Inlets and Outlets in General

When there is no heat loss from the room being ventilated, the entering air for ventilating purposes may be at very nearly the same temperature as the air in the room, and the air may be moved across the room, and the inlets and outlets may be opposite each other. They may be successful if calling for air circulation from floor to ceiling, or from ceiling to floor.

When, however, windows and cold walls and radiators must interpose their disturbing influence, or when there are gases or fumes or excess heat in great quantities, or when the entering air is cooler than the air in the room, complications are bound to occur, and in general the cooled air in the room or the cool entering air will fall to the floor, while the lighter heated air will rise to the ceiling. Therefore, in many cases both inlets and outlets, well designed, may be placed at the ceiling, the entering cool air being diffused and warmed somewhat as it falls slowly toward the floor, while the overheated air is skimmed off the top.

DESIGNING THE VENTILATING SYSTEM

After the heating and ventilation requirements have been calculated, the size of the heater and fan may be calculated for a given friction, temperature range, pressure loss in ducts, etc. Pressure losses build up rapidly as velocities are increased and generally they vary approximately as the square of the velocity. The allowable pressure loss through the heater should in general not exceed 50 per cent of the total static pressure of the system. In public building practice the allowable pressure loss through tempering coils and reheaters should be under 0.5 in. of water and when an air cleaner is used the friction through the tempering coil and reheater should not exceed 40 per cent of the total resistance, as a rule.

For data on the design and construction of duct systems for ventilating work, see Chapter 31.

A greater friction allowance for the heaters than 50 per cent of the total may be made in industrial work where the duct runs are comparatively short and where the resistance of the heater is a large part of the entire pressure loss in the system.

The fan may be selected when the following facts are known:

1. Quantity of air required in cubic feet per minute.
2. Static pressure of the system (ducts, heaters, air cleaners, entrance connections, etc.)

The rating used for the fan should have been determined by the A. S. H. V. E. Standard Code for Testing Centrifugal and Disc Fans (See TRANSACTIONS, 1923, Vol. 29, p. 407 and Chapter 32).

A mechanical ventilation installation rightly designed and operated will be quiet and efficient, but every precaution should be taken to prevent vibration or sound transmission to the rooms.

Sound reduction is best accomplished when the foundation or base which carries the fan and motor is floated on a layer of cork or other sound-inert substance interposed between it and the sub-foundation.

Several systems for soundproofing of machinery are available and contracts may be made covering assured results.

Importance of Intelligent Operation

It is good practice for the engineer to prepare a complete set of operating instructions for the particular kind of ventilating system installed so that a change in building operators will not involve explanation of the system by the old operator to the new. Every precaution should be taken to insure that the system will be operated as it is designed to be operated.

UNIT VENTILATING SYSTEMS

Unit supply systems of mechanical ventilation (see Chapter 9) also may operate to warm the air sufficiently to care for the heating of the building, or may be accompanied by independent heating apparatus.

EQUIPMENT FOR ATTAINING SYNTHETIC AIR CHART PERCENTAGES

The following classifications are given to assist in selecting the type of equipment necessary to attain certain percentages on the Synthetic Air Chart described in Chapter 26. It will be understood that considerable variation may be found in certain classes of equipment due to individual ideas on the part of the designer, the character of the workmanship, the location of the building in which the equipment is installed, etc.; nevertheless, if the equipment is properly designed, installed and operated, it will give at least the percentage listed under any particular classification. To design an installation approaching 100 per cent, it is necessary to provide apparatus for heating and humidifying the air, and for cleaning it and distributing it with controlling devices that will maintain the temperature and humidity in conformity with the comfort lines as given by the Research Laboratory of the AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS. Any equipment omitted or any part that is ineffective will reduce the final percentage attained.

Class "A" equipment capable of attaining over 95 per cent on the Synthetic Air Chart, consisting of a mechanical system including the following apparatus:

1. Mechanical air supply having a maximum capacity of 30 cu. ft. per minute per occupant.
2. Mechanical exhaust equipment.
3. Excellent air distribution.
4. Accurate automatic temperature control.
5. Efficient humidifying apparatus.
6. Accurate automatic humidity control devices.
7. Efficient air cleaning apparatus.

Note.—It is understood that 100 per cent efficiency is a physical impossibility since this would mean 100 per cent efficiency in the air cleaning device, in air distribution, in temperature control, etc.. Perfect results of this kind have not yet been obtained in practice, although it is possible to obtain approximately 99 per cent of the Synthetic Air Chart with an apparatus of this kind carefully designed and installed and skillfully operated.

Class "B" equipment capable of attaining from 90 to 95 per cent on the Synthetic Air Chart, consisting of a mechanical system including the following apparatus: