tially recessed into the wall to save space without materially affecting the results.

Air Exhaust Vents and Flues

The size and location of the air exhaust vent[6] outlet are important and in many cases, are regulated by laws for public buildings. Where no codes govern, the location and size of vents are left to the discretion of the engineer.

Best results have been obtained with a velocity through the vent openings nearly equal to that at which the air is introduced into the room, thus maintaining a slight pressure in the room. Calculated velocities at the vent openings of from 600 to 800 fpm produce the best diffusion results from this system. Many states, however, have regulations that will not permit velocities as high as 800 fpm. If a vent opening at or near the floor is near a desk or place where a person is seated, a velocity of 800 fpm in the vent opening will produce an objectionable draft. In such a case the velocity in the vent opening should not exceed 400 to 450 fpm, although duct velocities may be maintained at 600 to 800 fpm if codes permit.

In school buildings provided with wardrobes or cloakrooms, the vents may be so located that the air passes through these spaces, ventilating them with air which otherwise would be passed to the outside without being used to the best advantage. Many state and local codes for ventilation of public buildings make this arrangement mandatory.

WINDOW VENTILATORS

A window ventilator consists of filter and switch controlled motor-driven fans enclosed in a cabinet to be mounted on the window sill. Such units accomplish ventilation, air cleaning, and air circulation, but have no means of heating the air. The direction of air discharge is manually adjustable for seasonal operation.

REFERENCES

[1] See *National Association of Fan Manufacturers* standard definitions in Chapter 33.

[2] Standard Code for Testing and Rating Steam Unit Heaters—Adopted jointly by THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS and the *Industrial Unit Heater Association*, Second Edition January 1950 (*IUHA* Bulletin No. 10).

[3] Standard Code for Testing and Rating Hot Water Unit Heaters—Adopted jointly by THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS and the *Industrial Unit Heater Association*, Second Edition April 1953 (*IUHA* Bulletin No. 11).

[4] A.S.H.V.E. RESEARCH REPORT No. 958—Temperature Gradient Observations in a Large Heated Space, by G. L. Larson, D. W. Nelson and O. C. Cromer (A.S.H.V.E. TRANSACTIONS, Vol. 39, 1933, p. 243). A.S.H.V.E. RESEARCH REPORT No. 1011—Tests of Three Heating Systems in an Industrial Type of Building, by G. L. Larson, D. W. Nelson and John James (A.S.H.V.E. TRANSACTIONS, Vol. 41, 1935, p. 185).

[5] A.S.H.V.E. Standard Code for Testing and Rating Steam Unit Ventilators (A.S.H.V.E. TRANSACTIONS, Vol. 38, 1932, p. 25) (Effective Jan. 1, 1934).

[6] A.S.H.V.E. RESEARCH REPORT No. 936—Investigation of Air Outlets in Class Room Ventilation, by G. L. Larson, D. W. Nelson and R. W. Kubasta (A.S.H.V.E. TRANSACTIONS, Vol. 38, 1932, p. 463). A.S.H.V.E. RESEARCH REPORT No. 1017—Air Supply to Classrooms in Relation to Vent Flue Openings, by F. C. Houghten, Carl Gutberlet and M. F. Lichtenfels (A.S.H.V.E. TRANSACTIONS, Vol. 41, 1935, p. 279).

CHAPTER 26

UNIT AIR CONDITIONERS AND UNIT AIR COOLERS

Definitions, Classification of Unit Type Equipment, Component Parts of Unit Type Equipment, Sound Isolation, Modifications of Remote Units, Ratings of Unit Air Conditioners, Application of Unitary Equipment, Unit Air Coolers

THIS chapter presents the physical characteristics of air cooling units and air conditioning units; a suggested procedure for selection of units; and some of the factors involved in the application of unitary equipment. In general, factory produced unit equipment can be obtained to accomplish all of the functions possible from field assemblies, but the advantages of unit equipment are most apparent in small and moderate capacities. Above 12,000 cfm capacity, or approximately 40 tons of refrigeration capacity, handling and assembly costs generally favor the use of field assembled units. Multiple application of unitary equipment is frequently justified for large gross tonnage installations where zoning or a minimum amount of air distributing ducts is desirable.

DEFINITIONS

The term *air conditioning* unit has been loosely used as a name for all types of factory produced air handling, cooling, or heating units. A joint committee[1, 2, 3] on Rating Refrigerating Equipment has defined the various types of unitary equipment:

1. A *Cooling Unit* is a specific air treating combination consisting of means for air circulation and cooling within prescribed temperature limits.[1]

2. An *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 maintaining temperature and humidity within prescribed limits.[1]

3. A *Cooling 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 cooling and maintaining temperature and humidity within prescribed limits.[1]

4. A *Self-Contained Air Conditioning or Cooling Unit* is one in which a condensing unit is combined in the same cabinet with the other functional elements. Self-contained air conditioning units are classified[2] according to the method of rejecting condenser heat (water cooled, air cooled, and evaporatively cooled), method of introducing ventilation air (no ventilation, ventilation by drawing air from outside, ventilation by exhausting room air to the outside, or ventilation by a combination of the last two methods), and method of discharging air to the room (free delivery or pressure type).

5. A *Free Delivery Type Unit* takes in air and discharges it directly to the space to be treated without external elements which impose air resistance.[1]

6. A *Pressure Type Unit* is for use with one or more external elements which impose air resistance.[1]

7. A *Forced-Circulation Air Cooler* is a factory encased assembly of elements by which heat is transferred from air to refrigerants.[3]

CLASSIFICATION OF UNIT TYPE EQUIPMENT

Field assembled apparatus as described in Chapter 30 can be designed in shape, size, and capacity for any application, with the refrigeration and heating system exactly balanced to a specific load condition.

To obtain the economies of factory production, component assemblies are available in the size ranges of greatest usage. In addition to assemblies