

TABLE 92. TYPICAL RESULTS OF ANALYSIS BY HILL SYNTHETIC AIR CHART

FACTOR	PERCENTAGE OF PERFECTION FOR FACTOR	PERCENTAGE OF PENALIZATION FOR FACTOR	PERCENTAGE OF PENALIZATION FOR IMPERFECT VENTILATION	PERCENTAGE OF PERFECTION FOR VENTILATION
Effective Temperature.....	9.6	8.4	7.6	-----
Dust.....	96.0	4.0	1.0	-----
Bacteria.....	98.0	2.0	1.0	-----
Odor.....	90.0	10.0	1.5	-----
Carbon Dioxide.....	99.5	0.5	0.4	-----
Distribution.....	92.6	7.4	2.2	-----
Total.....			13.7	86.3

The above observations are made as follows: The wet and dry bulb temperatures are determined with a sling psychrometer, the air velocity is determined by observing the speed of a smoke cloud with the aid of a stop watch. The smoke cloud may be caused by means of an ammonium cloud apparatus, Fig. 72 or by exploding a smoke bomb, or by other means.

The dust count is made by means of the Hill dust counter. In this instrument a given volume of air is made to impinge against a glass microscope cover slip coated with an adhesive. The particles are counted under a microscope of definite magnification and the number corrected per cu. ft. of air.

Carbon dioxide samples are taken in 120 cc. rubber stoppered bottles by exhausting air from the bottles with an atomizing bulb, Fig. 73. The bottle should be held at arms length while sampling so as not to be contaminated with the observer's breath and then tightly stopped until the sample can be analysed on a Petterman-Palmquist apparatus for carbon dioxide.

CHAPTER XVI

HOW TEMPERATURE, HUMIDITY
AND AIR MOTION AFFECT HUMAN COMFORT

By F. C. HOUGHTEN, Member

THE sense of warmth experienced by the human body is not due alone to the temperature indicated by the dry bulb thermometer, neither does it depend solely upon the wet bulb temperature. Dry air at a relatively high temperature may feel cooler than air of considerably lower temperature with high moisture content.

Human comfort or discomfort depend largely on body temperature and therefore on the relation between the rate of heat production and dissipation. By the process of metabolism heat is constantly generated within the body, while on the other hand, loss of heat is constantly occurring from the surface of the body by radiation, convection and evaporation. To maintain a constant body temperature the loss of heat must equal the heat produced. It is therefore apparent that any interference with the elimination of heat from the body is accompanied by a rise in temperature and a feeling of discomfort.

There are three principal factors affecting loss of body heat:

1. Temperature.
2. Humidity.
3. Air motion.

As the temperature of the air and surrounding objects rises, the loss of heat by convection and radiation decreases. When the temperature reaches that of the body, the loss by radiation and convection ceases. Finally as the air temperature exceeds that of the body, heat passes from the air to the body.

If on the other hand, the relative humidity is increased the heat loss by evaporation decreases. If while the dry bulb temperature increases, the wet bulb temperature decreases sufficiently, the increase in loss of heat by evaporation may be made equal to the decrease in loss of heat by radiation and convection, resulting in no change in body temperature or comfort.

From the above, it is concluded that there must necessarily exist certain combinations of temperatures and humidities, which produce the same total body heat loss by radiation, convection and evaporation and therefore the same feeling of comfort or discomfort. Lines passing through such air conditions plotted as a psychrometric chart may be called equal comfort lines. The fact is further substantiated by the general experience of heating engineers in observing that the lower the humidity the higher the dry bulb temperature required for the same degree of comfort.

A series of tests have been made in the two psychrometric rooms of the Research Laboratory of the AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS, in order to locate these lines on the psychrometric chart, both for still and moving air.