

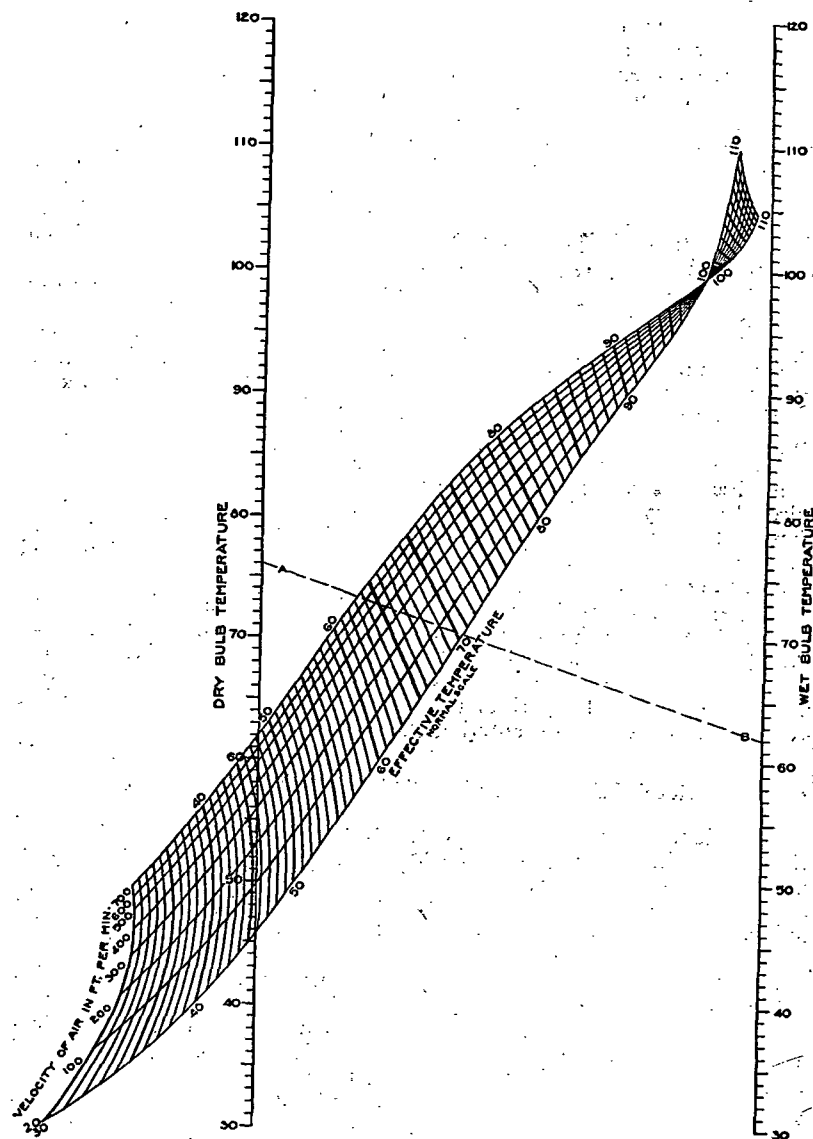


FIG. 1. EFFECTIVE TEMPERATURE CHART SHOWING NORMAL SCALE OF EFFECTIVE TEMPERATURE. APPLICABLE TO INHABITANTS OF THE UNITED STATES UNDER FOLLOWING CONDITIONS:

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.

ditions. A series of tests^{19, 20, 21, 22} at the A.S.H.V.E. Research Laboratory, Pittsburgh, established the equivalent conditions met with in general air conditioning work. This scale of thermo-equivalent conditions not only indicates the sensation of warmth, but also determines the physiological *effects* on the body induced by heat or cold. For this reason, it is called the *effective temperature* scale or index.

Effective temperature is an empirically determined index of the degree of warmth perceived on exposure to different combinations of temperature, humidity, and air movement. It was determined by trained subjects who compared the relative warmth of various air conditions in two adjoining conditioned rooms by passing back and forth from one room to the other.

Effective temperature is not in itself an index of comfort, except under ordinary humidity conditions (30 to 60 per cent) when the individual is least conscious of humidity. Moist air at a comparatively low temperature, and dry air at a higher temperature may each feel as warm as air of an intermediate temperature and humidity, but the *comfort* experienced in the three air conditions would be different, although the effective temperature is the same.

Air of proper warmth may, for instance, contain excessive water vapor, and in this way interfere with the normal physiologic loss of moisture from the skin, leading to damp skin and clothing and producing more or less discomfort; or the air may be excessively dry, producing appreciable discomfort to the mucous membrane of the nose and to the skin which dries up and becomes chapped from too rapid loss of moisture.

The numerical value of the effective temperature index for any given air condition is fixed by the temperature of calm (15 to 25 fpm air movement) and saturated air which induces a sensation of warmth or cold like that of the given condition. Thus, any air condition has an effective temperature of 60 deg, for instance, when it induces a sensation of warmth like that experienced in calm air at 60 deg saturated with moisture. The effective temperature index cannot be measured directly but it is computed from the dry- and wet-bulb temperature and the velocity of air using charts (see Figs. 1 or 2, 3 and 4) or tables. The accuracy in estimating effective temperature is ± 0.5 F, because the human organism cannot perceive smaller temperature differences. Therefore, there is no justification in trying to read chart values closer than 0.5 F, as this implies fictitious accuracy.

The charts shown in Figs. 1, 2, 3 and 4 apply to average normal and healthy persons adapted to American living and working conditions. Application is limited to sedentary or light muscular activity, and to rooms heated by the usual American convection methods (warm air, central fan and direct hot water and steam heating systems) in which the difference between the air and wall surface temperatures may not be too

¹⁹Determining Lines of Equal Comfort, by F. C. Houghten and C. P. Yaglou (A.S.H.V.E. TRANSACTIONS, Vol. 29, 1923, p. 361).

²⁰Cooling Effect on Human Beings by Various Air Velocities, by F. C. Houghten and C. P. Yaglou (A.S.H.V.E. TRANSACTIONS, Vol. 30, 1924, p. 193).

²Effective Temperature with Clothing, by C. P. Yaglou and W. E. Miller (A.S.H.V.E. TRANSACTIONS, Vol. 31, 1925, p. 89).

²Effective Temperature for Persons Lightly Clothed and Working in Still Air, by F. C. Houghten, W. W. Teague and W. E. Miller (A.S.H.V.E. TRANSACTIONS, Vol. 32, 1926, p. 315).