

Answer.—The first condition is given by the intersection of the 75 deg. dry-bulb line and the 68 deg. wet-bulb line. The effective temperature is given by the numerical value of the effective temperature line passing through this point and indicated by the scale along the saturation curve, and is 71.9 deg. effective temperature. The second condition is given by the intersection of 80 deg. dry-bulb and 60 deg. wet-bulb and is 71.7 deg. effective temperature. It is therefore 0.2 deg. effective temperature cooler than the first condition.

Example 2.—Given 76 deg. dry-bulb and 61 deg. wet-bulb how many degrees difference between this condition and the comfort line or 64 deg. effective temperature?

Answer.—The effective temperature of this condition is given by the intersection of the 76 deg. dry bulb and 61 deg. wet-bulb lines and is 70 deg. effective temperature or 6 deg. effective temperature warmer than the comfort line.

Example 3.—Given the dry and wet bulb temperatures in a room 76 and 54 deg.

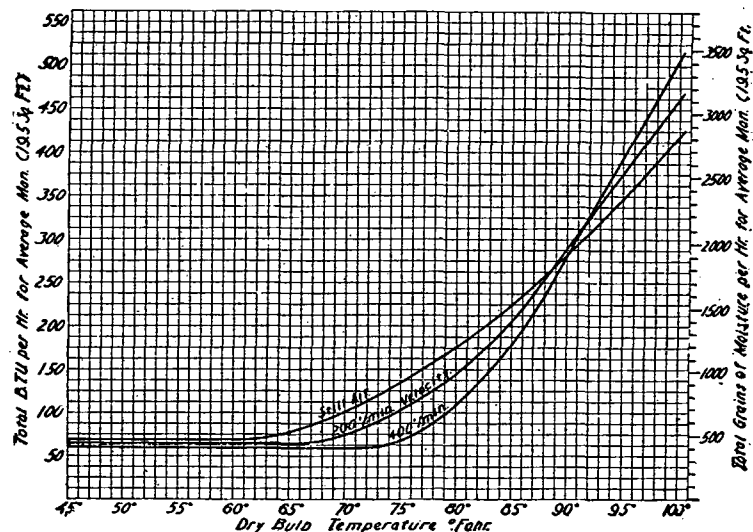


FIG. 8. RELATION BETWEEN HEAT AND WEIGHT LOSS FROM THE HUMAN BODY BY EVAPORATION AND DRY-BULB TEMPERATURE FOR STILL AND MOVING AIR

respectively, what air velocity will be necessary to make this condition ideally comfortable, that is, 64 deg. effective temperature?

Answer.—From Fig. 1 for still air it will be seen that this condition has an effective temperature of 68.1 deg. in still air, while an air velocity of 300 ft. (see Fig. 3) gives an effective temperature of 64.7 deg. A velocity of something more than 300 ft. per minute will give the desired result. The exact velocity may be found by looking through the various tables 2 to 7, for moving air, in the JOURNAL OF THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS, November, 1926.

Example 4.—Given a condition having dry and wet bulb temperature of 90 and 85 deg., respectively, how much cooler will this condition feel if 300 ft. air velocity is supplied instead of still air?

Answer.—From Fig. 1 it will be found that this condition in still air has an effective temperature of 86.6 deg., while if the air has 300 ft. velocity it will be found from Fig. 3 that it will have an effective temperature of 83.8 deg. Cooling of 2.8 deg. will be produced by the 300 ft. air velocity.

There are many applications for these data. In warm weather it is especially desirable to have greater comfort in school rooms, theaters,

auditoriums, also factories, foundries, iron, steel and glass works, mines and other places where workers are subjected to extreme temperature conditions. Maintaining comfortable conditions indoors in summer when the temperature is about 95 deg. is a more complicated problem than maintaining the proper condition in winter.

Effective cooling, using cold water or refrigeration, is frequently resorted to in theaters and other public buildings and this practice may be expected to increase.

HOW RELATIVE HUMIDITY AFFECTS HUMAN COMFORT

Relative humidity has a bearing on the well being of man besides having an effect in determining his feeling of warmth. While its effect on health and comfort has never been thoroughly investigated, and while authorities do not agree as to reasons why a high or a low humidity is 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 Table 38, Chapter 2), or that air circulates freely between the outside and inside of most buildings.

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. Air at a temperature of 70 deg. with a relative humidity of 20 per cent or lower is noticeably dry and 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 opinions 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.

TESTING METHODS AND INSTRUMENTS

Temperatures

In the measuring of room temperatures care must be exercised to prevent the results from being affected by the body heat of the observer, by drafts from doors, windows and other openings or by radiant heat from some local source such as a radiator, wall, etc. All thermometers