IDENTIFICATION OF PIPING SYSTEMS BY COLOR

The color scheme for identification of piping systems listed in the following table and shown in Fig. 1 is reprinted from Part V, Fourth Edition, of the Engineering Standards of the *Heating, Piping and Air Conditioning Contractors National Association*[7].

All piping systems are classified according to the material carried in the pipes and colors are assigned as follows:

CLASS	COLOR
F—Fire-protection	Red
D—Dangerous materials	Yellow or Orange
S—Safe Materials	Green (or the achromatic colors, white, black, gray or aluminum)

and, when required

P—Protective materials	Bright blue
V—Extra valuable materials	Deep purple

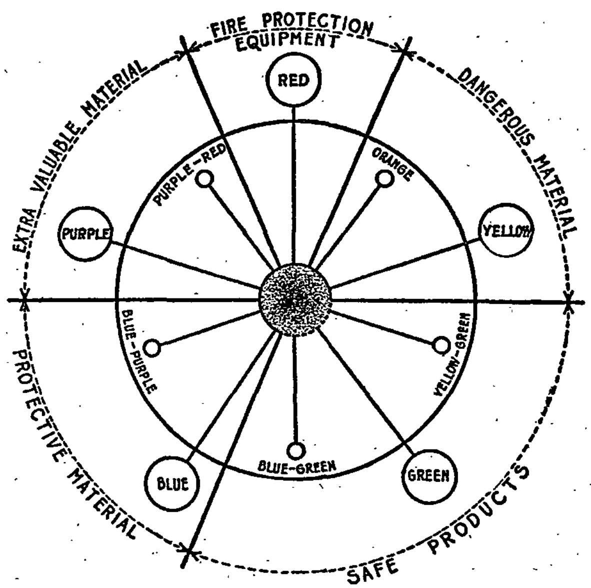

FIG. 1. MAIN CLASSIFICATION BY COLOR[a]

[a] From Scheme for Identification of Piping Systems, *Heating, Piping and Air Conditioning Contractors National Association*, Part V, Fourth Edition, p. 17. Used by permission.

[7] See Scheme for Identification of Piping Systems, A13-1928, *American Standards Association*.

CHAPTER 3

THERMODYNAMICS

Thermodynamic Properties of Moist Air and of Water; Degree of Saturation; Goff Diagram for Moist Air; Derived Properties; Typical Air Conditioning Processes, Heating, Cooling, Adiabatic Mixing; Wet-Bulb Temperatures Below 32F; Dalton's Rule; Steady Flow Energy Equation, U. S. Standard Atmosphere

THE working substance of the air conditioning engineer is called *moist air*. In order to be able to apply the laws of conservation of energy and mass to the analysis of typical air conditioning processes, it is necessary to know the thermodynamic properties of moist air, particularly its enthalpy and volume. When the limitations imposed by the Second Law of Thermodynamics have to be considered, it is also necessary to know its entropy.

For the purpose of analysis, moist air may be regarded as a mixture of only two constituents, namely, *dry air* and *water vapor*. It has long been customary to predict the thermodynamic properties of the mixture from a knowledge of those of dry air and water vapor separately by means of Dalton's Rule. According to this rule: each constituent of a gas mixture occupies the whole volume of the mixture just as if no other constituent were present; it therefore exerts a *partial pressure* equal to the pressure it would exert if alone in the whole volume at the temperature of the mixture; the observed pressure of the mixture is the sum of these so-called partial pressures; the enthalpy of the mixture is the sum of separate contributions from the individual constituents as determined by their partial pressures, their weights, and the temperature of the mixture; and the entropy of the mixture is obtained in a similar manner.

Dalton's Rule has long been regarded erroneously as a fundamental law of nature. Actually it is not, and in many cases its predictions are quite unreliable. In the case of moist air at atmospheric pressure, it happens to give a close approximation to the truth; but as progress is made the need for greater accuracy than the rule can afford is felt even in this case. Fortunately, most of the complications involved in following a correct procedure, based on the predictions of statistical mechanics, are met in preparing suitable tables of thermodynamic properties; and, once these tables have been prepared, their use in the analysis of typical air conditioning processes is actually simplified by abandonment of the rule together with its fictitious concepts of partial pressure, relative humidity, etc.

Thermodynamic Properties of Moist Air

Table 1, Thermodynamic Properties of Moist Air (Standard Atmospheric Pressure, 29.921 In. Hg), contains results of a cooperative investigation between the AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS and the Towne Scientific School, University of Pennsylvania. These results are being studied by an International Joint Committee on Psychrometric Data as a possible starting point from which to reach agreement on standard properties of moist air. A detailed explanation of the data and methods used in constructing Table 1 is given in a paper[1] presented before the ASHVE.