Although heat and moisture from the human body constitute the major portion of the cooling load, in most cases where air conditioning is provided for comfort and health other factors must also be considered. These include heat from lights, machinery, and processes, as well as the transmission and infiltration of heat through the building structure. The computations for these factors may be made in accordance with data given in Chapters 5 and 7.

TABLE 4. CONDITION OF SENSIBLE PERSPIRATION FOR PERSONS SEATED AT REST UNDER VARIOUS ATMOSPHERIC CONDITIONS[4]

Degree of Perspiration[a]	Atmospheric Condition					
	95 Per Cent Relative Humidity			20 Per Cent Relative Humidity		
	E. T.	D. B.	W. B.	E. T.	D. B.	W. B.
Forehead clammy	73.0	73.6	72.4	75.0	87.0	60.7
Body clammy	73.0	73.6	72.4	75.0	87.0	60.7
Body damp	79.0	79.7	78.4	81.0	97.5	67.5
Beads on forehead	80.0	80.8	79.4	87.0	109.4	75.2
Body wet	84.5	85.4	84.0	86.5	108.5	74.6
Perspiration on forehead runs and drips	88.0	89.0	87.6	94.0	125.2	85.4
Perspiration runs down body	88.5	89.5	88.1	90.0	116.0	79.5

[a]Forty per cent of subjects registered degree of perspiration equal to or greater than indicated.

TABLE 5. CONDITION OF SENSIBLE PERSPIRATION FOR PERSONS AT WORK UNDER VARIOUS ATMOSPHERIC CONDITIONS[30]

Degree of Perspiration[a]	Atmospheric Condition					
	95 Per Cent Relative Humidity			20 Per Cent Relative Humidity		
	E. T.	D. B.	W. B.	E. T.	D. B.	W. B.
Forehead clammy	59.0	59.4	58.3	69.5	80.5	56.5
Body clammy	50.0	50.2	49.3	57.0	61.6	44.2
Body damp	60.0	60.3	59.3	62.5	69.6	49.5
Beads on forehead	68.0	68.5	67.5	76.0	91.0	63.4
Body wet	69.0	69.6	68.5	71.0	82.8	53.0
Perspiration on forehead runs and drips	78.5	79.3	78.0	82.0	100.5	70.2
Perspiration runs down body	79.0	79.8	78.5	81.0	99.8	69.0

[a]Forty per cent of subjects registered degree of perspiration equal to or greater than indicated.

In many cases, allowance must also be made for sun effect and for heat capacity of the building structure in accordance with studies by the A.S.H.V.E. Research Laboratory[37]. Another item to be considered is the radiant heat received by the body from high temperature wall and ceiling surfaces.

[37]Heat Transmission as Influenced by Heat Capacity and Solar Radiation, by F. C. Houghten, J. L. Blackshaw, E. M. Pugh, and Paul McDermott (A.S.H.V.E. TRANSACTIONS, Vol. 38, 1932).

PROBLEMS IN PRACTICE

1 ● What is the purpose and method of conditioning the air of occupied rooms?

Chiefly comfort, and the method is to control the temperature, humidity, and air distribution, and to prevent the accumulation of excessive body odors in the air. Other factors have yet to be studied.

2 ● What are the most comfortable air conditions?

Comfort standards are not absolute, but they are greatly affected by the physical condition of the individual, and the climate, season, age, sex, clothing, and physical activity. For the northeastern climate of the United States, the conditions which meet the requirements of the majority of people consist of temperatures between 68 and 72 F in winter and between 70 and 85 F in summer, the latter depending largely upon the prevailing outdoor temperature. The most desirable relative humidity range seems to be between 30 and 60 per cent.

3 ● Are the optimum conditions for comfort identical with those for health?

There are no absolute criteria of the prolonged effects of various air conditions on health. For the present it can be only inferred that bodily discomfort may be an indication of conditions that may produce poor health.

4 ● Given dry-bulb and wet-bulb temperatures of 76 F and 62 F, respectively, and an air velocity of 100 fpm, determine: (1) effective temperature of the condition; (2) effective temperature with still air; (3) cooling produced by the movement of the air; (4) velocity necessary to reduce the condition to 66 deg effective temperature.

(1) In Fig. 1 draw line *AB* through given dry- and wet-bulb temperatures. Its intersection with the 100-ft velocity curve gives 69 deg for the effective temperature of the condition. (2) Follow line *AB* to the right to its intersection with the 20-fpm velocity line, and read 70.4 deg for the effective temperature for this velocity or so-called still air. (3) The cooling produced by the movement of the air is 70.4 − 69 = 1.4 deg effective temperature. (4) Follow line *AB* to the left until it crosses the 66 deg effective temperature line and interpolate velocity value of 340 fpm to which the movement of the air must be increased.

5 ● Given dry-bulb and wet-bulb temperatures of 75 and 68 F, respectively, first, what is the effective temperature? Second, is this condition warmer or cooler than 80 F dry-bulb and 60 F wet-bulb?

The first condition is given by the intersection of the 75 F dry-bulb line and the 68 F wet-bulb line (Fig. 3). The effective temperature of 72.1 deg is given by the numerical value of the effective temperature line passing through this point and indicated by the scale along the saturation curve. The second condition is given by the intersection of 80 F dry-bulb and 60 F wet-bulb and is 71.8 deg ET. It is therefore 0.3 deg ET cooler than the first condition.

6 ● Given 76 F dry-bulb and 61 F wet-bulb, how many degrees difference are there between this condition and the winter comfort line or 66 deg ET?

The effective temperature for this condition is given by the intersection of the 76-F dry-bulb and 61-F wet-bulb lines and is 70 deg ET, which is 4 deg ET warmer than the comfort line.

7 ● Assume that the design of an air conditioning system for a theater is to be based on an outdoor dry-bulb temperature of 95 F and a wet-bulb temperature of 78 F with an indoor relative humidity of 50 per cent. According to Table 2, the dry-bulb temperature in the auditorium should be 80 F. Estimate the sensible and latent heat given up per person.

The sensible heat given up per person per hour under this condition may be obtained from Fig. 7. With an abscissa value of 80 F, Curve *D* for men seated at rest gives a value on the ordinate scale of 220 Btu per person per hour as the sensible heat loss. The latent heat given up by a person seated at rest per hour may be obtained from Fig. 8. With an