

are described in Chapter XVII. These qualities along with dustiness, odor, bacteriological content and carbon dioxide content, have been considered and combined in the preparation of a Synthetic Air Chart as a means of measuring the percentage of perfection or the ideal quality of air. This chart is explained in Chapter XVII.

Control is the principal factor in deciding whether the ventilation in any space will be satisfactory or unsatisfactory; control of quantity, quality, temperature, dirt, humidity, odors and movement. Experience and experiments have shown all of these factors are important in ventilation work, and control of them is essential if a high rating of ventilation perfection is desired.

It is a familiar fact that a room may be comfortable at one temperature and yet decidedly uncomfortable at another time even though the same dry bulb temperature is recorded. This fact may be due either to change a relative humidity or air motion. On the other hand a room may feel equally comfortable with different dry bulb temperatures provided the relative humidity or air motion is varied to produce this effect.

Elaborate tests have been made to determine the effective temperature range most comfortable to the majority of people and this has been called the Comfort Zone. Reports of the cooperative tests on this work with the U. S. Bureau of Mines and the U. S. Public Health Service, appear in the A. S. H. & V. E. TRANSACTIONS, 1922 to 1927, and in many government bulletins.

The prolonged effect of temperature humidity and air motion upon health is not so well understood as the effect upon comfort. Strictly speaking good ventilation is merely a relative term and today ventilation is considered necessary for personal comfort and good health. The standards today are more exact than ever before and consequently adequate ventilation is considered a necessity.

After a good ventilating system is designed the engineer is only fairly well started on the road to good ventilation. A system is not a ventilating system until it ventilates. Here is where the operating man and proper supervision of operation come in.

It is recommended that the engineer who designs a ventilating plant shall supervise its installation, and that his interest and responsibility shall be maintained during the operation of the plant.

CHAPTER XVII

THE HILL SYNTHETIC AIR CHART

PERFECTION in ventilation depends upon the condition of the air in a room as it affects health and comfort rather than upon the quantity of outside air supplied. The known conditions of air which may affect human health and comfort are its temperature, humidity, motion, dustiness, odors, bacteriological contents, and carbon dioxide contents.

The synthetic air chart, devised by Dr. E. Vernon Hill, and revised as a result of the investigations by the Society's Research Laboratory is the accepted standard for grading the perfection of ventilation in any room by the conditions of the air itself.

The chart is devised for recording test data of air conditions and obtaining, mathematically, a "percentage of perfect" for the test as a whole. It substitutes definite figures for personal opinion and guess work. The value of the chart encourages accurate testing of the specific factors that determine air conditions. Furthermore, the test data in the various columns reveal at a glance wherein conditions are followed and indicate what steps should be taken to correct the same.

The Synthetic Air Chart consists primarily of an arrangement of ventilating factors in seven vertical columns, arranged in five groups. The first group contains one factor; namely, the effective temperature condition, and is often referred to as the physical group. It includes the temperature, humidity and air motion.

The second group contains three factors—dust, bacteria and odors. This group may be considered the chemical group.

The third group is carbon dioxide; the fourth, distribution; and the fifth, the "percentage of perfect" for the test as a whole. The chart contains all the known factors that influence or determine air conditions in an occupied room.

It is unnecessary to describe the theory of the chart and its development, the relative and absolute weights of the various factors, etc., in this article, as a complete description of the same may be found in the TRANSACTIONS of the Society in volumes 23 and 26, namely, for the years 1917 and 1920. It may be well, however, to mention in this connection that the chart, as illustrated (see Fig. 1), has been somewhat modified from the one illustrated and described in the previous GUIDE and in the TRANSACTIONS. None of the values have been changed, but the plus percentage which appears to the left of each column has been omitted. The plus percentage columns in the previous chart were for the purpose of determining the relative values on a percentage basis of each individual factor, but as these percentages were not used in arriving at a final