

or sub-freezing weather they are objectionable on account of condensation and frosting on the windows. Information on this subject is given in Chapter 7.

A degree of atmospheric humidity sufficiently high to cause deposition of moisture in the clothing may perhaps increase the chilling effects of cold air; but little or no exact information is available on this point. The dividing line at which humidity has no effect upon warmth varies with the air velocity and is about 46 F (dry-bulb) for still air and about 50, 56 and 60 F for air velocities of 100, 300 and 500 fpm, respectively.

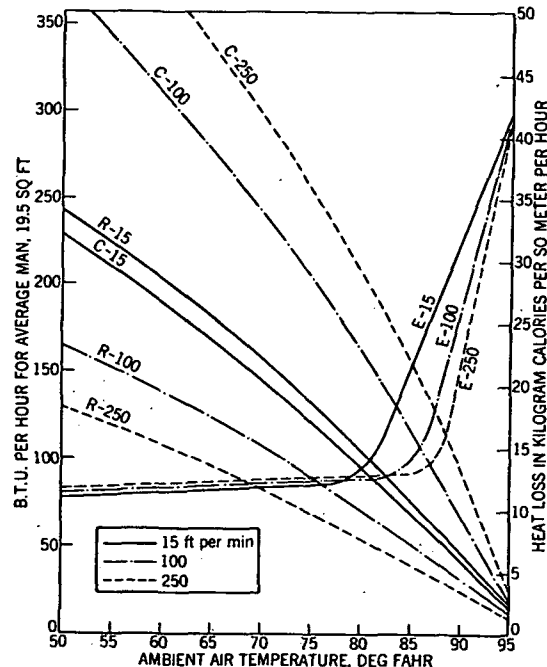


FIG. 10. CHANGES IN DISTRIBUTION OF HEAT LOSS BY RADIATION, CONVECTION, AND EVAPORATION AT VARIOUS AIR TEMPERATURES WITH THREE DIFFERENT AIR MOVEMENTS

As to the effects of dryness of the air, *per se*, and irrespective of thermal effects, there is a common belief that dry air in itself exerts a harmful effect upon the skin and mucous membranes; but there is no convincing evidence that the increase of atmospheric moisture which can practically be introduced by humidification into the air of cool occupied rooms has any effect upon health and comfort. All controlled experiments on this point have yielded negative results; and the respiratory membranes of industrial workers exposed to hot moist air are distinctly more abnormal than those of workers exposed to hot dry air⁵⁰.

⁵⁰Loc. Cit. Note 12.

INFLUENCE OF AIR MOVEMENT

The problem of the influence of air movement is a highly complex one as illustrated in Fig. 10, where heat losses per unit of body surface by radiation, convection and evaporation are plotted against air temperature for three different rates of air movement (with 50 per cent relative humidity). It will be noted that:

1. Evaporative heat loss is constant and minimal at air temperatures below 80 F and is relatively uninfluenced in this area by air movement. With low air movement, sweat secretion begins to rise at 80 F, but with very high air movement only the rise does not begin until 87 F (because, with high air movement, the body cools more readily by convection and hence the sweat secreting mechanism, need not operate at so low an air temperature). Above this critical point, evaporation increases very sharply with increasing air temperature.

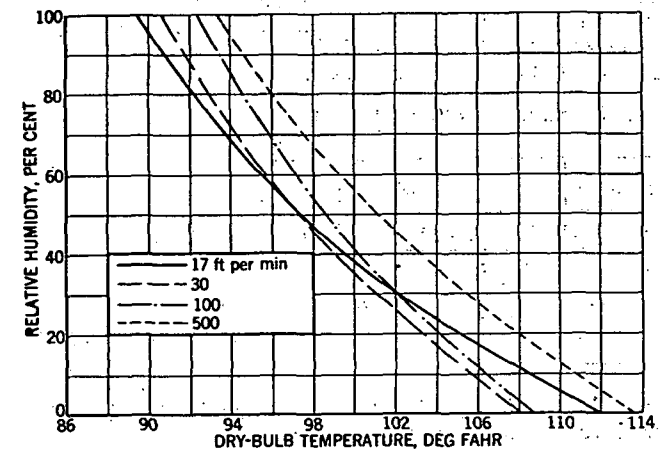


FIG. 11. CONTOUR CHART INDICATING UPPER LIMITS (WETTED AREA = 100 PER CENT) OF THE ZONE OF EVAPORATIVE REGULATION FOR VARIOUS AIR VELOCITIES FOR UNCLOTHED SUBJECTS

2. Heat loss by radiation is *decreased* as air movement increases because the greater influence of convection, when air movement is high, lowers the skin temperature and thus lowers radiation which depends on the differential between walls and body surface.

3. Convection rises at all points sharply with increased air movement, according to a relation discussed in a succeeding paragraph.

It will be noted that the proportionate heat loss by the three processes involved varies widely, as indicated in Table 6.

At air temperatures above the temperatures of the body surfaces, the body will, of course, be gaining heat by convection and losing heat only by evaporation. Increased air movement will favor both these processes and its net effect will depend on the relative humidity of the atmosphere. The phenomena involved are illustrated in Fig. 11 which shows the influence of air movement (at varying air temperatures and humidities) upon the upper limit of the *zone of evaporative regulation*. It will be noted that (for the nude subject in a semi-reclining posture) increase in air