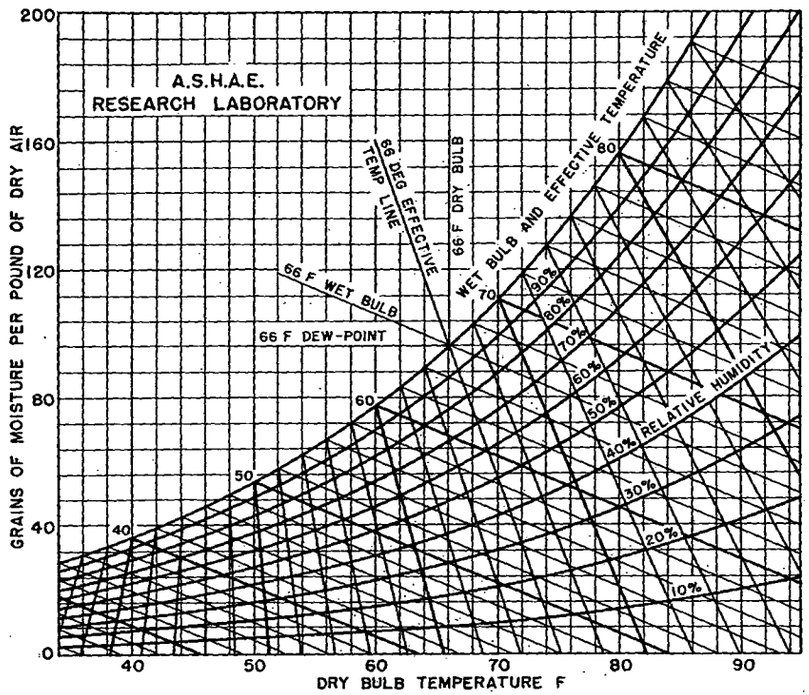


Fig. 8 .... Psychrometric Chart, Persons at Rest, Normally Clothed, in Still Air

Radiation from occupants to room surfaces, and between the occupants, has an important bearing on the feeling of warmth, and may alter to some measurable degree the optimum conditions for comfort previously indicated. Since the mean radiant temperature of a space is affected by cold walls and windows, as well as by the warm surfaces of heating units placed within the room or embedded in the walls, these factors must be compensated. Likewise, in densely occupied spaces, such as classrooms, theaters, and auditoriums, temperatures somewhat lower than those indicated by the comfort line may be desirable because of counter-radiation between the bodies of occupants in close proximity to each other. Such radiation will also elevate the mean radiant temperature of the room.

Many field studies[28] have been made to determine the optimum indoor effective temperature for both winter and summer in several metropolitan districts of the United States and Canada, in cooperation with the managements of offices employing large numbers of workers (Fig. 11). On the whole, women of all age groups studied prefer an effective temperature for comfort 1.0 deg higher than men. All men and women over 40 years of age prefer a temperature 1 deg ET higher than that desired by persons below this age. The persons serving in all of these studies were representative of office workers dressed for air-conditioned spaces in the summer season, and engaged in the customary office activity.

On the basis of present knowledge, for different geographical regions and age groups, the most popular temperature varies from a low of 66 ET in winter to a high of 73 ET in summer. The spread for summer comfort is 69 to 73 ET.

A spread of 3 deg in the optimum effective temperature for summer cooling is ascribed to geographical location. However, variations in sensation of comfort among individuals may be greater for any given location than variations due to a difference in geographical location. The available information indicates that changes in weather conditions over a period of a few days do not alter the optimum indoor temperature.

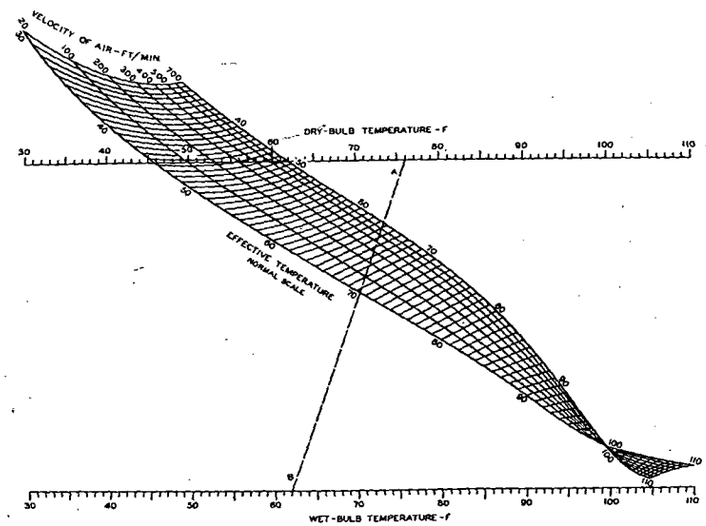
Laboratory studies of Keeton and others,[29] and years of practical field experience show that the adjustments in the heat regulatory mechanisms of healthy people on entering and leaving air-conditioned spaces are prompt, easy, and safe. Sudden sensation of coolness on entering a cooled room from the hot street is associated with sweat on the skin and in the clothing. Several minutes are required for the skin temperature to fall and the free moisture to disappear. Even ambulatory heart patients endure such changes with ease. The use of the word *shock* to describe any part of these adjustments is unwarranted.

Upon leaving an air-cooled space and re-entering a hot atmosphere, sudden warming occurs. Experiments at the ASHAE Research Laboratory[30] and elsewhere[31] indicated no demonstrable harm to a healthy individual. Adaptation occurred as soon as normal perspiration was established. Mild exercise shortened the adaptation time.

Most healthy, sedentary, and slightly active men and women, normally clothed and in uniform environments, with air velocities of the order of 25 fpm, are thermally comfortable the year around when the dry-bulb air temperature is in the range 73 to 77 F and the relative humidity is in the range of 25 to 60 percent.[32]

Satisfactory comfort conditions for persons at work[33] vary, depending upon the rate of work and the amount of clothing worn. In general, the greater the degree of activity, the lower the effective temperature necessary for comfort. Clothing has been evaluated for its overall insulation effects by a physical unit, the *clo* which equals 0.116 C deg per (kilogram calorie) (square meter) (hour).[34] Yaglou[35] criticizes the concept of overall insulation, and points out that different parts of the body require different amounts of insulation. The literature on effects of clothing is difficult to coordinate at the present time, as much of it is still in military service reports which are yet to be published and amplified.

For prematurely born infants, the optimum temperature varies from 100 to 75 F, depending upon the stage of development. The optimum relative humidity for these infants is placed at 65 percent.[36] No data are yet available on the op-



A. Clothing: Customary indoor clothing. B. Activity: Sedentary or light muscular work. C. Heating Methods: Convection type, i.e., warm air, direct steam or hot water radiators, plenum systems.

Fig. 9 .... Effective Temperature Chart Showing Normal Scale of Effective Temperature, Applicable to Inhabitants of the United States Under Following Conditions: