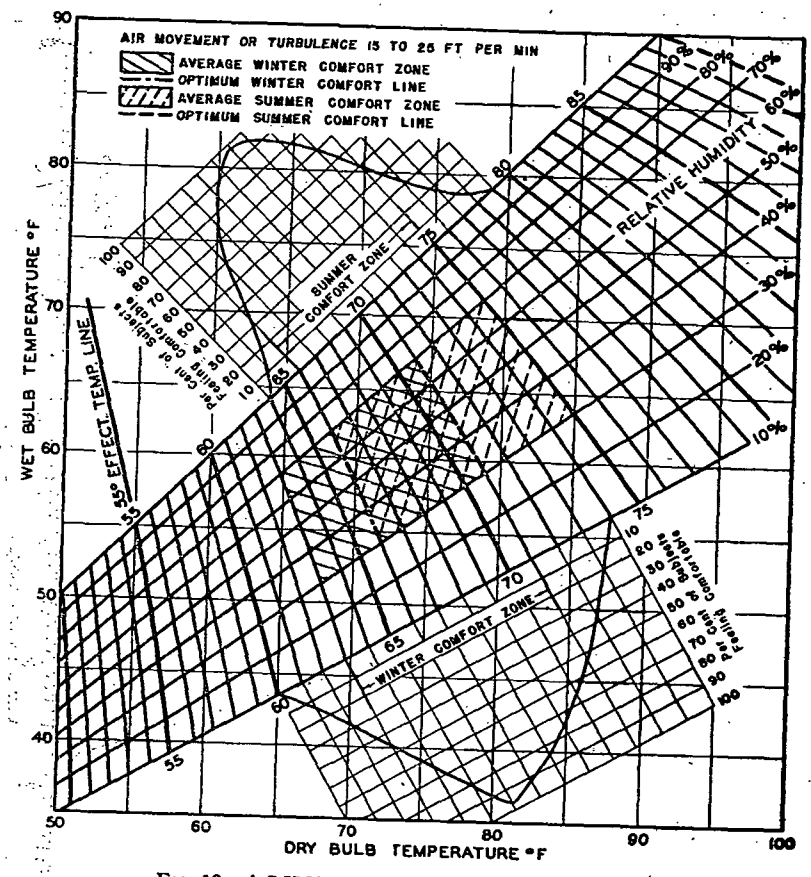

FIG. 10. A.S.H.V.E. COMFORT CHART FOR STILL AIR

Note.—Both summer and winter comfort zones apply to inhabitants of the United States only. Application of winter comfort line is further limited to rooms heated by central station systems of the convection type. The line does not apply to rooms heated by radiant methods. Application of summer comfort line is limited to homes, offices and the like, where the occupants become fully adapted to the artificial air conditions. The line does not apply to theaters, department stores, and the like where the exposure is less than 3 hours. The optimum summer comfort line shown pertains to Pittsburgh and to other cities in the northern portion of the United States and Southern Canada, and at elevations not in excess of 1000 ft above sea level. An increase of one deg ET should be made approximately per 5 deg reduction in north latitude.

Tests [10] made at the A.S.H.V.E. Research Laboratory in very hot conditions with subjects doing light work were in very close agreement with the effective temperature chart. Other work [16] under similar environmental conditions, but with subjects walking 3 mph and carrying 20 lb packs indicated that the effective temperature lines should be more nearly horizontal. It therefore appears that the slope of the ET lines may vary depending upon the rate of work being performed.

Fig. 10, shows the A.S.H.V.E. Comfort Chart [18]. The summer and winter *comfort zones* indicate conditions under which 50 per cent or more of the people are comfortable. The summer comfort zone extends from 66 ET to 75 ET; a maximum of 98 per cent of the subjects were comfortable at 71 ET. The winter comfort zone extends from 63 ET to 71 ET with a maximum of 97 per cent feeling comfortable at 66 ET. The 71 ET and 66 ET lines are referred to, respectively, as the summer and winter comfort lines.

The comfort zones and lines as shown in Fig. 10 are based on research prior to 1932. Later studies [19] by the A.S.H.V.E. Research Laboratory indicate a desirable winter effective temperature of 67 deg, and this finding is confirmed by current practice. The shape of the curve showing the per cent of subjects comfortable in winter also justifies this conclusion, since a drop of only one degree from the 66 ET line seriously reduced the percentage of subjects comfortable. Systems should be designed to assure comfort for the maximum possible number [20].

The comfort zones in Fig. 10 are located between the 30 per cent and 70 per cent relative humidity lines. There is some evidence that the zones could be extended somewhat beyond these limitations.

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 imbedded 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 [19] 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 deg ET in winter to a high of 73 deg ET in summer. The spread for summer comfort is 69 to 73 deg ET.

The A.S.H.V.E. Technical Advisory Committee on Sensations of Comfort, ascribes a spread of 3 deg in the optimum effective temperature for summer cooling to geographical location. However, it should be recognized that variations in sensation of comfort among individuals may be greater for any given location, as shown in Fig. 11, 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. In general, people experiencing low or high temperatures over an extended period of time become acclimated to lower or higher indoor temperatures respectively.

Sudden chilling (shock) of persons entering a cooled and air conditioned space during the summer months, may at times be important. It is due to the rapid evaporation of perspiration which accumulated on the skin