

Mass: A measure of the inertia of a body. It also measures the quantity of matter in a body. Since the only general property of a given portion of matter that cannot be changed is its inertia, it is this property by which quantities of matter are defined. Two bodies which have equal inertias are said to have equal masses, or to contain equal quantities of matter. (This definition fails at velocities approaching the velocity of light.) The mass of a body is numerically equal to the ratio of the force required to give the body a given acceleration, to the acceleration, $m = F/a$. The common units of mass are the gram and the pound.

Mechanical Equivalent of Heat: The quantity of mechanical energy equal to one unit of heat. $J = 778.177 \text{ ft-lb per Btu} = 4.1855 \times 10^7 \text{ ergs per g-cal}$.

Medium, Heating: A substance such as water, steam, air, or furnace gas used to convey heat from the boiler, furnace, or other source of heat or energy to the heating unit from which the heat is dissipated.

Micron: A unit of length, the thousandth part of 1 mm or the millionth of a meter.

Millimeter of Mercury: A unit of pressure equal to the pressure exerted by a column of mercury 1 mm high at a temperature of 0°C. One millimeter of mercury at 0°C = 1.334×10^{-3} psi.

Mol: A weight of a substance numerically equal to its molecular weight. If the weight is in pounds the unit is a *Pound Mol*, in grams the unit is a *Gram Mol*. For perfect gases the volume of 1 mol is constant for all gases at the same temperature and pressure. For real gases this is approximately true at moderate pressures. At 32°F and zero-pressure the value of the product, pressure times specific volume, is 359.045 ± 0.006 atmosphere cubic feet (atm ft³), for 1 mol of any gas. For dry air at 32°F and standard atmospheric pressure, the specific volume is 358.83 cu ft per mol (ft³ per mol).

One-Pipe Supply Riser (Steam): A pipe which carries steam vertically to a heating unit, and which also carries the condensate from the heating unit. In an up-feed system, steam and condensate flow in opposite directions; in an overhead or down-feed system, they flow in the same direction.

One-Pipe System (Steam): A steam heating system in which a single main serves the dual purpose of supplying steam to the heating unit and conveying condensate from it. Ordinarily to each heating unit there is but one connection which must serve as both the supply and the return, although separate supply and return connections may be used. (*Hot Water*)—A hot water system in which the cooled water from the heating unit is returned to the supply main. Consequently, the heating units farthest from the boiler are supplied with cooler water than those near the boiler in the same circuit.

Overhead System: Any steam or hot water system in which the supply main is above the heating unit. In a steam system the return must be below the heating units; in a water system the return may be above or below the heating units.

Panel Heating: A heating system in which heat is transmitted by both radiation and convection from panel surfaces to both air and surrounding surfaces.

Panel Radiator: A heating unit placed on or flush with a flat wall surface, and intended to function essentially as a radiator.

Perimeter System: See *Warm Air Heating System*.

Permeability: Water vapor permeability is a property of a substance which permits passage of water vapor, and is equal to the permeance of a 1 in. thickness of the substance. When permeability varies with psychrometric conditions, the *Spot or Specific Permeability* defines the property at a specific condition. Permeability is measured in perm-inches.

Permeance: The water vapor permeance of a sheet of any thickness (or assembly between parallel surfaces) is the ratio of water vapor flow to the vapor pressure difference between the surfaces. Permeance is measured in perms.

Perm: The unit of permeance. A perm is equal to 1 grain per (sq ft) (hr) (inch of mercury vapor pressure difference).

Plenum Chamber: An air compartment maintained under pressure, and connected to one or more distributing ducts.

Potentiometer: An instrument for comparing small electromotive forces, or for measuring small electromotive forces by comparison with a known electromotive force. Its principal

advantage is that during the measurement, no current flows through the source of electromotive force.

Power: The rate of performing work. Common units are horsepower, Btu per hour, and watts.

Pressure, Force per unit area: Common units are pounds per square inch, gram per square centimeter, inch of water, millimeter of mercury.

Pressure, Absolute: The sum of the gage pressure and the barometric pressure.

Pressure, Dynamic: Same as *Total Pressure*.

Pressure, Gage: Pressure measured from atmospheric pressure as a base. Gage pressure may be indicated by a manometer which has one leg connected to the pressure source and the other exposed to atmospheric pressure.

Pressure, Saturation: The saturation pressure for a pure substance for any given temperature is that pressure at which vapor and liquid, or vapor and solid, can coexist in stable equilibrium.

Pressure, Static: The normal force per unit area that would be exerted by a moving fluid on a small body immersed in it if the body were carried along with the fluid. Practically, it is the normal force per unit area at a small hole in a wall of the duct through which the fluid flows (Pitotometer) or on the surface of a stationary tube at a point where the disturbances, created by inserting the tube, cancel. It is supposed that the thermodynamic properties of a moving fluid depend on static pressure in exactly the same manner as those of the same fluid at rest depend upon its uniform hydrostatic pressure.

Pressure, Total: In the theory of the flow of fluids; the sum of the static pressure and the velocity pressure at the point of measurement.

Pressure, Vapor: The pressure exerted by a vapor. If a vapor is kept in confinement over its liquid so that the vapor can accumulate above the liquid, the temperature being held constant, the vapor pressure approaches a fixed limit called the maximum, or saturated, vapor pressure, dependent only on the temperature and the liquid. The term *vapor pressure* is sometimes used as synonymous with *saturated vapor pressure*.

Pressure, Velocity: In a moving fluid, the pressure capable of causing an equivalent velocity, if applied to move the same fluid through an orifice such that all pressure energy expended is converted into kinetic energy.

Psychrometer: An instrument for ascertaining the humidity or hygrometric state of the atmosphere.

Psychrometric: Pertaining to psychrometry or the state of the atmosphere with reference to moisture.

Psychrometric Chart: A graphical representation of the thermodynamic properties of moist air.

Psychrometry: The branch of physics relating to the measurement or determination of atmospheric conditions, particularly regarding the moisture mixed with the air.

Pyrometer: An instrument for measuring high temperatures.

Radiant Heating: A heating system in which only the heat radiated from panels is effective in providing the heating requirements. The term *Radiant Heating* is frequently used to include both *Panel and Radiant Heating*.

Radiation: The transmission of energy by means of electromagnetic waves.

Radiation, Thermal (Heat) Radiation: The transmission of energy by means of electromagnetic waves of very long wavelength. Radiant energy of any wavelength may, when absorbed, become thermal energy and result in an increase in the temperature of the absorbing body.

Radiation, Equivalent Direct (EDR): A unit of heat delivery of 240 Btu per hr. It does not imply 144 sq ft. of surface.

Radiator: A heating unit exposed to view within the room or space to be heated. A radiator transfers heat by radiation to objects within visible range, and by conduction to the surrounding air which in turn is circulated by natural convection; a so-called radiator is also a convactor, but the term radiator has been established by long usage.

Radiator, Concealed: A heating device located within, adjacent to, or exterior to the room being heated, but so covered or enclosed or concealed that the heat transfer surface of the device, which may be either a radiator or a convactor, is not

visible from the room. Such a device transfers its heat to the room largely by convection air currents.

Radiator, Direct: Same as *Radiator*.

Radiator, Recurred: A heating unit set back into a wall recess, but not enclosed.

Radiator, Tube or Tubular: A heating unit used as a radiator in which the heat transfer surfaces are principally tubes.

Refrigerant: A substance which produces a refrigerating effect by its absorption of heat while expanding or vaporizing.

Refrigeration, Ton of: The removal of heat at a rate of 200 Btu per min, 12,000 Btu per hr, or 288,000 Btu per 24 hr.

Resistance, Thermal: The reciprocal of thermal conductance. Symbol *R*.

Resistivity, Thermal: The reciprocal of thermal conductivity. Symbol *r*.

Resistor, Electric: A material used to produce heat by passing an electric current through it.

Return, Dry: A return pipe in a steam heating system which carries both water of condensation and air. The dry return is above the level of the water line in the boiler in a gravity system. (See *Return, Wet*.)

Return, Wet: That part of a return main of a steam heating system which is filled with water of condensation. The wet return usually is below the level of the water line in the boiler, although not necessarily so. (See *Return, Dry*.)

Return Main: Pipes or conduits which return the heating or cooling medium from the heat transfer unit to the source of heat or refrigeration.

Reversed-Return System: A system in which the heating or cooling medium from several heat transfer units is returned along paths arranged so that all circuits composing the system or composing a major sub-division of it are of practically equal length.

Sabin: A unit of equivalent sound absorption equal to the equivalent absorption of one square foot of a surface of unit absorptivity (i.e., of one square foot of surface which absorbs all incident sound energy).

Saturation: The condition for co-existence in stable equilibrium of a vapor and liquid or a vapor and solid phase of the same substance. Example: Steam over the water from which it is being generated.

Saturation, Degree of: The ratio of the weight of water vapor associated with a pound of dry air to the weight of water vapor associated with a pound of dry air saturated at the same temperature.

Smoke: An air suspension (aerosol) of particles, usually but not necessarily solid, often originating in a solid nucleus, formed from combustion or sublimation. Also defined as carbon or soot particles less than 0.1 micron in size which result from the incomplete combustion of carbonaceous materials such as coal, oil, tar, and tobacco.

Smokeless Arch: An inverted baffle placed in an up-draft furnace toward the rear to aid in mixing the gases of combustion, and thereby to reduce the smoke produced.

Solar Constant: The solar intensity incident on a normal surface located outside the earth's atmosphere at a distance from the sun equal to the mean distance between the earth and the sun. Its value is 415, 445, or 430 Btu per (sq ft) as the July, January, or mean value, respectively. At sea level in July the solar intensity value is about 300 Btu per (sq ft) (hr) since about 28 percent is absorbed in the earth's atmosphere.

Sorbent: A material which extracts one or more substances present in an atmosphere or mixture of gases or liquids with which it is in contact, due to an affinity for such substances.

Sorption: Adsorption or absorption.

Split System: A system in which the heating is accomplished by means of radiators or convectors supplemented by mechanical circulation of air (heated or unheated) from a central point. Ventilation may be provided by the same system.

Square Foot of Heating Surface (Equivalent): This term is synonymous with Equivalent Direct Radiation (EDR).

Stack Height: The height of a gravity convactor between the bottom of the heating unit and the top of the outlet opening.

Steam: Water in the vapor phase. *Dry Saturated Steam* is steam at the saturation temperature corresponding to the pressure, and containing no water in suspension. *Wet Saturated Steam* is steam at the saturation temperature corresponding to the pressure, and containing water particles in suspension. *Superheated Steam* is steam at a temperature higher than the saturation temperature corresponding to the pressure.

Steam Heating System: A heating system in which heat is transferred from the boiler or other source of heat to the heating units by means of steam at, above, or below atmospheric pressure.

Steam Trap: A device for allowing the passage of condensate, or air and condensate, and preventing the passage of steam.

Supply Mains: The pipes through which the heating medium flows from the boiler or source of supply to the run-outs and risers leading to the heating units.

Surface, Heating: The exterior surface of a heating unit. *Extended Heating Surface (or Extended Surface):* Heating surface consisting of fins, pins, or ribs which receive heat by conduction from the prime surface. *Prime Surface:* Heating surface having the heating medium on one side and air (or extended surface) on the other. (See also *Boiler Heating Surface*.)

Temperature: The thermal state of matter with reference to its tendency to communicate heat to matter in contact with it. If no heat flows upon contact, there is no difference in temperature.

Temperature, Absolute: Temperature expressed in degrees above absolute zero.

Temperature, Dew-Point: The temperature at which the condensation of water vapor in a space begins for a given state of humidity and pressure as the temperature of the vapor is reduced. The temperature corresponding to saturation (100 percent relative humidity) for a given absolute humidity at constant pressure.

Temperature, Dry-Bulb: The temperature of a gas or mixture of gases indicated by an accurate thermometer after correction for radiation.

Temperature, Effective: An arbitrary index which combines into a single value the effect of temperature, humidity, and air movement on the sensation of warmth or cold felt by the human body. The numerical value is that of the temperature of still, saturated air which would induce an identical sensation.

Temperature, Mean Radiant (MRT): The temperature of a uniform black enclosure in which a solid body or occupant would exchange the same amount of radiant heat as in the existing non-uniform environment.

Temperature Scales: Three temperature scales, Centigrade, Fahrenheit, and Reaumur, derive their degree values by dividing the difference between the ice point and steam points of water as follows: Centigrade 100, Fahrenheit 180, and Reaumur 80. Only the first two are important in the United States. The value of a Fahrenheit degree is therefore 5/9 of a Centigrade degree.

The Kelvin scale, sometimes called Centigrade absolute, has its zero point at the lowest attainable temperature 273.15 Centigrade degrees below the triple-point temperature of water and exactly 273.15 below the zero of the Centigrade scale.

The Rankine scale, sometimes called Fahrenheit absolute, has its zero at the lowest attainable temperature 459.688 Fahrenheit degrees below the triple-point temperature of water and exactly 459.67 F deg below the zero of the Fahrenheit scale.

To convert Centigrade to Kelvin temperature (generally designated K) add 273.15 deg.

To convert Fahrenheit to Rankine temperature (generally designated R) add 459.67 deg.

Temperature, Wet-Bulb: Thermodynamic wet-bulb temperature is the temperature at which liquid or solid water, by evaporating into air, can bring the air to saturation adiabatically at the same temperature. Wet-bulb temperature (without qualification) is the temperature indicated by a wet-bulb psychrometer constructed and used according to specifications. (*ASME Power Test Codes, Series 1932, Instruments and Apparatus, Part 18.*)

Therm: A quantity of heat equivalent to 100,000 Btu.