

THE purpose of this chapter is to present a discussion of types of central systems usually encountered, together with a discussion of the factors involved in use and design and an outline of design procedure.

Insofar as this chapter is concerned, a central system is defined as a field assembled apparatus, comprising such elements of equipment as are necessary to fulfill the purpose for which it is designed, and serving one or more conditioned spaces. A factory produced unit, including all the essential items of equipment may be employed as a central system. Unitary equipment is discussed in Chapter 36. Further, this chapter is confined to comfort air conditioning systems as such, and ventilating systems, warm air heating systems, together with central systems of a special nature, are excluded from the discussion.

This chapter assumes a knowledge of all the component parts of a system and the reader is referred specifically to other chapters covering design conditions and physiological principles, cooling and heating loads, spray equipment, heat transfer surface coils, cooling, dehumidification and dehydration, fans, air cleaning devices, refrigeration, air distribution and air duct design, automatic controls and instruments. In addition, the engineer should refer to the Code of Minimum Requirements for Comfort Air Conditioning [1] prepared by the joint committee of the AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS and the *American Society of Refrigerating Engineers*, and to national, state or local codes that may apply.

CLASSIFICATION OF SYSTEMS

The generally accepted method of classifying systems is with regard to their function. A given type of system may be changed by the omission of certain of its functions or by the inclusion of others. As an example, a winter air conditioning system, by the omission of humidifying sprays, air cleaning devices, etc., will become a simple warm air heating system, and by further omissions will become a simple ventilating system. On the other hand, with the inclusion of a dehumidifier with its source of cooling, the system can become a year 'round air conditioning system. The three major types of systems are:

1. *Winter Air Conditioning Systems.* The function is to ventilate, heat and humidify in winter the spaces under consideration, and provide the desired degree of air motion and air cleanliness. The equipment required normally consists of a preheater, filters, humidifying sprays or air washer, reheater, fan, distributing ducts, and the necessary manual or automatic means of control. See Fig. 1.

2. *Summer Air Conditioning Systems.* The function is to ventilate, cool and dehumidify the spaces under consideration and to provide the desired degree of air motion and cleanliness. The normal complement of equipment includes filters, dehumidifier with its source of cooling, reheaters or by-pass if required, fan, distributing ducts, and the necessary manual or automatic means of control. See Fig. 2.

3. *Year 'Round Air Conditioning Systems.* The function is to ventilate, heat and humidify in winter and cool and dehumidify in summer the spaces under consideration, and to provide the desired degree of air motion and cleanliness. The equipment usually comprises preheater, filters, spray or surface dehumidifier, reheaters and by-pass if