in Fig. 7. Effective temperatures for various combinations of wet- and dry-bulb temperature readings are given in Fig. 8 accompanied by various air movements.

The Comfort Chart shown applies to average normal and healthy persons adapted to American living and working conditions. Application is limited to sedentary or light muscular activity. It will probably not apply to inhabitants of other countries where the living conditions, climate, heating methods, and clothing are materially different than those of the subjects employed in experiments at the Research Laboratory.

In rooms in which the average wall surface temperature is considerably below or above air temperature, a correction must be applied to the

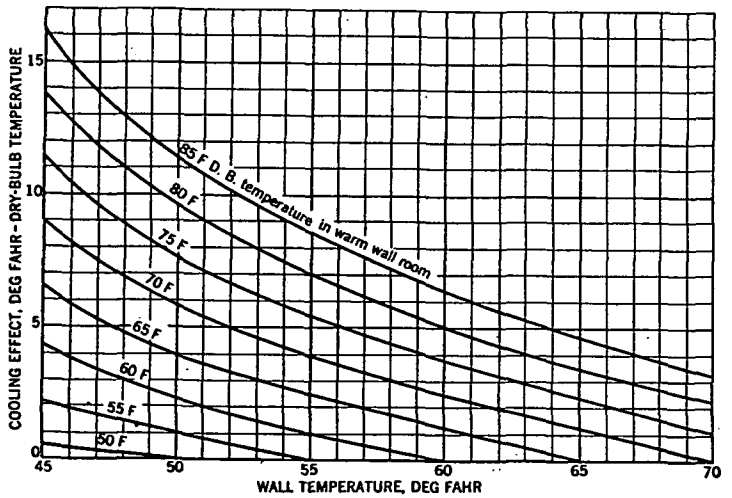


FIG. 9. COOLING EFFECT OF THREE COLD WALLS IN A SMALL EXPERIMENTAL ROOM, AS DETERMINED BY COMPARISON WITH SENSATIONS IN A ROOM OF UNIFORM WALL AND AIR TEMPERATURE

readings of the dry-bulb thermometer to allow for such negative or positive radiation. In Fig. 9 is given the cooling effect of cold walls as determined at the A.S.H.V.E. Research Laboratory[29] by trained subjects passing back and forth from a small experimental room having three cold walls, to a control room with walls and air at the same temperature.

It can be seen in Fig. 9 that in comparison with air and walls at 70 F in the control (warm wall) room, the cooling effect of three cold walls, at 55 F of the experimental room was 4 F. Therefore, for the same feeling of warmth, the temperature in the experimental room should be increased to 74 F. The reverse would hold in rooms with high wall surface temperature; a lower air temperature would be required to compensate for positive radiations to the occupants.

In Fig. 6 is shown the A.S.H.V.E. winter comfort zone which was

[29]Loc. Cit. Note 28.

determined experimentally with large groups of men and women subjects wearing customary indoor winter clothing[30,31]. The extreme comfort zone includes conditions between 60 and 74 deg ET in which one or more of the experimental subjects were comfortable. The average comfort zone includes conditions between 63 and 71 deg ET conducive to comfort in 50 per cent or more of the experimental subjects. The most popular effective temperature was found to be 66 deg, and was adopted by the Society[32] as the *winter comfort* line for individuals at rest wearing customary winter clothing.

The comfort line separates the cool air conditions to its left from the warm air conditions to its right. Under the air conditions existing along or defined by the comfort line, the body is able to maintain thermal equilibrium with its environment with the least conscious sensation to the individual, or with the minimum physiologic demand on the heat regulating mechanism.

The average winter comfort line (66 deg ET) applies to average American men and women living inside the broad geographic belt across the United States in which central heating of the convection type is generally used during four to eight months of the year. It does not apply to rooms heated by radiant energy, rooms with excessive glass area or rooms with poorly insulated or cold walls.

In densely occupied spaces, such as classrooms, theaters and auditoriums, somewhat lower temperatures may be necessary than those indicated by the comfort line on account of counter-radiation between the bodies of occupants in close proximity[33].

The sensation of comfort, insofar as the physical environment is concerned, is not absolute but varies considerably among certain individuals. Therefore, in applying the air conditions indicated by the comfort line, it should not be expected that all the occupants of a room will feel perfectly comfortable. When the winter comfort line is applied in accordance with the foregoing recommendations, the majority of the occupants will be perfectly comfortable, but there will always be a few who would feel *a bit too cool* and a few *a bit too warm*. These individual differences among the minority should be counteracted by suitable clothing.

Air conditions lying outside the average comfort zone but within the extreme comfort zone may be comfortable to certain persons. In other words, it is possible for half of the occupants of a room to be comfortable in air conditions outside the *average* comfort zone, but in the majority of cases, if not in all, these conditions will be well within the extreme comfort zone as determined experimentally.

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 per cent[34]. No data are yet available on the optimum air conditions for full term infants and

[30]Loc. Cit. Note 25.

[31]The Summer Comfort Zone; Climate and Clothing, by C. P. Yaglou and Philip Drinker, (A.S.H.V.E. TRANSACTIONS, Vol. 35, 1929, p. 269).

[32]How to Use the Effective Temperature Index and Comfort Charts (A.S.H.V.E. TRANSACTIONS, Vol. 38, 1932, p. 410).

[33]Loc. Cit. Note 31.

[34]Application of Air-Conditioning to Premature Nurseries in Hospitals, by C. P. Yaglou, Philip Drinker, and K. D. Blackfan (A.S.H.V.E. TRANSACTIONS, Vol. 36, 1930, p. 383).