THE COMFORT LINE AND THE COMFORT ZONE

That range of effective temperatures over which 50 per cent of people feel comfortable, namely 62 to 69 deg. fahr. is called the Comfort Zone.

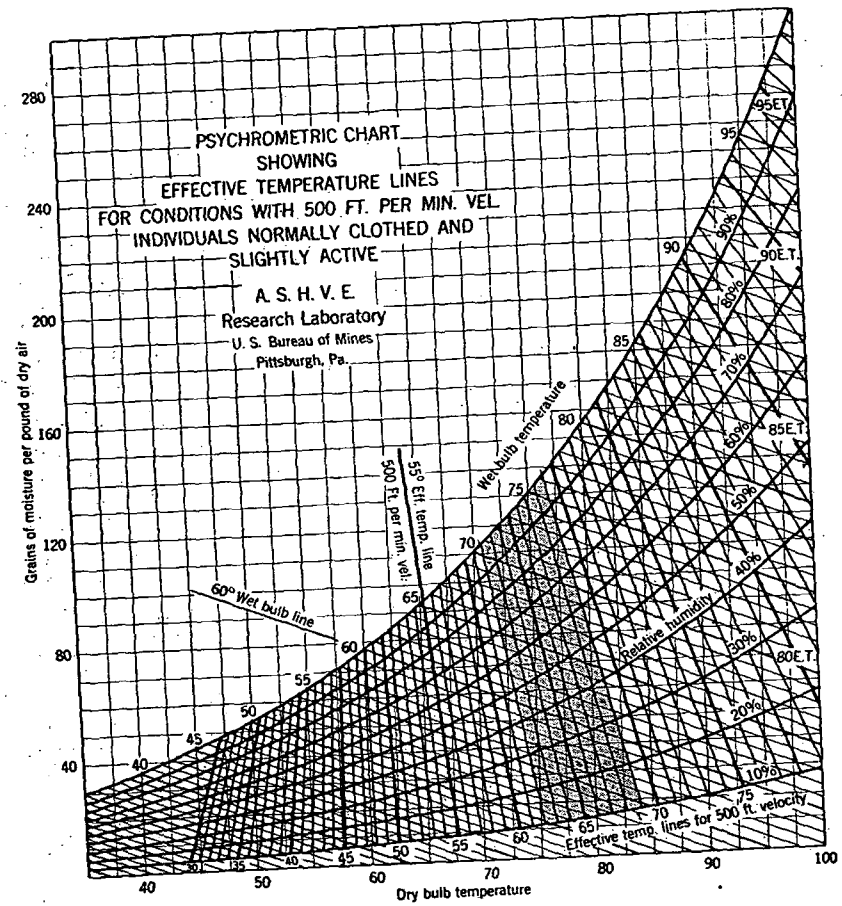

FIG. 4. PSYCHROMETRIC CHART WITH EFFECTIVE TEMPERATURE LINES FOR 500 FT. AIR VELOCITY. SHADED AREA INDICATES THE COMFORT ZONE

That particular effective temperature at which a maximum number of people feel comfortable is called the comfort line. While at rest, 97 per cent of people have been found to be comfortable at 64 deg. fahr. effective

temperature. Persons working at various rates are most comfortable at effective temperatures below 64 deg. The exact effective temperature giving maximum comfort for persons working at various rates have not yet been determined by the Research Laboratory but from the best data available, they are as follows: At rest, 64 deg.; Light work, 62 deg.; Hard work, 60 deg.

The data given in the charts, Figs. 1 to 5 are for persons normally clothed and differ somewhat from the data contained in earlier editions of THE GUIDE which data were for persons stripped to the waist.

HEAT DISSIPATED TO THE ATMOSPHERE FROM THE HUMAN BODY

The heat dissipated from the human body is a factor which must be taken into consideration in conditioning air in audience halls. Research at the Laboratory of the AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS[2] shows that the total heat dissipated from the body of an individual does not vary greatly over the temperature range usually met with in air conditioning and is a function of Effective Temperature. The relative proportion of this total heat loss dissipated as latent heat (heat of evaporation of perspiration) and sensible heat (heat loss by radiation and convection) does, however, vary greatly over this temperature range and is for all practical purposes a function of dry bulb temperature. The curve, Fig. 6, gives the total heat loss in B.t.u. per hour for an average person for different effective temperatures. The percentages of the total heat loss dissipated as latent and sensible heat are plotted against dry bulb temperature in Fig. 7.

An atmospheric condition resulting in sensible perspiration is to be avoided for good air conditions. Table 2 gives the approximate effective temperature at which perspiration is noticeable in different degrees by most individuals for 95 per cent and 20 per cent relative humidity.

(*A*) How much sensible heat, how much latent heat, and how many pounds of water vapor will be added to the atmosphere of an auditorium per hour by an audience of 1000 adults, when the dry and wet bulb temperatures are 75 and 63.5 deg. fahr. respectively.

(*B*) If the dry and wet bulb temperatures of the auditorium were 85 deg. and 63 deg. respectively, how much heat and moisture would be dissipated to the atmosphere?

(*C*) From Fig. 1 find the effective temperature of the atmospheric condition to be 70.3 deg. and from the curve, Fig. 6 find the total heat loss for this effective temperature to be 403 B.t.u. per hour for an average person. This curve Fig. 7 shows the sensible and latent heat loss at 75 deg. dry bulb to be 69.0 per cent and 31.0 per cent respectively. The sensible heat added per hour by the audience is $0.69 \times 403 \times 1000 = 278{,}070$ B.t.u. The latent heat added per hour is $0.31 \times 403 \times 1000 = 124{,}930$ B.t.u. The weight of water vapor added to the atmosphere per hour is given by the latent heat loss divided by the latent heat of evaporation at body temperature or $\frac{124{,}930}{1036} = 120.6$ lb.

(*D*) The wet and dry bulb temperatures of 85 and 63 deg. respectively will give an effective temperature of 74.9 deg., and a total heat loss of 401 B.t.u. per hour per person. The sensible heat added to the atmosphere will be $0.45 \times 401 \times 1000 = 180{,}450$ B.t.u. per hour and the latent heat added will be $0.55 \times 401 \times 1000 = 220{,}550$ B.t.u. per hour. The water vapor added to the atmosphere of the auditorium will be $\frac{220{,}550}{1036} = 212.9$ lb. per hour.

[2]Will be published in future issues of the JOURNAL of the AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS.