

harmful, there is general agreement that very high or very low humidities indoors are to be avoided. It is generally accepted that for good ventilation the relative humidity should not be below 30 per cent or above 60 per cent.

Maintaining proper humidity indoors is particularly a problem in cold weather. The reason for this can easily be seen when one considers that most rooms have from 1 to 2 air changes per hour due to infiltration (See Chapter I, p. 48-60 of THE GUIDE) or, that air circulates freely between the outside and inside of most buildings.

TABLE 2. CONDITION OF SENSIBLE PERSPIRATION FOR VARIOUS ATMOSPHERIC CONDITIONS

DEGREES OF PERSPIRATION	EFFECTIVE TEMPERATURES AT	
	95 Per Cent Relative Humidity	20 Per Cent Relative Humidity
Forehead clammy.....	73	75
Body clammy.....	73	75
Body damp.....	80	85
Beads on forehead.....	85	90
Body wet.....	85	90
Perspiration on forehead runs and drips.....	90	95
Perspiration runs down body.....	90	95

The psychrometric chart, Fig. 1, shows that one pound of dry air at 30 deg. fahr. can have a maximum of only 24 grains of moisture even if the relative humidity is 100 per cent. If this air upon coming indoors is heated to 70 deg. fahr. without addition of moisture the moisture content will still be the same but the relative humidity will fall to 23 per cent. Likewise an outside temperature of zero with 100 per cent relative humidity will give 5.2 per cent relative humidity inside while 20 deg. below zero outside will give 1.7 per cent inside. 70 deg. air with relative humidity of 20 per cent or lower is noticeably dry or has a great affinity for moisture and takes it rapidly from any available source, resulting in raising of dust, damage to glued furniture, and a parched or irritated condition of the mucous membrane of the outer portions of the respiratory tract. Contrary to common belief, however, the total moisture removed from the entire respiratory tract through breathing a given mass of air is practically the same indoors with 70 deg. and 5.2 per cent relative humidity as it is out-of-doors with zero and 100 per cent relative humidity.

There is likewise difference of opinion concerning the relation of high relative humidity to health and comfort. A high humidity indoors is objectionable due to precipitation on windows and other cold surfaces and a general tendency for a damp unsanitary condition to develop.

CHAPTER XXIV

SYSTEMS OF VENTILATION

Methods of Fan Application, Air Supply, Fan Selection, Types of Equipment, Unit Systems.

VENTILATING systems may be classified as follows:

Method of Supply	Method of Exhaust
Window (or other natural means)	Gravity
Gravity	Fan
Fan	Gravity
Fan	Fan (with or without recirculation)

In addition to these, there is also a system employing fan supply without exhaust fans or gravity exhaust duct work, the exhaust depending entirely on natural leakage around doors and windows and through open entrance doors. This system has seen considerable use in connection with theatres and auditoriums where air cooling and refrigeration is employed and where a large percentage of the air is recirculated. A more modern adaptation of this type of system for theatres includes a system of exhaust recirculating ducts extending back to the inlet of the supply apparatus, with an exhaust relief branch duct leading to the outside through which most of the discharged air is forced. The air forced outward by interior excess air pressure is equivalent in volume to the outside air taken in by the supply apparatus.

The movement of air in natural ventilation systems is produced by the difference in density between that of the air in building and that of the outside air, coupled with the action of the outside air movements on ventilators, openings and the building itself. The greater the difference in temperature between the two columns of air, other conditions being equal, the more rapid the air movement.

Outside air movements may either augment or retard the air movements due to temperature difference, depending upon the velocity and direction of the outside currents, the location and character of openings and the character of the building. (See Chapter XXXIII, Natural Ventilation.)

With mechanical systems the circulation of air is maintained positively and uniformly regardless of outside air conditions and when properly designed and operated they will also furnish any desired temperature or humidity under automatic control.

Five methods of fan application in heating and ventilating are common, as follows:

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