SCHOOL ROOM VENTILATION[1]

The entire field of ventilation presents no more important problem than the adequate and satisfactory ventilation of the average school room occupied for approximately six hours of the day by a class of 40 pupils and a teacher. Any attempt to place the responsibility for the control and regulation of the heating and ventilating system on the teacher is of dubious value, when it is considered that, with constantly changing outside temperatures and winds, no possible adjustment of window openings can be correct for any length of time even for a given room. Considering the building as a whole, it is apparent that rooms on the windward side are always subjected to pressure, while those on the leeward side are subjected to suction whenever an appreciable wind is blowing. Outside air will readily enter the open windows of the former rooms, but inside air will pass out of the open windows of the latter rooms, so that open window ventilation under windy weather conditions can be applied to only one-half of the building at best. The leeward half has to take the *drift* of the air from the rooms of the other half.

It would appear that a mechanical system designed on the basis of the present knowledge of the essential factors as outlined in Chapter 28 is, in most cases, the best present solution of this problem, if complete and positive automatic control of the proper air conditions in a school room is to be accomplished.

Studies of school room ventilation made by the New York State Commission on Ventilation[2] (1913-17) and continued by the New York Commission on Ventilation[3, 4, 5, 6] (1926-29) originally attributed differences in the rate of incidence of respiratory illness to the kind of ventilating systems used. However, a later report,[7] which includes studies of the influences of previously uncompensated variables such as race, age, sex, social and economic status, distance pupils had to walk to school, and the inability of various observers to diagnose respiratory diseases consistently, announces the important conclusion that respiratory illness does not constitute a satisfactory criterion for judging the effects of air conditions on the health of school children.

[1] *See School Room Ventilation*, by A. C. Willard, *Heating, Piping and Air Conditioning*, September, 1929.

[2] *Ventilation, Report of the New York State Commission on Ventilation*, 1923.

[3] *Effects of Mechanical and Natural Ventilation on the Health of School Children*, by T. J. Duffield (A.S.H.-V.E. TRANSACTIONS, Vol. 34, 1928).

[4] *A Study of Ventilation and Respiratory Illness in Syracuse Schools*, with an Analysis of Factors Affecting Criteria Used, by Rufus Cole, et al (*The American Journal of Hygiene*, Vol. 12, 1930, p. 196).

[5] *A Study of Ventilation and Respiratory Illness in Syracuse Schools;* Rate of Air Flow and Room Temperature in Relation to the Health of School Children, by Rufus Cole, et al (*American Journal of Hygiene*, Vol. 12, 1930, p. 215).

[6] *A Study of Ventilation and Respiratory Illness in New York Schools; Comparison of Window-Gravity Ventilation and of Unit Fan Ventilation with Varying Air Flow*, by Rufus Cole, et al (*Ibid.*, Vol. 13, 1931, p. 235).

[7] *The Principles of School Ventilation—A Review of Recent Experimental Work and the Consensus of Scientific Opinion at the Present Time*, by T. J. Duffield (*The Aerologist*, April, 1930).

Chapter 25

VENTILATION OF INDUSTRIAL BUILDINGS; EXHAUST SYSTEMS

Requirements of Efficient System; Design of Exhaust Systems; Typical Layout and Calculations; Selecting the Fan; Collectors; Design of Hoods; Conveyor Pipes; Maintenance of System; Clothing Factory Pressing Rooms; Cold Storage Warehouses; Lacquer Spray Booths.

VENTILATION (air change) as applied to industrial buildings, factories, etc., is used mainly for the purpose of removing excessive heat, objectionable odors and injurious substances. Data concerning the deleterious effects on the human body of these factors are given in Chapter 28. The removal of heat frequently is accomplished by means of natural ventilation (see Chapter 26), although in many cases mechanical means are necessary. The removal of injurious substances usually is obtained by mechanical exhaust systems.

When air conditioning is applied to industrial buildings, it is done so in most cases to control some manufacturing process as outlined in Chapter 29, but occasionally it is used solely to maintain conditions considered essential to the comfort, health and efficiency of the workmen. It often happens, however, that the conditions best suited to a certain manufacturing process are also ideal from the standpoint of comfort and efficiency.

This chapter contains information on mechanical exhaust and collecting systems. The exhausted air and refuse is, of course, replaced by an equal amount of *fresh* air through openings in the building construction. If the exhaust system efficiently removes the objectionable substances, the air which replaces the exhausted air, if it comes from an uncontaminated source, is more than sufficient, in most cases, to adequately ventilate the building.

TYPES OF EXHAUST SYSTEMS

There are two general arrangements, the central and the group systems. In the central system a single or double fan is located near the center of the shop with a piping system radiating to the various machines to be served. In the group system, which is sometimes employed where the machines to be served are widely scattered, small individual exhaust fans are located at the center of the machine groups. The group arrangement has the advantage of flexibility.

Exhaust systems are also classified by the means employed to collect dust or other material handled. The dust or refuse may be collected and