

3 • Why is baffling inside the casing necessary on fan systems?

Because the movement of air is independent of its temperature, air must be guided by baffles of one form or another to bring it in contact with the hot surfaces so it will not pass through the casing unheated. On the other hand, if the air is held against a hot surface too long it might become overheated, for the average register temperature on a fan system should not exceed 120 F.

4 • What practical points should be observed in designing a fan system in order to eliminate noise?

- Use a large fan so it can be run at slow speed.
- Set the fan and motor on a solid foundation.
- Insulate the fan and motor from the foundation with rubber, cork, or other springy material according to the principles given in Chapter 30, provided, of course, that such insulation is of value.
- See that the air velocity is not too high in the ducts. Properly designed splitters in the elbows will avoid high velocities at the turns in cases where the velocity through the ducts themselves is not too high.
- Use canvas connections between the ducts and any running equipment.
- Be sure the ducts have a relatively smooth interior and are rigid.

5 • Why do furnaces designed to burn bituminous coal, oil, or gas require larger combustion spaces than those designed for anthracite?

Anthracite burns largely as fixed carbon whereas gas and oil burn as gases, and as much as 50 per cent of bituminous coal burns as a gas. Ample space must be provided for the intimate mixture of these gases with the oxygen of the air to secure proper combustion.

6 • A furnace has the following dimensions: Grate diameter, 24 in.; casing diameter for gravity air flow, 56 in.; combustion chamber diameter, 30 in. What is the unobstructed area required for passage of air across the heating surface when a motor-driven blower, operating at an outlet velocity of 1200 fpm, delivers 1600 cfm into the casing near its bottom?

For residence applications using small blowers, an air outlet velocity of about one-third of the blower outlet velocity is considered good practice.

$$\text{Air-pass velocity} = \frac{1200}{3} = 400 \text{ fpm.}$$

$$\text{Air-pass area} = \frac{1600}{4} = 4 \text{ sq ft} = 576 \text{ sq in.}$$

7 • In Question 6 what would be the gap between the chamber and the baffle when the chamber is centered in the casing?

Area of combustion chamber (30-in. diam)	706.9 sq in.
Area of air pass	576.0 sq in.
Total area	1282.9 sq in.

The diameter of a circle with an area of 1282.9 sq in. is 40.4 in. One-half of the difference between the diameters is the amount of gap.

$$\text{Gap} = \frac{40.4 - 30.0}{2} = 5.2 \text{ in.} = \text{approximately } 5\frac{1}{4} \text{ in.}$$

Chapter 21

CENTRAL SYSTEMS FOR COMFORT AIR CONDITIONING

Types of Systems for Heating, Humidifying, Cooling, Dehumidifying with Modifications, Design Details, Load Calculations, Selection of Equipment

A CENTRAL system for comfort air conditioning includes a central fan with complete supply and recirculating duct system which is designed to serve one or more conditioned spaces from one central apparatus. The air conditioning equipment includes the heating and cooling coils, humidifying and dehumidifying apparatus, air cleaning equipment, and the controls, all designed so that the air introduced to the space will maintain the desired temperature and humidity in that space *after* it has been affected by the losses and gains in heat or moisture which occur in the space. This chapter is intended to serve as a general guide in the selection and design of the central system for year-round air conditioning for commercial installations. References are made to other chapters which give complete data and discussion on certain portions of the work. Many systems will not include all of the functions of the complete year-round system and it is impractical in the space allowed here to show all the different combinations of equipment which could be used for central system work to suit special conditions or the preferences of the designing engineer.

In January, 1938 the Society adopted an application Code¹ for the design of comfort air conditioning installations which was prepared by a Joint Committee of the AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS and the *American Society of Refrigerating Engineers*. In some states and municipalities local codes have been prepared giving specific design requirements for those localities and the engineer should refer to these standards if they are in existence.

CLASSIFICATION OF SYSTEMS

Central systems which are designed to produce dehumidification by the use of cold surfaces or sprays may be classified as:

1. Central unit with heating and cooling coils and humidifying sprays (refer to Fig. 1). This system is very common and used extensively for summer and winter conditioning.

¹Code of Minimum Requirements for Comfort Air Conditioning (A.S.H.V.E. JOURNAL SECTION, *Heating, Piping and Air Conditioning*, April, 1938, p. 276). Reprints of this code are available at \$1.0 a copy.