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(तीसरा पुनरीक्षण)

Refrigeration and Air Conditioning — Glossary of Terms

(Third Revision)

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FOREWORD

This Indian Standard (Third Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Refrigeration and Air Conditioning Sectional Committee had been approved by the Mechanical Engineering Divisional Council.

This standard was first published in 1967 and subsequently revised in 2007 and 2020. The third revision has been taken up to include the other terms that are generally being used in the field of refrigeration and air conditioning.

This glossary of terms has been prepared for the guidance of manufacturers, users of refrigeration and air conditioning equipment and others concerned to assist them in the correct interpretation of the common terms used in this trade. It is hoped that this standard will help in establishing a generally recognized meaning and eliminate ambiguity and confusion arising out of individual interpretation.

Definition have been arranged in alphabetical order and cross references have been given wherever necessary.

The composition of the Committee responsible for the formulation of this standard is given in Annex A.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values (*second revision*)’. The number of significant places retained in the rounded-off value should be the same as that of the specified value in this standard.

Indian Standard

REFRIGERATION AND AIR CONDITIONING — GLOSSARY OF TERMS

(Third Revision)

1 SCOPE

This standard is intended to provide definitions of words and terms employed in all phases of activities connected with refrigeration and air conditioning.

2 TERMINOLOGY

For this standard the following definitions shall apply:

2.1 Absolute Filter — It is a filter having an efficiency of 99.90 percent or higher, capable of dealing with particle sizes down to 0.01 micrometre (*see* HEPA filter).

2.2 Absolute Humidity — It is the measure of water vapor (moisture) in the air, regardless of temperature and expressed as grams of moisture per cubic meter of air (g/m^3).

2.3 Absolute Pressure — A positive value of a pressure when the datum pressure is absolute zero.

2.4 Absolute Temperature — It is temperature as measured above absolute zero.

2.5 Absolute Vacuum — It is a space totally void of matter (theoretical).

2.6 Absolute Viscosity — It is force per unit area required to produce unit-relative velocity between two parallel areas of fluid unit distance apart. Also called coefficient of viscosity.

2.7 Absolute Zero Temperature — It is zero point on an absolute temperature scale (*see* Kelvin Temperature and Rankine Temperature).

2.8 Absorbate —It is substance absorbed by absorbent.

2.9 Absorbent — A material which, due to its affinity for certain substances, extracts one or more such substances from a liquid or gaseous medium with which it is in contact and which changes physically or chemically, or both, during the process. Calcium chloride is an example of a solid absorbent, while solutions of lithium chloride, lithium bromide, and the ethylene glycols are examples of liquid absorbents.

2.10 Absorber — It is a device containing an absorbent for absorbing refrigerant vapour or other vapours. In an absorption system, it is that part of the low side used for absorbing refrigerant vapour.

2.11 Absorptance

a) It is absorbed portion of the radiant energy striking a surface; and
b) It is the ratio of radiant flux absorbed by a body to that incident upon it (compare to reflectance).

2.12 Absorption — It is a process whereby a material extracts one or more substances present in an atmosphere or mixture of gases or liquids accompanied by physical change or chemical change, or both, of the material.

2.13 Absorptivity — Absorbed portion of the radiant energy striking unit area of a substance. (compared to absorptance).

2.14 Acceptable Indoor Air Quality — Air in which there are no known contaminants at harmful concentrations as determined by cognizant authorities and with which a substantial majority (80 percent or more) of the people exposed do not express dissatisfaction.

2.15 Acceptable Performance — A component or system able to meet specified design parameters under actual load.

2.16 Acceptable Thermal Environment — An environment that a substantial majority of the occupants would find thermally acceptable.

2.17 Acceptance Angle — The angular zone within which radiation is accepted by the receiver of a concentrator. Radiation is said to be accepted because radiation incident within this angle reaches the absorber after passing through the aperture.

2.18 Access Door — A door provided in a unit casing, wall, floor, ceiling, duct etc, to permit access for inspection, entrance, or accessibility to concealed parts or devices.

2.19 Accessory — Part or assembly that aids the effectiveness of equipment without changing its function.

2.20 Accidental Release — It is unanticipated emission of a regulated substance or other extremely hazardous substance into the ambient air from a stationary source.

2.21 Accumulator — It is a storage chamber for low-side liquid refrigerant, also known as surge drum or surge header; also, a pressure vessel whose volume is used in a refrigerant circuit to reduce pulsation.

2.22 Acoustic Anemometer — It is a device to sense velocity of air at a point by use of the Doppler Effect on the velocity of sound. It may also sense temperature.

2.23 Activated Alumina — It is a form of aluminium oxide, which absorbs moisture readily and is used as a drying agent.

2.24 Activated Carbon — It is a form of carbon specially processed to have small pores which is capable of absorbing various odours, anaesthetics, and other vapours. It is also called Activated Charcoal.

2.25 Active Chilled Beam — It is a convector with integrated air supply where primary air plus induced air pass through the cooling coil(s). Cooling medium is generally water.

2.26 Active Power — The product of the voltage across a branch of an alternating current circuit and the component of the electric current that is in phase with the voltage.

2.27 Active Tracer Gas Release — It is the controlled release of a tracer gas by a pressurized system or pump. (Term is used in ventilation rates measurement).

2.28 Actuator — It is a device, either electrically, pneumatically, or hydraulically operated, that acts as a motor to change the position of movable devices such as valves or dampers.

2.29 Acute Toxicity — The adverse health effect(s) from a single, short-term exposure, as might occur during an accidental release of refrigerants or other toxic chemicals.

2.30 Adaptive Model — A model that relates indoor design temperatures or acceptable temperature ranges to outdoor meteorological or climatological parameters.

2.31 Adiabatic Process — It is a thermodynamic process in which no exchange of heat or matter takes place between the thermodynamic system and surrounding. In an adiabatic process energy is transferred only as work.

2.32 Adjusted Net Total Capacity — The gross sensible capacity less the actual fan power (*see* gross sensible capacity).

2.33 Adopting Authority — The agency or agent that adopts a standard.

2.34 ADPI — Stands for 'air diffusion performance index'. It is the percentage of the measurements taken within an occupied space where the effective draft temperature is between – 1.5 and + 1K, with the air velocity less than 0.35 m/s.

2.35 Adsorbent — It is a material which has the ability to cause molecules of gases, liquids, or solids to adhere to its internal surfaces without changing the adsorbent physically or chemically. Certain solid materials, such as silica gel and activated alumina, have this property.

2.36 Adsorption — The action, associated with surface adherence, of a material in extracting one or more substances present in an atmosphere or mixture of gases and liquids, unaccompanied by physical or chemical change. Commercial adsorbent materials have enormous internal surfaces.

2.37 Aeration — It is a process of exposing a substance or area to air circulation.

2.38 Aerodynamic Excitation — It is the time varying loads acting on the blades of a fan due to nonconformities of the airflow.

> NOTE — Spatial non-uniformities of airflow, which are steady in time, give rise to harmonic excitation at frequencies which are integer multiples of the rotation rate of the fan. Time excitations of the airflow give rise to random excitation. Turbulence of the airflow gives rise to random excitation.

2.39 Aerosol — It is an assemblage of small particles, solid or liquid, suspended in air. The diameters of the particles may vary from 100 microns to 0.01 micron or less; that is dust, fog, smoke.

2.40 Age of Air — It is the time of passage of air from one point to another within an indoor space.

2.41 Agitator — It is a device causing turbulent motion in a fluid confined in a tank.

2.42 Air Alternator — It is a device which automatically switches the air from one side of the ice tank to the other.

2.43 Air Change — Introduction of new, cleansed, or recirculated air to conditioned space, measured by the number of complete changes per unit time.

2.44 Air Changes — A method of expressing the amount of air leakage into or out of a building or room in terms of the number of building volumes or room volumes exchanged.

2.45 Air Cleaner — It is a device used to remove airborne impurities.

2.46 Air Conditioner, Room — Room Air conditioner

a) Window type — The entire assembly is fitted in the room wall being air-conditioned; and

b) Split type — The evaporator unit is fitted inside the conditioned room while the condensing unit, consisting of compressor, condenser etc, is installed outside the room. Both the units are connected through copper pipe of suitable size.

2.47 Air Conditioning — It is the process of treating (conditioning) air to simultaneously control its temperature, humidity, distribution and quality.

2.48 Air Conditioning Unit — It is an assembly of equipment for the treatment of air so as to simultaneously control its temperature, humidity, quality, and distribution to meet the requirements of a conditioned space.

2.49 Air Conditioning Unit, Cooling (Heating) — It is a specific air-treating combination, consisting of means for ventilation, air circulation, air cleaning, and with control means for cooling (or heating).

2.50 Air Conditioning, Comfort — It is the process of treating air so as to simultaneously control its temperature, humidity, quality and distribution to meet the comfort requirements of the occupants of the conditioned space.

2.51 Air Conditioning, Complete — It is the process of air conditioning in which the temperature and humidity are independently controlled.

2.52 Air Conditioning, Industrial — It is the process of air conditioning for requirements other than comfort.

2.53 Air Conditioning, Summer — It is the comfort air conditioning carried out primarily when outside temperature and humidity are above those to be maintained in the conditioned space.

2.54 Air Conditioning, Winter — It is the process of heating, humidification, air distribution, and air cleaning, where outside temperatures are below the inside room temperature.

2.55 Air Conditioning, Year-Round System — It is a complete system, which ventilates, heats and humidifies in winter, cools and dehumidifies in summer, the air in the spaces under consideration and provides the deserved degree of air cleanliness and motion.

2.56 Air Cooler — It is a factory-encased assembly of elements whereby the temperature of air passing through the device is reduced.

2.57 Air Cooler Unit — It is a specific air treating combination of means of air circulation and cooling.

2.58 Air Cooler, Dry — It is an equipment that removes sensible heat from the dehydrated air whenever it leaves the dehydrator at an elevated temperature.

2.59 Air Cooler, Dry-Type — It is a forced circulation air cooler wherein heat transfer is not implemented by a liquid spray during the operating period.

2.60 Air Lateral — It is a pipe which supplies the air to the ice cans contained in the freezing tank.

2.61 Air Main — It is a pipe which carries air to the air laterals supplying ice cans contained in the freezing tank.

2.62 Air — The Earth's atmosphere; the mixture of many invisible, odourless, tasteless gases (Nitrogen, Oxygen and others) that surrounds the earth.

2.63 Air Treatment — It is a process by which one or more of the following characteristics of air are modified:

a) Temperature;
b) Humidity; and
c) Cleanliness.

2.64 Air Tunnel — It is a refrigerated tunnel with rapid air circulation through which the product to be frozen is passed.

2.65 Air Washer — It is a washer spray system or device for cleaning, humidifying or dehumidifying the air.

2.66 Air Ambient — It is the air surrounding an object.

2.67 Air, Outdoor — It is the air taken from outdoors and, therefore, not previously circulated through the system.

2.68 Air, Outside — It is external air; atmosphere exterior to refrigerated or conditioned space and ambient (surrounding) air.

2.69 Air, Recirculated — It is the returned air passed through the conditioner before being again supplied to the conditioned space.

2.70 Air, Reheating — In an air conditioning system, the final step in treatment in the event the temperature is too low.

2.71 Air Return — It is the air returned from conditioned or refrigerated space.

2.72 Air, Saturated — It is the moist air in which the partial pressure of the water vapour is equal to the vapour pressure of water at the existing temperature. This occurs when dry air and saturated water vapour coexist at the same dry-bulb temperature.

2.73 Air Standard — It is dry air at a pressure 760 mm Hg at 21 ºC temperature and with a specific volume of 0.833 m^3/kg.

2.74 Air/Cloth Ratio — It is a value used in dust collector calculations to measure air velocity through the bag filter media.

NOTE — Air/cloth ratio is calculated by dividing active volumetric airflow by the effective area of the cloth media.

2.75 Air/Gas Ratio — It is the ratio of the air volume to the gas volume. A specified ratio is necessary to achieve a desired character of combustion.

2.76 Air/Mass Ratio — It is the ratio of the mass of the atmosphere in the actual earth to the sun path to the mass which would exist at sea level if the sun were directly overhead.

2.77 Air/Media Ratio — It is the value used in dust collector calculations to measure air velocity through non-cloth bag filter media (for example, paper cartridges).

NOTE — Air/media ratio is calculated by dividing active volumetric airflow by the effective area of the cloth media.

2.78 Airborne Droplet Nuclei — Particles are released when an infected host coughs or sneezes; droplet nuclei are formed when mucus coating these particles evaporates and the virus becomes airborne. Also known as quanta.

2.79 Airborne Particles — The impurities as solid or liquid particulate matter from whatever source.

2.80 Airborne Sound — It is the sound that reaches the point of detection by radiation through the air.

2.81 Airflow

a) It is the movement of air usually within boundaries (such as ducts); and

b) The volume of air per unit time.

2.82 Airflow Rate (Q) — The volume of standard air per unit of time that moves past a given plane, expressed in cubic feet per minute (cfm) or litres per second (l/s).

2.83 Airflow Resistance — It is a deterrent (due to friction, change of direction, etc) to the passage of air within an air-distribution system and/or equipment.

2.84 Airflow Retarder — A material or construction that adequately impedes transmission of air under specified conditions (compare to structural barrier and water vapor retarder).

2.85 Airfoil — A cross sectional blade shape of a fan type that is used to optimize flow to reduce turbulence.

2.86 Airing — It is natural ventilation by window opening.

2.87 Airtight Construction — The construction in which the building envelope is designed with a continuous air barrier.

2.88 Airtightness — A qualitative term describing the integrity of the building envelope relative to air permeation; the resistance of the building envelope to the flow of air and entrained moisture (compare to air infiltration).

2.89 AK Factor — The effective area of an air terminal device equal to the measured airflow rate divided by the velocity reading of a particular instrument used in a prescribed manner.

2.90 Alkyl benzene — A synthetic hydrocarbon composed of a benzene ring attached to one or more saturated hydrocarbon chains.

2.91 Allocation Device — A device that monitors parameters used to determine the net HVAC energy consumed in conditioning an individual unit.

2.92 Alpha-Value (α-Value) — The ratio of path pressure drops, including fully open control damper pressure drop, to the pressure drop across the fully open damper at design flow.

2.93 Alteration — Replacement or addition to a building or its systems and equipment; routine maintenance, repair, and service or a change in the building's use classification or category shall not constitute an alteration.

2.94 Alternating Current — Electric current in an electrical circuit that periodically reverses polarity (*see* frequency).

2.95 Alternative Energy Sources — The non-depletable sources alternative to energy derived from combustible waste or heat recovery processes.

2.96 Ambient Air — Air within a defined space. Air surrounding a building, the source of outdoor air brought into a building, etc (usually outdoor air or the air in an enclosure under study).

2.97 Ambient Air Conditions — They are characteristics of the environment. For example, temperature, relative humidity, pressure, and motion.

2.98 Ambient Noise — All noise associated within a given environment at a given time, including noise from the sound source of interest (for example, background noise plus the particular sound of interest). (Compare to Background Noise)

2.99 Ambient Pressure

a) It is the environmental pressure in which a device operates;

b) The pressure of the medium surrounding a device; and

c) The pressure of the surroundings relative to zero absolute pressure.

2.100 Ambient Temperature — It is the temperature of the medium (such as air, water, or earth) into which the heat of equipment is dissipated.

2.101 Ammonia Refrigerant — Anhydrous Ammonia (NH_3).

2.102 Analyzer — It is a device in the high side of an absorption system for increasing the concentration of refrigerant in the vapour entering the rectifier or condenser.

2.103 Anechoic Termination — It is a device placed at the end of a test duct to prevent excessive reflection of the sound waves back into the test duct where they would interfere with the waves to be measured.

2.104 Anemometer — It is an instrument for measuring the velocity of fluid.

2.105 Aneroid Barometer — A barometer in which a change of atmospheric pressure relative to a vacuum bends a metallic surface connected to a pointer.

2.106 Aneroid Capsule — A thin, disc-shaped box or capsule, usually metallic, partially evacuated and sealed, held extended by a spring, that expands and contracts with changes in atmospheric or gas pressure.

2.107 Angle of Discharge — It is the largest included angle between centre lines of principal jets of the primary airstream.

2.108 Angle of Incidence — It is the angle between the solar beam and the normal to the aperture plane of the solar collector.

2.109 Angle Valve — A valve in which the inlet and outlet are at an angle, usually 45° or 90°.

2.110 Annual Fuel-Utilization Efficiency (AFUE) — It is the ratio of annual output energy to annual input energy, which includes any non-heating season pilot input loss and, for gas- or oil-fired furnaces or boilers, does not include electric energy.

2.111 Annual Heating Load — The heating load for the entire one-year simulation period (for example, for hourly simulation programs, this is the sum of the hourly heating loads for the one-year simulation period).

2.112 Annual Incident Unshaded Total Solar Radiation — It is the sum of direct solar radiation and diffuse solar radiation that strikes a given surface for the entire one-year simulation period when no shading is present (for example, for hourly simulation programs, this is the sum of the hourly total incident solar radiation for the one-year simulation period).

2.113 Annual Mean Zone Air Temperature — It is the average zone air temperature for the one-year simulation period (for example, for hourly simulation programs, this is the average of the hourly zone air temperatures for the one-year simulation period).

2.114 Annual Sensible-Cooling Load — It is the sensible-cooling load for the entire one-year simulation period (for example, for hourly simulation programs, this is the sum of the hourly sensible cooling loads for the one-year simulation period).

2.115 Annual Transmitted Solar Radiation — It is the sum of direct solar radiation and diffuse solar

radiation that strikes a given surface for the entire one-year simulation period when no shading is present (for example, for hourly simulation programs, this is the sum of the hourly total incident solar radiation for the one-year simulation period).

2.116 Annular Flow — It is a form of two-phase flow in a pipe where the gas forms the core and the liquid flows annularly against the internal walls of the pipe.

2.117 Anticipating Control — The control methodology that is actuated faster than normal to produce a smaller differential of the controlled variable.

2.118 Antisiphon Valve — It is a valve or mechanical device that eliminates siphon flow.

2.119 Apparatus Dew Point (ADP) — The effective coil surface temperature when there is dehumidification. This is the temperature to which all the supply air would be cooled if 100 percent of the supply air contacted the coil. On the Psychrometric Chart, this is the intersection of the condition line and the saturation curve, where the condition line is the line going through entering air conditions with slope defined by the sensible heat ratio [(gross sensible capacity)/(gross total capacity)]. *See* gross sensible capacity and gross total capacity.

2.120 Apparent Load — It is a value that can be calculated for a system based on the quantity of the fluid flow, the average temperature of the entering fluid, and the average temperature of the space.

2.121 Apparent Power — It is a product of the volts and amperes of a circuit. This product generally is divided by 1 000 and designated in kilovolt-amperes (kVA). It comprises both real and reactive power.

2.122 Apparent Solar Time — It is time based on the apparent angular motion of the sun across the sky, with solar noon the time the sun crosses the meridian of the observer.

2.123 Apparent Temperature — It is the temperature of an object as determined from the measured radiance.

2.124 Apparent Thermal Conductivity — It is a measured property of a material or assembly of materials; heat flows by a combination of conduction, convection, radiation, and latent heat exchange and may depend on orientation, direction, or both. The specific test conditions (that is, sample thickness, orientation, environment, environmental pressure, surface temperature, mean temperature, temperature difference, and moisture distribution) should be reported with the values. The symbol K is used to denote the lack of pure conduction or to indicate that all values reported are apparent. Materials with a low apparent thermal conductivity are called insulation materials.

2.125 Apparent Volumetric Efficiency — On an indicator card, it is the ratio of suction line length to stroke.

2.126 Application Part-Load Value (APLV) — A part load value is based on operation at actual design conditions. Typically used in system design and specification (*see* part-load value).

2.127 Application Rating — A rating based on tests performed at application rating conditions (other than standard rating conditions).

2.128 Application-Specific Controller (ASC) — The digital controller dedicated to a specific application, such as a VAV box or water-source heat pump.

2.129 Approach — In an evaporative cooling device, the difference between the average temperature of the circulating water leaving the device and the average wet-bulb temperature of the entering air. In a conduction heat exchanger device, the difference in temperature between the leaving treated fluid and the entering working fluid.

2.130 Approximate Lethal Concentration (ALC) — The concentration of a substance, such as a refrigerant, that is lethal to even a single test animal when tested by the same conditions as for an LC50 test.

2.131 Aquastat — A thermostat designed for use in water.

2.132 Aquifer — It is a geologic unit that is capable of yielding groundwater to a well in sufficient quantities to be of practical use.

2.133 Archimedes principle — A body immersed in a fluid undergoes an apparent loss in weight equal to the weight of the fluid it displaces.

2.134 Area, Core — It is the total plane area of the portion of a grille, face, or register bounded by a line tangent to the outer edges of the outer openings through which air can pass.

2.135 Area, Free — It is the total minimum area of the openings in an air inlet or outlet through which air can pass.

2.136 Arithmetic-Mean Temperature Difference — In a parallel flow or counter flow heat exchanger, the arithmetic mean of the temperature differences between the two fluids at both ends of the exchanger.

2.137 ASHRAE Arrestance — It quantifies filter efficiency by mass of particles removed or arrestance and is generally only used to measure performance of pre filters or low efficiency filters, efficiencies measured by weight give little indication of their performance for the smallest, lightest particles (the most respirable and hazardous).

2.138 ASHRAE Atmospheric Dust Spot Efficiency — It is a measure of the ability of a device to remove the staining portion of atmospheric dust from the test air.

2.139 ASHRAE Synthetic Arrestance Dust — Compounded test dust used for arrestance measurement and for loading filters.

2.140 Aspect Ratio — It is the ratio of the length of the core of a grille, face, or register to the width in air distribution outlets. In rectangular ducts, it is the ratio of width to depth.

2.141 Aspirated Psychrometer — Psychrometer having mechanical means for rapidly circulating air to be tested over dry and wet bulbs.

2.142 Aspiration — It is production of movement in a fluid by suction created by fluid velocity.

2.143 Assembly — It is a portion of an envelope component represented by an arrangement and connection of building construction materials with a specific thermal transmittance or thermal conductance.

2.144 Atmospheric Condenser — Condenser in which the pipes in open air are cooled by water flowing over them.

2.145 Atmospheric Dust — It is particulate matter naturally occurring in the air (*see* air contaminant).

2.146 Atmospheric Freeze Drying — It is a process in which the solid phase of the solvent is sublimed at atmospheric pressure.

2.147 Atmospheric Pressure — The standard atmospheric reference pressure (assumed sea level) is defined by the International Civil Aeronautics Organization (ICAO) as 101.325 kPa. In I-P units, the value is approximately 14.696 psi, or 29.921 inches of mercury at 32 °F.

2.148 Atmospheric Tower — Air movement through a cooling tower by aspiration or natural convection (also called natural draft cooling tower).

2.149 Atomization — It is the process of reducing a fluid to fine spray.

2.150 Atomize — It is a process to create a fine spray from a liquid. To create a fine spray from a liquid.

2.151 Attenuation — The decrease in the sound level between the source and the receiver from various mechanisms, such as geometrical divergence, atmospheric absorption, and building structures.

2.152 Attic Fan — Exhaust fan to exhaust air near the top of a building while air, generally cooler, is forced (drawn) in at lower levels.

2.153 Attic Ventilation — Introduction of cool, outdoor air into an attic by exhausting its warm air to the outdoors.

2.154 Authority of a Controller — It is ratio of effect on a manipulated variable of one input signal as compared to that of another.

2.155 Authority Having Jurisdiction — The agency or agent responsible for enforcing a standard.

2.156 Automatic Changeover — The change over from one mode of operation to another without operator intervention (for example, a thermostat that changes from heat to cool without need for manual operation of levers or set points).

2.157 Automatic Control Device — A device capable of automatically controlling devices without manual intervention.

2.158 Automation

a) It is implementation of process by automatic means;

b) Investigation, design, development, and application of methods of rendering processes automatic, self-moving, or self-controlling; and

c) Theory, art, or technique of making a process more automatic.

2.159 Auxiliary Air — It is unconditioned or partially conditioned supply or supplemental air

delivered to a laboratory at the laboratory fume hood to reduce room air consumption.

2.160 Auxiliary Devices —They are equipment such as relays and switches to manipulate signals (also known as controls).

2.161 Auxiliary Fuel — Fuel used in an auxiliary thermal source.

2.162 Auxiliary Thermal Source — A source of thermal energy, other than solar, used to provide the service water heating, usually in the form of electrical resistance heat or thermal energy derived from combustion of fossil fuels.

2.163 Available Energy — Energy in the form of shaft work or in a form completely convertible to shaft work by ideal processes.

2.164 Average Age of Air — It is the average of local mean ages of air measured throughout an indoor airspace.

2.165 Average Air Outlet Speed — It is the time-averaged speed of the air from each individual supply air outlet.

2.166 Average Arrestance — For an air cleaning device with efficiencies less than 20 percent in the size range of 3.0 – 10.0 µm, the average value of the arrestances made on the device during the loading test, weighted by the amounts of dust fed to the device during each, incremental, dust-loading step.

2.167 Average ASHRAE Arrestance — The average value of the arrestances made on a single filter during the loading test, weighted by the dust fed to the filter between successive arrestance measurements.

2.168 Average ASHRAE dust-spot efficiency — The average value of the dust spot efficiencies made on a single filter during the loading test, weighted by the dust fed to the filter during the intervals between successive dust spot tests.

2.169 Avogadro's Law — Under the same conditions of pressure and temperature, equal volumes of all gases contain equal numbers of molecules.

2.170 Axial Fan — Fan that moves air in the general direction of the axis about which it rotates.

2.171 Axial Flow Compressor — It is a turbo-compressor in which the compressed fluid generally flows in a direction parallel to the axis of rotation.

2.172 Axonometric Drawing — A perspective drawing showing plan and partial elevations on the same drawing.

2.173 Azeotrope — A mixture of liquids whose vapor and liquid phases in equilibrium have identical compositions (the boiling point is constant).

2.174 Azeotropic Blend — A blend containing two or more refrigerants whose equilibrium vapor and liquid phase compositions are the same at a given pressure. At this pressure, the slope of the temperature versus composition curve equals zero, which mathematically is expressed as $(dt/dx)\ p = 0$, which, in turn, implies the occurrence of a maximum, minimum, or saddle point temperature. Azeotropic blends exhibit some segregation of components under other conditions. The extent of the segregation depends on the particular azeotrope and the application.

2.175 Azeotropic Point — A temperature at which a liquid mixture boils and produces a vapor having the same composition as the liquid.

2.176 Azeotropic Refrigerant — A blend that contains two or more refrigerants whose equilibrium vapor phase and liquid phase compositions are the same at a given pressure. The temperature of an azeotropic refrigerant remains constant as it evaporates or condenses at constant pressure (compared to zeotropic refrigerant).

2.177 Azeotropic Temperature — The temperature at which the liquid and vapour phases of a blend have the same mole fraction of each component at equilibrium for a specified pressure.

2.178 Babo's law — Addition of a non-volatile solid to a liquid in which it is soluble lowers the vapor pressure of the solvent in proportion to the amount of substance dissolved.

2.179 Back Pressure — The static pressure existing at the outlet of an operating pressure relief device due to pressure in the discharge line.

2.180 Back Pressure Valve — (Also known as evaporator pressure regulator). An automatic valve located between the evaporator outlet and the compressor inlet that responds to its own inlet pressure that prevents the evaporator pressure from falling below a selected value.

2.181 Back Siphonage — A reverse flow in a water system caused by negative pressure in an incoming pipe when the point of use is at

atmospheric pressure.

NOTE — Back siphonage generally is more evident in an open water system.

2.182 Backdraft Damper — A device which, when mounted in a duct or opening, permits the flow of air in one direction only. Can be gravity (counter weighted) or power operated.

2.183 Backflow — The reverse flow in a water system from the normal or intended direction.

NOTE — Backflow generally is more evident in an open water system.

2.184 Backflow Preventer — It is a device designed to prevent reverse flow in a water system.

NOTE —Term normally used where back-pressure-type backflow is implied.

2.185 Backflow Prevention — The program, ordinance, or code designed to prevent backflow into a potable water system and to discover, eliminate, and prevent all uncontrolled cross connections, existing or potential.

2.186 Background Irradiance — Irradiance at the entrance aperture of the infrared sensing system that is not radiated directly from the object being investigated.

2.187 Background Noise — Total noise from all sources other than a particular sound that is of interest. Compared to ambient noise.

2.188 Back-Siphonage Preventer — *See* backflow preventer

2.189 Backward-Curved Impeller — It is the centrifugal rotor in which the convex sides of blades face in the direction of rotation.

2.190 Backward-Inclined Impeller — It is a component of a centrifugal fan or pump consisting of simple flat blades backwardly inclined to match the velocity pattern of the fluid passing through the impeller wheel for high-efficiency operation. Impeller blade width and length affect flow rate and pressure or lift performance (*see* centrifugal fan and centrifugal pump).

2.191 Baffle — It is a partition or deflector used for diverting fluid, usually in the form of a plate or wall.

2.192 Baffle, Refrigerator — It is a plate, wall, or partition which is designed to perform one or more of the following functions:

a) To pervert contact of food with refrigerated surfaces;

b) To prevent dripping of condense on food; and

c) To regulate and/or direct circulation of refrigerated air.

2.193 Balance Point — The outdoor temperature at which a building's heat loss to the environment is equal to internal heat gains from people, lights, and equipment.

2.194 Balanced Draft — Two fans connected to a combustion unit, one to supply the combustion air and the other to induce draft.

2.195 Balanced Flow — Fluid flows where the design supply flow volumetric rate equals the design return/exhaust volumetric rate. Also called balanced ventilation or balanced system.

2.196 Balanced Heat Recovery — It occurs when internal heat gain equals recovered heat, and no external heat is introduced to the conditioned space. Maintaining balance may require raising the temperature of recovered heat.

2.197 Balanced Relief Valve — A pressure relief valve that incorporates means of minimizing the effect of back pressure on the operational characteristics of the valve (opening pressure, closing pressure, and relieving capacity).

2.198 Balancer — A commonly used term for the person or firm that performs testing, adjusting, and balancing of HVAC systems.

2.199 Balancing — The methodical proportioning of air and hydronic flows through the system mains, branches, and terminal devices using acceptable procedures to achieve the specified airflow or hydronic flow within testing, design, and installation limitations.

2.200 Balancing Damper — An adjustable blade device to control airflow.

2.201 Balancing Station — An assembly to measure and control fluid flow; composed of a measuring device, a volume control device, and recommended lengths of straight ductwork or pipe leading into and out of the measuring device.

2.202 Balancing Valve — It is a metering-type valve with locking positions to control hydronic flow.

2.203 Ball Valve — A valve consisting of a rotatable ball with a hole through its centre typically manufactured in either full port (opening) or conventional (reduced) port (opening) construction.

2.204 Barometer — It is an instrument for measuring atmospheric pressure. Standard atmosphere is the equivalent of 14.696 psia (101.325 kPa) or 29.92 in. (760 mm) of mercury at 32 °F (0 °C).

NOTE — 'psia' means psi absolute.

2.205 Barometric Condenser — It is an apparatus in which steam is condensed at reduced pressure by direct contact with water.

2.206 Barometric Damper

a) It is the counterweight damper set so that variations in chimney barometric pressure will cause the damper to open or close gradually to maintain a constant draft directly upstream of the damper; and

b) Mechanically balanced damper that rotates from changes in pressure within breeching to bleed air into the breeching to maintain a steady draft.

2.207 Barometric Effect — The variations in barometric pressure caused by altitude or weather changes.

2.208 Barometric Pressure — It is the pressure of the atmosphere relative to zero absolute pressure (a perfect vacuum).

2.209 Base Temperature — It is the temperature from which temperature departure is calculated (for example, degree-day).

2.210 Base Use — Primary HVAC system losses incurred and auxiliary system energy consumed in maintaining a central HVAC energy source available for consumption by all residents.

2.211 Baseboard Radiator — It is a steam, hydronic, or electric heating device located at or near the floor.

2.212 Baseline Building Design — A computer representation of a hypothetical design based on the proposed building project. This representation is used as the basis for calculating the baseline building performance for rating above standard design.

2.213 Baseline Building Performance — The annual energy cost for a building design intended for use as a baseline for rating above standard design.

2.214 Baseline Data — The measurements and facts describing facility operations and design during the baseline period. This will include energy use or demand and parameters of facility operation that govern energy use or demand.

2.215 Baseline Model — The set of arithmetic factors, equations, or data used to describe the relationship between energy use or demand and other baseline data. A model may also be a simulation process involving a specified simulation engine and set of input data.

2.215 Baseline Period — The period of time selected as representative of facility operations before retrofit.

2.216 Basis of Design (BOD) — A document that records the concepts, calculations, decisions, and product selections used to meet the owner's project requirements and to satisfy applicable standards and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process.

2.217 Baudelot Cooler — Liquid cooler in which the liquid to be cooled passes by gravity over a refrigerated surface. (Also known as falling film surface cooler)

2.218 Beam Irradiance — Irradiance received from the sun without significant change in direction from the sun's apparent position.

2.219 Bellows

a) A flexible, corrugated chamber that converts pressure variation into mechanical movement; and

b) It is a flexible, fluid-containing vessel that will expand or contract as a result of a change in the pressure of the contained fluid. Can be used to transmit force and/or motion in a pneumatic or hydraulic system or as a sensor of temperature or pressure when the bellows is sealed.

2.220 Bellows Seal — A mechanical seal of flexible, corrugated-metal bellows with one end attached to a ring pressed against the shoulder of the shaft, the other end to a disc pressed against the housing.

2.221 Bellows Valve — It is the packless valve in which a bellows forms the seal between the adjustment spindle and the valve body.

2.222 Benching Machine — It is a portable device for elevating and stacking ice blocks.

2.223 Bifurcated Fan — It is a tube axial (ducted) fan whose motor is mounted outside a bifurcated (divided) duct with only the blades of the fan located in the airstream.

2.224 Bimetallic Element — It is an element formed of two metals having different coefficients of thermal expansion, used as a temperature control device.

2.225 Bin — A class interval or grouping, typically for outdoor air temperature.

2.226 Bin Method — It is the energy calculation method, usually used in prediction, in which the annual (or monthly) energy use of a building is calculated as the sum of the energy used for all of the outdoor temperature bins. The bin method allows heat pump (or other heater or cooler) performance, which is different for each bin, to be accounted for.

2.227 Binary — It is characteristic or property involving a selection, choice, or condition in which there are two possibilities (as binary numbers in a computer, on/off or open/closed switch position).

2.228 Binary Vapor Cycle — The thermodynamic cycle relative to the varying condensing and evaporating temperatures of a non-azeotropic mixture of two fluids.

2.229 Biocide — A chemical substance capable of killing living organisms, usually in a selective way.

2.230 Blackbody

a) Body that absorbs all the radiant energy falling on it; and

b) Body that has the maximum, theoretical, radiant-energy emittance at a given temperature (*see* absorber).

2.231 Blackbody Equivalent Temperature — It is the apparent temperature of an object as determined from the measurement of its radiance and the assumption that it is an ideal blackbody with emissivity of 1.0.

2.232 Blade Pitch — The angle between the chord of the blade and the plane of rotation (axial fan) or centreline of the rotor hub. The pitch may be constant for the length of the blade, or it may be larger at the blade root than at the tip.

2.233 Blade Twist — The property of a propeller blade describing the variation of the pitch from the blade root to the tip.

2.234 Blanch — This is a process of sterilization. In the case of vegetables to be canned, cooked, or frozen, this is usually by dipping in a hot water bath.

2.235 Blanket Thermal Insulation — It is relatively flat and flexible insulation in coherent form, furnished in units of substantial area.

2.236 Blast Coil — The heat transfer surface, most frequently of an extended surface arrangement, over which air is blown to be heated or cooled, depending on the temperature of the fluid within the coil.

2.237 Blast Freezer — The chamber in which cold air is circulated rapidly around products to be frozen so that freezing occurs rapidly enough to avoid formation of large ice crystals which may damage the product.

2.238 Blast Gate — It is a heavy-duty duct closure device.

2.239 Blast Gate Damper — A sliding damper in an air-handling system.

2.240 Blast Heater — It is a set of heat transfer coils or sections used to heat air which is drawn or forced through them by a fan. A unit heater.

2.241 Bleed Valve — A valve that has a fixed orifice incapable of being closed by an action of the valve, permitting a flow through or in parallel with the main valve port.

2.242 Bleeder — It is a pipe attached to a unit, such as a condenser, to bleed off liquid refrigerant parallel to the main flow.

2.243 lends — Refrigerants consisting of mixtures of two or more different chemical compounds, often used individually as refrigerants for other applications.

2.244 Blind Flange — Flange used to seal the end of a pipe.

2.245 Block Thermal Insulation — It is a rigid insulation performed into rectangular units.

2.246 Blowdown

a) Discharge of water from a steam boiler or open recirculating system that contains high total dissolved solids. The addition of makeup water will reduce the concentration of dissolved solids to minimize their precipitation; and

b) In pressure relief-devices, the difference between actuation pressure of a pressure relief valve and reseating pressure, expressed as a percentage of set pressure or in pressure units.

2.247 Blower — A ducted centrifugal fan used in a heating, ventilating, and air-conditioning system (*see* Centrifugal Fan and Fan).

2.248 Blower Door — An assembly consisting of a fan/blower and a calibrated flow measuring station [orifice plate, flow nozzle(s), flow ring, etc] used for pressurizing or depressurizing a building envelope.

2.249 Blow off Valve — It is a safety valve that maintains a predetermined pressure in a vessel by discharging excess gas to the atmosphere.

2.250 Blow through Unit — It is an air-handling unit with a section or sections downstream of the supply air fan.

2.251 Boiler — A closed, pressure vessel that uses fuel or electricity for heating water or other fluids to supply steam or hot water for heating, humidification, or other applications.

2.252 Boiler Burner Unit — Boiler designed especially for gas and oil and sold integrally with the burner.

2.253 Boiler Capacity — It is designed for a maximum rate of heat output.

2.254 Boiler Crown Sheet — The part of a boiler forming the top of the furnace in a firebox boiler or the equivalent surface in other types.

2.255 Boiler Feed Pump — A pump that returns condensed steam, makeup water, or both directly to the boiler. Normally installed with a large receiver.

2.256 Boiler Feedwater — It is the water supplied to a boiler by pumping.

2.257 Boiler Feedwater Heater — It is an apparatus for raising the temperature of the boiler feedwater, usually with exhaust steam.

2.258 Boiler Foaming — Carryover of slugs of water into the piping from overloading of the boiler. Compared to Boiler Priming.

2.259 Boiler Generator — A part of an absorption machine in which the refrigerant vapor is driven off by heat.

2.260 Boiler Heating Surface — Surfaces of the boiler that are exposed to the products of combustion on one side and water on the other, expressed in area units (of the side receiving the heat).

2.261 Boiler Horsepower — Equivalent evaporation of 34.5 lb of water per hour from and at 100 °C (212 °F). This is equal to heat output of 970.3 Btu/lb/h × 34.5 lb = 33 475 Btu/h, approximately 9 809.5 W.

2.262 Boiler Priming — The carryover of boiler water with the steam due to insufficient steam space, faulty boiler design, or operating conditions. Compared to foaming.

2.263 Boiler Rating — Design maximum rating of a steam or water boiler expressed as the total heat transferred by the heating surfaces in Btu/h (kW). Sometimes expressed in horsepower or pounds (torque, kilograms) of steam per hour. Compared to boiler capacity.

2.264 Boiler Water Leg — The space that contains water between the outer shell and furnace shell.

2.265 Boiler Waterline — The level at which water is maintained within a steam boiler.

2.266 Boiling Point — It is the temperature at which the vapour pressure of a liquid equals the absolute external pressure at the liquid-vapour interface.

2.267 Boil-off Gas — It is liquefied gas lost by vaporization during storage in a tank.

2.268 Bolometer — It is a sensitive thermal device for measuring radiant energy.

2.269 Bonding — It is the connection to ground potential of a metal part on an appliance or component which may become energized by an electrical fault or may develop a static charge (also known as electrical ground).

2.270 Booster — An accessory to increase output of, for example, a compressor, pump, or header.

2.271 Boot — The sheet metal transformation piece used to make connections between round and rectangular ductwork.

2.272 Bore — It is the inside diameter of a hollow cylinder or of a hole.

2.273 Boundary Conditions — The physical conditions (values of physical quantities, conditions of energy interchange, etc) imposed on a system at the boundaries separating the system from its surroundings.

2.274 Boundary Layer — It is the region of retarded fluid flow near the surface of a body moving through the fluid or past which the fluid moves. *See* flow.

2.275 Boundary Layer Flow — It is the flow of that portion of a viscous fluid in the area of a body in contact with the fluid and in motion relative to the fluid.

2.276 Bourdon Gauge — A mechanical pressure measuring instrument that senses pressure with a curved oval tube that tends to straighten when the pressure increases and recurves when the pressure decreases.

2.277 Boyle's Law — The product of the volume of a gas times its pressure is a constant at fixed temperature. Also known as Mariotte's Law.

2.278 Brackish Water — The impure water with a lesser salt content than seawater, but higher than that of potable water.

2.279 Branch

a) It is another section of the same size or smaller in ducts, piping, or conduit, at an angle with the main; and

b) Section of pipe or duct from a main to a terminal device.

2.280 Branch Circuit — The circuit conductors between the final overcurrent device protecting the circuit and the outlet(s). The final wiring runs to the load.

2.281 Branch Line — The air supply line connecting a controller and controlled device.

2.282 Breaker — It is a relatively poor conductor of heat used to join the liner and outer shell of an internally refrigerated container such as a refrigerator.

2.283 Breaker Strip — Refrigerator cabinet, a separate insulating element or integral insulating extension of the cabinet interior surfaces around the periphery of the cabinet door or drawer opening(s) which functions as a thermal barrier to minimize heat flow to the interior of the cabinet.

2.284 Break-Even Temperature — It is the outdoor temperature at which total heat losses from conditioned spaces equal internally generated heat gains.

2.285 Breakthrough — A condition that occurs in a gas phase filter when, as contaminated air passes through a filter, the outlet contaminant concentration reaches a predetermined percentage of the challenge.

2.286 Breakthrough Time — For gas phase filters, the sudden decline in efficiency is defined as the operating time (at constant operating conditions) before a certain penetration is achieved.

2.287 Breather Plug — It is a removable plug, cap, or other means of venting a space containing insulating material through vapour-tight sheathing to the interior of a refrigerated compartment.

2.288 Breathing Zone — The region within an occupied space between planes 3 and 72 in. (75 and 1 800 mm) above the floor and more than 2 ft. (600 mm) from the walls or fixed air-conditioning equipment.

2.289 Brine — Any liquid cooled by the refrigerant and used for the transmission of heat without a change in its state, having no flash point or a flash point above 68 °C.

2.290 Brine, Electrolytic — Any brine capable of causing chemical decomposition of one of two dissimilar metals by electrolysis.

2.291 Briquette Ice — Ice produced as small, regularly shaped and sized pieces.

2.292 British Thermal Unit (Btu) — It is the quantity of heat required of one pound of air-free water through one-degree Fahrenheit at a constant pressure of one normal atmosphere.

NOTE — This definition is given only for guidance though we use SI units.

1 Btu = 0.251 9 kcal/h.

2.293 Btu Meter — It is a metering system capable of measuring the energy added to or extracted from an electric or fluid stream. Also called thermal energy meter, heat meter, or thermal meter (compare to watt meter).

2.294 Bubble-Point Temperature — A liquid-vapor equilibrium point for a volatile pure liquid or for a multicomponent mixture of miscible, volatile, pure component liquids, in the absence of non-condensable, where the temperature of the mixture at a defined pressure is the minimum temperature required for a vapor bubble to form in the liquid.

2.295 Buffer

a) It is a digital circuit element used to increase the number of outputs a circuit can drive or to convert input or output levels for signal level compatibility. Also, any isolating amplifier stage;

b) An insulating circuit used to avoid reaction of a drive circuit on any driven circuit;

c) Salts or other compounds that reduce the changes in the pH of a solution upon the addition of an acid or alkali; and

d) A storage device used to compensate for a difference in rate of flow, data, time, or occurrence of events when transmitting data from one device to another.

2.296 Buffer Tank — It is the tank fitted into a circuit to dampen fluctuations in flow.

2.297 Buffer Zone — It is an unconditioned part of a building containing some or all of the distribution system.

2.298 Building — A structure wholly or partially enclosed within exterior walls, or within exterior and party walls, and a roof, affording shelter to persons, animals, or property.

2.299 Building Automation System (BAS) — An energy management system, usually with additional capabilities, relating to the overall operation of the building in which it is installed, such as equipment monitoring, protection of equipment against power failure, and building security. Compared to the Building Management System.

2.300 Building Envelope Leakage — It is the overall leakage of the building characterized by the airflow rate at a given pressure difference across the envelope of the building (Compare to Air Infiltration).

2.301 Building Envelope

a) It is the outer elements of a building, including walls, windows, doors, roofs, and floors, including those in contact with earth; and

b) The exterior plus the semi-exterior portions of a building. For the purposes of determining building envelope requirements, the classifications are defined as follows. Building envelope, exterior: the elements of a building that separate conditioned spaces from the exterior. Building envelope, semi-exterior: the elements of a building that separate conditioned space from unconditioned space or that enclose semi heated spaces through which thermal energy may be transferred to or from the exterior, to or from unconditioned spaces, or to or from conditioned spaces.

2.302 Building Envelope Opaque Areas — All the exposed areas of a building envelope which enclose space, except for openings for windows, skylights, doors, and building service systems (that is, all areas of a building envelope that permit passage of radiant energy in or out of the building space).

2.303 Building Envelope Void — Any localized area of the building envelope that has a thermal resistance significantly different from the area surrounding it. The void may be due to partial or complete absence of thermal insulation.

2.304 Building Information Model (BIM) — It is a data specification for representing building information for the purposes of interoperable data exchange. Also, a data model of a specific building or its systems, components, or other information elements based on that specification.

2.305 Building Information Modelling (BIM) — It is the human activity of using BIM software and other related software, hardware, and technologies to create and use in a building information model (*See* Building Information Model).

2.306 Building Management System (BMS) — This is an energy management system relating to the overall operation of the building in which it is installed. It often has additional capabilities, such as equipment monitoring, protection of equipment against power failure, and building security. It may also be a direct digital control (DDC) system where the mode of control uses digital outputs to control processes or elements directly.

2.307 Building Material — Any element of the building envelope, other than air films and insulation, through which heat flows and that is included in the component U-factor calculations.

2.308 Building Space — It is the volume of a building that exchanges air with outdoor (ambient) air. The building volume is the space that is deliberately conditioned for human comfort (ft^3 [m^3]).

2.309 Building Thermal Envelope — The elements of a building that enclose spaces and which control or regulate heat and mass transfer (air, water vapor, and entrained moisture) between the interior spaces and the building exterior.

NOTE — The interior surfaces of insulated floors, walls, windows, and ceilings generally comprise the thermal envelope. Compared to Thermal Envelope (*See* Air Infiltration).

2.310 Bulb — It is the portion of a thermal sensing system that is placed in the controlled (or measured) variable.

2.311 Buoyancy Inertial Parameter — A parameter derived from the dimensionless Richardson number relating fluid inertial forces to buoyancy forces in a storage device.

2.312 Butterfly Damper

a) A damper consisting of a plate turning on a diametral axis inside a duct;

b) The pair of flaps hinged to a common diametrical spindle and permitting flow in one direction only; and

c) Two flaps in 'V' arrangement.

2.313 Butterfly Valve — The valve in which the regulating mechanism is a circular or elliptical disc that is rotatable about an axis.

2.314 Bypass — A pipe or duct, usually controlled by a valve or damper, for conveying a fluid around an element of a system.

2.315 Bypass Air — Any portion of the mixed air that circumvents conditioning.

2.316 Bypass Factor — This is the percentage of the air that does not come into contact with the coil; the remaining air is assumed to exit the coil at the average coil temperature (*see* apparatus dew point).

2.317 Bypass Leakage — The unwanted passing of untreated air into the treated air between the components within casings such as filters or coils within a section.

2.318 Bypass Terminal — The air terminal unit using a method of volume modulation whereby airflow is varied by distributing that volume required to meet the load, the balance of primary air being diverted to the return.

2.319 Calculated Variable

a) The variable that cannot actually be measured directly but one which can be calculated by measuring other variables (for example, measure wet-bulb temperature and measure dry-bulb temperature to determine enthalpy); and

b) It is a variable that is calculated from one or more inputs.

2.320 Calorie — It is the quantity of heat required to raise the temperature of 1 g of water through 1 °C, at a constant pressure of one normal atmosphere.

2.321 Calorimeter — It is a device for measuring heat quantities, such as machine capacity, combustion heat, specific heat, vital heat, heat leakage, etc.

2.322 Calorimeter, Compressor — It is an apparatus for determining the refrigerant flow rate, and subsequently, the capacity of a refrigerant compressor by measuring the heat input required to balance the refrigerating effect produced in the evaporator by the compressor.

2.323 Calorimeter, Condensing unit — It apparatus for determining refrigerant flow rate, and subsequently the capacity of a condensing unit by measuring the heat input required to balance the refrigerating effect produced in the evaporator by the condensing unit.

2.324 Calorimeter, Room — It is a test facility for small air conditioners, consisting of two contiguous calorimeters with a common partition through which the air conditioner to be tested is mounted.

2.325 Capacity — It is the usable output of a system or system component in which only losses occurring in the system or component are charged against it.

2.326 Capacity Reducer — In a compressor, it is a device, such as a clearance pocket, movable cylinder head, or suction bypass, by which compressor capacity can be adjusted without changing the operating conditions.

2.327 Capacity, Air Conditioner, Useful Latent (Dehumidifying) — It is the available refrigerating capacity of an air conditioner for removing latent heat from the space to be conditioned.

2.328 Capacity, Air Conditioner, Useful Sensible — It is the available refrigerating capacity of an air conditioner for removing sensible heat from the space to be conditioned.

2.329 Capacity, Air Conditioner, Useful Total — It is the available refrigerating capacity of an air conditioner for removing sensible and latent heat from the space to be conditioned.

2.330 Capacity, Condensing Unit — It is the refrigerating effect in kcal/h produced by the difference in total enthalpy between refrigerant liquid leaving the unit and the total enthalpy of the refrigerant vapour entering the unit.

2.331 Capacity, Cooler Refrigerating, Net — It is the rate of heat removal from a fluid flowing through a cooler (air, water, brine, etc) at stated conditions; the difference in specific enthalpies of the cooling fluid entering and leaving the cooler. In case frosting occurs within the cooler, the latent heat of fusion and the subcooling heat of the ice (frost) must be added in determining the net cooler refrigerant capacity.

2.332 Capacity, Expansion Valve — It is the refrigerating effect in kcal/h, produced by the evaporation of refrigerant passed by the valve under specified conditions.

2.333 Capacity, Ice Making — It is the actual productive ability of a system making ice in a given period.

2.334 Capacity, Ice Melting Equivalent — It is the amount of heat absorbed by one kilogram of ice at 0 °C in liquefying to water at 0 °C.

2.335 Capacity, Refrigerating — It is the rate of heat removal from a medium or space to be cooled at stated conditions. The term refrigerating effect is used to denote heat transfer to or from the refrigerant itself in a refrigerating system, whereas the term refrigerating capacity is used to denote the rate of heat removal from a medium or space to be cooled.

2.336 Capacity, Refrigerating Compressor — It is the rate of heat removal by the refrigerant assigned to the compressor in a refrigerating system. This is equal to the product of the mass rate of refrigerant flow produced by the compressor and the difference in specific enthalpies of the refrigerant vapour at its thermodynamic state entering the compressor and the refrigerant liquid at saturation temperature corresponding to the pressure of the vapour leaving the compressor.

2.337 Capacity, Refrigerating Gross — It is the total rate of heat removal from all sources by the evaporator of a refrigerating system at stated conditions. It is numerically equivalent to the system refrigerating effect.

2.338 Capacity, Refrigerating System — It is the cooling effect produced by the change in total enthalpy between the refrigerant entering the evaporator and the refrigerant leaving the evaporator.

2.339 Capacity, Refrigerating, Net — It is the remaining rate of heat removal from all sources by the evaporator of a refrigerating system, at stated conditions, after deducting internal and external heat transfers to the evaporator that occur before distribution of the refrigerating medium and after its return.

2.340 Capacity, Refrigerating, Useful — It is the refrigerating capacity available for the specific ultimate cooling function for which the system was designed.

2.341 Capacity, Refrigerating, Volumetric — It is the refrigerating capacity of a system per unit volume of refrigerant circulated at the compressor suction.

2.342 Capillary — It is the action by which the surface of a liquid, where it is in contact with a solid (as in a slender tube), is raised or lowered.

2.343 Capillary Tube — In refrigeration practice, it is a tube of small internal diameter used as a liquid refrigerant flow control or expansion device between high and low sides; also used to transmit pressure from the sensitive bulb of some temperature controls to the operating element.

2.344 Carbonation — It is the absorption of injected carbon dioxide (CO_2) into a liquid, usually preceded or accompanied by liquid cooling.

2.345 Carnot Cycle — The ideal, reversible thermodynamic cycle composed of two isothermal processes and two adiabatic processes. The cycle represents the maximum, theoretical conversion of heat energy into mechanical energy.

2.346 Carnot Cycle Efficiency — It is the conversion of heat to work, which is limited by the temperature at which conversion occurs as $(T_1 - T_2)/T_1$, where T_1 is the higher absolute temperature where heat is absorbed, and T_2 is the lower absolute temperature where heat is rejected.

2.347 Cascade Refrigerating System — The system having two or more refrigerant circuits, each with a pressure-imposing element, condenser, and evaporator, where the evaporator of one circuit cools the condenser of another (lower temperature) circuit.

2.348 Casing — It is the enclosure normally housing fans, coils, filters, or other components and generally made of metal lined where necessary with material for thermal insulation and/or acoustic attenuation.

2.349 Cavitation

a) It is formation by mechanical forces of vapor in liquids; specifically, the formation of vapor cavities in the interior or on the solid boundaries of liquids in motion, where the pressure is reduced to a critical value without a change in ambient temperature;

b) Formation of cavities on a surface of a solid by liquid moving over it with velocity high enough to induce erosion of the surface when the cavity collapses; and

c) In pumps, cavitation occurs when the pressure of the fluid is below the vapor pressure of the fluid at that temperature. Cavitation has been described as having marbles or small stones inside the impeller casing. Cavitation over an extended period of time will erode the impeller and cause pump failure.

2.350 CBR (Chemical, Biological, and/or Radiological) — It is generally used with respect to airborne contaminants.

2.351 CDD (Cooling Degree Day) — *See* degree day

2.352 Ceiling Outlet — A round, square, rectangular, or linear air diffuser located in the ceiling which provides a horizontal distribution pattern of primary and secondary air over the occupied zone and induces low velocity secondary air motion through the occupied zone.

2.353 Cellular Elastomeric Thermal Insulation — The insulation composed principally of natural or synthetic elastomers or both, processed to form a flexible, semi rigid or rigid foam, having a predominately closed-cell structure. Insulation is usually expressed in k value (Btu/h.ft.°F [w/m·°K]).

2.354 Cellular Filter — It is an air filter of juxtaposed square or rectangular elements which can be easily dismantled for cleaning or replacement.

2.355 Cellular Polystyrene Thermal Insulation Board — The insulation composed of cellular polystyrene in the form of boards, produced by heat and pressure from expansion of foamable polystyrene beads within a mould (bead board) or by in situ foaming of molten polystyrene in an extrusion mode (extruded board).

2.356 Cellular Polyurethane Thermal Insulation — It is the insulation composed principally of the catalysed reaction product of polyisocyanate and polyhydroxy compounds, usually processed with fluorocarbon gas to form a rigid foam having a predominately closed-cell structure.

2.357 Celsius Temperature — The temperature scale used with the SI system in which the freezing point of water is 0 °C, the triple point is 0.01 °C, and the boiling point is 100 °C; absolute zero is minus 273.15 °C (Formerly referred to as the centigrade scale).

2.358 Centaxial Fan — It is an in-line duct fan with centrifugal blades which can develop static pressures higher than normal duct fans. Also identified as a tubular centrifugal fan.

2.359 Central Control — It is the ability to control all functions from one central location, thereby enabling the operator to request and respond to all commands from one physical or network location.

2.360 Centrifugal Compressor — It is a turbo-compressor, which is a nonpositive displacement compressor that depends, in part, on centrifugal forces for pressure rise.

2.361 Centrifugal Exhauster — It is a factory-assembled fan consisting of one or several centrifugal wheels connected to a motor and enclosed in a housing. A back-draft damper can be provided.

2.362 Centrifugal Fan — It is the fan in which the air enters the impeller axially and leaves it substantially in a radial direction. Fan rotor or wheel within a scroll-type casing (shroud) that includes supports for either belt drive or direct connection. Centrifugal-fan-types are as follows: forward curve, backwardly inclined (backward curved), airfoil, or radial blade design. Fans can be provided as single width, single inlet (SWSI) or double width, double inlet (DWDI) configurations and are limited to 16 predefined arrangement types based on discharge location and rotation.

2.363 Centrifugal Freeze Drying — It is the process in which a liquid product is vacuum frozen while being centrifuged in order to avoid foaming.

2.364 Centrifugal Pump — It is the pump having a stationary element (casing) and a rotary element (impeller) fitted with vanes or blades arranged in a circular pattern around an inlet opening at the centre. The casing surrounds the impeller and usually has the form of a scroll or volute. Centrifugal pump types are inline or base mounted. Pump arrangements are end suction, horizontal, or vertical split case.

2.365 Centrifuge — It is a device for separating substances of different densities by centrifugal action.

2.366 Certificate of Readiness — It is a document stating that all equipment, systems, and controls have been correctly installed, operated as specified, tested, adjusted, and balanced, and are verified as ready for functional performance testing and other acceptance procedures.

2.367 CFC — Chlorofluorocarbon

2.368 Change of State

a) It is referred to change from one of the three phases, solid, liquid, or gas, to another; and

b) The occurrence in a remote system causes the contact of an alarm or status device to move from one of two possible positions to the other (for example, into alarm, causing the contact of an alarm device to close or return to normal, causing the contact to open).

2.369 Changeover

a) It is the change from heating to cooling or vice versa; and

b) It is the change from one set of controls to another.

2.370 Changeover Temperature — The outdoor temperature the designer selects as the point of changeover from cooling to heating by the HVAC system.

2.371 Charge Capacity — It is the amount of heat that can be transferred into the storage device at a specified rate for a specific set of values for the initial temperature of the storage device, the temperature rises of the existing fluid, and the mass flow rate of fluid through the storage system.

2.372 Charge Neutralizer — It is a device that brings the charge distribution of the aerosol to a Boltzmann charge distribution. This represents the charge distribution of the ambient aerosol.

2.373 Charge Test Time — It is the duration of a single transient test in which energy is added to the storage device.

2.374 Charging Connection — It is the device to enable a refrigerating system to be charged with refrigerant. Also, the tube or hose through which charging is accomplished.

2.375 Charging Valve — It is the valve used to charge or add refrigerant to a system or add oil to a compressor crankcase.

2.376 Charles' Law — This law states that, at constant pressure, the volume of a fixed mass or quantity of gas varies directly with the absolute temperature. Also known as Gay-Lussac's law.

2.377 Check Valve — (Also known as non-return valve), valve allowing fluid flow in one direction only. When flow is initiated, the force of the fluid flowing opens a disc from its seating surface, allowing flow. Upon deactivation of flow, the disc returns the valve seat and does not allow backflow. There are two main types of check valves: swing-check valves and lift-check valves.

2.378 Chemically Active or Toxic — These are the materials corrosive or in-themselves toxic or productive of poisonous gases or fluids. Flammable or explosive materials easily ignited, including materials known to be fire producers or explosives.

2.379 Chill — It is a process of refrigeration moderately, as to meats, without freezing.

2.380 Chilled Beam Systems — The chilled ceiling systems have a very low profile (often flush with the ceiling) and work by means of convection heat transfer and induced air movement in the room in which they are placed. Chilled ceilings lack the ability to control the humidity or provide ventilation and must be paired with a ventilation system in order to maintain latent heat gains.

2.381 Chilled Water — The water used as a cooling medium (particularly in air-conditioning systems or in processes) at below ambient temperature.

2.382 Chiller (Drip Tray) — A drawer or receptacle located directly beneath the refrigerated surfaces of a manual or semi-automatic defrosting refrigerator for chilling of food and/or water collecting during defrosting. It may also serve as a baffle to regulate compartment temperature.

2.383 Chiller (Drip Tray) Volume — It is the product of the mean inside width and length of the tray and the mean height between the inside bottom of the tray and the outside bottom of the surface of the refrigerated plate or coil when the tray is in its lowest position.

2.384 Chilling (Cooling) — It is the process of lowering the temperature of a substance by the removal of heat in the temperature range above freezing.

2.385 Chilling Room — It is a room where products are cooled prior to cold storage.

2.386 Chlorofluorocarbon

a) It is generally, any of several compounds composed of carbon, fluorine, and chlorine, used chiefly as refrigerants and as blowing agents in plastic foams (Compare to Fluorocarbon and Halocarbon); and

b) It is a fully halogenated (no hydrogen remaining) halocarbon containing chlorine, fluorine, and carbon atoms.

2.387 Chronic Toxicity — It is an adverse health effect(s) from long-term, repeated exposures. This information is used, in part, to establish (TLV-TWA), PEL, or consistent indices.

2.388 Circulating Fan — It is the free flow propeller fan designed to circulate the air in a room without any air duct.

2.389 Circulation-type Evaporator — The flooded evaporator comprising a low-pressure receiver, in which the un-vaporised refrigerant returns to the evaporator inlet by gravity or by means of a pump or an ejector.

2.390 Circulator — It is a small pump, typically fractional horsepower.

2.391 Class of Construction — For the building envelope, this is a subcategory of roof, above-grade wall, below-grade wall, floor, slab-on-grade floor, opaque door, vertical fenestration, or skylight.

2.392 Class of Refrigerating System — This phrase formerly in extensive use but now becoming obsolete as a result of code change to classification. Systems are classified according to the degree of probability that a leakage of refrigerant will enter occupied areas. The two classifications are high probability system or low probability system (*see* ASHRAE Standard 15).

2.393 Clean Space — A defined area in which the concentration of airborne particles is controlled within specified limits; air that has been treated to remove pollutants, particulates, and odours.

2.394 Cleanroom — It is the specially constructed, enclosed area environmentally controlled with respect to airborne particulates, temperature, humidity, air pressure, air-pressure flow patterns, air motion, vibration, viable organisms, and lighting.

2.395 Clear Ice — (also known as crystal ice), block ice obtained by agitating water during freezing and subsequently removing, by suction, the core of unfrozen water where impurities are concentrated.

2.396 Clear Zone — When outlets are placed within or near the test zone, a clear zone is defined as the space around the outlet within which long-term occupancy is not recommended.

2.397 Clearance — It is the distance between the item requiring maintenance and the closest interfering surface.

2.398 Clo — A unit used to express the thermal insulation provided by garments and clothing ensembles, where 1 Clo = 0.88 $ft^2 \cdot h \cdot °F/Btu$ (0.155 $m^2.°C/W$).

2.399 Clo Unit — It is the unit of measurement of the insulation or thermal resistance of clothing.

2.400 Closed Crankcase Compressor — It is the enclosure in which the crankcase is completely sealed from the atmosphere but connected with the low-pressure side of the system.

2.401 Closed Cycle — A refrigeration system where the fluid is used without introduction of new fluid.

2.402 Closed Process — It is a series of changes of state in a system at the termination of which the system is reverted to its original state.

2.403 Closed System — A heating or refrigerating piping system in which circulating water or brine is completely enclosed, under pressure above atmospheric, and shut off from the atmosphere, except that the expansion/compression tank could be open to the atmosphere (*see* Water System).

2.404 Closed-loop Control

a) The control system in which the effect of the control action on the controlled variable is sensed and used by the controller to provide a new output (also known as feedback control). Compare to (open-loop control); and

b) It is the signal path that includes a forward path, a feedback path, and a summing point and that forms a closed circuit.

2.405 Clothing/Ensemble Insulation — It is the resistance to sensible heat transfer provided by a clothing ensemble. Expressed in Clo units.

NOTE —The definition of clothing insulation relates to heat transfer from the whole body and, thus, also includes the uncovered parts of the body, such as the head and hands.

2.406 Cloud Point — It is the temperature at which a clear liquid becomes hazy or cloudy due to the formation of crystals or particles when tested under standardized conditions.

2.407 Coanda Effect — It is the characteristic of an airstream that causes it to cling to the surface along which it flows. The velocity of the airstream as it passes along the surface generates low pressures. This action causes surrounding air to be aspirated.

2.408 Coaxial Condenser — It is the water-cooled condenser in which water and refrigerant flow in parallel paths but in opposite directions.

2.409 Cock Valve — It is generally a plug valve, usually for regulating the flow of a fluid, and requiring a wrench for operating.

2.410 Code Official — *See* building official

2.411 Coefficient of Performance (COP) (Heat Pump) — It is the ratio of the rate of heat delivered to the rate of energy input, in consistent units, for a complete operating heat pump plant or some specific portion of that plant, under designated operating conditions.

2.412 Coefficient of Performance (COP) (Refrigerating) — It is the ratio of the rate of heat removal to the rate of household combination refrigerator-freezers operating energy input, in consistent units, for a complete at average temperatures between – 12 °C and 0 °C shall refrigerating plant or some specific portion of that be considered part of the general refrigerated plant, under designated operating conditions compartment.

2.413 Coefficient of Performance (COP), Compressor, Heat Pump — It is the ratio of the compressor heating effect (heat pump) to the rate of energy input to the shaft of the compressor, in consistent units, in a complete heat pump, under designated operating conditions.

2.414 Coefficient of Performance (COP), Compressor, and Refrigerating — It is the ratio of the compressor refrigerating effect to the rate of energy input to the shaft of the compressor, in consistent units, in a complete refrigerating plant, under designated operating conditions.

2.415 Cogeneration — The sequential production of either electrical or mechanical power and useful thermal energy (heating or cooling) from a single energy form.

2.416 Coil — A cooling or heating element made of pipe or tubing with or without external fins.

2.417 Coil, Direct Expansion — It is a coil using the direct method of refrigeration.

2.418 Coil, Expansion — An evaporator constructed of pipe or tubing.

2.419 Coincident Demand — The metered demand of a device, circuit, or building that occurs at the same time as the peak demand of the building or facility or at the same time as some other peak of interest, such as a utility's system load. This should properly be expressed so as to indicate the peak of interest (for example, demand coincident with the building peak).

2.420 Colburn Heat Transfer Equation — It is the dimensionless heat transfer equation used in calculating natural convection movement of heat from vertical surfaces or horizontal cylinders to fluids (gases or liquids) flowing past these surfaces. The symbol is jH.

2.421 Colburn Mass Transfer Equation — The dimensionless mass transfer equation consisting of the Sherwood number divided by the Reynolds number and the Schmidt number to the 1/3 power. The symbol is jD.

2.422 Cold Storage — It is a process of preserving perishables on a large scale by refrigeration.

2.423 Collector Cover Glazing — The material covering the aperture to provide thermal and environmental protection.

2.424 Collector Time Constant — The time required for the fluid leaving a solar collector to attain 63.2 percent of its steady-state change following a step change in irradiance.

2.425 Collector-loop Heater — A heater installed within the collector loop when testing the solar domestic-water heating system with a non-irradiated array.

2.426 Collimation Angle — It is the angle within which the radiation beams from the source depart from the line drawn from the source to the receiver.

2.427 Color Temperature — It is the temperature of a perfect radiator (blackbody) that would emit the same relative intensity at two wavelengths (usually red and green lights) as the relative intensity radiated by the subject surface.

2.428 Combination Control — The control device in which one or more control variables are being monitored (such as a combination high- and low-pressure control for a refrigerant system).

2.429 Combination Space-Heating and Water-Heating Appliance — A unit that is designed to provide space heating and potable water heating from a single, primary energy source.

2.430 Combined Appliance — It is an assembly consisting of a heat pump or air conditioner, a desuperheater, a water heater, and if required, a potable water pump; the assembly provides space conditioning and domestic hot water.

2.431 Combined Cycle Gas Turbine — It is the device that uses waste heat boilers to capture exhaust energy for steam generation.

2.432 Combined Heat and Power System (CHP) — The system combines power production with the use of a lower-quality heat by-product of power generation for district heating.

2.433 Combined Panel — A complete ceiling panel that is designed and can be independently installed and operated for both sensible cooling and sensible heating of an indoor space through heat transfer between the thermally effective panel surfaces and the occupants and/or the indoor space by thermal radiation and natural convection.

2.434 Combined Performance Factor Cooling Season (CPFCS) — It is the seasonal coefficient of performance of the combined appliance when used to meet both the space-cooling and domestic water-heating loads that occur during the space-cooling season. The quantity is dimensionless.

2.435 Combined Radiative and Convective Surface Coefficient — It is the constant of proportionality relating the rate of combined convective and radiative heat transfer at a surface to the temperature difference across the air film on that surface.

2.436 Combined Section of an Air-handling Unit — It is the section within which two or more functions are combined.

2.437 Combined Space-Heating and Water-Heating Mode — It is an operating mode where the heat pump is space heating and the desuperheater is heating domestic water.

2.438 Combined Surface Coefficient — *See* combined radiative and convective surface coefficient.

2.439 Comfort Chart — It is a chart showing effective temperatures with dry-bulb temperatures and humidity (and sometimes air motion) by which the effects of various air conditions on human comfort may be compared.

2.440 Comfort Cooling — Refrigeration used for comfort as opposed to refrigeration used for storage or manufacture.

2.441 Comfort Line — It is a line on the comfort chart showing the relation between the effective temperature and the percentage of adults feeling comfortable.

2.442 Comfort Zone — Average of the range of effective temperatures over which the majority (50 percent or more) of adults feel comfortable, extreme of the range of effective temperatures over which one or more adults feel comfortable.

2.443 Comfortable Extreme — It is the range of effective temperatures over which one or more adults feel comfortable.

2.444 Commercial Refrigerator

a) A refrigerated enclosure containing goods which are accessible to the exterior through a door; and

b) Types of refrigerators used commercially, including reach-ins, walk-ins, and refrigerated display cases (all types being either service or self-service, which are used by business establishments).

2.445 Commercial System — It is a heating, cooling, or refrigerating system used in a commercial or business place.

2.446 Compartment Freezer — The compartment in a household refrigerator designed for short-term storage of food at temperatures below 0 °C. In a household combination refrigerator-freezer, it is that compartment(s) designed for storage of foods at temperatures of – 12 °C average or lower. In a household freezer, it is that compartment or compartments designed for extended storage of frozen foods at a recommended rating temperature of – 18 °C, having inherent capability for the freezing of food.

2.447 Compartment, General Refrigerated — The general refrigerated compartment(s) in a household refrigerator, 'all-refrigerator', or combination refrigerator-freezer is that compartment(s) designed for the refrigerated storage of food at an average temperature above 0 °C. Special compartments designed for the storage of fresh foods to temperatures near 0 °C shall be considered part of the general refrigerated compartment. Special compartments of household combination refrigerator-freezers operating at average temperatures between – 12 °C and 0 °C shall be considered part of the general refrigerated compartment.

2.448 Compartments, Butter, Margarine, or Cheese — Compartments provided for the storage of butter, margarine, or cheese.

2.449 Compartments, Special — Those compartments designed for maintaining special environmental conditions for an articular type of product or purpose.

2.450 Component Direct Evaporative Cooler — A self-contained cabinet without a fan whose primary functions are:

a) The conversion of the sensible heat of unsaturated air passing through the cabinet to latent heat by the process of evaporating recirculating or non-recirculating water directly exposed to this air; and

b) The movement of this air through the cabinet allows a portion of this water to evaporate.

2.451 Component of Ventilation or Air Conditioning — The single, functional element forming a part of a ventilation or an air-conditioning installation.

2.452 Compound Compression — The compression that is accomplished by stages, as in two or more cylinders in series.

2.453 Compound Compressor — The compressor in which compression is accomplished by stages, as in two or more cylinders.

2.454 Compound Gauge — The pressure gauge that indicates pressures above and below atmospheric pressure.

2.455 Compound-Refrigerating System — It is a multistage refrigeration system where a single charge of refrigerant circulates through all stages of compression.

2.456 Compressibility — It is the ease with which a fluid may be reduced in volume by the application of pressure. Compressibility depends on the state of the fluid as well as the type of the fluid itself.

2.457 Compressibility Factor — This is a relative variation of the departure from the perfect gas laws.

2.458 Compressing Cycle — The refrigerating cycle is composed of four principal stages: vaporization of the refrigerant, compression of the vapor, liquefaction of the vapor, and expansion of the liquid.

2.459 Compression — In a compression refrigeration system, it is a process by which the pressure of the refrigerant is increased.

2.460 Compression Efficiency — It is the ratio of work required to compress, and reversibility, all the vapour delivered by a compressor (per stage) to the actual work delivered to the vapour by the piston or bladder of the compressor.

2.461 Compression, Compound — It is the process of compression by stages in two or more cylinders.

2.462 Compression, Dual — Split suction valving arrangement on compressor for carrying two suction pressures.

2.463 Compression, Multistage — It is the process of compression in two or more steps, where the discharge of one earlier stage compressor is connected with the suction of the next higher stage compressor.

2.464 Compressor Unit, Refrigerant — A refrigerating component designed to compress a specific refrigerant vapour, consisting of compressor, prime mover, and regularly furnished accessories.

2.465 Compressor, Booster — It is a compressor for very low pressures, usually discharging into the suction line of another compressor.

2.466 Compressor, Centrifugal — A nonpositive displacement compressor which depends for pressure rise, at least in part, on centrifugal effect.

2.467 Compressor, Compound — It is a compressor in which compression is accomplished by stages, as in two or more cylinders.

2.468 Compressor, Double Acting — One which has two compression strokes per revolution of the crankshaft per cylinder that is, both faces of the piston are working faces.

2.469 Compressor, Double Suction — It is split suction; valving arrangement on compressors for carrying two suction pressures.

2.470 Compressor, Horizontal — It is a compressor with horizontal cylinder or, in small sizes, with horizontal crankshaft.

2.471 Compressor, Motor, sealed (Hermetic Type) — A combination consisting of a compressor and motor, both of which are enclosed

in the same housing, with no external shaft or shaft seals, the motor operating in the refrigerant.

2.472 Compressor, Open-Type — It is a refrigerant compressor with a shaft or other moving part extending through its casing to be driven by an outside source of power, thus requiring a shaft seal or equivalent rubbing contact between a fixed and moving part.

2.473 Compressor, Positive Displacement — It is a refrigerant compressor in which an increase of refrigerant gas or vapour pressure is attained by changing the internal volume of the compression chamber.

2.474 Compressor, Reciprocating — It is a positive displacement compressor in which the change in internal volume of the compression chamber(s) is accomplished by the reciprocating motion of one or more pistons.

2.475 Compressor, Refrigerant — It is a component of a refrigerating system which increases the pressure of a compressible refrigerant fluid and simultaneously reduces its volume, while moving the fluid through the device.

2.476 Compressor, Refrigerant, Accessible Hermetic (Semi-hermetic) — It is a hermetic refrigerant compressor whose housing is seated by one or more gasketed joints and is provided with means of access for servicing internal parts in the field.

2.477 Compressor, Refrigerant, Mechanical — It is a mechanically operated component of a refrigerating system which draws refrigerant in a gaseous state and discharges it at a higher pressure.

2.478 Compressor, Refrigerant, Welded Hermetic, Sealed Unit — A hermetic refrigerant compressor whose housing is permanently sealed by welding or brazing and is not provided with means of access for servicing internal parts in the field. Or, a motor compressor assembly having the compressor contained within a gas-tight casing through which no shaft extends. Drive is usually by a motor within the same casing but may be induced by external means.

2.479 Compressor, Rotary — It is a positive displacement compressor in which the change in internal volume of the compression chamber(s) is accomplished by the rotary motion of a positive displacement member(s).

2.480 Compressor, Screw — It is a positive displacement compressor in which pressure is increased by contra-rotating intermeshing screws from members.

2.481 Compressor, Scroll — It is a positive displacement compressor in which a scroll compressor has one scroll or spiral orbiting in a path defined by a matching fixed scroll. The fixed scroll is attached to the compressor body. The orbiting scroll is coupled to the crankshaft in orbit rather than rotated. The orbiting motion creates a series of gas pockets traveling between the two scrolls. On the outer portion of the scroll the pocket draws in gas, and then moves it to the centre of the scroll where it's discharged. As the gas moves in the increasing smaller inner pocket, the temperature and pressure increase to the desired discharged pressure

2.482 Compressor, Single-Acting — It is a compressor in which one compression stroke per revolution of the crank for each cylinder takes place.

2.483 Compressor, Vertical — It is a compressor with a vertical cylinder or, cylinders in small sizes, with a vertical crankshaft.

2.484 Computer and Data Processing Room (CDPR) Unitary Air Conditioner — It is a unitary air conditioner, for a computer and data processing room, consisting of one or more assemblies that include a DX evaporator or chilled-water cooling coil, an air-moving device, and air-filtering devices. The air conditioner may include a compressor, condenser, humidifier, or reheating device.

2.485 Concealed Fixing — The installation of an air--terminal device where the attachment to the duct, wall, or ceiling is hidden from view to room occupants.

2.486 Concentration — It is a number specifying the composition of a solution with respect to the constituent names, as gram salt per litre of brine.

2.487 Condensate — The liquid formed by condensation of a vapour. In steam heating, water condensed from steam; in air conditioning, water extracted from air, as by condensation on the cooling coil of a refrigeration machine.

2.488 Condensation — It is the process of changing a vapour into liquid by the extraction of heat. Condensation of steam or water vapour is affected in either steam condensers or

dehumidifying coils and the resulting water is called condensate.

2.489 Condenser (Refrigerant) — A heat exchanger in which the refrigerant, compressed to a suitable pressure, is condensed by rejection of heat to an appropriate external cooling medium.

2.490 Condenser, Air Cooled Refrigerant — It is a refrigerant condenser in which heat rejection is accomplished entirely by raising the temperature of the air used as a cooling medium.

2.491 Condenser, Atmospheric Refrigerant — It is a condenser cooled with water which is exposed to the atmosphere.

2.492 Condenser, Evaporative Refrigerant — A refrigerant condenser in which part of the heat rejection may be accomplished by raising the temperature of an air steam passing over a heat exchange surface and the remainder by evaporation of water sprayed or otherwise distributed over the heat exchange surface.

2.493 Condenser, Open-Shell-and-Tube — It is a condenser in which the cooling fluid usually water passes through a number of tubes in order to liquefy the refrigerant passing through the shell.

2.494 Condenser, Secondary — It is the condenser of a secondary system, also, a condenser and a secondary system where the condenser is cooled by the evaporator of the secondary system.

2.495 Condenser, Submerged — Condenser piping submerged in a bath of condenser water.

2.496 Condenser, Water-Cooled Refrigerant — It is a refrigerant condenser in which heat rejection is accomplished entirely by raising the temperature of the water used as a cooling medium.

2.497 Condensing Refrigerating Effect — The condensing heat added to the refrigerant vapour in the refrigerant compressor unit.

2.498 Condensing Unit, Hermetically Sealed — A sealed condensing unit in which the housing is permanently sealed by welding or brazing and is not provided with means of access for servicing internal parts in the field.

2.499 Condensing Unit, Mechanical, Performance Factor — It is the ratio of its capacity to its energy input, expressed in kcal/kWh.

2.500 Condensing Unit, Refrigerant — An assembly of refrigerating components designed to compress and liquefy a specific refrigerant, consisting of one or more refrigerants.

2.501 Condensing Unit, Service-Sealed — A sealed condensing unit in which the housing is sealed by one or more gaskets and means of access are provided for servicing internal parts in the field.

2.502 Condition, Steady State, Refrigerator — Steady state condition shall be considered to be established during a stabilization period under either cyclic or continuous conditions when:

a) The average general refrigerated compartment temperature in household refrigerators, 'all refrigerators', or combination refrigerator-freezers does not vary more than 0.6 °C in two cycles (if cycling occurs) or in 2 h, whichever is longer;

b) The average general refrigerated compartment temperature in household refrigerators, 'all refrigerators', or combination refrigerator- freezers does not vary more than 0.6 °C in two cycles (if cycling occurs) or in 2 h, whichever is longer; and

c) The average frozen food temperature in household refrigerators, combination refrigerator-freezers, or household freezers is changing at a rate not exceeding 0.6 °C in 24 h, based on temperature observations covering a period of not less than 8 h.

2.503 Conditioned Air — (Also known as treated air), air treated to control its temperature, relative humidity, purity, pressure, and movement (also treated air).

2.504 Conditioned Space — It is that part of a building that is heated and/or cooled and/or humidity controlled for the comfort of occupants (Compare Unconditioned Space).

2.505 Conditions, Steady — An operating state of a system, including its surroundings, in which the extent of change with the time of all the significant parameters is so small as to have no important effect on the performance being observed or measured.

2.506 Conductance, Surface Film — It is the time rate of heat flow per unit area under steady conditions between a surface and a fluid for unit temperature difference between the surface and the fluid.

2.507 Conductance, Thermal — It is the time rate of heat flow through a body (frequently per unit area) from one of its bounding surfaces to the other for a unit temperature difference between the two surfaces, under steady conditions.

2.508 Conduction, Thermal — It is the process of heat transfer through a material medium in which kinetic energy is transmitted by the particles of the material from particle to particle without gross displacement of the particles.

2.509 Conductivity, Thermal — It is the time rate of heat flow through unit area and unit thickness of a homogeneous material under steady conditions when a unit temperature gradient is maintained in the direction perpendicular to area. Materials are considered homogeneous when the value of the thermal conductivity is not affected by variation in thickness or in size of the sample within the range normally used in construction.

2.510 Connection in Parallel — The system in which flow is divided among two or more channels from a common starting point or header.

2.511 Connection in Series — The system in which flow through two or more channels is in a single path entering each succeeding channel only after leaving the first or previous channel.

2.512 Console Air Conditioner — *See* packaged air conditioner

2.513 Constant Cut-In — It is used in refrigerating devices constructed to permit the cut-in point to remain constant while providing a variable cut-out (variable differential) range when the setting is changed.

2.514 Constant Pressure Expansion Valve — The valve that maintains a constant output pressure regardless of the input pressure.

2.515 Constant-level Valve — It is a device for maintaining within a reservoir a constant level of fluid (for example, oil fuel for delivery to an oil burner).

2.516 Contact Cooling — The cooling achieved by direct contact with a cold surface.

2.517 Contact Freezing

a) A contact freezer is a freezer in which the product is frozen by contact with a refrigerated surface; and

b) Freezing of produce by direct contact with a refrigerated surface. Crust freezing (shell freezing) is very quick freezing of the outer part of a product (mainly poultry), and final freezing is completed by conventional methods.

2.518 Contact Icing — The process of chilling in which finely crushed ice is placed in direct contact with the product in its unpacked or packed state.

2.519 Continuous Insulation (ci) — Insulation that is continuous across all structural members without thermal bridges other than fasteners and service openings. It is installed on the interior or exterior or is integral to any opaque surface of the building envelope.

2.520 Contra-Rotating Fan — It is a technique whereby parts of a mechanism rotate in opposite directions about a common axis, usually to minimise the effect of torque (*see* fan types).

2.521 Control — It is any manual or automatic device for regulation of a system or component in normal operation. If automatic, the implication is that it is responsive to changes of pressure, temperature, or any other property whose magnitude is to be regulated.

2.522 Control, Dual Effect — It is a control responsive to temperatures of two zones or to two variable conditions.

2.523 Controlled Atmosphere Storage (Gas Storage) — It is the artificial addition of carbon dioxide to the atmosphere, particularly in large concentrations, with no attempt to regulate the amount of oxygen.

2.524 Controller, High Pressure — A pressure controller designed to control the pressure at a selected point on the high-pressure side of a refrigerating system.

2.525 Controller, Low Pressure — A pressure controller designed to control the pressure at a selected point on the low-pressure side of a refrigerating system.

2.526 Controller, Pressure — It is an automatic control device actuated by pressure, designated to be responsive to pressure convection, transfer of heat by the movement of fluid.

2.527 Convection, Forced — Convection resulting from forced circulation of a fluid, as by a fan, jet, or pump.

2.528 Convection, Natural — Circulation or movement of gas or liquid (usually air or water) taking place due to differences in density resulting from temperature changes.

2.529 Convective Film Coefficient — The constant of proportionality relating the convective rate of heat transfer at a surface to the temperature difference across the air film on that surface.

2.530 Convector — An agency of convection. In heat transfer, a surface designed to transfer its heat to a surrounding fluid largely or wholly by convection. The heated fluid may be removed mechanically or by gravity (gravity connector). Such a surface may or may not be enclosed or concealed.

2.531 Cool — To remove heat in an environment generally at a temperature not below 33 °F (– 1 °C). Compared to Refrigerants.

2.532 Cooling Efficiency Ratio (CER) — It is a ratio calculated by using the formula:

$$CER = \frac{C + FE}{E}$$

where

C = Cooling capacity, Btu/h (W);

FE = Fan electrical input; and

E = Total electrical input (W).

2.533 Cool Down — The reduction of space temperature down to the occupied set-point after a period of shutdown or setup.

2.534 Cooling Load Factor (CLF) — This factor is used to represent the temperature difference between indoor and outdoor air with the inclusion of the heating effects of solar radiation

2.535 Cool Storage — Technology or systems used to store cooling capacity. Normally applies to comfort or air-conditioning applications (Compare to Cold Storage and Ice Storage).

2.536 Coolant — A single-phase fluid (usually a liquid) used for transferring heat from one place to another. Sometimes referred to as heat transfer fluid, brine, and/or secondary refrigerant (*see* Refrigerant).

2.537 Cooler, Brine (Water) — Evaporator for cooling brine in an indirect system.

2.538 Cooler, Cold Storage — An insulated room maintained at 0 °C or above.

2.539 Cooler, Non-Priming — Tubes are omitted with a medium held at a temperature lower than that of the top segment of the shell leaving a gas space above of the air. Cooling may be accompanied by moisture the tubes about equal to one-fourth of the inside shell addition (evaporation), by moisture extraction diameter (dehumidification), or by no change whatsoever of moisture content.

2.540 Cooler, Oil — It is a heat exchanger for the purpose of cooling oil in the lubrication system.

2.541 Cooler, Sensible Heat — It is a form of cooling surface using water, brine, or direct expansion refrigerant. It is always located on the leaving side of the dehydrator but frequently treats in addition a large volume of room air which is not circulated through the dehydrator for moisture reduction.

2.542 Cooling Coil — It is an arrangement of pipe or tubing which transfers heat from air to a refrigerant or brine.

2.543 Cooling Effect, Sensible, Air Cooler — It is the difference between the total cooling effect and the dehumidifying effect in kcal/h.

2.544 Cooling Effect, Total, Air Cooler — It is the difference between the total enthalpy of the dry air and water vapour mixture entering the cooler per hour and the total enthalpy of the dry air and water vapour mixture leaving the cooler per hour, expressed in kcal/h.

2.545 Cooling Element — It is the heat transfer surface containing refrigerating fluid in the location where refrigerating effect is desired.

2.546 Cooling Medium — Any substance whose temperature is such that it is used with or without a change of state, to lower the temperature of other bodies or substances.

2.547 Cooling of Air — Reduction in air temperature due to the abstraction of heat as a result of contact with a medium held at a temperature lower than that of the air. Cooling may be accompanied by moisture addition (evaporation), by moisture extraction (dehumidification), or by no change whatsoever of moisture content.

2.548 Cooling Power — It is the maximum rate of heat-removal from a cooling plant operating under normal conditions

2.549 Cooling Range — In a water-cooling device, it is the difference between the average temperature of the water entering the device and the average temperature of the water leaving it.

2.550 Cooling, Direct Method of — It is a system in which the evaporator is in direct contact with the material or space refrigerated or is located in air circulating passages communicating with such spaces.

2.551 Cooling, Evaporative — It is the process of evaporating part of a liquid by supplying the necessary latent heat from the sensible heat of the main bulb of the liquid which is thus cooled.

2.552 Cooling, Indirect Method — It is a system in which a liquid, such as brine or water, cooled by the refrigerant, is circulated to the material or space refrigerated or is used to cool air.

2.553 Cooling, Regenerative — It is the process of utilizing heat which must be rejected or absorbed in one part of the cycle to perform a useful function in another part of the cycle by heat transfer.

2.554 Cooling, Surface — It is a method of cooling air of other gas by passing it over cold surfaces.

2.555 COP Degradation Factor (CDF) — This is a multiplier (≤ 1) applied to the full-load system COP or COP2. CDF is a function of part-load ratio (*see* part-load ratio).

2.556 Core Sucking and Filling System — A combination consisting of a pump, distributing piping, hose, and device by which water containing impurities may be withdrawn from the unfrozen core of an ice block, and by means of connection to the source of water supply; the core may be refilled with pure water.

2.557 Corrected Effective Temperature — The effective temperature corrected by accounting for the effect of radiation (*see* operative temperature).

2.558 Corrosion — The rusting or deterioration of a substance (usually a metal) because of a reaction to its environment.

2.559 Corrosion Inhibitor

a) Typically, a chemical agent that protects internal machine parts from the corrosive effects of the absorbent solution in the presence of an air chemical agent that slows corrosion of metal parts of a system; and

b) It is a substance added to a brine or other cooling medium.

2.560 Corrosivity — The capacity of an environment or environmental factor to bring about destruction of a specific metal by the process of corrosion.

2.561 Counter Flow Heat Exchanger — The heat exchanger in which fluids flow in opposite directions approximately parallel to each other; inlets for the two fluids are at opposite ends of the exchanger.

2.562 Counter Flow Heat Transfer — The directional pattern of the heat transfer fluids used in energy-exchange equipment where the warmest fluid 'A' indirectly contacts the warmest fluid 'B' at the entering side of the equipment and the coldest fluid 'A' indirectly contacts the coldest fluid 'B' at the leaving side of the equipment. Most energy exchange equipment is designed to use this method of heat transfer as it creates the highest log mean temperature difference (LMTD). When an energy exchange equipment is designed for counter flow heat transfer, and it is correctly connected in the field, the results would be loss in heat transfer capacity.

2.563 Counterflow Tower — One in which air, drawn in through air inlets at the tower perimeter (induced draft) or forced in (forced draft) at the base by the fan flows up through the fill material in a direction opposite to the falling hot water.

2.564 Cowl — It is the air terminal device intended to be installed above a natural ventilation exhaust duct with the aim (by creating negative pressure and depending on wind speed) of avoiding reverse flow and increasing flow rate. It may or may not have moving parts.

2.565 Creep Action — It is slow make/break action of a switch mechanism in a controller, as differentiated from snap action or toggle action.

2.566 Critical Velocity — It is the velocity above which fluid flow is turbulent.

2.567 Cross Connection

a) The connection between supply and return line in a hydronic system. May be used to balance system pressure, maintain a minimum circulation flow rate or temperature, etc; and

b) In a piping system, a connection in which a pipe carrying potable water is connected to a closed vessel (or system) that is above atmospheric pressure and that contains non-portable fluid. This is typically the point where a backflow preventer is required.

2.568 Cross Pipe — The fitting with four branches in the same plane with right angles between them.

2.569 Cross Ventilation

a) The natural ventilation in which the airflow mainly results from wind pressure effects on the building facades and where stack effects in the building are of less importance; and

b) It is a type of ventilating with air supply and exhaust points at opposite sides of ventilated space.

2.570 Cross-Connection Control Backflow Prevention — (First line of defense) installation of a backflow preventer or a vacuum breaker at each cross connection on a premise to protect both premise system and the main system.

2.571 Cross Flow Heat Exchanger — The heat exchanger in which fluids flow perpendicular to each other. Compared to counter flow heat exchanger.

2.572 Crossflow Tower — The tower in which air, drawn or forced in through the air intakes by a fan, flows horizontally across the fill section perpendicular to the falling hot water.

2.573 Crossover — It is migration between airstreams.

2.574 Crosstalk — This is an undesirable transfer of energy from active signal line(s) to one or more independent signal lines, creating signals that may reach proportions to cause system errors.

2.575 Cryocooling (Cryogenic Cooling) — It is cooling below – 244 °F (– 153 °C, 120 K).

2.576 Cryogenic Liquid — Liquefied gas below – 244 °F (– 153 °C, 120 K).

2.577 Cryogenics — The science that deals with the production of very low temperatures and their effect on the properties of matter.

2.578 Cryogrinding Process — (Freeze grinding), grinding at a low temperature of a substance that otherwise could not be ground or would be spoiled by the temperature rise resulting from the operation.

2.579 Cryo Hydrate — A frozen mixture of water and salt; brine mixed in eutectic proportions to give the lowest freezing point.

2.580 Cryopump — It is a device designed for producing an ultrahigh vacuum by condensation or adsorption of a gas at a very low temperature, usually below – 320 °F (– 196 °C, 77 K).

2.581 Cryostat — A batch operating apparatus in which a cryogenic liquid or solid evaporates to maintain a cryotemperature, which need not be constant but may vary in a predetermined fashion.

2.582 Cryo Temperature (Cryogenic Temperature) — The temperature within a few degrees of absolute zero (2.2 K).

2.583 Cryotrap — It is surface cooled below – 244 °F (– 153 °C, 120 K) in order to condense vapours. Can be used to reduce pressure.

2.584 Crystal Formation — It is the zone of maximum temperature range in freezing in which most of the freezing takes place (about 0.8 °C to 1.1 °C for water).

2.585 Cutting Room — The cold room in locker plants where animal carcasses are cut up into commercial sizes, such as rib roast, legs, etc.

2.586 Cycle, Binary Vapour — A refrigerating cycle in which two separate refrigerants are used, one superimposed upon augmenting the cycle of the other.

2.587 Cycle, Closed — It is any cycle in which the primary medium is always enclosed and repeats the same sequence of events.

2.588 Cycle, Defrosting — It is a refrigeration cycle which permits the cooling unit to defrost during 'OFF' period.

2.589 Cycle, Refrigerating — A sequence of thermodynamic processes through which a refrigerant passes, in a closed open system, to absorb heat at a relatively low temperature level and reject heat at a higher temperature level.

2.590 Cycle, Refrigerating, Ideal Basic Vapour Compression — A closed refrigerating cycle in which the refrigerant vapour compressed reversibly and is entropically, de-superheated irreversibly and condensed reversibly at constant pressure expanded irreversibly and adiabatically, and evaporated reversibly at constant pressure.

2.591 Cycle, Reversible — Theoretical thermodynamic cycle composed of a series of reversible processes, which can be completely reversed, for example, carnot cycle.

2.592 Daily Range — It is the difference between high and low temperatures for a typical day. Used in HVAC load calculations.

2.593 Dalton's Law — This law states that each constituent of a mixture of gases behaves thermodynamically as if it alone occupied the space. The sum of the individual pressures of the constituents equals the total pressure of the mixture.

2.594 Damp Building — A building that has a persistent and excessive accumulation of moisture which will, if allowed to persist, shorten the intended useful life of the building's contents, materials, structural fasteners, or systems.

2.595 Damper — A valve, or plate, used to regulate the flow of air or other fluid.

2.596 Damper, Multiple Louvers — It is a damper having a number of adjustable blades.

2.597 Dead Air Pocket — (Also known as dead zone), stagnant area in a space unaffected by air circulation.

2.598 Dead-End Trap — The piping arrangement for collecting oil or liquid refrigerant from suction gas prior to entry to a compressor.

2.599 Declination of Sun — It is the angle above or below the equatorial plane. It is plus if north of the plane and minus if below. Celestial objects are located by declination.

2.600 Dedicated Outdoor Air — A ventilation system that delivers 100 percent outdoor air to each individual space in a building.

2.601 Dedicated Outdoor Air System (DOAS) — This is an HVAC system specifically designed to condition 100 percent outdoor air to appropriate design conditions (temperature and humidity) and deliver this air to other systems or spaces.

2.602 Deep Ground Temperature — It is ground temperature at or below a soil depth of two meters.

2.603 Deep Vacuum — (also known as High Vacuum), a vacuum of 1 000 µm Hg (130 Pa) or less of absolute pressure.

2.604 Defrost, Automatic — A defrost system in which the defrost cycle is automatically initiated and automatically terminated with automatic resumption of normal refrigeration at the conclusion of the defrost operation. The defrost water is disposed off automatically.

2.605 Defrost, Manual — Manual defrost is one in which defrosting of refrigerated surface is accomplished by natural or manual means with manual initiation and manual termination of the overall defrost operation.

2.606 Defrost, Semi-automatic — A defrost system in which the defrost cycle is manually initiated and automatically terminated, with automatic resumption of normal refrigeration at the conclusion of the defrost operation. Defrost water is disposed off automatically or collected in a container for subsequent manual removal.

2.607 Defrost, Semi-automatic, Fast — A semi-automatic fast defrost system is the same as a semi-automatic defrost except that a means of accelerating defrosting is provided.

2.608 Defrosting — It is the process of removing unwanted ice or frost from a cooling surface.

2.609 Degradation Coefficient — It is a measure of efficiency loss due to cycling of equipment.

2.610 Degree Day (Kelvin-day) — This is the difference in temperature between the outdoor mean temperature over a 24 h period and a given base temperature, used in estimating heating and cooling energy use. For any one day, there are as many degree days (kelvin-days) as there are degrees fahrenheit (degrees celsius) departure of the mean temperature for the day from the base temperature.

2.611 Degrees of Freedom (DOF) — It is the number of parameters that determine the state of a physical system

2.612 Dehumidification — It is the process of condensation of water vapour from air by cooling below the dew point or the removal of water vapour from air by chemical or physical methods.

2.613 Dehumidifier — An air cooler or washer used for lowering the moisture content of the air passing through it; and an absorption or adsorption device for removing moisture from air.

2.614 Dehumidifier, Surface — An air-conditioning unit, designed primarily for cooling and dehumidifying air through the action of passing the air over wet cooling coils.

2.615 Dehumidifying Effect — The mass of water condensed during cooling or the equivalent refrigerating capacity expressed in terms of the latent heat of the water condensed per unit of time.

2.616 Dehydration — The removal of water vapour from air by the use of absorbing or adsorbing materials; and the removal of water from stored goods.

2.617 Dehydrator — This is a device for removing moisture from refrigerants or other substances.

2.618 Deicing — This is intentional melting of an ice layer.

2.619 Delivery Effectiveness — It is the ratio of the thermal energy transferred to or from the conditioned space to the thermal energy transferred at the equipment distribution system heat exchanger. Energy delivered to or from the conditioned space includes distribution system losses to the conditioned space.

2.620 Demand

It is the time rate of energy flow. In many other countries, demand is commonly used with other energy sources, especially district heat; and

a) The highest amount of power (average Btu/h over an interval) recorded for a building or facility in a selected time frame.

NOTE — Demand charges offset construction and maintenance of a utility's need for large generating capacity.

2.621 Demand Charge — It is a part of an electric bill based on kilowatt demand and the demand interval, expressed in dollars per kilowatt.

NOTE — Demand charges offset construction and maintenance of a utility's need for large generating capacity.

2.622 Demand Control — An application that utilizes input signals that measure the past and current demand and provide control of future use to maintain or reduce the target level.

2.623 Demand Defrost — Automatic defrosting system in which the defrost cycle is initiated by a drop-in performance of the refrigerating system.

2.624 Demand Factor — It is the ratio of the maximum electric demand to the connected load, usually monthly or annually (*see* electric power load factor).

2.625 Demand Interval — It is the period during which kilowatt demand is monitored by a utility service, usually 15 or 30 min.

2.626 Demand Limit Tripping — It is the removal of interruptible or deferrable load(s) at the user level when electric power or current flow to that user, or to a portion of the load, exceeds a specified level for more than a specified time, as determined by agreement. The automatic function can be enabled or disabled remotely by the serving utility via centralized communication.

2.627 Demand Limiter — A device that monitors user electric power demand and causes that demand to be limited in a manner not to exceed a selected or programmed maximum value.

2.628 Demand Load — It is the actual load on a circuit at any time. Sum of all loads which are on. Equal to the connected load minus the loads that are off.

2.629 Demand Period — It is the electric power demand interval.

2.630 Demand Savings — The reduction in the demand from the pre-retrofit baseline to the post-retrofit demand once independent variables (such as weather or occupancy) have been adjusted for. This term is usually applied to billing demand, to calculate cost savings, or to peak.

2.631 Demand-Limited Storage — This is a thermal storage system controlled to limit the electric power demand.

2.632 Dense-Air System — The cold-air system maintained under pressure greater than atmospheric in which air is compressed, heat of compression dissipated, and the air, chilled by expansion and performance of work, can create useful refrigeration.

2.633 Deposition — The direct formation of the solid phase by cooling a vapor below the triple point.

2.634 Desiccant — Any absorbent or adsorbent, liquid or solid, that will remove water or water vapour from a material. In a refrigeration circuit the desiccant should be insoluble in the refrigerant.

2.635 Desiccation — It is any process for evaporating water or removing water vapour from a material.

2.636 Design Working Pressure — It is the maximum allowable working pressure for which a specific part of a system is designed.

2.637 Desorption — It is liberation of a gas held in a substance by sorption.

2.638 Desuperheater — It is a refrigerant-to-water heat exchanger that transfers heat from high-pressure, high-temperature refrigerant to domestic water. Heat transfer occurs when the heat pump (air conditioner) operates to satisfy the building space conditioning load. Within the refrigeration circuit, the desuperheater is located between the compressor discharge and the reversing valve of a heat pump or between the compressor discharge and the inlet to the refrigerant-to-air condenser of an air conditioner.

2.639 Desuperheating Coil — This is a heat exchanger, preceding the condenser or incorporated in it, for removing all or part of the superheat.

2.640 Desuperheating Heat Rejection — It is sensible heat rejection from gaseous refrigerant in a condenser. Occurs prior to the gas-to-liquid phase change.

2.641 Determination — A complete set of measurements for a particular point of operation of a fan.

2.642 Deviation

a) It is the difference between the setpoint and the value of the controlled variable at any point in time; and

b) The difference between a single result and the mean of many results.

2.643 Dew Point, Apparatus — That temperature which would result if the psychometric process occurring in a dehumidifier, humidifier, or surface cooler were carried to the saturation condition of the leaving air while maintaining the same ratio of sensible to total heat load in the process.

2.644 Dew Point, Room — It is the dry-bulb (dewpoint, etc) temperature of the conditioned room or space.

2.645 Dewar Flask — It is a silvered vacuum flask with double walls with the space between the walls highly evacuated.

2.646 Dew-Point Rise — The increase in moisture content (specific humidity) of air expressed in terms of rise in dew-point temperature.

2.647 Diagram, Indicator — Pressure-volume diagram tracing condition of gas in a compressor or engine cycle in terms of pressure and volume displaced.

2.648 Dial Thermometer — It is a device that indicates temperature by a pointer moving over a circular scale.

2.649 Differential

a) Of a control, the difference between cut-in and cut-out temperatures or pressures; and

b) Range in which the controlled variable must pass in order to actuate various control functions.

2.650 Differential Controller

a) This is a controller reactive to the difference between values of two variables; and

b) It is a device used to maintain a given difference in pressure or temperature between two elements or two points.

2.651 Differential Pressure — It is the difference in pressure between any two points in the system.

2.652 Differential Pressure Control — *See* differential controller

2.653 Differential Temperature

a) This is the difference in temperature that exists between any two points or states when measured on the same temperature scale; and

b) In control terminology, the difference in temperature between the high event and the low event.

2.654 Diffuse — It indicates that flux propagates in many directions as opposed to a single direction, as in a direct beam, which refers to collimated flux. When referring to reflectance, it is the directional hemispherical reflectance less the specular reflectance.

NOTE — Diffuse has been used in the past to refer to hemispherical collection of transmitted or reflected radiation (including the specular component). This use is deprecated in favour of the more precise term hemispherical.

2.655 Diffuse Reflectance — It is the directional hemispherical reflectance less the specular reflectance.

2.656 Diffuse Sky Irradiance — The solar radiation that has been scattered in passing through the earth's atmosphere. It is equal to the global irradiance less the direct-normal and ground-reflected components.

2.657 Diffuse Solar Radiation — The solar radiation received from the sun after its direction has been changed by scattering by the atmosphere or other objects, such as the ground.

2.658 Diffuser Air — A circular, square, or rectangular air distribution outlet generally located in the ceiling and comprised of deflecting members discharging supply air in various directions and planes and arranged to promote mixing of primary air with secondary room air.

2.659 Diffuser, Air Ceiling — It is an air diffuser suitable only for ceiling mounting.

2.660 Diffuser, Air, Adjustable Flow Rate — It is an air diffuser incorporating a device for varying air flow rate without affecting the direction of the air jets.

2.661 Diffuser, Air, and Fully Adjustable — An air diffuser that incorporates independent devices to achieve the following:

a) Variation of the direction of air jets without alteration of the air flow rate; and

b) Variation of the airflow rate without alteration of the direction of the air jets.

2.662 Diffusible, Air, Adjustable Pattern — It is an air diffuser that incorporates an integral device by means of which the direction of the air jets can be varied.

2.663 Diffusion

a) It is the displacement of the molecules of a fluid within another fluid; and

b) The distribution of air within a space by an outlet discharging supplies air in various directions and planes.

2.664 Diffusion Absorption System — It is the refrigerating absorption system that, in addition to refrigerant and absorbent, also has an inert medium (such as hydrogen) to balance pressure in the various parts of the refrigerating circuit.

2.665 Diffusion Area — It is the effective area covered by a jet of air on leaving an outlet air device.

2.666 Diffusion Coefficient — It is the ratio of the mass flow of a substance diffusing through a surface of unit area to the rate of variation in the concentration of this substance normal to this surface (*see* mass diffusivity ratio).

2.667 Dimensions, Overall — The projected dimensions of a device, usually on horizontal and vertical planes, that can be used to determine whether the device will tit in an assigned space or can be moved through a designated passageway.

2.668 Direct Exhaust System — It is the mechanical venting system supplied or recommended by the manufacturer through which the products of combustion pass directly from the furnace or boiler to the outside and which does not employ a means of draft relief. Includes units that have small air passages in the flue that have an opening area that is not in excess of 10 percent of the cross-sectional area of the stack.

2.669 Direct Expansion (DX) — *See* direct-expansion (DX) refrigeration systems.

2.670 Direct Ice Contact — The ice storage system using a method of heat exchange in which ice is formed by direct refrigeration and melted by immersion in circulating water or secondary coolant. Also called static direct contact storage.

2.671 Direct Normal Irradiance — The (beam) irradiance received from the sun without significant change of direction from the apparent position of the sun. *See* the pyrheliometer.

2.672 Direct Vent System — The system that provides outdoor air directly to a unit for combustion and for draft relief and which provides for discharge of all flue gases to the outside atmosphere.

2.673 Direct-Expansion (DX) Refrigeration Systems

a) It is a system in which the cooling effect is obtained directly from the expansion of the liquid refrigerant into a vapour; and

b) It is the common term applied to an air-conditioning or refrigeration system that utilizes the vapor-compression refrigeration cycle. In a vapor-compression refrigeration cycle, the refrigerant removes heat in the evaporator by directly expanding the entering liquid refrigerant into vapor as it leaves the evaporator. The vapor is then compressed and piped to a condenser where the heat removed by the evaporator and the heat of compression are rejected to another medium so that the gaseous refrigerant is condensed to a liquid. The liquid is then piped to a pressure reducing device/metering device to be supplied to the evaporator.

2.674 Direct-Injection Humidifier — It is a device that injects steam directly into the airflow.

2.675 Directional Thermal Emittance — It is the ratio of the radiance from a surface in a particular direction to the radiance in that direction from a blackbody at the same temperature under the same conditions.

2.676 Direct-Return Piping System — It is the two-pipe system in which the heat transfer medium supplied to the first load is the first returned to the heat transfer equipment (Compare to Reverse Return Piping System).

2.677 Disc Valve — It is the compressor valve consisting of a metal disc that is lifted from an orifice in order to control fluid flow (*see* diaphragm valve).

2.678 Discharge Capacity — It is the amount of thermal energy that can be removed from the storage device during a period of time and for a specific set of values for the initial temperature of the storage device, the temperature of the entering fluid, and the mass flow rate of fluid through the storage system. Compared to Storage Capacity.

2.679 Discharge Coefficient — In the flow of fluids through nozzles and orifices, discharge coefficient is the product of the velocity coefficient and the contraction coefficient (*see* air discharge coefficient).

2.680 Discharge Line — (Also known as hot gas line), line through which refrigerant vapor flows from a compressor to a condenser.

2.681 Discharge Line Valve — (Also known as discharge stop valve), shutoff valve fitted to a compressor (or in the discharge line adjacent to it) which can be used to isolate the compressor from the discharge line.

2.682 Discharge or Intake Velocity (V_k) — The discharge or intake velocity (V_k) of an outlet or inlet, in fpm (m/s), is the velocity of the airstream measured at specified locations relative to the face of an outlet or inlet.

2.683 Discharge Pressure

a) It is the pressure generated on the leaving side of a fan or pump;

b) The pressure generated on the output side of a gas compressor in a refrigeration or air-conditioning system. The discharge pressure is affected by several factors: size and speed of the condenser fan, condition and cleanliness of the condenser coil, and the size of the discharge line. An extremely high discharge pressure coupled with an extremely low suction pressure is an indicator of a refrigerant restriction. It is also called high-side pressure or head pressure; and

c) It is the operating pressure in a system measured in the discharge line at the compressor or fan outlet.

2.684 Discharge Sound Power Level — The sound power that is transmitted from a device emanating sound and proceeding out of a device such as a terminal outlet.

2.685 Discharge Temperature — (Also known as delivery temperature), temperature of fluid as discharged, such as from a fan or compressor.

2.686 Discharge Test Time — It is the duration of a single transient test in which energy is removed from the storage device.

2.687 Discharge Valve — (Also known as delivery valve or outlet valve), in a compressor, the valve that allows compressed fluid to flow from the cylinder and prevents return flow.

2.688 Discharge-loss Coefficient — The actual discharge airflow rate divided by the theoretical discharge airflow rate at a given pressure difference.

2.689 Displacement Flow — The movement of air within a space in a piston- or plug-type motion. Minimal mixing of the room air occurs in ideal displacement flow, which is desirable for removing pollutants generated within a space. The laminar flow air-distribution system that sweeps air across a space may produce displacement flow.

2.690 Displacement Ventilation System — A type of air-distribution system, used only for cooling purposes, in which air at a temperature below room temperature is supplied to the floor level at a low discharge velocity [< 100 fpm (0.5 m/s)] and is returned near ceiling level. Thermal plumes, which develop over heat sources in the room, drive the overall floor to ceiling air motion, producing a stratified environment with cooler and fresher air near the floor and warmer and less fresh air near the ceiling.

2.691 Disposable Filters — The filters that are designed to operate through a specified performance range and then be discarded and replaced. An example is the cartridge filter.

2.692 Distribution Law — The law states that, if a substance is dissolved in two immiscible liquids, the ratio of its concentration in each is constant.

2.693 Distribution System

a) Conveying means, such as ducts, pipes, and wires, to bring substances or energy from a source to the point of use. The distribution system includes auxiliary equipment such as fans, pumps, and transformers; and

b) The parts of a cooling tower, beginning with the inlet connection, distribute the hot, circulating water within the tower to the points where it contacts the air.

2.694 Distribution System Efficiency — It is the ratio between the energy consumption by the equipment if the distribution system had no losses (gains for cooling) to the outdoors or effect on the equipment or building loads and the energy consumed by the same equipment connected to the distribution system under test.

2.695 Distributor — It is a device for dividing flow of liquid fluid between parallel paths in an evaporator or in other types of heat transfer apparatus.

2.696 District Cooling — The concept of providing and distributing, from a central plant, cooling energy to a surrounding area (district) of tenants or clients (residences, commercial businesses, or institutional sites). Compared to district heating.

2.697 District Energy System — It is the centralized facility for generation and distribution of the heating and cooling and/or power needs of a community, rather than individual heat or cold generators (that is, furnace or air conditioner) at each residential, commercial, or institutional site.

2.698 District Heating — The concept of providing and distributing, from a central plant, heating energy to a surrounding area (district) of tenants or clients (residences, commercial businesses, or institutional sites). Compared to district cooling.

2.699 District-Cooling System Cooling Density — It is the measure of cooling demand per unit area. Customary units are kW/hectare or tons/acre.

2.700 District-Heating System Heating Density — It is the measure of heating demand per unit area. Customary units are kW/hectare or therms/acre.

2.701 Diversion Pipe Fitting — A venturi jet or orifice in a tee that induces flow through branch lines by reducing the pressure in the main line following the branch.

2.702 Diversity Factor — A ratio, or percentage, obtained when the total output capacity of a system is divided by the total output capacity of all the terminal devices connected to the systems. Example: to express the ratio of VAV supply air fan capacity to the total capacity of the VAV terminal devices as a percentage.

2.703 Diverting Element — It is the element to divert the flow of air from one duct to another.

2.704 Diverting Valve — It is a three-way valve piped to supply a single source of fluid to either of two outlets. Compared to Mixing Valve.

2.705 Domestic Hot Water

a) It is heating water for domestic or commercial purposes other than space heating and process requirements; and

b) The potable hot water is distinguished from hot water used for heating.

2.706 Domestic Water Coil — It is the coil of tubing within a boiler to heat water for potable use; usually a hot-water tank is used for hot-water storage.

2.707 Door Dike — A door dike is a projection on the door which extends into the refrigerated compartments(s) and which functions primarily as a barrier to minimize heat flow to the interior of the cabinet.

2.708 Door, Refrigerator, Left Hand — It is a door which is hinged on the left-hand side of the door when viewed facing the cabinet.

2.709 Door, Refrigerator, Right Hand — It is a door which is hinged on the right-hand side of the door when viewed facing the cabinet.

2.710 Double-Acting Compressor — It is the compressor which has two compression strokes per revolution of crankshaft per cylinder (that is, both faces of the piston are working faces).

2.711 Double-Bundle Condenser — It is the condenser that contains two separate tube bundles, allowing the option of either rejecting the heat to the cooling tower or to another building system requiring heat input.

2.712 Double-Check Valve Backflow Preventer — It is a backflow prevention device designed to protect water supplies from contamination. It consists of two check valves assembled in series, usually with a ball valve or gate valve installed at

each end for isolation and testing. Often, test cocks (very small ball valves) are in place to attach test equipment for evaluating whether the double-check assembly is still functional. The double-check valve assembly is suitable for prevention of back pressure and back siphonage but is not suitable for high-hazard applications. It is commonly used on lawn irrigation, fire sprinkler, and combi-boiler systems. May also be referred to as double-check assembly (DCA).

2.713 Double-Contact Freezer — It is the contact freezer in which the product to be frozen is placed between two refrigerated surfaces and making contact with both the surfaces.

2.714 Double-Detector Check (DDC) Backflow Preventer — This device designed to serve as a detector check on fire-protection systems where pollutants are involved.

NOTE — DDC includes a line size, approved double-check valve backflow preventer with a metered bypass, into which has been incorporated a three-quarter inch, approved, double-check valve backflow preventer.

2.715 Double-Pipe Condenser (Tube-in-Tube Condenser) — It is the condenser constructed of concentric tubes in which the refrigerant circulates through the annular space and the cooling medium through the inner tube.

2.716 Double-Pipe Heat Exchanger — It is two pipes arranged concentrically, one within the other, and in which one fluid flows through the inner pipe and the other through the annulus between them.

2.717 Double-Riser Suction Line — An arrangement of two vertical suction lines in order to ensure oil entrainment or carryover at minimum load. Often the minimum load line is smaller than the full-load suction riser.

2.718 Double-Seated Valve — It is the valve having two seats and two discs arranged so that the upstream pressure is acting on one side of one disc and the opposite side on the other disc. This acts to cancel system forces and allows the use of a smaller actuator.

2.719 Double-Suction Compressor — It is the split suction valving arrangement on a compressor for carrying two suction pressures.

2.720 Double-Suction Riser — *See* double-riser suction line.

2.721 Double-Wall Heat Exchanger — In this exchanger two fluids separated by two walls with the space between open to the atmosphere so that a fracture on one wall will not transfer one fluid into the other. Used in water systems with a potable fluid and a potentially hazardous fluid.

2.722 Down-Discharge Makeup Air — The makeup air delivered directly to the interior plenum of an exhaust hood such that it is introduced vertically downward, typically from the front edge of the hood. Sometimes this kind of makeup air is referred to as an air curtain.

2.723 Down-Feed System — It is the piping arrangement for heating, air-conditioning, or refrigerating systems in which heating and cooling fluid is circulated through supply mains which are above the levels of the heating or cooling units they serve.

2.724 Down-Flow-Type Central Furnace — It is a furnace designed with airflow essentially in a vertical path, discharging air at or near the bottom of the furnace.

2.725 Draft — A current of air, when referring to the pressure difference which causes a current of air or gases to flow through a flue, chimney, heater, or space, or when referring to a localized effect caused by one or more factors of high air velocity, low ambient temperature, or direction of airflow, whereby more heat is withdrawn from a person's skin than is normally dissipated.

2.726 Drain Pan — It is the vessel or tray placed under an evaporator coil or cooling coil to receive condensed moisture, melted frost, or ice. Also called a drip tray or a defrost pan.

2.727 Drain Plug (Drain Cock) — It is the removable plug or key-operated draw-off valve intended to permit the removal of fluids or condensates.

2.728 Draft Rate (DR) — Estimated percentage of people dissatisfied due to annoyance by draft

2.729 Drain Valve — It is the valve fitted to the lowest point of an apparatus or refrigeration system for the purpose of tapping or draining the system.

2.730 Draught — *See* draft

2.731 Drawdown — It is the difference between the static water level and the active-pumping water level.

2.732 Drier — A manufactured device containing a desiccant, placed in the refrigerant circuit, its primary purpose being to collect and hold within the desiccant all water in the system in excess of the amount which can be tolerated in the circulating refrigerant.

2.733 Drift — In a water spray device the entrained unevaporated water carried from the device by air movement through it.

2.734 Drinking Water Cooler — An assembly which either employs or is used in conjunction with a mechanical condensing unit for the purpose of cooling drinking water.

2.735 Drinking Water Cooler, Bottled — A cooler which employs a bottle for storing the supply of water to be cooled and which utilizes a faucet for filling glasses or cups.

2.736 Drinking Water Cooler, Bubbler-Type — A cooler which is equipped to use water under pressure from a piped system as a supply to the cooler and which employs a valve in the drinking water line for controlling the flow of water to a bubbler or open flowing stream so that the water maybe drunk without utilizing glasses or cups.

2.737 Drinking Water Cooler, Capacity — The quantity of a water cooler will cool in a given ambient temperature with a given incoming water temperature and a given outgoing water temperature, under steady state conditions.

2.738 Drinking Water Cooler, Electric — A completely self-contained unit comprised of an insulated cabinet, evaporator, and electric motor-driven condensing unit.

2.739 Drinking Water Cooler, Faucet Pressure Type — A cooler which is equipped to use water under pressure from a piped system as a supply to the cooler and which utilizes a faucet for filling glasses or cups.

2.740 Drinking Water Cooler, Pressure Type — It is a type of water cooler, which employs a closed cooling chamber having connections for inlet water under pressure and outlet for cold water.

2.741 Drinking Water Cooler, Self-contained — A factory made assembly, in one structure which includes a complete mechanical refrigerating system and which has the primary function of cooling potable water and also provides for dispensing such water, by either integral or remote means or both.

2.742 Drinking Water Cooler, Storage Type — It is a type of water cooler, which stores and cools the water in the same container or separate containers. Such water coolers may or may not be filled with plumbing connection for water inlet, drain, overflow, etc.

2.743 Drip

a) A pipe, or a steam trap and a pipe considered as a unit, which conducts condensation from the steam side of a piping system to the water or return side of the system; and

b) Water which appears on thawing frozen food, water melting from evaporator, or water dropping from a cooling surface.

2.744 Droop

a) The deviation from the no-load control point that results from a change in the heating or cooling load;

b) A linear term referring to the percentage decrease in output voltage for a square wave or rectangular wave as a function of time. Also, can apply to voltage error caused by leakage in a sample and hold circuit; and

c) It is the vertical distance (hv) between the lowest horizontal plane tangent to a specified isovel and the centre of the core of an air jet (of an air jet in mixing air diffusion).

2.745 Drop-in Refrigerant — The replacement refrigerant that has thermodynamic properties similar to one being replaced and does not require air conditioning or refrigerating equipment to be replaced but may require modifications.

2.746 Droplet Condensation — This is the phenomenon encountered when the condensate does not wet the cold surface but settles in the form of separate droplets.

2.747 Drum Cooler — A rotating refrigerated cylinder whose surface is in contact with the liquid to be cooled.

2.748 Dry-Bulb Temperature (DBT) — It is the temperature of air measured by a thermometer freely exposed to the air, but shielded from radiation and moisture.

2.749 Dry Ice — A term used to describe solid carbon dioxide (CO_2) on account of its sublimation into gas without intermediate liquefaction.

2.750 Dryer — An appliance that removes moisture. Compared to Drier.

2.751 Dual Compression — The compression of refrigerant entering a single cylinder from two sources at different suction pressures.

2.752 Dual Thermostat

a) A pneumatic thermostat designed to maintain one temperature during the day and a lower temperature during the night;

b) The changes thermostat output from direct acting (DA) to reverse acting (RA) for seasonal changeover; and

c) It has two temperature controls in one enclosure.

2.753 Dual-Duct Air-Conditioning System — It is the system of a central plant that produces conditioned air at two temperatures and humidity levels to supply air through two independent duct systems to the points of usage where mixing may be carried out.

2.754 Dual-Duct Terminal — The terminal that mixes, for individual zonal needs, varying portions of two independent sources of primary air.

2.755 Dual-Effect Compressor — The compressor in which the cylinders have an additional suction inlet part way along the compression stroke which enables refrigerant to be drawn in at two different suction pressures.

2.756 Dual-Effect Control — It is the device responsive to temperatures of two zones or to two variable conditions.

2.757 Dual-Heating System — The heating system utilizing two fuel or energy sources, such as gas, oil, coal, or electric power, either as alternate sources or with one as a booster to the other.

2.758 Dual-Pressure Control

a) A combined pressure-regulating device, one part connected to the low-pressure side of the system and one part to the high-pressure side of the system, with a common switch mechanism;

b) It is two pressure controls in one enclosure; and

c) The use of a single device to accomplish some form of pressure control at two distinct setpoints, such as a dual-pressure switch.

2.759 Dual-Pressure Regulator — Upstream pressure regulator equipped with two controls, used in refrigerant suction lines to provide freeze-up protection or for safety pressure relief.

2.760 Dual-Pressure Relief Device — The two pressure relief devices mounted on a three-way valve that allows one device to remain active while the other is isolated.

2.761 Dual-Temperature Refrigerator — The two-compartment refrigerated cabinet with one used for chilling foods and the other for either freezing foods or storing frozen products.

2.762 Duct — A passageway made of sheet metal or other suitable material, not necessarily leak tight, used for conveying air or other gas at low pressures.

2.763 Ductless Hood — A listed, packaged system incorporating a hood, a fan, and air-treatment devices designed to remove most grease and particulate matter from the airstream before reintroducing the treated air into the occupied space.

2.764 Ductwork — A system of ducts for distribution and extraction of air. *See* system.

2.765 Dulong-Petit Law — The law states that, the product of the specific heat per gram and the atomic weight of many solid elements at room temperature have almost the same value, about 6.3 calories per degree Celsius (264 J/K).

2.766 Dump Water — The water drainage from an ice maker to control the clarity of ice or to prevent scaling.

2.767 Dump-Trap Liquid-Return Heating System — The method of separation and automatic return of liquid refrigerant from an accumulator in the low side to the high side of the plant.

2.768 Dunnage — These are strips of wood used in stowing cargo to provide air space between pieces or packages.

2.769 Dust — An air suspension (aerosol) of particles of any solid material usually with particle size less than 100 microns.

2.770 DX — Direct-expansion (DX) refrigeration systems.

2.771 Dynamic Characteristics of a Fan — The resonance frequencies and mode shapes of a fan.

2.772 Dynamic Head Loss — The reduction in the velocity head during flow, consisting of friction or energy losses per length of pipe and losses associated with bends, fittings, valves, etc. The most common equation used to calculate major head losses is the darcy–weisbach equation. Older, more empirical approaches are the hazen-williams equation and the prony equation.

2.773 Dynamic Ice — Ice formed on a cooling surface, then removed to be stored in an insulated container (tank). Compared to ice harvester.

2.774 Dynamic Pressure — *See* velocity pressure

2.775 Dynamic Suction Head — This is given by positive static suction head minus friction head and minus velocity head.

2.776 Dynamic Suction Lift — This is sum of suction lift and velocity head at the pump suction when the source is below the pump centreline.

2.777 Dynamic Viscosity — Force per unit area required to produce unit-relative velocity between two parallel areas of fluid unit distance apart. Also called coefficient of viscosity.

2.778 Dynamometer — A device for measuring power output of a running engine or motor.

2.779 Ebullator — A device inserted in flooded evaporator tubes to prevent the evaporator from becoming oil bound or the refrigerant liquid from becoming quiescent at a pressure lower than its boiling point.

2.780 Economizer

a) A process employing heat recovery equipment or heat exchangers; and

b) A device that, on proper variable sensing, initiates control signals or actions to conserve energy. A control system that reduces the mechanical heating and cooling requirement.

2.781 EDB — *See* entering dry-bulb (EDB) temperature

2.782 Energy Efficiency Ratio (EER) — It is the ratio of the cooling capacity (in British thermal units [BTU] per hour) to the power input (in watts).

2.783 Effect, Chimney — The tendency of air or gas in a duct or other vertical passage to rise when heated due to its lower density in comparison with that of the surrounding air or gas; in buildings, the tendency toward displacement (caused by the difference in temperature) of internal heated air by unheated outside air due to the difference in density of outside and inside air.

2.784 Effect, Cooling, Total — The difference between the total enthalpy of the dry air and water vapour mixture entering a unit per hour and the total enthalpy of the dry air and water vapour (and water) mixture leaving the unit per hour, expressed in kcal/h.

2.785 Effect, Dehumidifying — The heat removed in reducing the moisture content of air, passing through a dehumidifier from its entering to its leaving condition.

2.786 Effect, Heating, Compressor (Heat Pump) — The rate of heat delivery by the refrigerant assigned to the compressor in a heat pump system. This is equal to the product of the mass rate of refrigerant flow produced by the compressor and the difference in specific enthalpies of the refrigerant vapour at its thermodynamic state leaving the compressor and saturated liquid refrigerant at the pressure of the vapour leaving the compressor.

2.787 Effect, Humidifying — The latent heat of vaporization of water at the average evaporating temperature multiplied by the number of kilograms of water evaporated per hour and expressed in kcal/h.

2.788 Effect, Refrigerating — It is the rate of heat removal by a refrigerant in a refrigerating system. This is equal to the product of the mass rate of refrigerant flow in the system and the difference in specific enthalpies of the refrigerant at two designated points in the system or two designated thermodynamic states of the refrigerant. The term refrigerating effect is used to denote heat transfer to or from the refrigerant itself in a refrigeration system, whereas the term refrigerating capacity is used to denote the rate of heat removal from a medium or space to be cooled.

2.789 Effect, Refrigerating, Compressor — The rate of heat removal by the refrigerant assigned to the compressor in a refrigerating system. This is equal to the product of the mass rate of refrigerant flow produced by the compressor and the difference in specific enthalpies of the refrigerant vapour at its thermodynamic state entering the compressor and refrigerant liquid at saturation temperature corresponding to the pressure of the vapour leaving the compressor.

2.790 Effect, Refrigerating, Condensing Unit — The rate of heat removal by the refrigerant assigned to the condensing unit in a refrigerating system. This is equal to the product of the mass rate of refrigerant flow produced by the condensing unit and the difference in the specific enthalpies of the refrigerant vapour entering the unit and the refrigerant liquid leaving the unit.

2.791 Effect, Sun — Solar energy transmitted into space through windows and building materials.

2.792 Effect, Total Cooling — The difference between the total enthalpy of the dry air and water vapour mixture entering a unit per hour and the total enthalpy of the dry air and water vapour (and water) mixture leaving the unit per hour, expressed in kcal/h.

2.793 Effective Air Change Rate — The constant outdoor air change rate that would result in the same average pollutant concentration over the same period of time as actually occurs under varying conditions.

2.794 Effective Compressor Work — The network input absorbed at the shaft of a compressor, irrespective of time.

2.795 Effective Draft Temperature — A calculated temperature difference that combines air temperature difference and measured air speed at each test point.

2.796 Effective Efficiency

a) Overall efficiency; and

b) The ratio of the work absorbed in conveying and compressing a unit mass of refrigerant in a perfect compressor and the work absorbed, per unit mass of refrigerant, by the shaft of an actual compressor.

2.797 Effective Emittance of an Air Space — The combined effect of emittances from the boundary surfaces of an air space, where the boundaries are parallel and of a dimension much larger than the distance between them.

2.798 Effective Freezing — It is the time required from a given initial temperature to freeze a product and to lower its temperature at the thermal centre to a given value.

2.799 Effective Length of a Duct — The dimension by which a straight duct contributes to the length of an air-distribution installation.

2.800 Effective Length of a Fitting — The dimension by which a duct fitting contributes to the length of an air-distribution installation.

2.801 Effective Power Input — The average electrical power input to the equipment within a defined interval of time, in watts (that is, the sum of: the power input for operation of the compressor, excluding additional electrical heating devices; the power input of all control and safety devices of the equipment; and the proportional power input of the conveying devices for the transport of the heat transfer media through the heat pump only. Also, indoor-side and outdoor-side pumps, whether internal or external, whether provided with the equipment or not).

2.802 Effective Temperature — *See* operative temperature

2.803 Effective Temperature Difference — The difference between the room air temperature and the supply air temperature at the outlet in the room.

2.804 Effectiveness — Ratio of actual energy transfer to the maximum possible transfer.

2.805 Effectiveness Ratio of a Heat Exchanger — It is the ratio of the actual heat transfer to the thermodynamically limited maximum heat transfer possible in a counterflow exchanger of infinite transfer area.

2.806 Efficiency, Compression — Ratio of work required to compress, adiabatically and reversibly, all the vapour delivered by a compressor (per stage) to the actual work delivered to the vapour by the piston or blades of the compressor.

2.807 Efficiency, Mechanical — It is the ratio of the compression energy or work of a compressor to the energy or work input.

2.808 Efficiency, Volumetric, Apparent — It is the ratio of length of suction line, on indicator card, to stroke.

2.809 Efficiency, Volumetric, Due to Cylinder Heating — It is the ratio of the total to the apparent volumetric efficiency. It is also called real or no-clearance volumetric efficiency.

2.810 Efficiency, Volumetric, Total — It is the ratio of the actual volume of gas moved by the compressor or pump to the actual displacement of the compressor or pump.

2.811 Ejector — A device which builds up a high fluid velocity in a restricted area to obtain a lower static pressure at that point so that fluid from another source may be drawn in.

2.812 Elbow (Ell) — A pipe or duct fitting to make an angle between connected pipes or ducts. If angle is not specified, a 90° angle is implied.

2.813 Electric Space Heating — Permanently installed electric heating as the principal source of space heating throughout an entire dwelling or business establishment.

2.814 Electrolytic Hygrometer — It is a device that indicates relative humidity from the electrical resistance of a hygroscopic salt.

2.815 Element, Electric Heating — It is a unit assembly consisting of a resistor, insulated supports and terminals for connecting the resistor to electric power.

2.816 Element, Pressure Imposing — Any device or portion of the equipment used for the purpose of increasing the pressure upon the refrigerant.

2.817 Emergency Relief Valve — A manually operated safety valve for discharge of refrigerant in case of fire or another emergency.

2.818 Emissive Power — *See* emittance

2.819 Emissivity — The capacity of a material to emit radiant energy, emittance is the ratio of the total radiant flux emitted by a body to that emitted by an ideal black body at the same temperature.

2.820 Emittance — The ratio of the radiant flux emitted by a physical surface to that emitted by a blackbody at the same temperature and under the same conditions.

2.821 Emulsion — It is a relatively stable suspension of small but not colloidal particles of a substance in a liquid, the suspended particles being undissolved.

2.822 Enclosed Liquid Cooler

a) It is an apparatus for cooling fluid out of contact with the atmosphere; and

b) In a pressure-tight vessel, a heat exchanger consisting of an assembly of tubes containing the liquid to be cooled.

2.823 Energy — It is defined as capacity for producing an effect. Having several forms, which may be either stored or transient, and can be transformed from one into another. Forms include thermal (heat), mechanical (work), electrical, radiant, and chemical.

2.824 Energy, Internal — The sum of all the kinetic and potential energies contained in a substance due to the states of motion and separation of its several molecules, atoms, and electrons. It includes sensible heat (vibration energy) and that part of the latent heat that is represented by the increase in energy during evaporation.

2.825 Enhancement Factor — The water vapor pressure enhancement factor, f, is the ratio of the actual partial pressure, pwvs, of saturated water vapor in moist air to the vapor pressure of pure water (H_2O), e, at the same temperature. [f = pwvs(p,t)/e(t)].

This factor accounts for the non-ideal behaviour of saturated water vapor in air due to:

a) The effect of intermolecular forces (gas imperfections);

b) The effect of pressure on the properties of the condensed phase; and

c) The effect of dissolved gases.

2.826 Entering Dry-Bulb (EDB) Temperature — The temperature that a thermometer would measure for air entering the evaporator coil. (for example, for a draw-through fan configuration with no heat gains or losses in the ductwork, EDB equals the indoor dry-bulb temperature).

2.827 Entering Wet-Bulb (EWB) Temperature — The temperature that the wet-bulb portion of a psychrometer would measure if exposed to air entering the evaporator coil. For a draw-through fan with no heat gains or losses in the ductwork and no outdoor air mixed with return air, this would also be the zone air wet-bulb temperature. For a similar configuration, but when outdoor air is mixed with return air, EWB equals the mixed-air wet-bulb temperature. For mixtures of water vapor and dry air at atmospheric temperatures and pressures, the wet-bulb temperature is approximately equal to the adiabatic saturation temperature (temperature of the air after undergoing a theoretical adiabatic saturation process). The wet-bulb temperature given in psychrometric charts is really the adiabatic saturation temperature.

2.828 Enthalpy — A thermodynamic property of a substance defined as the sum of its internal energy plus the quantity pv/J.

where

p = Pressure of the substance;

v = Volume; and

J = Mechanical equivalent of heat.

2.829 Enthalpy, Specific — It is enthalpy per unit weight of a substance.

2.830 Entrainment Flow — Systems with ceiling-based supply air diffusers and return air grilles are common examples of air-distribution systems that produce entrainment flow (also known as conventional mixing).

2.831 Entropy — The ratio of the heat added to a substance to the absolute temperature at which it was added.

2.832 Entropy Specific — It is entropy per unit weight of a substance.

2.833 Entry Loss — The loss in pressure caused by a fluid stream flowing into a pipe, duct, hood, or vessel.

2.834 Envelope — The boundary surface of points of equal terminal velocity that describe the air-diffusion profile. Envelope is also referred to as isovel.

2.835 Envelope Component — The major section of the entire envelope, such as the opaque walls above grade, ceilings, slabs, floors, glazings, doors, or walls below grade.

2.836 Envelope Floor — The lower portion of the building envelope, including opaque area and fenestration, that has conditioned or semi heated space above and is horizontal or tilted at an angle of less than 15 ºC (60 ºF) from horizontal but excluding slab-on-grade floors. For the purposes of determining building envelope requirements, the classifications are defined as follows:

a) Mass floor: A floor with a heat capacity that exceeds:

   1) 7 Btu/ft²·°F (39.7 watt h/m² °C); or

   2) 5 Btu/ft²·°F (28.4 watt h/m²·°C) provided that the floor has a material unit mass not greater than 120 lb/ft³ (1924.6 kg/m³).

b) Steel joist floor: a floor that:

   1) That is not a mass floor; and

   2) It has steel joist members supported by structural members.

c) Wood framed and other floors: all other floor types, including wood joist floors.

2.837 Environment — All of the elements over which a designer has no control and that affect a system and its input or output.

2.838 Environmental Chamber — Enclosed space designed to create a particular environment (also known as climatic chamber).

2.839 Environmental Conditions — The natural or controlled conditions of air and radiation prevailing around a person, an object, a substance, etc.

2.840 Environmental Systems — The systems that primarily use a combination of mechanical equipment, airflow, water flow, and electrical energy to provide heating, ventilating, air conditioning, filtration, humidification, and dehumidification for the purpose of human comfort or process control of temperature and humidity.

2.841 Enzyme — It is a complex organic substance such as diastase, pepsin, etc, capable of transforming, by catalytic action, some other compound; a soluble ferment.

2.842 Equal Friction Method Duct Sizing — The method in which ducts are sized so that their frictional resistance per unit length is constant.

2.843 Equalizer — It is a piping arrangement to maintain a common liquid level or pressure between two or more chambers.

2.844 Equalizer, External — In a thermostatic expansion valve, a tube connects from a selected control point in the low-side circuit to the pressure sensing side of the control element such that the control-point pressure is transmitted to the actuating element (diaphragm or bellows). This connection provides a means for compensating for the pressure drop through accessories and the evaporator.

2.845 Equalizer, Internal — In a thermostatic expansion valve, an integral internal port or passage whereby the actuating element (diaphragm or bellows) is exposed to pressure leaving the valve.

2.846 Equalizing Damper — It is a device to maintain constant downstream static pressure or volume flow.

2.847 Equilibrium — It is the steady-state condition during which the fluctuations of variables being measured remain within stated limits.

2.848 Equilibrium-Point Dryness (EPD) — The water content of a liquid refrigerant after being in contact with a specific drier at a particular temperature long enough to reach an equilibrium state. EPD is expressed in milligrams of water per kilogram of refrigerant (ppm).

2.849 Equipment — A devices that serve all or part of the building and may include electric power, lighting, transportation, or service water heating, including, but not limited to, furnaces, boilers, air conditioners, heat pumps, chillers, water heaters, lamps, luminaires, ballasts, elevators, escalators, or other devices or installations.

2.850 Equipment Capacity — The manufacturer's rated capacity at the defined rating point for HVAC equipment. Equipment capacity should be adjusted for altitude and other effects.

2.851 Equivalent Evaporation — The amount of water a boiler would evaporate, in litre per hour, if it received and vaporized feed water at 100 °C and atmospheric pressure.

2.852 Ethylene Glycol — The clear, colourless liquid used to depress the freezing point of water for use as a secondary coolant in HVAC and R systems. Inhibitors are required to control corrosion caused by ethylene glycol solutions.

2.853 Eudiometer — An instrument for volumetric measurement and analysis of gases.

2.854 Eupatheoscope — It is an instrument for assessing comfort environment in terms of operative temperature.

2.855 Eutectic — The mixture of substances whose solid and liquid phases in equilibrium have identical composition. Such a mixture has a minimum freezing point.

2.856 Eutectic Ice — It is a frozen eutectic mixture used as cold accumulation.

2.857 Eutectic Plate — A thin, rectangular container containing eutectic mixture, generally with a coil to be connected to a refrigerating system in order to freeze the mixture.

2.858 Eutectic Point — It is the freezing temperature of a liquid mixture that produces a solid phase of the same composition.

2.859 Eutectic Solution — The mixture that melts or freezes, normally at a specific temperature, with constant composition. The mixture's melting point is usually the lowest possible for mixtures of given substances (*See also* Cryohydrate).

2.860 Evacuated Thermal Insulation — Insulation consisting of double walls, with the space between them (with or without packing) evacuated (also known as Vacuum Insulation).

2.861 Evaporating Temperature — It is the temperature at which a fluid vaporizes at a given pressure.

2.862 Evaporation — Change of state from liquid to vapour.

2.863 Evaporative Equilibrium (of a Wet-Bulb Instrument) — The condition attained when the wetted wick has reached a stable and constant temperature. (When the instrument is exposed to air at velocities over 5 m/s, this temperature may be considered to approach the true wet-bulb temperature).

2.864 Evaporator (Refrigerant) — It is a heat exchanger in which the liquid refrigerant, after reduction of its pressure (expansion), is evaporated by absorption of heat from the medium to be cooled.

2.865 Evaporator, Dry Type — An evaporator of the continuous tube type where refrigerant from a pressure reducing device is fed into one end and the suction line connects to the outlet end.

2.866 EWB — *See* entering wet-bulb (EWB) temperature.

2.867 Excess Air — In combustion, percent of air greater than that required theoretically to completely oxidize the fuel.

2.868 Exergy — It is the property of a system that is the maximum useful work possible during a process that brings the system into equilibrium with a heat reservoir. Exergy is a combination property of a system and its environment because unlike energy, it depends on the state of both the system and environment. The exergy of a system in equilibrium with the environment is zero. Exergy is neither a thermodynamic property of matter nor a thermodynamic potential of a system.

2.869 Exfiltration — It is air flow outward through a wall, leak membrane, etc.

2.870 Exhaust Opening — It is any opening through which air is removed from a space which is being heated or cooled, or humidified or dehumidified, or ventilated.

2.871 Exhauster — A fan used to withdraw air under suction.

2.872 Exit Air — Air with acceptable quality that may be removed from the space for pressurization control.

2.873 Exitance — Total radiant flux that leaves a unit area of a surface. The sum of the radiant flux emitted and reflected by the surface plus any radiant flux transmitted through that surface. Compared to radiosity.

2.874 Expansion Valve, Capacity — It is the refrigerating effect in kcal/h produced by the evaporation of refrigerant passed by the valve under specified conditions.

2.875 Expansion Valve, Superheat — It is the difference between the temperature of the thermal bulb and the temperature corresponding to the pressure at the outlet or at the equalizer connection, when provided, of a thermostatic expansion valve.

2.876 Expansion Valve, Superheat Change — The change in superheat of a thermostatic expansion valve required to open the valve at a predetermined amount.

2.877 Expansion, Coefficient of — It is the change in length per unit length or the change in volume per unit volume per degree change in temperature.

2.878 Expansion, Dry — It is a processor heat removal by a refrigerant in an evaporator fed by a flow control, responsive to temperature or pressure, or both, at some point in the evaporator or to the difference between high- and low-side pressures and not to the liquid level in the evaporator. All entering refrigerant is evaporated before being re-circulated.

2.879 Expansion, Multistage — Passing volatile refrigerant through two or more pressure reducing devices, connected in series, usually with an evaporator between them, operating at one pressure and a second evaporator fed through both devices at a lower pressure.

2.880 Expendable Refrigerant

a) Liquefied gas (generally liquid nitrogen) whose vapor is lost after change of phase; and

b) Solid carbon dioxide (dry ice).

2.881 Extended Surface — It is a heat transfer surface, one side of which is increased in area by the addition of fins, discs, or other means.

2.882 Exterior Building Envelope — *See* building envelope

2.883 External Defrosting — Defrosting using heat from external sources.

2.884 External Equalizer — In a thermostatic expansion valve, a connection from a selected point in the low-pressure part of the circuit to the system pressure-sensing side of the actuating element such that the selected point pressure is transmitted to the actuating element (for example, diaphragm or bellows).

2.885 External Heat — Heat generated from sources outside the conditioned area. This heat from gas, oil, steam, electricity, or solar sources supplements internal heat and internal process heat sources. Recovered internal heat can reduce the demand for external heat.

2.886 External Static Pressure Loss — *See* static pressure loss

2.887 Extract Air — Airflow leaving a treated space. Compared with return air

2.888 Eyebrow Hood — An eyebrow hood is mounted directly to the face or top of an appliance above the opening(s) or door(s) from which effluent is emitted, overhanging the front of the opening(s) to capture the effluent. Mounting height is fixed.

2.889 Fabric Filter — The filter having a textile-based filter medium.

2.890 Facade Area — The area of the facade, including overhanging soffits, cornices, and protruding columns, measured in elevation in a vertical plane parallel to the plane of the face of the building. Non-horizontal roof surfaces shall be included in the calculation of vertical façade area by measuring the area in a plane parallel to the surface.

2.891 Face Area — The total plane area of the portion of a grille, coil, or other item bounded by a line tangent to the outer edges of the openings through which air can pass.

2.892 Face Velocity — It is the rate of air movement at the face of the device (airflow rate divided by face area), expressed in m/s (fpm) to three significant figures.

2.893 Fahrenheit Temperature — Temperature scale used with the I-P system in which, at standard atmospheric pressure, the boiling point of water is 212 °F and its freezing point is 32 °F; absolute zero is minus – 459.69 °F.

2.894 Fan — It is a device for moving air by two or more blades or vanes attached to a rotating shaft.

2.895 Fan Curve — It is a diagram showing the pressure/volume characteristics of a fan, and often the power required by the fan.

2.896 Fan, Attic — An exhaust fan to discharge air near the top of a building while cooler air is forced (drawn) in at a lower level.

2.897 Fan, Centrifugal — A fan rotor or wheel within a scroll-type housing and including driving mechanism supports for either belt drive or direct connection.

2.898 Fan, Economizer — A device which prevents operation of the fan motor on a cold diffuser during the shutdown period after the coil has been defrosted.

2.899 Fan, Exhaust — A fan used to remove or exhaust air from space.

2.900 Fan, Propeller — A propeller or disc-type wheel within a mounting ring or plate and including driving mechanism supports for either belt drive or direct connection.

2.901 Fan, Shroud — A protective housing which surrounds the fan and which may also direct the flow of air.

2.902 Fan, Tube Axial — A propeller or disc-type wheel viscous within a cylinder and including driving mechanism support for either belt drive or direct connection.

2.903 Fan, Vane Axial — A disc-type wheel within a cylinder, a set of air guide vanes located either before or after the wheel, and including driving mechanism supports either for belt drive or direct connection.

2.904 Fanning Friction Factor — It is dimensionless number f used in studying fluid friction in pipes, equal to the pipe diameter times the drop-in pressure in the fluid due to friction as it passes through the pipe divided by the product of the pipe length and the kinetic energy of the fluid per unit volume.

2.905 Feedwater Economizer — This is a heat exchanger installed in the hot-gas duct between the boiler and the stack to transfer a portion of the heat (that would be lost up the stack) to the feedwater.

2.906 Fenestration

a) This term is commonly used to refer to any opening, usually glazed, in a building envelope; windows. Examples include windows, plastic panels, clerestories, skylights, glass doors that are more than one-half glass, and glass block walls; and

b) In an external wall of a building, any area that allows light to pass.

2.907 Fenestration Elements

a) Framing, mullions, muntins, and dividers;

b) Glazing material, either glass or plastic;

c) External shading devices;

d) Internal shading; and

e) Integral (between glasses) shading systems or devices.

2.908 F-Factor — The perimeter heat loss factor for slab-on-grade floors, expressed in $Btu/h \cdot ft^2 \cdot °F$ ($W/m^2 \cdot °K$).

2.909 Fick's Law — The rate of diffusion of matter across a plane is proportional to the negative of the rate of change of the concentration of the diffusing substance in the direction perpendicular to the plane.

2.910 Film Boiling — Boiling phenomenon corresponding to the development of a continuous vapor layer on the heating surface that separates this surface from the boiling liquid.

2.911 Film Coefficient — It is the heat transferred between a surface and a fluid in unit time through unit area induced by unit temperature difference.

2.912 Film-Cooling Tower — Cooling tower with a type of packing over which the water spreads in a thin film.

2.913 Film-Forming Condensation — This is the phenomenon encountered when the condensate wets a cold surface to form a continuous film that separates this surface from the vapor.

2.914 Filter — It is a device to remove solid material from a fluid.

2.915 Filter Press — It is a device for separating solid and liquid matter under pressure so that the solid residue is compressed into briquettes to facilitate removal.

2.916 Filter, Air Cleanable — It is a filter in which the medium can be washed or wiped.

2.917 Filter, Air Replaceable Media — It is a non-cleanable filter in which the filter medium, when dirty, is discarded and replaced by a new one.

2.918 Filter, Air, Dust Holding Capacity — The mass of duct which a filter can retain at rated airflow during an increase in resistance from that under clean conditions to the resistance at some arbitrary chosen value. It is usually twice the value of the pressure drop at clean conditions.

2.919 Filter, Air, Electrostatic — An air filter that applies an electric charge to the dust particles in the air stream, and collects, precipitates or builds up the particles on plates of opposite charge.

2.920 Filter, Suction-Line — It is a device installed in the suction line of a refrigerating system for the purpose of removing solid contaminants. The device generally consists of a shell with fittings and an internal filtering element.

2.921 Filtration — The process of passing a liquid through a porous material in such a manner as to remove suspended matter from the liquid.

2.922 Fin — An extended surface to increase the heat transfer area, as metal sheets are attached to tubes.

2.923 Fin Pitch — It is the number of transverse fins per unit length of tube.

2.924 Fin Spacing — It is the distance between two successive transverse fins on a tube.

2.925 Final Filter

a) A filter positioned in the last filtering position in an air-handling system; and

b) The filter used to collect the loading dust that has passed through a device during the test procedure.

2.926 Final Resistance

a) The resistance at which a filter, or filter media, should be replaced; and

b) The resistance to airflow of the air-cleaning device at which the test is terminated and results calculated, expressed in Pa (in. of water).

2.927 Finned Length — It is distance between the two end fins (excluding lengths for return bends and other overall lengths).

2.928 Finned Surface Area — It is the total area of fins and prime surface of tube or plate to which fins are attached.

2.929 Fire Damper — It is a device that interrupts airflow automatically through part of an air system to restrict passage of flame. Installed in a fire-rated wall or floor and closes automatically in the event of fire to maintain the integrity of the fire-rated separation.

2.930 First Air — In a cleanroom, air that issues directly from the HEPA filter before it passes over any work location.

2.931 Flammability — It is the ability of a material to burn.

2.932 Flammable Refrigerant — The refrigerant that is ignitable when mixed with air (for example, ethyl chloride, methyl chloride, and the hydrocarbons).

NOTE — *See* IS 16656/ISO 817 for flammability categories.

2.933 Flare Fitting — It is a type of soft-tube connector which requires the flaring of the tube to provide a mechanical seal.

2.934 Flash Chamber — Separating tank placed between the expansion valve and evaporator in a refrigeration system to separate and bypass any flash gas formed in the expansion valve.

2.935 Flash Point — Temperature of combustible material, as oil, at which there is sufficient vaporization to support combustion of the material.

2.936 Flashing — The physical transformation of a fluid from its liquid state into its vapor or gaseous state. It is caused by the actual pressure of the fluid being lower than the vapor pressure of the fluid at that operating temperature.

2.937 Flexible Duct — The ducts constructed of flexible materials, such as polymeric films, metal foils, and impregnated fabrics, and used to connect rigid ducts to air devices and terminals.

2.938 Flexible-Shaft Centrifugal Compressor — The impeller and shaft are a one-piece assembly, the latter of a small diameter so that it can flex and spontaneously balance the inertial forces resulting from rotation.

2.939 Floc Point — The temperature observed at the start of the formation of wax or other solid; determined by a standardized test to assess the low-temperature compatibility of certain petroleum products with refrigerants.

2.940 Flooded Evaporator — Refrigerant evaporator characterized by no organized flow, in which most of the evaporator surface is in contact with the liquid refrigerant, and from which the refrigerant exits at a vapor quality of one, without significant superheat (compared to dry expansion evaporator).

2.941 Flotation — It is a method of treating materials floating in a liquid. It is an ice-making method in which ice floats away from the surface on which it has been frozen.

2.942 Flow — It is continuous motion of a fluid in pipes, ducts, channels, or through openings.

2.943 Flow, Turbulent — It is fluid flow in which the fluid moves transversely as well as in the direction of the tube or pipe axis, as opposed to streamline or viscous flow.

2.944 Flowmeter

a) A device employing a detecting element that determines the flow rate of a volatile refrigerant in the gaseous or liquid phase within a closed conduit by measuring a suitable response of the detecting element; and

b) A device for measuring or determining the mass or volumetric flow rate of a fluid in a duct, pipe, or terminal device.

2.945 Fluid — It is substance, as a liquid or gas, that is capable of flowing, and which changes shape when acted on by a force.

2.946 Fluid, Heat Transfer — Any gas, vapour, or liquid used to absorb heat from a source at a high temperature and reject it to a lower temperature substance.

2.947 Fluid, Primary — It is the refrigerant, distinguished from secondary fluid or brine.

2.948 Fluid Refrigerating — Any fluid used to transfer heat between cold refrigerant and the substance or bodies to be cooled, by circulation of the fluid without change of state or by an evaporation-condensation process at essentially equal pressures.

2.949 Fluid, Secondary — Fluid cooled by the refrigerant in an indirect method of refrigeration.

2.950 Fluidized-Bed Freezer — Having a perforated bottom through which an upward flow of cold air suspends the produce, usually of small unit size, and causes it to flow like a fluid.

2.951 Fluorocarbon — Any of a broad group of organic compounds analogous to hydrocarbons in which all or most of the hydrogen atoms of the hydrocarbon have been replaced by fluorine; some types also contain chlorine, and these are called chlorofluorocarbons. The saturated, aliphatic-type fluorocarbons comprise the series of refrigerants developed by Midgeley in the 1 930 s (compared to halocarbon).

2.952 Foaming — Formation of a foam or froth of oil-refrigerant due to rapid boiling out of the refrigerant dissolved in the oil when the pressure is suddenly reduced. This occurs when the compressor starts operating, and if large quantities of refrigerant have been dissolved, large quantities of oil may boil out and be carried through the refrigerant lines.

2.953 Fog — Suspended liquid droplets generated by condensation from the gaseous to the liquid state or by breaking up a liquid into a dispersed state, such as by splashing, foaming, and atomizing.

2.954 Forced Circulation Air Cooler — It is a cooler which includes a fan or a blower for positive air circulation.

2.955 Fore Cooler — In an ice plant, a device for cooling the water for ice making before it enters the cans; pre-cooler.

2.956 Forecooler — It is a device for cooling water before pouring into ice-making cans, precooler in an ice plant.

2.957 Four Pipe Air-Conditioning System — This is a multiple piping arrangement in which each unit is fitted with supply and return pipes separately for hot and chilled water.

2.958 Fractionation — A change in composition of a blend by preferential evaporation of the more volatile component(s) or condensation of the less volatile component(s).

2.959 Free Delivery-Type Air Cooler — It is a cooler taking air from and discharging it-directly to the space to be treated without any element external to the cooler to impose air resistance.

2.960 Free Delivery-Type Unit — It is a device which takes in air and discharges it directly to the space to be treated without external elements which impose air resistance.

2.961 Freeze/Thaw Resistance — The property of a material which permits it to be alternately frozen and thawed through many cycles without damage.

2.962 Freezer — A refrigerated chamber maintained substantially colder than the freezing point temperature of the contents.

2.963 Freezer, Carrying — Cold storage freezer room, generally kept between – 147 °C and – 7 °C, to receive and hold frozen goods.

2.964 Freezer, Household — A cabinet which is designed for the extended storage of frozen food at a recommended temperature of – 18 °C at 32 °C ambient, with inherent capability for the freezing of food and a source of refrigeration, and it is intended for household use.

2.965 Freezer, Household, Chest — It is a household freezer which is accessible from the top.

2.966 Freezer, Household, Upright (Vertical) — An upright freezer is a household freezer which is accessible from the front.

2.967 Freezer, Sharp — It is a storage freezer room, generally kept at – 34 °C to – 23 °C, to receive unfrozen goods and freeze them.

2.968 Freeze-Up — It is the failure of a refrigerating unit to operate normally due to formation of ice at the expansion device. A valve may freeze shut or open, causing improper refrigeration in either case. On a coil, frost formation to the extent that air flow stops or is severely restricted.

2.969 Freezing — It is the process of changing a liquid substance or the liquid content of a food or other commodity to a solid state by the removal of heat.

2.970 Freezing Method, Refrigerated Plate — It is heat transfer by means of the direct contact of refrigerated plates with the packaged product.

2.971 Freezing Method, Spray — Refrigerated liquid is sprayed into an insulated enclosure containing the product to be frozen.

2.972 Freezing Method, Tray — It is a method of freezing food by subjecting it to moving refrigerated air. The food is arranged on shallow trays which are placed in portable racks and put in an insulated chamber through which the air is blown.

2.973 Freezing Point — It is the temperature at which a given liquid substance will solidify or freeze upon removal of heat. Freezing point for water is 0 °C.

2.974 Freezing Time — It is the time for any complete freezing process to take place.

2.975 Freezing, Quick — It is the process of freezing a food or other commodity at a rapid rate of temperature reduction to produce a desired crystalline structure in the frozen product.

2.976 Fresh Air Makeup — The volume of outdoor air introduced into a space.

2.977 Friction Factor

a) Any of several dimensionless numbers used in studying fluid friction in pipes, equal to the Fanning friction factor times some dimensionless constant;

b) Coefficient used to calculate friction forces due to fluid flow; and

c) Quotient of the tangential force exerted by a fluid on a surface (per unit area) by half the product of the density and the square of the velocity.

2.978 Friction Head — The height of liquid that represents system resistance caused by the flow.

2.979 Friction Loss — It is the pressure loss due to friction between a flowing fluid and its contact surface.

2.980 Frost Back — It is the flooding of liquid from an evaporator into the suction line, accompanied by frost formation on the suction line in most cases.

2.981 Frozen Food — Any food in which the water contained in it is in solid form.

2.982 Fume — Solid particles formed by condensation of vapors of solid materials or a discharge gas or byproduct of combustion or chemical process. Very small airborne particles, usually less than one micrometer in size, from burning or melting materials or a chemical process.

NOTE— Popularly, the term fumes refers to any kind of air contaminant, many laws and regulations add a qualification that the contaminant has some unwanted action.

2.983 Fume Hood (Generic Term) —It is a fume-collection device mounted over a work space, table, or shelf and serving to conduct unwanted gases away from the area enclosed. The least effective fume hood is a canopy hood, open on four sides. The most effective fume hood effective is an enclosed hood with operable front sash and fixed sides and back (compared to laboratory fume hood).

2.984 Fume-Hood Face — It is the plane of minimum area at the front portion of a laboratory fume hood through which air enters when the sash is fully opened or opened to a stop position [usually in the same plane as the sash(es) when present].

2.985 Fume-Hood System — An arrangement consisting of a fume hood, its adjacent room environment, and the air exhaust equipment (such as blowers and ductwork) required to make the hood operable.

2.986 Fumes — Solid particles commonly formed by the condensation of vapours from normally solid materials such as molten metals. Fumes may also be formed by sublimation, distillation, calcination, or chemical reaction wherever such processes create airborne particles predominantly below one micron in size. Such solid particles sometimes serve as condensation nuclei for water vapour to form smog.

2.987 Fumigation — In the food industry, exposure of a product to gaseous substances, generally to kill insects, their eggs, and larvae.

2.988 Functional Performance Testing (FPT)

a) The process of determining the ability of the HVAC system to deliver heating, ventilating, and air-conditioning services in accordance with the final design intent; and

b) That full range of checks and tests carried out to determine if all components, subsystems, systems, and interfaces between systems function in accordance with the contract documents. In this context, function includes all modes and sequences of control operation, all interlocks and conditional control responses, and all specified responses to emergency conditions.

2.989 Furnace

a) It is an enclosed chamber or structure in which heat is produced, as by burning fuel or by converting electrical energy; and

b) It is the part of a warm-air heating system in which energy is converted to heat.

2.990 Fusible Plug — It is a device having a predetermined melting temperature member for the relief of pressure (gauge):

a) An instrument for measuring pressure or liquid level; and

b) Also, an arbitrary scale of measurement for sheet metal thickness, wire, and drill diameters, etc.

2.991 Fusion — It is a chemical term for a change of phase from solid to liquid.

2.992 Garment Insulation (Iclu) — The increased resistance to sensible heat transfer obtained from adding an individual garment over the nude body. It is expressed in clo units.

2.993 Gas — A gas is defined as a state of matter consisting of particles that have neither a defined volume nor defined shape because of less intermolecular force.

2.994 Gas Constant — The coefficient R in the perfect gas equation pv = Rt.

2.995 Gas, Flash — It is the gas resulting from the instantaneous evaporation of refrigerant in a pressure reducing device to cool the refrigerant to the evaporation temperature at a reduced pressure.

2.996 Gas, Foul (Non-condensable Gas) — It is a gas in a refrigerating system, which does not condense at the temperature and partial pressure at which it exists in the condenser, therefore imposing a higher head pressure on the system.

2.997 Gas, Inert — A gas that neither experiences nor causes chemical reaction nor undergoes a change of state in a system or process; for example, nitrogen or helium mixed with a volatile refrigerant.

2.998 Gas/Air Mixture

a) Lean mixture — Gas/air mixture of which the air content is more than adequate for complete combustion, and the resultant combustion gases will contain an excess of oxygen; and

b) Rich mixture — Gas/air mixture of which the air content is not sufficient for complete combustion and the resultant combustion gases will contain burnable but unburned hydrocarbons.

2.999 Gaseous State — It is one of the three basic states of matter, characterized by the greatest freedom of molecules and the lack of any inherent fixed shape or volume.

2.1000 Generator — Basic part of an absorption system. A still provided with means of heating, used to drive refrigerant out of solution.

2.1001 Glass, Gauge — It is a device for showing a liquid level.

2.1002 Glass, Sight — Glass tube used to indicate the liquid level in tanks, bearings, and similar equipment.

2.1003 Glazing of Foods — It is freezing a coat of ice on frozen foods by dipping in water, the latent heat of the coat being absorbed inwards.

2.1004 Glide — The absolute value of the difference between the starting and ending temperatures of a phase-change process by a refrigerant within a component of a refrigerating system, exclusive of any subcooling or superheating. This term usually describes condensation or evaporation of a zeotrope.

2.1005 Global Irradiance

a) Quantity of solar energy incident on a unit surface area in unit time through a unit hemisphere above the surface, expressed in $Btu/h \cdot ft^2$ (W/m^2) (also known as hemispherical irradiance); and

b) The global (or hemispheric) solar radiant energy is the quantity of solar energy incident upon a unit surface area in unit time through a unit hemisphere above the surface, expressed in W/m^2 ($Btu/[h \cdot ft^2]$).

2.1006 Global Warming Potential (GWP) — It is an index developed to provide a simplified means of describing the relative ability of a chemical compound to affect radiative forcing, if emitted to the atmosphere, over its lifetime in the atmosphere, and thereby to affect the global climate. Radiative forcing reflects the factors that affect the balance between the energy absorbed by the earth and the energy emitted by it in the form of longwave infrared radiation. The GWP is defined on a mass basis relative to carbon dioxide. The GWP for a compound must be calculated up to a particular integrated time horizon, for example, 20 years, 100 years, or 500 years. The time horizon most widely accepted is 100 years.

2.1007 Graduated Acting — Term applied to a control instrument or device which functions to give throttling control; that is, operates between full 'ON' and full 'OFF' position.

2.1008 Graetz Number — It is a dimensionless number used in calculation of streamline flow, equal to the mass flow rate of a fluid times its specific heat at constant pressure, divided by the product of its thermal conductivity and a characteristic length. Also spelled Gratz number. Symbol Gz or NGz.

2.1009 Graham's Law — This law states that the rate of diffusion of a gas is inversely proportional to the square root of its density.

2.1010 Grain of Moisture — The convenient unit of measurement of water vapor.

1 grain = 1/7 000 pound avoirdupois (historically, the average weight of a grain of wheat).

2.1011 Grashof Number — It is a dimensionless number used in the calculation of free convection of a fluid caused by a hot body, equal to the product of the fluid's coefficient of thermal expansion, the temperature difference between the hot body and the fluid, the cube of a typical dimension of the body, and the square of the fluid's density divided by the square of the fluid's dynamic viscosity. Also known as free convection number. Symbol Gr or NGr.

2.1012 Gravity, Specific — Density compared to density of standard material; reference usually to water or to air.

2.1013 Grease Duct — A containment system for the transportation of air and grease vapor. The system is designed and installed to reduce the possibility of the accumulation of combustible condensation, thus reducing the possibility of damage if a fire occurs within the ventilation system.

2.1014 Grease-Laden Exhaust — It is the effluent from a cooking process that contains grease particles or grease vapor. This type of exhaust requires a rated hood (for example, Type I, Type II).

2.1015 Grease-Removal Device — A listed device (such as, but not limited to, baffle filters, removable extractors, and stationary extractors) designed and installed to remove grease vapor and/or particles from the airstream.

2.1016 Grease Tight — Constructed and performing in such a manner as to prevent the passage of grease under normal operating conditions.

2.1017 Grid — A device for lifting a row of ice cans.

2.1018 Grill — It is a louvered or perforated covering for an air passage opening which can be located in the sidewall ceiling, or floor.

2.1019 Grille — The louvered or perforated covering for an opening in an air passage which can be located in a wall, ceiling, or floor.

2.1020 Gross Building Envelope Floor Area — The gross floor area of the building envelope, excluding slab-on-grade floors.

2.1021 Gross Capacity — This is the load (uncorrected) that a machine, apparatus, device, or system is designed to deliver.

2.1022 Gross Conditioned Floor Area — It is the gross floor area of a conditioned space.

2.1023 Gross Floor Area — It is the sum of the floor areas of all the spaces within the building with no deductions for floor penetrations other than atria. Gross floor area is measured from the exterior faces of exterior walls or from the centerline of walls separating buildings, but it excludes covered walkways, open roofed-over areas, porches and similar spaces, pipe trenches, exterior terraces or steps, roof overhangs, parking garages, surface parking, and similar features.

2.1024 Gross Refrigerating Capacity — Total rate of heat removal from all sources by the evaporator of a refrigerating system at stated conditions. It is numerically equal to the system refrigerating effect.

2.1025 Gross Roof Area — The area of the roof measured from the exterior faces of walls or from the centreline of party walls.

2.1026 Gross Semi Heated Floor Area — The gross floor area of semi-heated spaces.

2.1027 Gross Sensible Capacity — It is the rate of sensible heat removal by the cooling coil for a given set of operating conditions. This value varies as a function of performance parameters such as EWB, ODB, EDB, and airflow rate (*See* sensible heat).

2.1028 Gross Total Capacity — The total rate of both sensible heat and latent heat removal by the cooling coil for a given set of operating conditions. This value varies as a function of performance parameters such as EWB, ODB, EDB, and airflow rate. *See* sensible heat and latent heat.

2.1029 Gross Wall Area — The area of the wall measured on the exterior face from the top of the floor to the bottom of the roof.

2.1030 Ground Coupling — In a thermal storage system or a heat pump, a closed loop of piping, plastic tubing, or ducting is used as a heat exchanger between the ground (acting as a low-grade heat source or heat sink) and a circulating fluid.

2.1031 Ground-Loop Heat Pump Application — The heat pump using a brine solution circulating through a subsurface piping loop functioning as a heat source/heat sink.

2.1032 Guillotine Damper — An isolation damper with a blade which is withdrawn from the duct area when the damper is fully open.

2.1033 Habitable Space — The building space intended for continual human occupancy; such space generally includes areas used for living, sleeping, dining, and cooking but does not generally include bathrooms, toilets, hallways, storage areas, closets, or utility rooms.

2.1034 Halogenated Chlorofluorocarbon — Fully halogenated chlorofluorocarbon is one in which all of the hydrogen atoms are replaced by chlorine and fluorine atoms. Atmospheric lifetimes of fully halogenated chlorofluorocarbons are long (75 years for CFC 11 and 111 years for CFC 12).

2.1035 Heating Degree Day (HDD) — It is a measurement designed to quantify the demand for energy needed to heat a building

2.1036 Head

a) It is energy per unit mass of fluid divided by gravitational acceleration; and

b) In fluid statics and dynamics, it is a vertical linear measure.

2.1037 Head, Dynamic — In flowing fluid, the sum of the static and velocity pressures at the point of measurement (same as total head).

2.1038 Head, Static — The static pressure of a fluid expressed in terms of the height of a column of the fluid, or of some manometric fluid, which it would support.

2.1039 Head, Total — In flowing fluid, the sum of the static and velocity pressures at the point of measurement.

2.1040 Head, Velocity — In a moving fluid, it is the height of the fluid or of some manometric fluid equivalent to its velocity pressure.

2.1041 Heat — It is the form of energy that is transferred by virtue of a temperature difference.

2.1042 Heat Capacity — It is the amount of heat necessary to raise the temperature of a given mass one degree. Numerically, the mass multiplied by the specific heat.

2.1043 Heat Conductor — It is a material capable of readily conducting heat.

2.1044 Heat Exchanger — A device specifically designed to transfer heat between two physically separated fluids.

2.1045 Heat Exchanger, Air-to-Air — Heat exchanger that transfers heat from an exhaust airstream to a separated supply airstream.

NOTE — Fixed plate, rotary wheels, heat pipes, run-around coil loops, and shell-and-tube are the most common types.

2.1046 Heat Exchanger, Counter Flow—Heat exchanger in which fluids flow in opposite directions approximately parallel to each other; inlets for the two fluids are at opposite ends of the exchanger.

2.1047 Heat Exchanger, Crossflow — Heat exchanger in which fluids flow perpendicular to each other.

2.1048 Heat Exchanger, Direct Contact — Heat exchanger in which the fluids exchanging heat are brought into contact with each other

2.1049 Heat Exchanger, Double Wall — Heat exchanger in which two fluids are separated by two walls with the space between open to the atmosphere so that a fracture on one wall will not transfer one fluid into the other. Used in water systems with a potable fluid and a potentially hazardous fluid.

2.1050 Heat Exchanger, Double-Pipe — One in which two pipes are arranged concentrically, one within the other, and in which one fluid flows through the inner pipe and the other through the annulus between them.

2.1051 Heat Exchanger, Heat Pipe — Heat exchanger in which a tubular closed chamber containing a volatile fluid; in which heating one end of the pipe causes the liquid to vaporize and transfer to the other end where it condenses and dissipates its heat. The liquid that forms flows back toward the hot end by gravity or by means of a capillary wick.

2.1052 Heat Exchanger, Parallel Flow — Heat exchanger in which fluids flow approximately parallel to each other and in the same direction.

2.1053 Heat Exchanger, Shell-and-Tube — Heat exchanger in which a nest of tubes or pipes, or a coil of tube or pipe, contained in a shell or container. The pipe(s) carries a fluid through it, while the shell is also provided with an inlet and outlet for flow of another fluid. Tube and fin type: The heat exchanger having no tubes surrounded by fins. The gas inside the tube is cooled by the blowing air passing through the fins-Micro Channel Heat exchanger with multiple micro tubes having smaller diameter are used to transfer refrigerant.

2.1054 Heat Exchanger, Plate — Heat exchanger in which fixed plates that separate and keep the hot and cold fluids separate.

2.1055 Heat Interchanger — It is a device to transfer heat from the liquid refrigerant to the suction gas; also known as heat exchanger.

2.1056 Heat of Fusion — Latent heat involved in changing between the solid and the liquid states.

2.1057 Heat of Reaction — Heat per unit mass or per mole of one of the reagents of products of reaction in a chemical reaction, exothermal if given off, endothermal if absorbed.

2.1058 Heat of the Liquid — It is enthalpy of a mass of liquid above an arbitrary zero.

2.1059 Heat Pump — A refrigerating system employed to transfer heat into a space or substance. The condenser provides the heat while the evaporator is arranged to pick up heat from air, water, etc. By shifting the flow of air or other fluid, a heat pump system may also be used to cool the space.

2.1060 Heat Pump, Cooling and Heating — A refrigerating system designed so that the heat extracted at a low temperature and the heat rejected at a higher temperature may be utilized alternately or simultaneously for cooling and heating functions respectively.

2.1061 Heat Pump, Heating — A refrigerating system designed primarily to utilize the heat rejection from the system for a desired heating function.

2.1062 Heat Rejection Effect — Condensing, that portion of the total refrigerant heat rejecting effect of a condenser which is used for condensing the entering refrigerant vapour to a saturated liquid at the entering refrigerant pressure.

2.1063 Heat Rejection Effect, Subcooling — It is the total refrigerant heat rejection effect less the condensing heat rejection effect.

2.1064 Heat Rejection Effect, Total Refrigerant — The total useful capacity of a refrigerant condenser for removing heat from the refrigerant circulated through it.

2.1065 Heat Transmission — Any time rate of heat flow; usually refers to conduction, convection, and radiation combined.

2.1066 Heat, Humid — It is the ratio of increase of enthalpy per kilogram of dry air, with its associated moisture, to rise of temperature under conditions of constant pressure and constant specific humidity.

2.1067 Heat, Latent — Change of enthalpy during a change of state, usually expressed in kcal/kg. With pure substances, latent heat is absorbed or rejected at constant temperature at any pressure.

2.1068 Heat, Latent of Condensation — It is the difference in specific enthalpy of a condensable fluid between its dry saturated vapour state and its saturated liquid state at the same pressure.

2.1069 Heat, Latent of Condensation or Evaporation (Specific) — Thermodynamically, it is the difference in the specific enthalpies of a pure condensable fluid between its dry saturated vapour state and its saturated (not subcooled) liquid state at the same pressure.

2.1070 Heat, Sensible — Heat which is associated with a change in temperature; specific heat exchange of temperature; in contrast to a heat interchange in which a change of state (latent heat) occurs.

2.1071 Heat Specific — The ratio of the quantity of heat required to raise the temperature of a given mass of any substance one degree to the quantity required to raise the temperature of an equal mass of a standard substance (usually water at 15 °C) one degree.

2.1072 Heat, Vital — Heat generated by fruits and vegetables in storage, due to ripening.

2.1073 Heater — An apparatus or appliance to supply heat to a space or a fluid (*see* water heater).

2.1074 Heating, Regenerative (or Cooling) — It is a process of utilizing heat, which must be rejected or absorbed in one part of the cycle, to perform a useful function in another part of the cycle by heat transfer.

2.1075 HEPA Filter

a) A high-efficiency particulate air filter; and

b) A filter with removal efficiencies of 99.97 percent or higher for a mass median particle size of 0.30 µm (microns).

2.1076 Herringbone Evaporator (V-coil) — Evaporator in which the tubes, arranged in the vertical plane, are bent in the form of a V.

2.1077 HFC (Hydrofluorocarbon) —A halocarbon that contains only fluorine, carbon, and hydrogen.

2.1078 High Pressure Side (High Side) — It is that portion of a refrigerating system operating at approximately the condenser pressure.

2.1079 Higher Heating Value (HHV) — The amount of heat produced per unit of fuel when complete combustion takes place at constant pressure, the products of combustion are cooled to the initial temperature of the fuel and air, and the vapor formed during combustion is condensed. HHV is expressed in Btu/lb (J/kg) or Btu/ft^3 (W/m^3) for gaseous fuel and in Btu/lb (J/kg) or Btu/gal (J/l) for liquid fuel.

2.1080 HLF (Heating Load Factor)

a) It is the ratio of the heating building load to the steady-state heating load; and

b) It is the ratio of the total heating of a complete cycle for a specified period, consisting of an on time and off time, to the steady-state heating done over the same period at constant ambient conditions.

2.1082 Hold Over — In an evaporator, the ability to stay cold after heat removal from the evaporator stops. A material used to store heat in latent or sensible form.

2.1081 Hoarfrost — Deposit of ice crystals produced in a manner similar to dew but at a temperature below 0 °C (32 °F).

2.1083 Holding Charge — Reduced quantity of refrigerant or inert gas used to avoid the ingress of air and moisture into a component before start-up (also known as service charge).

2.1084 Holdover Coil — An apparatus to store cold by fusion of ice or eutectic on a refrigerated coil.

2.1085 Hot Gas Line — A line used to convey discharge gas from the compressor to the evaporator for the purpose of defrosting.

2.1086 Hot/Humid Climate — The climate in which the wet-bulb temperature is 19 °C (67 °F) or higher for 3 500 h or more or 23 °C (73 °F) or higher for 1 750 h or more during the warmest six consecutive months of a year that is typical for that geographic area.

2.1087 Hourly Free-Floating Zone Air Temperature — A zone or space air temperature for a given hour when heating and cooling equipment is off or for an unconditioned space.

2.1088 Hourly Heating Load — It is a heating load for a given hour.

2.1089 Hourly Incident Unshaded Solar Radiation — The sum of direct solar radiation and diffuse solar radiation that strikes a given surface for a given hour.

2.1090 Humid Heat — The ratio of increase of enthalpy of moist air to the rise of temperature expressed per unit mass of the dry air component under conditions of constant pressure and humidity ratio.

2.1091 Humidifier — It is a device to add moisture to air.

2.1092 Humidifier, Central — It is a device which humidifies air to be circulated through ducts in an air conditioning system.

2.1093 Humidifier, Room Spray Type — It is an air humidifier which sprays water directly into the room.

2.1094 Humidify — It is adding water vapour to the atmosphere; adding water vapour or moisture to any material.

2.1095 Humidifying Effect — Product of the mass of water evaporated times the latent heat at the evaporating temperature.

2.1096 Humidistat — It is a regulatory device, actuated by changes in humidity, used for the automatic control of relative humidity.

2.1097 Humidity — It is the water vapour within a given space.

2.1098 Humidity Ratio (Specific Humidity) — The weight of water vapour (steam) associated with one-kilogram weight of dry air.

2.1099 Humidity, Absolute — It is the weight of water vapour per unit volume.

2.1100 Humidity, Percentage — The ratio of the specific humidity of humid air to that of saturated air at the same temperature and pressure, usually expressed as a percentage (degree of saturation: saturation ratio).

2.1101 Humidity, Relative — The ratio of the mole fraction of water vapour present in the air to the mole fraction of water vapour present in saturated air at the same temperature and barometric pressure. Approximately, it equals the ratio of the partial pressure or density of the water vapour in the air to the saturation pressure or density, respectively, of water vapour at the same temperature.

2.1102 HVAC Duct — The duct and fittings used for conveying air in residential, commercial, institutional, and industrial heating, ventilating, and air-conditioning systems.

2.1103 HVAC System — The equipment, distribution systems, and terminals that provide, either collectively or individually, the processes of heating, ventilating, or air conditioning to a building or portion of a building.

2.1104 HVAC System End-to-End Accuracy — It is the combined end-to-end accuracy of the EMCS (energy monitoring and control system) and the accuracy with which the EMCS sensors represent the HVAC process.

2.1105 HVAC Zone — A space or group of spaces, within a building with heating, cooling, and ventilating requirements, that are sufficiently similar so that desired conditions (for example, temperature) can be maintained throughout using a single sensor (for example, thermostat or temperature sensor).

2.1106 Hydrofluorocarbon (HFC) — A halocarbon that contains only fluorine, carbon, and hydrogen.

2.1107 Hydrolysis — It is the process of splitting-up of compounds by reaction with water, for example, of dichlorodifluoromethane or methyl chloride with water, in which case acid materials are formed.

2.1108 Hydrometer — It is an instrument which, by the extent of its submergence, indicates the specific gravity of the liquid in which it floats.

2.1109 Hydronic Distribution System — A thermal distribution system that uses water or a mixture of water and additives as the distribution medium in a building.

2.1110 Hydronic System Balancing — Adjusting water flow rates through hydronic distribution system devices, such as pumps and coils, by manually adjusting the position valves or by using automatic control devices, such as automatic flow control valves.

2.1111 Hydronics — The science of heating and cooling water.

2.1112 Hydrostatic Pressure

a) It is the normal force per unit area that would be exerted by a moving fluid on an infinitesimally small body immersed in it if the body were carried along with the fluid; and

b) Pressure exerted by a fluid at rest.

2.1113 Hygrometer — It is an instrument responsive to humidity conditions (usually relative humidity) of the atmosphere.

2.1114 Hygrometry — It is the branch of science that deals with the measurement of humidity.

2.1115 Hygroscopic — Substances which has got the nature of attracting and holding water molecules from the surrounding environment, which is usually at normal or room temperature.

2.1116 Hygrostat — It is an automatic control, responsive to humidity.

2.1117 Hyperbolic Tower — The cooling tower of hyperbolic shape that depends on natural draft for air movement through the tower. The air movement can be either crossflow or counter flow.

2.1118 Ice Bank — It is a thermal accumulator in which during off-peak periods of refrigeration demand, ice is formed, and in which, during peak periods of refrigeration demand, compressor capacity is supplemented by melting ice.

2.1119 Ice Can — An open content top tank or can have properly formed and reinforced sheet metal which, when submerged in a chilled antifreeze solution in an ice tank, will permit the freezing of its water into a block of ice of a desired form or weight.

2.1120 Ice Can Frames — It is a metal frame or support in which a number of ice cans are fixed so as to enable them to be handled as a group rather than as individual cans.

2.1121 Ice Can Truck — A wheeled frame with arm and hoist suitably arranged to be moved over the ice tank top for lifting individual cans from the tank.

2.1122 Ice Maker Cycle — A cycle type automatic ice maker has separate and sequence water fill, freezing and harvesting phases of the ice making operation.

2.1123 Ice Maker, Non-cyclic — A non-cyclic type (continuous) automatic ice maker has simulated water supply freezing and/or harvesting phases in the ice making operation.

2.1124 Ice Making Capacity — It is the amount of ice that a refrigerating plant is able to produce in a given period of time.

2.1125 Ice Point — It is the temperature at which water freezes under normal atmospheric pressure 760 mmHg and 0 °C.

2.1126 Ice Storage, Bin Rating — The capacity of an automatic ice-maker storage bin is the average weight of ice contained in the bin when the bin-fill device terminates the ice-making operation.

2.1127 Ice Tank Grating and Covers — A framework of wood, metal, or combination of both, which positions the ice cans in the ice-making tank and upon which are supported removable covers, usually of wood, above the cans to exclude dirt and the warmer air of the tank room.

2.1128 Ice Tray — An ice tray is a container for freezing water into ice.

2.1129 Ice Tray Capacity Rating — The weight of water with the tray filled to within mm of the top and with the grids in place.

2.1130 Ice Tray, Automatic-Fill — An automatic-fill ice tray provides for automatic filling with water for freezing into ice.

2.1131 Ice-Melting Equivalent — It is the amount of heat absorbed by one kilogram of ice at 0 °C in liquefying to water at 0 °C.

2.1132 Icing — Chilling

2.1133 ID

a) Induced draft; and

b) Also, I.D., Inside diameter.

2.1134 Ideal Gas — The gas whose internal energy and enthalpy depend solely on temperature and, which is defined by pressure times specific volume divided by temperature, is a constant for a unit mass ($pv/T = R$). Also called perfect gas.

2.1135 Immediately Dangerous to Life or Health (IDLH) — The maximum concentration from which unprotected persons are able to escape within 30 min without escape-impairing symptoms or irreversible health effects.

2.1136 Indicating Thermometer — The thermometer designed for the visual display of temperature.

2.1137 Indirect Cooling System — The system in which a liquid such as brine or water, cooled by the refrigerant, is circulated to the material or space to be refrigerated or is used to cool air.

2.1138 Indirect Evaporative Cooler

a) A heat and mass transfer device used to sensibly cool a primary airstream without addition of moisture, by means of an evaporatively cooled secondary airstream. Since the secondary air provides wet-bulb depression, it represents a heat sink to the primary air; and

b) An indirect evaporative cooling device consisting of an indirect evaporative-cooling heat exchanger, a means of delivering and distributing water to the wet passages of the heat exchanger, a basin for collecting water, a recirculating water pump, and the piping that connects the basin and the water distribution system.

2.1139 Indirect Evaporative Cooler with Integrated Heat Exchanger — An indirect evaporative cooling device with integrated primary (dry) and secondary (wet) air passages in a single sensible and evaporative heat exchanger.

2.1140 Indirect Evaporative Cooling Unit — A packaged, semi-packaged, or component indirect evaporative cooling unit. The term cooling unit is also used interchangeably for evaporative cooling unit or evaporative cooler.

2.1141 Indirect Fired — Machines using steam or hot liquids as a heat source.

2.1142 Indirect Heat Exchanger — It is the heat exchanger taking heat from steam or water rather than heat directly (also known as water heater).

2.1143 Indirect Ice Contact — Ice storage system using a method of heat exchange in which ice in containers is formed and melted by a circulating secondary coolant enclosed in a pipe or tube (also known as Internal Melt).

2.1144 Indirect Load Management — It is a sub-function of power system distribution automation that implements economic incentives to induce user action, including automation provided by the user. Characterized by user local control of loads in response to economic incentives applied. Also called Passive Load Management.

2.1145 Indirect Refrigerating System — The system in which a secondary coolant, cooled or heated by the refrigerating system, is circulated to the air or substance to be cooled or heated.

2.1146 Indirect System — It is the refrigerating system in which secondary coolant, cooled by a refrigerant, is circulated to the material or space to be cooled or is used to heat or cool circulated air.

2.1147 Indirect-Fired Generator — Usually of the shell-and-tube type with the absorbent solution either flooded or sprayed outside the tubes and the heat source (steam or hot fluid) inside the tubes.

2.1148 Indirect-Fired Heater — It is one in which combustion products do not come into contact with the material to be heated; heating of the material is accomplished by radiation or conduction from the heated surface.

2.1149 Indirect-Heating System — It is a system in which a fluid, such as air, is circulated to the material or space to be heated or is used to heat air.

2.1150 Indoor Air — The air inside the building envelope.

2.1151 Indoor Air Quality (IAQ) — Attributes of the respirable air inside a building (indoor climate), including gaseous composition, humidity, temperature, and contaminants. *See* indoor environment quality (IEQ). *See* sick building syndrome.

2.1152 Indoor Air Volume — The entire air volume of a space or building in which the ventilation air is distributed, including ductwork and plenums. The volume of indoor furnishings, equipment, and occupants must be subtracted from the gross indoor volume that is based on interior dimensions of the space or building.

2.1153 Indoor Coil — The heat exchanger that removes heat from or adds heat to the conditioned space.

2.1154 Indoor Environment Quality (IEQ) — A perceived indoor experience of the building indoor environment that includes aspects of design, analysis, and operation of energy efficient, healthy, and comfortable buildings. Fields of specialization include architecture, HVAC design, thermal comfort, indoor air quality (IAQ), lighting, acoustics, and control systems. *See* indoor air quality (IAQ).

2.1155 Indoor Side — It is that part of the system that removes heat from or adds heat to the indoor airstream.

2.1156 Induced Air Temperature — The air temperature of the internally induced airflow. The mixed airstream resultant temperature of the mix of room air temperature stream with supply airstream.

2.1157 Induced Draft — The fan-induced movement of hot gases from the heat-absorbing equipment.

2.1158 Induced-Draft Water-Cooling Tower — It is the type of mechanical draft tower in which one or more fans are located in the air outlet to induce airflow through the air inlets.

2.1159 Induction Unit, High-Pressure — It employs nozzles which produce a high velocity jet. The high velocity jet of primary air induces a flow of secondary air through coils located in the secondary air stream.

2.1160 Induction Unit, Low-Pressure — It is essentially an induction-type convector. It uses a jet of conditioned air (or primary air) to induce into the unit a flow of room or secondary air which mixes with the primary air. The mixture is discharged into the room through a grill at the top of the unit. Heating coils are located in the secondary air stream for use in heating.

2.1161 Infiltration — It is air flowing inward as through a wall, leak, etc.

2.1162 Infrared Emittance — It is the ratio of the infrared spectrum radiant flux emitted by a physical body to that emitted by a blackbody at the same temperature and under the same conditions.

2.1163 Infrared Radiation (IR) — These are the range of electromagnetic radiation wavelengths greater than those of visible light and shorter than those of microwaves; generally, between 0.8 micrometre and 1 millimetre. IR originates from

either incandescent or non-incandescent hot bodies or from flames. The energy is used as a means of direct heat transfer from the source to the object(s) to be heated without materially heating the intervening air.

2.1164 Initial Resistance — The pressure loss of the device operating at a specified airflow rate with no dust load, expressed in Pa (in water).

2.1165 Input Rating — The fuel burning capacity of an appliance in British thermal units per hour (Btu/h) [kilowatts (kW)] as specified by the manufacturer. Appliance input ratings are based on sea-level operation and need not be changed for operation up to 2 000 ft (600 m) altitude.

2.1166 Insert System — A combined appliance where refrigerant tubing is inserted directly into the water heater, usually through one of the ports on the water heater; the inserted tubing is the desuperheater.

2.1167 Insertion Thermostat

a) Thermostat that has an element that is inserted directly into the airstream of a duct or pipe; and

b) Thermostat with the sensing member in the sensed variable but with the controlling element outside.

2.1168 Insolation — Solar radiation incident on the solar collector. *See* Instantaneous Irradiance.

2.1169 Instantaneous Efficiency — It is the ratio of the energy removed by the transfer fluid per unit of collector area to the total solar radiation incident on the collector per unit area (aperture or gross) during a test period for which the condition of the test corresponds to the steady state or quasi-steady state.

2.1170 Instantaneous Heater — A self-contained packaged water-heating device that is capable of providing a continuous supply of hot water at a predetermined temperature without any storage capacity. Energy sources can be fuel fired (natural gas/propane), electric, or steam fired. The term is typically utilized for domestic water-heating applications, but pool, spa, and radiant heating systems are also an application. Another term that is used on smaller heaters is point-of-use heaters. Some manufacturers allow for multiple unit installations when the need for larger capacity is required.

2.1171 Instantaneous Irradiance — The rate at which solar radiation is incident on a unit surface area in unit time, measured in Btu/(h·ft^2) [W/m^2].

2.1172 Instantaneous Thermal Efficiency — The amount of energy removed by the transfer fluid per unit of gross collector area during the specified time period divided by the global total solar radiation incident on the collector per unit area during the same test period, under steady state or quasi-steady state.

2.1173 Insulation, Fill — Granulated, shredded, or powdered material prepared from vegetable, animal, or mineral origin. It can come in bulk or batt form.

2.1174 Insulation, Sound — It is an acoustical treatment of fan housings, supply ducts, space enclosures, and other parts of system and equipment for isolation of vibration or to reduce transmission of noise.

2.1175 Insulation, Thermal — A material having a relatively high resistance to heat flow and used principally to retard the flow of heat.

2.1176 Integrated Heater — A boiler operated in conjunction with an indirectly fired storage water heater or an external storage tank in which domestic water, heated by the boiler, is stored. Part-load value based on operation at standard ARI conditions; typically used for ARI rating purposes.

2.1177 Integrated Part-Load Value (IPLV) — A single number part-load efficiency figure of merit calculated per the method described in the current version of ANSI/AHRI Standard 550/590.

2.1178 Integrated System

a) More than one building system, such as lights and air distribution, combined into a common design; and

b) System in which many subsystems of a building are combined into a single package (for example, fire, security, clock, and HVAC).

2.1179 Integrator — A device using signals from temperature and flow sensors through time for computing thermal energy transfers.

2.1180 Intercooler (Interstage Cooler) — It is an apparatus for cooling compressed gas or vapor between two compression stages.

2.1181 Intercooling — It is removal of heat from compressed gas between compression stages.

2.1182 Intermediate Pressure (Interstage Pressure) — The pressure prevailing between stages of multistage compression.

2.1183 Internal Discharge Makeup Air — The makeup air delivered directly to the interior of an exhaust hood such that it is exhausted without entering the occupied space. Sometimes this kind of makeup air is called short-circuit makeup air.

2.1184 Internal Energy — Sum of all kinetic and potential energies contained in a substance due to the states of motion and separation of its several molecules, atoms, and electrons. It includes sensible heat (vibration energy) and that part of latent heat represented by the increase in energy during evaporation.

2.1185 Internal Heat — Total passive heat generated within the conditioned space. It includes heat generated by lighting, computers, business machines, occupants, and mechanical and electrical equipment such as fans, pumps, compressors, and transformers.

2.1186 Internal Process Heat — Heat from industrial activities and sources such as wastewater, boiler flue gas, coolants, exhaust air, and some waste materials. This heat is normally wasted unless equipment is included to extract it for further use.

2.1187 Internal Static Pressure Loss — *See* static pressure loss

2.1188 Interstitial Space — A space between two zones, rooms, or floors of a building.

2.1189 I-P units (Inch-Pound Units) — Units using inches, pounds, and other designations. Examples are: foot, Btu, horsepower, gallon. As compared to SI unit system.

2.1190 Irradiance

a) At a point of a surface, quotient of the flux incident on an element of a surface containing the point, divided by the area of that element, measured in watts per square meter; and

b) Radiant flux density. *See* solar irradiance.

2.1191 Irradiation — It is the process of subjecting foods, etc, to radiations of special wavelengths, such as the 0.253 7 micron wavelength, which kills certain bacteria; the quantity of radiant energy incident on a surface per unit time and unit area.

2.1192 Isenthalpic Expansion — Expansion of a fluid during which no heat or mechanical energy is exchanged with the surroundings; the enthalpy remains constant.

2.1193 Isentropic — An adjective describing a reversible adiabatic process; a change taking place at constant entropy.

2.1194 Isobar

a) Line at one barometric pressure; and

b) Line graph of state representing an isobaric process.

2.1195 Isobaric — An adjective used to indicate a change taking place at constant pressure.

2.1196 Isochore —Thermodynamic change at constant volume.

2.1197 Isochor — The graph that shows the variation of one quantity with another, for example, the variation of pressure with temperature when the volume of the substance is held constant.

2.1198 Isolated System — In thermodynamics, a system that can interchange neither matter nor energy with its surroundings.

2.1199 Isolation Devices — Devices that isolate HVAC zones so that they can be operated independently of one another. Also, a device, such as a service valve, that allows maintenance of a portion of a system. Isolation devices include, but are not limited to, separate systems, isolation dampers/valves, and controls providing shutoff at terminal boxes.

2.1200 Isomer — One of a group of substances having the same ultimate chemical composition but different molecular structures.

2.1201 Isopsychric — It is a state in which evaporation and condensation are both absent or precisely balance one another and as a result the relative humidity remains constant.

2.1202 Isothermal — An adjective used to indicate a change taking place at constant temperature.

2.1203 Jacketing — It is surrounded by a confined bath or stream of fluid for temperature control or heat absorption.

2.1204 Jet — Concentrated airstream formed as primary air leaves the diffuser.

2.1205 Jet Cooling — Quick chilling process using air at very high speed forced around the products, usually while those products are continuously moving on a conveyor belt (compare to air-blast cooling).

2.1206 Jet Freezing — Quick freezing process using cold air at very high speed forced onto the produce. Also called blast freezing.

2.1207 Jind Filter — A filter used to collect the dust passing a device during an arrestance test.

2.1208 Joint Brazed, High-Temperature — A gas-tight joint obtained by the joining of metal parts with alloys which melt at temperatures higher than 816 °C but less than the melting temperatures of the joined parts.

2.1209 Joint Brazed, Low-Temperature — A gas-tight joint obtained by the joining of metal parts with metallic mixtures or alloys which melt at temperatures below 816 °C but above 538 °C.

2.1210 Joint, Mechanical — A gas-tight joint obtained by the joining of metal parts through a positive holding mechanical construction (such as flanged joint, screwed joint, flared joint).

2.1211 Joint, Soldered — A gas-tight joint obtained by the joining of metal parts with metallic mixture alloys which melt at temperatures below 538 °C.

2.1212 Joint, Welded — A gas-tight joint obtained by the joining of metal parts in the plastic or molten state.

2.1213 Joule-Thomson Effect — It is the ratio of temperature change to pressure change (dt/dp) of an actual gas in a process of throttling or expansion without doing work or interchanging heat.

2.1214 Kelvin Temperature — SI absolute temperature scale on which the triple point of water is 273.16 K and the boiling point is approximately 373.15 K (1 K = 1 °C). The Kelvin is the fraction 1/273.16 of the temperature of the thermodynamic triple point of water.

2.1215 K-Factor (Thermal Conductivity) — The time rate of steady-state heat flow through a unit area of a homogeneous material, induced by a unit temperature gradient in a direction perpendicular to that unit area. Units are Btu in./h.ft^2.°F or Btu/h.ft.°F [W/(m.K)].

2.1216 Kilovolt Ampere (kVA) — The product of the line current (amperes) times the nominal system voltage (kilovolts) times 1.732 for three-phase currents. For single-phase applications, kVa is the product of the line current (amperes) times the nominal system voltage (kilovolts).

2.1217 King Valve (Master Valve)

a) Stop valve between receiver and liquid main in a refrigeration system; and

b) Stop valve on boiler head.

2.1218 Kirchoff's Law — It is the ratio of the emissivity of a heat radiator to the absorptivity of the same radiator is the same for all bodies, depending on frequency and temperature alone, and is equal to the emissivity of a blackbody.

2.1219 Lag — The delay in action of the sensing element of a control device due to the time required for the sensing element to reach equilibrium with the property being controlled; namely temperature lag, flow lag, etc.

2.1220 Latent Cooling Capacity — The rate, expressed in Btu/h (W), at which the equipment removes latent heat (reduces the moisture content) of the air passing through it under specified conditions of operation.

2.1221 Latent Cooling Effect — It is that portion of the cooling effect that results in water vapor condensation in the air circulating through the equipment.

2.1222 Latent Heat — The change in enthalpy associated with a change in humidity ratio, caused by the addition or removal of moisture.

2.1223 Latent Heat Load — Cooling load required to remove latent heat (also known as moisture tons or wet tons).

2.1224 Latent Heat of Condensation — The quantity of heat released on change of unit mass of saturated vapor to saturated liquid with no change in temperature, measured in J/kg (Btu/lbm).

2.1225 Latent Heat of Fusion — The quantity of heat required to change a unit mass of ice to water at 0 °C (32 °F) temperature, measured in Btu/lbm (J/kg).

2.1226 Latent Heat of Vaporization — The quantity of heat required to cause a change of state of a substance from a saturated liquid to a saturated vapor with no change in temperature, measured in Btu/lbm (J/kg).

2.1227 Latent Storage — Use of a phase change of a medium for storing heating or cooling capacity (*See also* Ice Storage).

2.1228 Law of Partial Pressure, Dalton's — Each constituent of a mixture of gases behaves as if it alone occupied the space. The sum of the individual pressures of the constituents equals the total pressure of the mixture.

2.1229 Laws of Thermodynamics, First and Second —The first law states, in effect, the conservation of energy principle, particularly equating heat and mechanical energy and denying perpetual motion in so far as it implies a creation of energy. The second law states that the quality of energy varies as to form, particularly that heat energy is only in part capacity in a given transformable into mechanical energy. It denies the possibility of a machine operating in a cycle and developing mechanical energy from a single source of heat.

2.1230 Leak Detector — A device used to detect refrigerant leaks in a refrigerating system, Halide torch- a flame tester that generally uses alcohol and burns with a blue flame, but when the sampling tube draws in Freon vapour, the flame color changes to bright green.

2.1231 Leakage

a) Volumetric flow rate required to maintain a constant static pressure in the test section; and

b) The amount of air interchanged between the room side and outdoor side through a unit as a result of construction features, faulty sealing techniques, temperature differential, or height differential (*see* infiltration).

2.1232 Leakage Class — Divisions of airtightness based on normalized leakage.

2.1233 Life-Cycle Assessment — It is the process of evaluating a component, product, assembly, building, etc. and its development from the moment of extraction of raw materials, transportation, processing, manufacturing, use, recyclability, and disposal and assigning a value or assessment of its cumulative and ultimate social, environmental and economic costs, benefits, and impacts. This is often referred to as a cradle-to-grave or cradle-to-cradle assessment.

2.1234 Life-Cycle Cost — The cost of equipment over its entire life including operating, maintenance, and repair/replacement cost. May also include decommissioning cost.

2.1235 Lift — It is the vertical distance that fluid must be pumped to reach a specified height.

2.1236 Liner — It is the enclosure forming the interior of the general refrigerated compartment and/or some freezer compartment(s). The complete liner comprises the compartment liner in the cabinet, the exposed breaker strip surfaces, and the door liner(s).

2.1237 Liquefaction — A change of state to liquid; generally used instead of condensation in case of substance ordinarily gaseous.

2.1243 Liquid, Volatile — Any liquid, which evaporates readily at atmospheric pressure and room temperatures.

2.1244 Liquor — A solution used in absorption refrigeration.

2.1245 Liquor, Strong (Rich) — A solvent with relatively high concentration of solute.

2.1246 Liquor, Weak — A solvent with relatively low concentration of solute.

2.1247 Lithium Bromide — An absorption system where water (R-718) is the refrigerant and lithium bromide (LiBr) is the absorbent.

2.1248 Load — The amount of heat per unit time imposed on a refrigerating system or the required rate of heat removal.

2.1249 Load Factor — It is the ratio of actual mean load to a maximum load or maximum production capacity in a given period.

2.1250 Load, Usage — It is the sum of the air change, product, and miscellaneous loads on a refrigerator; the sum of the loads exclusive of wall heat gains.

2.1251 Loading Dust — A compounded, synthetic dust used for air cleaner capacity and efficiency testing.

2.1252 Local Mean Air Velocity — The magnitude of the time-averaged vector of velocity at a point of an airstream.

2.1253 Locker Plant — It is a cold storage establishment containing food storage boxes or lockers for individual users.

2.1254 Loop

a) Electric circuit containing a complete, continuous path, as in a feedback loop; and

b) Sequence of instructions that is repeated until an exit condition prevails.

2.1255 Loss of Charge Protector

a) A device that is capable of discerning the loss of refrigerant charge in a refrigerating machine and of reacting to protect the apparatus from motor burnout; and

b) Splitting of a condensate line to permit vapors to pass above and condensate to pass below an obstruction.

2.1256 Louver — An assembly of sloping vanes intended to permit air to pass through and to inhibit transfer of water droplets.

2.1257 Low-Pressure Side (Low Side) — It is that portion of a refrigerating system operating at approximately the evaporator pressure.

2.1258 Lubricant Circulation Rate — It is the ratio of the mass of lubricant circulating through a refrigerant system to the total mass of refrigerant and lubricant flowing through the system at a specified set of operating conditions.

2.1259 Lyophilisation — It is the process of dehydrating a frozen substance under conditions of sublimation, for example, vacuum freeze-drying.

2.1260 M and V — Monitoring and Verification. *See* monitoring and verification.

2.1261 Magnetic Cooling — Cryocooling by adiabatic demagnetization of certain paramagnetic substances.

2.1262 Main — It is the pipe for distributing to or collecting from various branches.

2.1263 Makeup Air

a) Dedicated replacement air;

b) Air brought into a building from the outdoors to replace air that is exhausted. Makeup air may or may not be conditioned;

c) Any combination of outdoor and transfer air intended to replace exhaust air and exfiltration;

d) In a clean room, air introduced to the secondary air system for ventilation, pressurization, and replacement of exhaust air; and

e) In a laboratory or kitchen, outdoor air is deliberately brought into the building from the outside and supplied to the vicinity of an exhaust hood to replace air, vapor, and contaminants being exhausted. Makeup air is generally filtered and fan forced, and it may be heated or cooled depending on the requirements of the application. Makeup air may be delivered through outlets integral to the exhaust hood or through outlets in the same room.

2.1264 Makeup Air Unit — A air-handling unit that provides 100 percent outdoor air to offset air that is exhausted and exfiltrated, often providing conditioning or treatment of the outdoor air.

2.1265 Makeup Water — Water supplied to replenish the water of a system.

2.1266 Manifold — It is that portion of main in which several branches are close together. Also, a single piece in which there are several fluid paths.

2.1267 Manometer — An instrument for measuring pressures; essentially a U-tube partially filled with a liquid, usually water, mercury, or a light oil, so constructed that the amount of displacement of the liquid indicates the pressure being exerted on the instrument.

2.1268 Manual Damper — It is a device that can be used to manually adjust the airflow rate by manual operation (*see* damper and valve).

2.1269 Manual Expansion Valve — A hand-operated, needle-type valve for controlling the flow of liquid refrigerant to an evaporator.

2.1270 Manual Reset Valve — It is an automatic shutoff valve installed in a supply piping and set to shut off when unsafe conditions occur. The device remains closed until manually reopened.

2.1271 Mass — The quantity of matter in a body as measured by the ratio of the force required to produce a unit acceleration to the acceleration.

2.1272 Maximum Allowable Charging Period — The period of time within which charging of the thermal storage device must be completed. This period is typically determined by the utility rate structure, the building operating schedule, and the design operating strategy.

2.1273 Maximum Allowable Pressure

a) It is the maximum gage pressure permitted on a completed system; and

b) The setting of the pressure-relieving devices protecting the system.

2.1274 Maximum Deviation — For a set of multiple measurements of a physical property, from which statistical methods have been used to remove spurious data points, the greatest of the deviations of the set of indicated values from the mean of the set.

2.1275 Maximum Outdoor Air Damper — A modulating damper or set of dampers used to control the outdoor airflow to the system in excess of minimum ventilation outdoor air for free cooling (airside economizer). Also called economizer outdoor air damper. May also serve to provide the minimum outdoor airflow control.

2.1276 Maximum Temperature Glide — The difference between the saturated liquid temperature (bubble point) and the saturated vapor temperature (dew point) for the 'as-formulated' blend composition at constant pressure. For a given pressure, the evaporator temperature glide in a direct-expansion system will typically be 70 percent to 80 percent of the maximum temperature glide (as the refrigerant blend entering the evaporator is a mixture of liquid and vapor) and not at the saturated liquid temperature of the 'as-formulated' blend composition.

2.1277 Maximum Usable Cooling Supply Temperature — It is the maximum fluid supply temperature at which the cooling load can be met without adversely affecting latent space conditions.

2.1278 Maximum Usable Discharge Temperature — It is the maximum fluid temperature at which usable cooling can be obtained from the thermal storage device.

2.1279 M Btu/h — One thousand Btu per hour. An I-P unit of power. In SI, use watts or kilowatts.

2.1280 Mean Monthly Outdoor Air Temperature — This temperature is based on the arithmetic average of the mean daily minimum and mean daily maximum outdoor (dry-bulb) temperatures for the month in question.

2.1281 Mean Radiant Temperature (MRT) — The theoretical uniform surface temperature of an enclosure in which an occupant would exchange the same amount of radiant heat as in the actual non-uniform enclosure. Compared to Operative Temperature.

2.1282 Mean Temperature — It can be calculated as the average of temperature readings over a period of time or the average of the high and low temperatures over a given time.

2.1283 Mean Velocity — An average of the instantaneous air velocity over an interval of time.

2.1284 Measurement Station — Element inserted in the ductwork that facilitates the determination of air temperature, air humidity, airflow rate, and/or pressure.

2.1285 Meat Keeper — A meat keeper is an enclosed compartment or container which is designed for the storage of fresh meat at or near 0 °C.

2.1286 Mechanical Chiller — It is the refrigerating machine using mechanical energy input to generate chilled water.

2.1287 Mechanical Cooling — Process of reducing the temperature of a fluid by using vapor compression, absorption, desiccant dehumidification combined with evaporative cooling, or other energy-driven thermodynamic means. Indirect or direct evaporative cooling alone is not considered mechanical.

2.1288 Mechanical Efficiency — The ratio of the compression energy or work of a compressor to the energy or work input.

2.1289 Mechanical Energy — It is capacity for doing work, usually expressed in work units (foot-pounds or newton-meters); sometimes in heat units (Btu or joule). Energy may be inherent in the speed of a body (kinetic energy) or in its position relative to another body (potential energy).

2.1290 Mechanical Heating — Raising the temperature or change of phase of a solid or fluid by use of fossil-fuel burners, electric resistance heaters, heat pumps, or other systems that require energy to operate.

2.1291 Mechanical Refrigerating System — Refrigerating system using mechanical compression to move the refrigerant from the low-pressure side and to deliver it to the high-pressure side of the system.

2.1292 Mechanical Seal — Seal with small enough clearance between moving parts to provide pressure tightness and minimize leakage between mechanical parts.

2.1293 Mechanical Ventilation

a) It is the active process of supplying or removing air to or from an indoor space by powered equipment such as motor-driven fans and blowers but not by devices such as wind-driven turbine ventilators and mechanically operated windows; and

b) Ventilation provided by mechanically powered equipment, such as motor-driven fans and blowers, but not by devices such as wind-driven turbine ventilators and mechanically operated windows.

2.1294 Mechanical, Draft-water Cooling Tower — The tower through which air movement is affected by one or more fans. There are two main types: forced draft with fans located at the air inlet and induced draft with fans located at the air exhaust. *See* the cooling tower.

2.1295 Medium Pressure Refrigerant System — The system whose gage pressure at room temperature (23.3 °C [74 °F]) is greater than atmospheric pressure but typically less than 100 psig (689 kPa). Common medium pressure refrigerants include R-12, R-500, and R 134a.

2.1296 Medium Temperature Refrigerated Storage — The temperature range for maintaining food product above freezing in refrigeration applications. Typically, 3 °C to 5 °C (35 °F to 40 °F).

2.1297 Melting — Change of state from solid to liquid.

2.1298 Melting Point — For a given pressure, the temperature at which the solid and liquid phases of the substance are in equilibrium.

2.1299 MERV Rating — *See* minimum efficiency reporting values (MERV)

2.1300 Metabolic Heat — Heat produced by oxidation of food elements (that is, metabolism) in humans or animals. The heat represents the average heat produced by a sedentary man, approximately 90 kcal/h or 100 W (340 Btu/h).

2.1301 Metabolic Rate

a) The rate of energy production of the body. The rate varies with the type of activity; and

b) The rate of transformation of chemical energy into heat and mechanical work by metabolic activities within an organism, usually expressed in terms of unit area of the total body surface. Metabolic rate is expressed in met units.

2.1302 Metabolism — It is the chemical change in living cells by which energy is provided for vital processes.

2.1303 Metered Data — The energy end use data collected over time using a measuring device or group of measuring devices.

2.1304 Metered Demand — The average time rate of energy flow over a period of time.

2.1305 Methanol (Methyl Alcohol) — (CH_3OH) Colorless, toxic, flammable liquid with a boiling at 65 °C (148.9 °F) and having a flash point (open cup) of 54 °F (12.2 °C).

2.1306 Microclimate — Conditions such as temperature, humidity, and motion of air within an enclosure or limited outdoor area.

2.1307 Minimum Efficiency Reporting Values (MERV) — It is the scaled rating of the effectiveness of air filters. The scale is designed to represent the worst-case performance of a filter when dealing with particles in the range of 0.3 micrometres to 10 micrometres. The MERV rating is from 1 to 16. Higher MERV ratings correspond to a greater percentage of particles captured on each pass, with a MERV rating of 16 filters capturing more than 95 percent of particles over the full range.

2.1308 Minimum Outdoor Air Damper — A damper in parallel with the maximum outdoor air damper to provide the minimum outdoor air required for ventilation.

2.1309 Mixed Air

a) Air that contains two or more streams of air; and

b) Combined outdoor air and recirculated air.

2.1310 Mixed Flow Fan — The fan whose characteristics combine both centrifugal and axial airflow.

2.1311 Mixing Air Diffusion — Air diffusion where the mixing of supply air and room air is intended.

2.1312 Mixing Box (Blending Box; Mixing Unit) — It is a compartment into which two air supplies are mixed together before being discharged.

2.1313 Mixing Section — A section for the mixing of two air streams at different temperatures or humidity or both.

2.1314 Mixing System — A type of air-distribution system in which conditioned air is delivered to the space at a velocity sufficient to promote complete mixing of supply air with room air, thereby maintaining the entire volume of air in the space at a relatively uniform temperature, humidity, and air quality condition. A conventional overhead air distribution, which supplies and returns air at ceiling level, is an example of a mixing system.

2.1315 Mixing Valve — A three-way valve to mix two fluids. Compared to diverting valve.

2.1316 Mixture, Eutectic — A mixture, which melts or freezes normally at constant temperature and with constant composition. Its melting point is usually the lowest possible for mixtures of the given substances.

2.1317 Modular Air-Conditioning System — On-site assembly of prefabricated components, each with a functional role in an air-conditioning (air-circulation, air-filtration, cooling, heating, humidification, etc) system.

2.1318 Modulating — It is a control, tending to adjust by increments and decrements; also one modified by variation of a second condition.

2.1319 Moisture Carryover — The retention and transport of water droplets in a gas stream (usually air) (for example, water droplets formed by bridging fins of a coil and transported by the airstream).

2.1320 Moisture Content — It is the amount of moisture per unit volume of porous material, w, in lbm/ft^3 (kgm/m^3).

2.1321 Moisture Ratio — It is the amount of moisture per unit weight of dry porous material or the volume of moisture per unit volume of dry material, in percent.

2.1322 Moisture Removal Capacity — The mass of water vapor removed from the process air per unit of time and expressed in kg/h (lb/h).

2.1323 Moisture Removal Rate — The mass of water vapor removed from the desiccant per unit of time via the regeneration process (desorption) and expressed in kg/h (lb/h).

2.1324 Mol Fraction Water Vapor — In humid air, it is the ratio of the number of water vapor mols to the total number of moles in the mixture. Compared to humidity.

2.1325 Mole (Mel) — It is a weight of a substance numerically equal to its molecular weight. The unit is a gram mol.

2.1326 Molecular Sieve — An adsorbent composed of porous alumino-silicates with pores of uniform molecular dimensions which will selectively adsorb molecules of the substance to be gathered.

2.1327 Mollier Diagram (Mollier Chart) — The graph of enthalpy versus entropy of a vapor on which isobars, isothermals, and lines of equal dryness are plotted.

2.1328 Monitoring and Verification (M and V) Plan

a) A plan for gathering relevant measurement data over time to evaluate equipment or system performance. The plan defines specific M and V methods to be used, including baseline determination, performance period measurements, savings verification calculations, and acceptance criteria. The M and V methods chosen are consistent with the current facility requirements (CFR). During the implementation phase, a list is developed of specific instrumentation and data-gathering equipment that must be maintained at the site. During the hand-off phase, the type, frequency, and distribution of M and V reports to be submitted for approval is confirmed;

b) Equipment to measure and record the parameters of the HVAC and R systems (that is, temperature, humidity, pressure, electric current, kW, and volts); and

c) Gathering of relevant measurement data over time to evaluate equipment or system performance (for example, chiller electric demand, inlet evaporator temperature and flow, outlet evaporator temperature, condenser inlet temperature, and ambient dry-bulb temperature and relative humidity or wet-bulb temperature, for use in developing a chiller performance map (for example, kW/ton versus cooling load and versus condenser inlet temperature).

2.1329 Multicellular Metal-Foil Thermal Insulation — Thermal insulation consisting of waffled or corrugated sheets of metal foil to form a cellular structure.

2.1330 Multi-Channel Heat Exchanger — It is an apparatus in which fluids exchange heat by flowing in an assembly of separated channels.

2.1331 Multilayer Thermal Insulation — Many thin layers of materials combined to obtain a very high thermal resistance (superinsulation).

2.1332 Multi-shell Condenser — The condenser consisting of a number of closed shell-and-tube units.

2.1333 Multistage Compression — Compression in two or more stages; usually the low-stage compressor discharges to the suction of a higher-stage compressor.

2.1334 Multistage Compressor — Compressor in which compression is accomplished in more than two stages in separate cylinders or impellers.

2.1335 Multistage Expansion — This process allows refrigerants to pass through two or more expansion valves in series with each other.

2.1336 Multistage Refrigerating System — The system in which compression of refrigerant is carried out in two or more steps.

2.1337 Multi-Zone

a) Air-conditioning unit capable of handling variable loads from different sections of a building simultaneously; and

b) Spatial divisions of a building having different air-conditioning loads.

2.1338 Natural Convection Air Cooler — An air cooler depending upon natural convection for air circulation.

2.1339 Nebulize — To supply very fine water spray or steam into an airstream or enclosure.

2.1340 Negative Air Pressure

a) In a building, it is a pressure lower than pressure outdoors; and

NOTE — As the negative pressure increases, outdoor air is drawn in through any openings in the building envelope.

b) In building spaces, pressure is lower than pressure in adjacent spaces or rooms.

2.1341 Net Capacity

a) The maximum load that a machine, apparatus, device, or system is capable of carrying under service conditions; and

b) Capacity (volume) of a room after deducting the loss of space due to coils, columns, air ducts, dunnage, and other dedicated space required to provide air circulation.

2.1342 Net Cooler Refrigerating Capacity — The rate of heat removal from a fluid flowing through a cooler (air, water, brine, etc) at stated conditions; the difference in specific enthalpies of the cooling fluid entering and leaving the cooler. In case frosting occurs within the cooler, the latent heat of fusion and the subcooling heat of the ice (frost) must be added in determining the net cooler refrigerating capacity.

2.1343 Net Exhaust Flow Rate — The exhaust flow rate for a hood minus any internal discharge makeup airflow rate.

2.1344 Net Latent Cooling Effect — The total useful capacity of the air conditioner for removing water vapor from the space to be conditioned.

2.1345 Net Refrigerating Effect

a) The product of the mass rate of water or brine flow and the difference in enthalpy of the entering and leaving water or brine, expressed in heat units per unit of time. It is expressed also by the total refrigeration effect less the heat leakage losses;

b) (Condensing unit capacity) The rate at which heat is removed from outer media by a refrigerant in the low-pressure side or by the difference in total enthalpy between refrigerant liquid leaving the unit and the total enthalpy of the refrigerant vapor entering it;

c) The rate at which heat is removed from the airstream, as measured entering the cooling coil and leaving the unit; and

d) The rate at which heat is removed by the primary refrigerant from the cooling medium (secondary coolant) that is used to transmit the refrigerating effect.

2.1346 Net Refrigeration Capacity — This is a portion of the total refrigeration capacity of a liquid cooler that produces useful cooling. This is the product of the mass flow rate of liquid, specific heat of the liquid, and the difference between entering and leaving liquid temperatures expressed in energy units per unit of time. It is represented also by the total refrigeration capacity less the heat leakage rate

2.1347 Net Sensible Capacity — The gross sensible capacity less the default rate of fan heat assumed by the manufacturer; this rate of fan heat is not necessarily the same as for the actual installed fan.

2.1348 Net Total Capacity — The gross total capacity less the default rate of fan heat assumed by the manufacturer; this rate of fan heat is not necessarily the same as for the actual installed fan. (*See* adjusted net total capacity) (*see* gross total capacity).

2.1349 Net Total Cooling Capacity — Total cooling capacity with fan power adjustment.

2.1350 Net Total Cooling Effect — The refrigeration capacity available for space and product cooling. It is equal to the gross total cooling effect less the heat equivalent of energy required to operate the cooler.

2.1351 Neutral Pressure Level —The building height at which there is no difference between inside and outside building static air pressure. Also known as the neutral zone.

2.1352 Newton's Law of Cooling — The rate of heat flow out of an object by both natural convection and radiation is proportional to the temperature difference between the object and its environment and to the surface area of the object.

2.1353 Night Cover — The removable cover placed over an open-top refrigerated display case during overnight periods in order to reduce energy transfer with the environment.

2.1354 Night Setback Thermostat — Manual or automatic reset of temperature control point of a thermostat, usually coupled with a start-up time for restoration of desired daytime temperature level.

2.1355 No-Frost Refrigerating System

a) System in which all the refrigerated surfaces in the cabinet are defrosted by an automatic defrost system; and

b) Use of a secondary coolant sprayed on evaporator surfaces to prevent formation of frost; water absorbed in the coolant is removed by distillation.

2.1356 Noise — It is sound, or a sound of any sort; especially sound without agreeable musical quality.

2.1357 Noise Criteria Curves (NC Curves) — Curves that define the limits which the octave-band spectrum of a noise source must not exceed if a certain level of occupant acceptance is to be achieved.

2.1358 Nominal Capacity

a) The capacity recorded and reported by a given test; and

b) The capacity reported by the manufacturer for a specified device.

2.1359 Nominal Freezing — For a given product of specified dimensions and at an initial uniform temperature of 0 °C (32 °F), the time it takes for the thermal centre to reach – 10 °C (14 °F).

2.1360 Nominal Size of an Air Terminal — The nominal value of dimensions of the prepared opening (duct) into which the air terminal device is to be fitted.

2.1361 Nominal Size of Duct and Fitting — The reference dimension used for designation, calculation, and application of duct and fitting.

2.1362 Nominal Storage Capacity — A theoretical capacity of the thermal storage device, which in many cases is greater than the usable storage capacity. This measure should not be used to compare usable capacities of alternative storage systems.

2.1363 Nominal Time Constant — The indoor air volume of a space or building divided by the rate of outdoor air supply; the nominal time constant also equals the average age of air exiting from the space or building. The reciprocal of the nominal time constant is called the nominal air change rate.

2.1364 Noncyclic Ice Maker — Continuous ice maker with simultaneous water supply, freezing, and harvesting phases in the ice-making operation.

2.1365 Non-Isothermal Jet — The jet in which the primary air temperature differs from the mean space temperature.

2.1366 Nonstandard Part-Load Value (NPLV) — A single-number part-load efficiency figure of merit calculated and referenced to conditions other than IPLV conditions for units that are not designed to operate at ARI standard rating conditions.

2.1367 Non-Volatile Refrigerant — Refrigerant that remains a liquid during the process of absorbing heat within the air cooler.

2.1368 Normalized Leakage — The dimensionless value calculated from the leakage area, building height, and floor area that describes the relative airtightness of the building envelope.

2.1369 Nozzle — It is a short tube with a taper or constriction used to speed up or direct a flow of fluid.

2.1370 Nusselt Number — The dimensionless number, used in calculation of forced convection, that gives a measure of the ratio of total heat transfer to conductive heat transfer, equal to the heat transfer coefficient times a characteristic length divided by the thermal conductivity.

2.1371 Occupant Sensor — It is a device that detects the presence or absence of people within an area and that causes lighting, equipment, or appliances to be regulated accordingly.

2.1372 Occupant-Controlled Naturally Conditioned Spaces — Those spaces where the thermal conditions of the space are regulated primarily by the opening and closing of windows by the occupants.

2.1373 Occupiable Space

a) Any enclosed space inside the pressure boundary (including, but not limited to, all habitable spaces, toilets, closets, halls, storage and utility areas, and laundry areas) and intended for human activities; and

b) The portion of the premises accessible to or occupied by people, excluding machinery rooms.

2.1374 Occupied Zone — The portion of the space that is normally occupied. The occupied zone is typically defined as encompassing all space from the floor level, excluding the space from the floor to 0.076 m (0.25 ft) above the floor, to 1.83 m (6 ft) above the floor and excluding the space from the wall to 0.61 m (2 ft) away from any wall.

2.1375 Odour — A quality of gases, liquids, or particles that stimulates the olfactory organ.

2.1376 Odour Dispersion Time — Time taken to reduce odour to a defined level from a given concentration and resulting from a standard test.

2.1377 Odour Reduction Time — Efficiency of the reduction of odours by a device.

2.1378 Off-Cycle Defrosting

a) Method of defrosting in which the temperature of the evaporator coils is allowed to rise naturally during an off-cycle, during which no refrigerant is supplied; and

b) Rapid heating of the evaporator coil during the off part of each cycle.

2.1379 Off-Peak System — Refrigerating or cooling system with control that normally avoids use of power during peak-load periods and usually requires means for storage of energy.

2.1380 Oil — An Oil is any various viscous, combustible, water-immiscible liquid which is soluble in certain organic solvents, and may be extracted from animals, vegetables, minerals, or synthetics.

2.1381 Oil Charge — It is a normal quantity of oil in a reciprocating compressor or engine.

2.1382 Oil Receiver — It is a vessel for receiving and separating collected oil prior to returning to or discharging from the refrigerating system.

2.1383 Oil Removal — It is removal of oil or oil vapor from a refrigerant vapor.

2.1384 Oil Return — It is migration of oil from the evaporator to the crankcase of the compressor.

2.1385 Oil Separator — A device for separating oil and oil vapour from the refrigerant, usually installed in the compressor discharge line.

2.1386 Oil Still — It is a device to separate oil from refrigerant by a distillation process.

2.1387 Oil, Refrigerating — It is a stable fluid which is compatible with system components, will form a friction-reducing film between rubbing surfaces, seal critical clearances, and has low-temperature properties suitable for the application. The oil used for cooling the moving/rotating parts inside the compressor

2.1388 Oil, Synthetic — It is a synthesized material, often derived from petroleum compounds, but containing no petroleum oil fractions, that can act as a lubricant.

2.1389 Olf — Unit for quantifying the source strength of air pollution. One olf is the emission rate of air pollutants (bioeffluents) from a standard person.

2.1390 One-Pipe Hydronic System — The piping system in which a single pipe loop provides the cooling or heating distribution to multiple devices or through secondary or tertiary loops.

2.1391 One-Pipe Steam System — The piping system in which the condensable vapor withdrawn from the supply main passes into a heating unit and returns as condensate to the same supply main.

2.1392 Open Shell-and-Tube Condenser — Condenser in which the water passes in a film over the inner surfaces of the tubes, which are open to the atmosphere.

2.1393 Open System — Heating or refrigerating piping system in which the circulating water or brine return main is connected to an open-vented elevated tank that serves as a reservoir to accommodate expansion and contraction of the fluid and as an inspection point for the condition of the fluid. *See* the down-feed system and water system.

2.1394 Open-Brine Refrigerating System — The system in which the circulating brine returns to an open tank which serves as a reservoir for the pump suction and as an inspection tank for the condition and flow of brine.

2.1395 Open-Loop Control — The control system in which the effect of the control action is not felt by the sensed variable (for example, outside air when it is used for reset). Compared to closed-loop control.

2.1396 Open-Loop Control System — The control system that controls outputs by inputs only and where the actual system output is not considered.

2.1397 Open-Spray Recovery Loop Exchanger — The extended surface cooling towers with interconnecting piping placed in supply and exhaust airstreams. A circulated heat and mass transfer fluid is alternately brought in direct contact with each airstream.

2.1398 Open-Type Compressor — The refrigerant compressor with a shaft or other moving part extending through its casing to be driven by an outside source of power, thus requiring a shaft seal or equivalent rubbing contact between fixed and moving parts.

2.1399 Operating Efficiency — It is the ratio of output to input.

2.1400 Operating Life — Expected useful life of a device, usually expressed in number of operations or years/months/hours of typical operation.

2.1401 Operating Pressure — The pressure occurring at a reference point in a system when the system is in operation.

2.1402 Operative Temperature — The uniform temperature of an enclosure in which an occupant would exchange the same amount of heat by radiation plus convection as in the actual non-uniform environment. Compared to mean radiant temperature.

2.1403 Optimum Operative Temperature — The operative temperature that satisfies the greatest possible number of people at a given clothing and activity level. *See* operative temperature.

2.1404 Optimum Refrigerant Charge — This is the charge achieving maximum possible refrigerant effect within design limitations.

2.1405 Optimum Start — A control system that is designed to automatically adjust the start time of an HVAC system each day with the intention of bringing the space to desired occupied temperature levels immediately before scheduled occupancy.

2.1406 Organic Compound — Originally a chemical compound produced by a life process. Now it is generally understood to include all compounds containing carbon.

2.1407 Outdoor Air

a) Air outside a building or taken from the external atmosphere and, therefore, not previously circulated through the system;

b) Ambient air that enters a building through a mechanical ventilation system, through intentional openings for natural ventilation, or by infiltration; and

c) Compared to outside air.

2.1408 Outdoor Air Change Rate — It is the ratio of the volumetric rate at which outdoor air enters a building space to the building volume with identical volume units (normally expressed in units of air changes per hour).

2.1409 Outdoor Air Fraction — The outdoor air fraction is the ratio of the volumetric flow rate of outdoor air brought in by the air handler to the total supply airflow rate.

2.1410 Outdoor Coil — The heat exchanger that rejects heat to, or absorbs heat from, a source external to the conditioned space.

2.1411 Outdoor Dry-Bulb Temperature (ODB) — *See* dry-bulb temperature

2.1412 Outdoor Side — The part of the system that rejects heat to or absorbs heat from a source external to the indoor airstream.

2.1413 Outlet, Ceiling — A round, square, rectangular, or linear air diffuser located in the ceiling, which provides a horizontal distribution pattern of primary and secondary air over the occupied zone and induces low-velocity secondary air motion through the occupied zone.

2.1414 Outlet, Slotted — A long, narrow air distribution outlet, comprised of deflecting members, located in the ceiling, side wall, or sill, with an aspect ratio greater than , designed to distribute supply air in varying directions and planes, and arranged to promote mixing of primary air and secondary room air.

2.1415 Outlet, Varied — A register, or grill, equipped with vertical and/or horizontal adjustable vanes.

2.1416 Output — It is capacity, duty, performance, net, refrigeration produced by a system. It is equal to the load imposed.

2.1417 Outside Air Opening — It is any opening used as an entry for air from outdoors.

2.1418 Overall Heat Transfer Coefficient — Heat flow per area for a given construction and for an overall temperature difference of one degree.

2.1419 Overall System Efficiency — It is the ratio of the useful energy at the point of use to the thermal energy input over a designated time period.

2.1420 Overall Thermal Transfer Value (OTTV) — Quantity of heat transferred per unit of temperature difference into a building through its walls or roof, due to solar heat gain and outdoor/indoor temperature difference.

2.1421 Overhead System — Heating, air-conditioning, or radiant system in which the heating or cooling emission is overhead.

2.1422 Overpressure — The pressure in excess of the designed normal operating range.

2.1423 Overrun — In ice cream freezing, the ratio of the volume of ice cream to the volume of the mix used.

2.1424 Ozone — Triatomic oxygen (OS) sometimes used in air conditioning or cold storage as an odour eliminator; can be toxic in certain concentrations.

2.1425 Packaged Air Conditioner — A complete air-conditioning unit, including refrigeration compressor, cooling coils, fans, filters, automatic controls, etc, assembled into one casing (also known as Self-Contained Unit.

2.1426 Packaged Direct-Evaporative Cooler — A self-contained unit including a fan and fan motor whose primary functions are:

a) The conversion of the sensible heat of unsaturated air passing through the cabinet to latent heat by the process of evaporating recirculating or non-recirculating water directly exposed to this air; and

b) The movement of this air through the unit.

2.1427 Packaged Indirect Evaporative Cooler — An indirect evaporative cooler with integrated or non-integrated primary and secondary air passages and provided with both primary and secondary air moving devices. This device also includes the entire water distribution, collection, and recirculation system with pump and piping. This type may have provisions for installation of other heat and mass transfer devices, such as a direct evaporative cooler and auxiliary heating and cooling coils.

2.1428 Packaged Terminal Air Conditioner (PTAC) — A factory selected wall sleeve and separate unencased combination of heating and cooling components, assemblies, or sections. It may include heating capability by hot water, steam, or electricity and is intended for mounting through the wall to serve a single room or zone.

2.1429 Packaged Terminal Heat Pump (PTHP) — A PTAC capable of using the refrigerating system in a reverse cycle or heat pump mode to provide heat.

2.1430 Packing — It is the stuffing around a shaft or valve stem to prevent fluid leakage.

2.1431 Packing Plant — An establishment engaged in the slaughtering, dressing, and processing of animals; also used in connection with the processing of vegetables or fish.

2.1432 Panel Cooler — The refrigerated flat surface.

2.1433 Parallel Fan-powered VAV Box — A terminal device that combines a true VAV box in parallel with a fan and optional heating coils. Fan operation is intermittent.

2.1434 Parallel-Flow Heat Exchanger — The heat exchanger in which fluids flow approximately parallel to each other and in the same direction.

2.1435 Parallel-Flow Heat Transfer — A directional pattern of heat transfer fluids used in energy exchange equipment where the warmest fluid ‘A’ indirectly contacts the coldest fluid ‘B’ at the entering side of the exchanger.

2.1436 Partial Pressure

a) Partial pressure of component i for any (ideal or non-ideal) gas mixture is the product of the mole fraction of the component, x_i, and the

mixture pressure; and p. ($p_i = x_i . p$ for any gas mixture); and

b) The portion of total gas pressure of a mixture attributable to one component (Dalton's law of gases).

2.1437 Partially Halogenated Chlorofluorocarbon — A chlorofluorocarbon in which hydrogen atoms exist in the compound with chlorine and fluorine atoms. Partially halogenated chlorofluorocarbons are not expected to have high ozone depleting potential (ODP). Average atmospheric lifetime is about 2 years for HCFC 21 and 13 to 25 years for HCFC 22. Compared to halogenated chlorofluorocarbons.

2.1438 Part-Load Ratio — It is the ratio of the net refrigeration effect to the adjusted net total capacity for the cooling coil. *See* net refrigerating effect and adjusted net total capacity.

2.1439 Part-Load Value (PLV) — A single number figure of merit expressing part-load efficiency for equipment on the basis of weighted operation at various partial-load capacities for the equipment; expressed in kilowatts per ton of refrigeration.

2.1440 Passive Chilled Beam — Uses a pipe surrounded by a coil in order to form a radiator system. Passive chilled beams have no method for maintaining the humidity of a room and must be paired with a ventilation system in order to maintain latent heat gains.

2.1441 Passive System

a) A combined appliance that does not use a water pump but relies on thermosiphon flow through the desuperheater and water heater, generally the desuperheater is mounted on the side of the water heater or at an elevation lower than the water heater; and

b) A system where natural forces are utilized for HVAC purposes in lieu of mechanical/ electrical/chemical sources.

2.1442 Pasteurization — It is heat treatment, usually at 55 °C to 70 °C, for killing bacteria, as in milk, without greatly changing its chemical composition.

2.1443 Phase-Change Material (PCM) — It is a substance with a high heat of fusion which, melting and solidifying at a certain temperature, is capable of storing and releasing large amounts of energy.

2.1444 PD

a) Pressure dependent;

b) Pressure difference; and

c) Pressure drop.

2.1445 Peak Discharge Rate — The maximum rate at which heat is added to storage (cooling discharged from storage).

2.1446 Percent Outdoor Air — It is the volumetric outside airflow rate expressed as a percentage of total supply airflow rate.

2.1447 Perfect Mixing — A theoretical airflow distribution pattern within a ventilated space where the supply air is instantaneously and uniformly mixed with the air in the space such that the concentration of all constituents in the air, and the age of air, are spatially uniform.

2.1448 Perforated Ceiling — Perforated ceiling panels used to distribute the air uniformly throughout the ceiling or a portion of the ceiling. Filter pads may be used to achieve a similar result.

2.1449 Performance Factor — The ratio of the useful output capacity of a system to the input required to obtain it. Units of capacity and input need not be consistent.

2.1450 Perimeter Zone — Any space with at least one surface exposed to exterior loads.

2.1451 Permanent Bleed Rate — The capacity of the permanent bleed provision, expressed either as a percentage of the nominal capacity or in kW (Btu/h or tons) of refrigerating effect produced by the evaporation of that amount of refrigerant flow.

2.1452 Perfluorocarbon (PFC) — A hydrocarbon composed only of fluorine and carbon.

2.1453 Phase

a) In thermodynamics, one of the states of matter, as solid, liquid, or gaseous; and

b) Electrically, an alternating current whose alterations have a definite time relation to the rotational position of the alternator. In a polyphase machine, the phases are separated by 360 electrical degrees divided by the number of phases.

2.1454 Phosphorous Pentaoxide — It is a drier material which becomes gummy on reacting with moisture and, hence, is not used as a drying agent in refrigerating systems.

2.1455 Piggyback Refrigerating System — Two chilling plants, centrifugal and absorption, usually steam driven, using the same steam supply in sequence, with chilled water running counter flow to stream.

2.1456 Pilot Valve — The small valve where the opening or closing directly influences a larger valve, as in a servo system.

2.1457 Plane Radiant Temperature — Uniform temperature of an enclosure where the radiance on one side of a small plane element is the same as in the non-uniform actual environment.

2.1458 Plaque and/or Sump — The volume generated by embossed areas on the interior surfaces of the general refrigerated and/or freezer compartments.

2.1459 Plate Evaporator — Evaporator consisting of two plates containing channels for the circulation of refrigerant or a set of tubes connected to and between the two plates.

2.1460 Plate Freezer — The contact freezer in which the refrigerated surface is a flat metal plate. Compared to a Double-Contact Freezer.

2.1461 Plate Liquid Cooler — The heat exchanger made of thin plates so formed that liquid to be cooled flows through the passage between the plates and the cooling fluid flows through the alternate passages.

2.1462 Plate-Type Condenser

a) An air-cooled condenser consisting of plates between which are arranged channels for the circulation of refrigerant; and

b) The water-cooled condenser consists of a coil through which the refrigerant circulates, arranged between two plates, with water circulating between coil and plates.

2.1463 Plenum Chamber — An air compartment connected to one or more distributing ducts.

2.1464 Point, Critical — Of a substance, state point at which liquid and vapour have identical properties; critical temperature, critical pressure, and critical volume are the terms given to the temperature, pressure, and volume at the critical point. Above the critical temperature or pressure there is no line of demarcation between liquid and gaseous phases.

2.1465 Point, Triple — It is the state point at which three phases of a given substance (that is solid, liquid, and gas) exist in equilibrium.

2.1466 Polytropic-Change — Any set of changes in a gas represented by the equation:

$$PVn = constant$$

2.1467 Pond Spray — It is an arrangement for lowering the temperature of water in contact with outside air by evaporative cooling of the water. The water to be cooled is sprayed by nozzles into the space above a body of previously cooled water and allowed to fall by gravity into it.

2.1468 Power Roof Ventilator — (Also referred to as an up-blast fan). A fan designed for curb mounting on a roof or, within size and design constraints, for wall mounting. Air enters the fan in a typical axial arrangement but discharges radially from the centrifugal impeller and turns 90 degrees to exit through the top of the fan. It may be listed under UL standard 705, standard for power ventilators, in accordance with UL Subject 762, 'outline of investigation for power roof ventilators for restaurant exhaust applications'.

2.1469 Power Ventilator — The fan consisting of a centrifugal or axial-type impeller with integral driver in a weather-resistant housing with base designed to fit (usually by means of a curb) over a wall or roof opening.

2.1470 Parts Per Million (PPM) — Concentration by volume of one part of a gas (or vapor), or by weight of a liquid or solid, per million parts of air or liquid

2.1471 Prandtl Number

a) It is a dimensionless number used in calculation of forced and free convection, equal to the dynamic viscosity times the specific heat at constant pressure, divided by the thermal conductivity; and

b) It is a dimensionless number used in calculation of diffusion in flowing systems, equal to the kinematic viscosity divided by the molecular diffusivity. Symbol is Pr. Also known as Schmidt number 1 (Sc, or NSc1).

2.1472 Precipitator, Electric — A device for removing dust from the air by means of electric charges induced on the dust particles.

2.1473 Pre-cooler

a) A device for transferring heat from the incoming potable water to the spill;

b) A cooler for the removal of sensible heat before shipping, storing, or processing; and

c) A device for cooling a fluid before it enters some piece of apparatus.

2.1474 Pre-cooling — It refers to the practice of preparing fruits and vegetables for shipment by cooling before or after they enter a car.

2.1475 Predicted Mean Vote (PMV) — The index that predicts the mean value of thermal sensation votes of a large group of persons, expressed on a seven-point scale.

2.1476 Predicted Percentage Dissatisfied (PPD) — The index that predicts the percentage of a large group of people who are likely to feel thermally dissatisfied with the body as a whole (that is, feel either too warm or too cold).

2.1477 Preheat Coil — The heating coil installed upstream of the cooling coil or at the front of an air-handling system to preheat air.

2.1478 Preheating

a) Heating a food product prior to a subsequent treatment;

b) In air conditioning, to heat the air ahead of other processes; and

c) To heat the water prior to heating by the auxiliary thermal source.

2.1479 Pre-heating — In air conditioning, to heat the air in advance of other processes.

2.1480 Preliminary Run — Successive sets of readings compiled during continuous cooler operation with the objective of establishing a steady-state condition.

2.1481 Prescriptive Design — For energy compliance alternatives, a prescriptive design includes specific assumptions concerning shape, orientation, HVAC, and other system design features. The prescriptive design is compared with the proposed design using the annual energy cost method.

2.1482 Pressure — The normal force exerted by a homogeneous liquid or gas, per unit of area, on the wall of the container.

2.1483 Pressure Change of an Expansion Valve — The change in outlet pressure of a constant pressure expansion valve required to open the valve at a predetermined amount.

2.1484 Pressure Drop — It is the static pressure loss in fluid pressure, as from one end of duct to the other, due to friction, etc.

2.1485 Pressure Equalizing — Allowing high- and low side pressures to equalize or nearly equalize during idle periods as by use of an unloading valve or by a vapour lock liquid control, or nearly equalizing inlet and discharge pressures on the compressors. In either case, it is to reduce starting torque load.

2.1486 Pressure Imposing Element — Any device or portion of the equipment used for the purpose of increasing the pressure upon the refrigerant.

2.1487 Pressure Limiting Device — A pressure actuated mechanism designed to automatically stop the operation of a compressor or other pressure-producing component at a predetermined maximum or minimum pressure.

2.1488 Pressure Regulator, Evaporator (Back Pressure Valve) — An automatic valve located between the evaporator outlet and compressor inlet that is responsive to its own inlet pressure or to the evaporator or refrigerator temperature and functions to throttle the vapour flow when necessary to prevent the evaporator pressure from falling below a selected value.

2.1489 Pressure Relief Device — A valve or rupture member designed to relieve excessive pressure automatically.

2.1490 Pressure, Absolute — Pressure referred to a perfect vacuum. It is the sum of gauge pressure and atmospheric pressure.

2.1491 Pressure, Atmospheric — It is the pressure due to the weight of the atmosphere. It is the pressure indicated by a barometer. Standard atmospheric pressure or standard atmosphere is the pressure of 76 cm of mercury having a density of 13.595 1 g/cm^3 under standard gravity of 980.665 cm/sec.

2.1492 Pressure, Balance — It is in a system or container equal to that which exists outside.

2.1493 Pressure, Critical — Vapour pressure corresponding to the critical state of the substance at which the liquid and vapour have identical properties.

2.1494 Pressure, Discharge — An operating pressure in a refrigerating system measured in the discharge line at the compressor outlet.

2.1495 Pressure, Gauge — Pressure above atmospheric

2.1496 Pressure, Hydrostatic — The normal force per unit area that would be exerted by a moving fluid on an infinitesimally small body immersed in it if the body were carried along with the fluid.

2.1497 Pressure, Operating — It is the pressure occurring at a reference point in a refrigerating system when the system is in operation.

2.1498 Pressure, Partial — It is the portion of total gas pressure of a mixture attributable to one component.

2.1499 Pressure, Saturation — The saturation pressure for a pure substance for any given temperature is that pressure at which vapour and liquid, or vapour and solid, can co-exist in stable equilibrium.

2.1500 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 (piezometer) 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 test depend upon its uniform hydrostatic pressure.

2.1501 Pressure, Suction — An operating pressure in a refrigerating system measured in the suction line a pressure, total. It is the sum of the static pressure and the velocity pressure at the point of measurement.

2.1502 Pressure, Vapour — The pressure exerted by vapour. If a vapour is kept in confinement over liquid so that the vapour can accumulate above the liquid, the temperature being held constant, the vapour pressure approaches a fixed limit called the maximum or saturated vapour pressure dependent only on the temperature and the liquid. The term vapour is sometimes used synonymous with saturated vapour pressure.

2.1503 Pressure, Velocity — In a moving fluid, remove cable 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.

2.1504 Pressure-Type Air Cooler — It is a cooler for use with one or more external elements which impose air resistance.

2.1505 Pressurized Stair Shafts — A type of smoke control system in which stair shafts are mechanically pressurized with outdoor air to keep smoke from contaminating them during a fire incident.

2.1506 Prevention of Vacuum System — A refrigerant pressure-control system that prevents refrigerant loss and infiltration into idle low-pressure chillers and is also used to pressurize for leak testing without the use of non-condensables.

2.1507 Primary Air

a) Any air that is mixed with fuel at or in a burner prior to burning;

b) In a cleanroom, air that recirculates through the work space; and

c) Treated supply air that enters the space through any supply air device, such as air outlet or through any air supply terminal, such as a VAV unit or fan terminal unit. The air is not mixed with space air before entering the space.

2.1508 Primary Air Temperature — Air temperature of the primary airflow (for example, supply airflow from an air-handling unit).

2.1509 Primary Refrigerant — Working fluid of a refrigerating cycle (as opposed to secondary refrigerant).

2.1510 Primary Surface

a) (Direct surface), Portion that is exposed to radiation from fires and transfers heat directly to the air being heated; and

b) Surface that is in direct contact with both the heat-absorbing and heat-emitting media.

2.1511 Process Load — The load on a building resulting from the consumption or release of process energy.

2.1512 Properties, Thermodynamic — Basic qualities used in defining the condition of a substance, such as temperature, pressure, volume, enthalpy, entropy.

2.1513 Propylene Glycol — Clear, colourless liquid used to depress the freezing point of water for use as a secondary coolant in HVAC and R systems. Note: Inhibitors are required to control corrosion caused by glycol solutions.

2.1514 Psychrometer — It is an instrument for measuring relative humidity by means of wet- and dry-bulb temperature.

2.1515 Psychrometric Chart — It is a graphical representation of the properties of moist air, usually including wet- and dry bulb temperature, specific and relative humidity, enthalpy, and density.

2.1516 Psychrometry — The branch of physics relating to the measurement or determination of atmospheric conditions, particularly regarding the moisture mixed with the air.

2.1517 Pull-Down Load — The unmet cooling load that accumulates during a period when cooling is not provided to the load and that must be met upon system start-up. Maximum pull-down load generally occurs on a Monday morning.

2.1518 Pull-Down Test — First operational check on a refrigerating installation to measure the time taken to pull the temperature down to the desired conditions while also measuring the temperatures, pressures, and associated data.

2.1519 Pulldown Test — It is the first operational check on a refrigeration installation to measure the time taken to pull the temperature down to the desired conditions, while also measuring the temperatures, pressures, and associated data.

2.1520 Pump Down — It is the operation by which the refrigerant in a charged system is pumped into the liquid receiver.

2.1521 Purge

a) Removal of air from a hydronic system;

b) Removal of non-condensable gases from a refrigeration system;

c) Removal of unburned gases from a combustion chamber; and

d) To get rid of whatever is impure or undesirable.

2.1522 Purge Recovery System — It is the system used to recover refrigerant from purged mixture of gases and water (also known as Purger).

2.1523 Purge System — It is required on lithium bromide absorption equipment to remove non-condensables (air), which leak into the machine, or hydrogen (a product of corrosion), which is produced during equipment operation. Even in small amounts, non-condensable gases can reduce chilling capacity and even lead to solution crystallization. Purge systems for larger sizes above 100 tons (359 kW) of refrigeration typically consist of these components: vapor pickup tube(s), non-condensable separation and storage tank(s), and vacuum pump or valving system.

2.1524 Purge Valve — A device to allow non-condensable gases to flow out of a system.

2.1525 Purger — It is a device for removing non-condensable gas from refrigerant condensers or for removing low-concentration liquor from absorption system evaporators.

2.1526 Purging — It is the act of blowing out gas from a refrigerant containing vessel, usually for the purpose of removing non-condensables.

2.1527 Pyranometer — Radiometer used to measure solar radiation received from the whole hemisphere (two steradians).

NOTE — The instrument is suitable for measurement of global or diffuse solar radiation.

2.1528 Pyrgeometer — A radiometer used for measuring the incoming atmospheric infrared radiation spectrums from approximately 4 μm to 100 μm on a black surface at ambient air temperature. The solar shortwave radiation is excluded from the energy measured.

2.1529 Pyrheliometer — A radiometer used to measure the direct or beam solar irradiance incident on a surface normal to the sun's rays.

2.1530 Pyrometer — It is an instrument for measuring high temperature.

2.1531 Pyranometer — A radiometer used to measure the total solar radiation incident upon a surface per unit time per unit area. This energy includes the direct radiation, the diffuse sky radiation, and the solar radiation reflected from the foreground.

2.1532 Quality of Wet Vapour — It is the fraction by weight of vapour in a mixture of liquid and vapour.

2.1533 Radiance — The total radiant flux emitted from a surface through unit projected area by unit solid angle. It includes the self-emitted radiation plus reflections from sources other than the object evaluated as interpreted from the direction of measurement. The term intensity of radiation is sometimes used as a synonym for radiance. *See also* Radiosity.

2.1534 Radiance at a Point on a Surface — The quotient of the flux incident on an element of a surface containing the point, by the area of that element, measured in watts per square meter, W/m^2 (Btu/ft^2).

2.1535 Radiant — The radiating rays of light; emitting or reflecting beams of light; vividly shining; glowing; brilliant.

2.1536 Radiant Asymmetry Temperature — It is the difference between the plane radiant temperature of the two opposite sides of a plane element. *See* plane radiant temperature.

2.1537 Radiant Barrier — A surface of low emissivity (less than 0.1) placed inside an attic or roof space above (but not touching) the distribution system to reduce radiant heat transfer.

2.1538 Radiant Energy — Energy passing through space in the form of electromagnetic radiation (such as light or ultraviolet or infrared radiation) or as a stream of particles (for example, electrons or protons).

2.1539 Radiant Flux — The time rate of flow of radiant energy (watts).

2.1540 Radiant Flux Density — It is the measure of radiant power per unit area flowing across or onto a surface (also called Irradiance).

2.1541 Radiant Heat — The heat transferred by radiation.

2.1542 Radiant Panel — A heating or cooling surface that delivers 50 percent or more of its heat transfer by radiation, which may be either an integral part of the building (for example, floor or ceiling heating) or detached from the building elements (for example, suspended ceiling panel).

2.1543 Radiant Reflectance (Luminous Reflectance) — It is the ratio of the reflected radiant (or luminous) flux to the incident radiant (or luminous) flux.

2.1544 Radiant Transmittance (Luminous Transmittance) — It is the ratio of the transmitted radiant (or luminous) flux to the incident radiant flux.

2.1545 Radiant-Cooling System — A sensible cooling system that provides more than 50 percent of the total heat flux by thermal radiation.

2.1546 Radiant-Heating System — A sensible heating system that provides more than 50 percent of the total heat flux by thermal radiation.

2.1547 Radiation, Thermal — It is the process of transmission of heat through space by wave motion; the passage of heat from one object to another without warming the space between.

2.1548 Radiative Forcing — It represents the net amount of infrared radiation absorbed by gases in the atmosphere. The radiative forcing of a gas depends on the efficiency with which it traps infrared radiation and its concentration in the atmosphere. Atmospheric concentration depends on emission rates and the atmospheric lifetime of the gas.

2.1549 Radiator Valve — A manual or automatic valve that controls the flow of the fluid to a radiator.

2.1550 Radioactive — A material that emits ionizing radiation.

2.1551 Radiometer — An instrument for measuring irradiance in energy or power units.

2.1552 Radiosity — Total radiant flux that leaves a unit area of a surface. The sum of radiant flux emitted and reflected by the surface, plus any radiant flux transmitted through that surface (Compared to Exitance).

2.1553 Ranque-Hilsch Effect — This is a spot-cooling effect produced in a tube into which gas is introduced tangentially, producing vortex flow.

2.1554 Ranque-Hilsch Tube — It is a device in which the Ranque-Hilsch effect is produced (also known as Pulse Tube).

2.1555 Rated Airflow — The airflow rate in m^3/s (cfm) at which the device is tested.

2.1556 Rated Operating Pressure — The tested maximum positive pressure at which a device or component is rated.

2.1557 Rating — The assigned values of those performance characteristics, under stated rating conditions, by which a unit may be chosen to fit its application. These values apply to all units of like nominal size and type (identification) produced by the same manufacturer.

2.1558 Receiver — A vessel in the refrigerating system designed to ensure the availability of adequate liquid refrigerant for proper functioning of the system and to store the liquid refrigerant when the system is pumped down.

2.1559 Recirculated Air — Air taken from a space and returned to that space, usually after being passed through a conditioning system. The part of the return air that is reused. Air removed from a space and reused as supply air.

2.1560 Recirculating Unit — A remote unit with cooling that is provided at the dispensing valve and accomplished by circulating cold water or cold carbonated water through one of the lines and returning the same to a refrigeration unit.

2.1561 Recirculation of Discharge Air

a) A condition pertaining to air-cooled condensers in which a portion of the discharge air enters along with the fresh air, the amount of recirculation is determined by equipment design, placement in regard to adjoining objects, and atmospheric conditions. The effect is generally evaluated on the basis of the decrease in unit capacity; and

b) Conditions pertaining to cooling towers and evaporative condensers in which a portion of the discharge air enters along with the fresh air, the amount of recirculation is determined by equipment design, placement in regard to adjoining objects, and atmospheric conditions. The effect is generally evaluated on the basis of the increase in entering wet-bulb temperature compared to the ambient.

2.1562 Reclaimed Refrigerants — The refrigerants reprocessed to the same specifications as new refrigerants by any means, including distillation. Such refrigerants have been chemically analysed to verify that those specifications have been met.

2.1563 Recommissioning — An application of the commissioning process requirements to a project that has been delivered using the commissioning process. This may be a scheduled recommissioning developed as part of an ongoing commissioning process or it may be triggered by use change, operations problems, or other needs.

2.1564 Re-cooling

a) Cooling of air that has been previously heated; and

b) Lowering the temperature of air that has been previously heated by a mechanical heating system.

2.1565 Recover — To remove refrigerant in any condition from a system and store it in an external container.

2.1566 Recoverable Heat — It is the portion of thermal input to a prime mover and that is not converted to mechanical power and can be reclaimed.

2.1567 Recovered Energy — Energy reclaimed for useful purposes and that would otherwise be wasted.

2.1568 Recovered or Reclaimed Heat — It comes from internal heat sources. It is used for space heating, domestic or service water heating, air reheat in air conditioning, process heating in industrial applications, or other similar purposes. Recovered heat may be stored for later use.

2.1569 Recovered Refrigerants — Refrigerants removed from a system in any condition without necessarily testing or processing them.

2.1570 Rectifier — In refrigeration, an externally cooled heat exchanger in the high side of an absorption system for condensing absorbent and separating it from refrigerant before passing it to the condenser.

2.1571 Recycle — To reduce contaminants in used refrigerants by separating oil, removing non-condensables, and using devices such as filter driers to reduce moisture, acidity, and particulate matter.

2.1572 Recycled Refrigerants — Refrigerants for which contaminants have been reduced by oil separation, removal of non-condensable gases, and single or multiple passes through filter driers or other devices that reduce moisture, acidity, and particulate matter.

2.1573 Reducer, Pressure, Liquid Refrigerant — It is a device or devices, in a refrigerating system, in which the pressure of the fluid is reduced from that of condensed liquid to that of the evaporator.

2.1574 Re-expansion Line — The curve on an indicator card, representing the pressure; the total volume relationship of clearance fluid during the initial portion of the return stroke of the piston prior to the opening of the suction valve.

2.1575 Reference Filters — The dry-media-type filters that are carefully measured for resistance and initial efficiency immediately after a test system is qualified. These filters serve as references to ensure that the test system continues to operate as it did when it was qualified.

2.1576 Reference Temperature — The temperature at an appropriate, fixed location within the test zone, for example, at 42 in. (1.1 m) above the floor for an office space served by a mixing air system.

2.1577 Reflectance

a) A portion of the incident radiation on a surface that is reflected from the surface; and

NOTE — For an opaque surface, the sum of the reflectance and the absorptance is unity at equilibrium. Absorptances and reflectances are of various types, as are emittances.

b) It is the ratio of the light reflected by a surface to the light incident upon it.

2.1578 Reflective Thermal Insulation — The insulation that reduces radiant heat transfer across spaces by use of one or more surfaces of high reflectance and low emittance, for example, aluminium foil.

2.1579 Reflectivity — The portion of the radiation-striking unit area of a surface that is not absorbed or transmitted by the surface. *See* reflectance.

2.1580 Refrigerant — The fluid used for heat transfer in a refrigerating system, which absorbs heat at a low temperature and a low pressure of the fluid and rejects heat at a higher temperature and a higher pressure of the fluid, usually involving changes of state of the fluid.

2.1581 Refrigerant Charge — The designated amount of refrigerant required for proper functioning of a closed refrigerating system.

2.1582 Refrigerant Rectifier

a) In an absorption system, rectifier is the device between the analyser and the condenser for condensing the traces of absorbent; and

b) In a vapour compression system, a heat exchanger in which refrigerant is boiled off from oil refrigerant bled from the evaporator.

2.1583 Refrigerant, Flammable — Any refrigerant which will burn when mixed with air, such as ethyl chloride, methyl chloride, and the hydrocarbons.

2.1584 Refrigerant, Secondary — Any volatile or non-volatile substance in an indirect refrigerating system that absorbs heat from a substance or space to be refrigerated and rejects this heat to the evaporator of the refrigerating system.

2.1585 Refrigerated Plate Freezing — It is the heat removal by direct contact of the packaged product with refrigerated plates.

2.1586 Refrigerated Truck End Bunker — A refrigerated vehicle where the space given to the ice or cooling element is in the end of the truck or rail car.

2.1587 Refrigerating Effect, Condensing — The condensing heat rejection effect less the heat added to the refrigerant vapour in the refrigerant compressor unit.

2.1588 Refrigerating Effect, Net Water (Brine) Cooler — The product of the weight rate of water or brine flow and the difference in enthalpy of the entering and leaving water or brine expressed in heat units per unit of time. It is expressed also by the total refrigeration effect less the heat leakage losses.

2.1589 Refrigerating Effect, Sub-cooling — The additional refrigeration effect made available by subcooling the refrigerant liquid in the condenser.

2.1590 Refrigerating Effect, Total, Water (Brine) Cooler — It is the product of the weight rate of refrigerant flow and the difference in enthalpy of the entering and leaving refrigerant fluid, expressed in heat units per unit of time.

2.1591 Refrigerating Medium — Any substance whose temperature is such that it is used, with or without a change of state, to lower the temperature of other bodies or substances below the ambient temperature.

2.1592 Refrigerating Plant — A complete refrigerating system with all accessories, controls, and other apparatus required for its utilization and its enclosing structure.

2.1593 Refrigerating System Performance Factor — The ratio of the useful refrigerating effect of the system to the power input.

2.1594 Refrigeration (Cooling), Direct Method of — A system in which the evaporator is in direct control with the material or space refrigerated or is located in air circulating passages communicating with such spaces.

2.1595 Refrigeration (Cooling), Indirect Method of — It is a system in which a liquid, such as brine or water, cooled by the refrigerant, is circulated to the material or space refrigerated or is used to cool air.

2.1596 Refrigeration, Pipe Line — It is a service to a group of buildings with a refrigerant supply from a central refrigerating plant.

2.1597 Refrigerator — It is a container and means of cooling it, such as a domestic refrigerator, or a large container, such as a storage refrigerator, service refrigerator, etc.

2.1598 Refrigerator, Commercial — It is a general category referring to any of the many types of refrigerators used commercially. Includes reach-ins, walk-ins, and refrigerated display cases (all types being either service or self-service, which are used by business establishments).

2.1599 Refrigerator, Domestic — It is a refrigerator for the home, cooled by a mechanical or other type of condensing unit or by other means, having one or more compartments for preserving food either above or below freezing.

2.1600 Refrigerator, Electric — It is a completely self-contained unit comprising an insulated cabinet, evaporator, and electric-motor-driven condensing unit.

2.1601 Refrigerator, Gas — A refrigerator motivated by thermal energy of burning gas.

2.1602 Refrigerator, Household, 'All-Refrigerator' — An all-refrigerator is a household refrigerator which does not include a compartment designed for the storage of food at temperatures below 0 °C. It may include means designed for freezing and storage of ice.

2.1603 Refrigerator, Household, Frost Free — Insulated cabinet of suitable volume and equipment for household use, cooled by one or more energy consuming means having one or more compartments intended for the preservation of food, one at least of which is suitable for the storage of fresh food, in which all compartments are automatically defrosted with automatic disposal of the defrost water, and at least one compartment is cooled by a frost-free system.

2.1604 Refrigerator, Reach-in — It is a service refrigerator.

2.1605 Refrigerator, Self-Service — Any of a number of refrigerators generally found in food stores and other stores of the self-service type, wherein the customer helps himself or herself. This may be of the open type or with doors which the customer opens.

2.1606 Refrigerator Service — Generally, any of the various types of commercial refrigerators of the reach-in type or refrigerated display cases from which an attendant serves a customer, as differentiated from self-service refrigerators.

2.1607 Refrigerator, Walk-in — It is a refrigerated cooler or freezer with large entry doors suitable for foot traffic.

2.1608 Refrigerator-Freezer, Household, Combination — A household combination refrigerator- freezer is a cabinet which consists of two or more compartments, with at least one of the compartments designed for the storage of foods at temperatures above 0 °C and with at least one of the compartments designed for the storage of foods at temperatures of – 12 °C average or below. It has a source of refrigeration and is intended for household use.

2.1609 Refrigerator-Freezer, Household, Limited Freezer Combination — A limited-freezer combination refrigerator-freezer is a household combination refrigerator-freezer which has at least percent of its total net refrigerated volume at a temperature above 0 °C.

2.1610 Regain of Moisture — The amount absorbed by any material in percent of weight of that material.

2.1611 Regeneration Air — The airstream used as a carrier for the desorbed moisture and/or a mechanism to transfer heat for the regeneration of the desiccant in a dry desiccant system.

2.1612 Regeneration Heater — A device used to heat the solid desiccant regeneration air or the liquid desiccant.

2.1613 Regeneration Specific Heat Input — Energy per unit moisture removed expressed in kJ/kg (Btu/lb).

2.1614 Regenerative Air-Cycle System — It is the air-cycle refrigeration system fitted with heat regenerators.

2.1615 Regenerative Cooling — This is a process of using heat that must be rejected or absorbed in one part of the cycle to perform a useful function in another part of the cycle.

2.1616 Regenerative Heating — Heat rejected in one part of a system and used to perform a useful function in another part.

2.1617 Register — It is a combination grill and damper assembly covering an air opening.

2.1618 Regulation — Refreezing of water that has resulted from the melting of ice under pressure (does not require refrigeration).

2.1619 Reheat — Application of sensible heat to supply air that has been previously cooled below the temperature desired for maintaining the temperature of the conditioned space.

2.1620 Reheat Coil — Heating coil installed downstream of cooling coil.

2.1621 Reheat Terminal — Terminal that heats a single source of supply air.

2.1622 Reheat VAV Box — It is a true VAV box with a reheat coil mounted on the discharge of the unit.

2.1623 Reheating — Raising the temperature of air that has been previously cooled either by mechanical refrigeration or an economizer system.

2.1624 Relative Humidity (rh, RH)

a) It is the ratio of the mole fraction of water vapor to the mole fraction of water vapor saturated at the same temperature and barometric pressure; and

b) Ratio of the partial pressure or density of water vapor to the saturation pressure or density, respectively, at the same dry-bulb temperature and barometric pressure of the ambient air.

2.1625 Relief Air

a) All return air that is discharged directly to the outside or exhausted by separate exhaust fans; and

b) The building returns air discharged by the Air-Handling Unit (AHU) equipment to control building pressure when an HVAC system is operating in the economizer cycle.

2.1626 Replacement Air — The outdoor air that is used to replace air removed from a building through an exhaust system. Replacement air may be derived from one or more of the following: makeup air, supply air, transfer air, and infiltration. However, the ultimate source of all replacement air is outdoor air. When replacement air exceeds exhaust, the result is exfiltration.

2.1627 Residual Moisture — In a freeze-dried product, the ratio of the mass of residual water to the original mass of product.

2.1628 Residual Pressure — In freeze drying, the pressure of the gas (usually air) at the trap.

2.1629 Resistance, Thermal — It is the reciprocal of thermal conductance.

2.1630 Resistively, Thermal — It is the reciprocal of thermal conductivity.

2.1631 Resorption-Type Refrigerating System — The system in which the refrigerant vapor is not condensed to a pure liquid but is absorbed in a weak solution from which it is subsequently evaporated at a lower temperature to produce refrigeration.

2.1632 Respiration — It is the release of carbon dioxide and heat by the ripening of perishables in storage; also, the breathing process of animals.

2.1633 Response Time

a) Output, expressed as a function of time, resulting from the application of specified input; and

b) Time (preferably in seconds, may also be in cycles of supply frequency) required for the output quantity to change by some agreed-on percentage of the differential output quantity in response to a step change input; and

NOTE — in measurement, the initial and final output quantities shall correspond to the test-output quantities. The response time shall be the maximum obtained including differences arising from increasing or decreasing output quantity or time phase of signal application.

c) Time for a measuring sensor to reach 90 percent of the final value after a step change. For a measuring system that includes only one exponential time constant function, the 90 percent response time equals 2.3 times the time constant.

2.1634 Return Air — Air returned from conditioned or refrigerated space.

2.1635 Reverse Cycle Defrosting — Defrosting an evaporator by reversing its function with that of the condenser.

2.1636 Reynolds Number — A dimensionless number, designated Re, that indicates whether the fluid flow is laminar or turbulent. For flow in a pipe, transition generally occurs between Reynolds' numbers of 2 300 and 4 000.

2.1637 Rigid Duct — The ducts constructed of rigid materials such as metal and fiberglass duct board.

2.1638 Rigid Duct Flow Area — It is calculated by using the average inside duct dimensions determined by measurement of a minimum of three representative sections of the duct envelope.

2.1639 Rime Ice — It is the granular deposit of opaque ice on a surface, formed by quick freezing of supercooled water droplets.

2.1640 Rock Bed Regenerative Cooling System — It is the system of air conditioning in which packed beds of crushed stone or gravel are used for both evaporative cooling and heat energy storage.

2.1641 Roof Spray Cooling — The system that reduces heat gain through a roof by cooling the outside surface with a water spray; suited for only temporary treatment because high humidity may be introduced by air intakes on the roof.

2.1642 Rooftop Air Conditioner — The packaged air conditioner mounted on a roof, the conditioned air being discharged directly into the rooms below or through a duct system.

2.1643 Room Dry Bulb (Dew Point) — It is the dry bulb (dew-point) temperature of the conditioned room or space.

2.1644 Room, Quick Freezer — Room kept at very low temperature for the purpose of freezing foodstuffs rapidly.

2.1645 R-value

a) It is the measure of the acoustical absorption properties of a room; the average absorption of all the surfaces in a room times the total surface divided by the average reflection; and

b) (Also known as thermal resistance), It is the quantity determined by the temperature difference, at steady state, between two defined surfaces of a material or construction that induces a unit heat flow rate through unit area ($R = \Delta T/q$). R-value is the reciprocal of thermal conductance.

2.1646 Safe Pressure — The maximum pressure a system can be subjected to without component failure.

2.1647 Safety Head — In a compressor, a cylinder head held in place by a spring of such strength that it will not be compressed during normal operation but will be moved by solid or liquid matter or abnormal gas pressure between it and the piston, thereby protecting the compressor.

2.1648 Salinometer — Hydrometer calibrated in salt concentration.

2.1649 Saponify — It is turning to soap, as oil in contact with an alkali or alkaline refrigerant. Chemically, to cause an ester to react with an inorganic base, the products being an alcohol and an acid (either free or in the form of a salt). By extension, to hydrolyze compounds other than esters.

2.1650 Saturated Air

a) Air that holds the maximum water vapor possible at a specified temperature and pressure; and

b) Moist air in which the partial pressure of the water vapor is equal to the vapor pressure of water at the existing temperature.

2.1651 Saturated Liquid — The liquid existing at the saturation temperature and pressure.

2.1652 Saturated Water-Vapor Pressure — The water-vapor pressure at the saturation temperature corresponding to the reference pressure and without any liquid phase.

2.1653 Saturation — It is the condition for co-existence in stable equilibrium of a vapour and liquid or a vapour and solid phase of the same substance. As an example, steam over the water from which it is being generated.

2.1654 Saturation, Degree of (Saturation Ratio) — The ratio of the specific humidity of humid air to that of saturated air at the same temperature and pressure, usually expressed as a percentage.

2.1655 Scale

a) The formation of thick corrosion product layers on a metal surface at high temperature; and

b) The precipitation of water-insoluble constituents on a surface.

2.1656 Scale Inhibitor — It is the substance added to water used in condensers, boilers, piping, and cooling towers to prevent or minimize the formation of insoluble deposits.

2.1657 Scale Setting

a) A control set point at which temperature is to be maintained; and

b) It is an indicated temperature to which a thermostat is set.

2.1658 Scale Trap — In a refrigeration system, an arrangement for gravitational separation of the larger impurities from a refrigerant.

2.1659 Scrubber (Air Washer)

a) A device for reducing the carbon dioxide (CO_2) content of a controlled-atmosphere storage room; and

b) System to reduce noxious substances from a flowing stream, as in chimneys or process discharges.

2.1660 Seal — It is a device to prevent the passage of gas or liquid into or out of a pipe, container or along a shaft.

2.1661 Seal, Bellows — Metal bellows used in a shaft seal or in place of a packing for valves; also used in long pipe lines instead of gaskets to compensate for expansion of the line with temperature.

2.1662 Seal, Shaft — A rubbing seal or stuffing box used to prevent fluid leakage between the shaft and bearing of a compressor or other fluid-moving device.

2.1663 Secondary Air

a) Air for combustion supplied to the furnace to supplement the primary air (after ignition);

b) Air prevailing in a treated space;

c) Air used to reject heat to an ambient environment or elsewhere; and

d) Primary air recirculated through a terminal unit.

2.1664 Secondary Condenser — The condenser cooled by the evaporator of a secondary system.

2.1665 Secondary Coolant (Secondary Fluid) — Any liquid used for the transmission of heat without vaporization.

2.1666 Secondary Fluid — A fluid of known properties (for example, water, steam, or brine) that is used as a heating medium.

2.1667 Secondary Refrigerant

a) A volatile refrigerant (usually a single refrigerant or an azeotropic mixture) of known properties that is used as a heating medium; and

b) Volatile or non-volatile substance in an indirect refrigerating system that absorbs heat from a substance in space to be refrigerated and transfers this heat to the evaporator of the refrigerating system.

2.1668 Secondary Surface —In extended surface exchangers, the additional surface that is not in direct contact with both the heat-absorbing and heat-emitting media (also known as indirect surface).

2.1669 Secondary Transfer Fluid

a) The fluid that flows through the condenser as a coolant; and

b) Fluid that flows through a heat exchanger that transfers thermal energy from the primary transfer fluid to the application that uses solar energy.

2.1670 Self-Contained Air Conditioning (Cooling) Unit — An air conditioning unit having the means for ventilation, air circulation, air cleaning, and air cooling, and the controls thereof, in the same cabinet with the condensing unit. Self-contained air-conditioning units are classified according to the method of rejecting condenser heat (water cooled, air cooled, and evaporatively cooled); the method of introducing ventilation air (no ventilation, ventilation by drawing air from outside, ventilation by a combination of the two methods); and the method of discharging air to the room (free delivery or pressure type).

2.1671 Semi-packaged Primary Indirect Evaporative Cooler (Semi-packaged Primary IEC) — A component of an indirect evaporative cooler provided with a primary air-moving device, that delivers primary air. This device also includes the entire water distribution, collection, and recirculation system with pump and piping.

2.1672 Semi-packaged Secondary Indirect Evaporative Cooler (Semi-packaged Secondary IEC) — A component of an indirect evaporative cooler with integrated or non-integrated primary and secondary air passages and provided with a secondary air moving device, which delivers secondary air. This device also includes the entire water distribution, collection, and recirculation system with pump and piping.

2.1673 Sensible Heat Ratio, Air Cooler — It is the ratio of sensible cooling effect to total cooling effect of an air cooler.

2.1674 Sensitivity — A measure of the smallest incremental change to which an instrument can respond.

2.1675 Sensitivity Ratio — In instrumentation, ratio of a change in output magnitude to the change of input that causes it after the steady state has been reached.

2.1676 Sensor — It is a device or instrument designed to detect and measure a variable.

2.1677 Series Fan-Powered Terminal — The terminal where primary airflow is modulated and mixed with induced air by a continuously operated integral fan to provide a relatively constant volume of discharge.

2.1678 Series Perimeter Loop-Heating System — A hot-water heating system in which each radiator is connected in series with the next and all flow returns to the boiler in the loop. Also known as a single pipe or one pipe system.

2.1679 Set Pressure — The pressure at which a pressure relief device or pressure control is set to operate.

2.1680 Setback — It is reduction of heating (by reducing the set point) or cooling (by increasing the set point) during hours when a building is unoccupied or during periods when lesser demand is acceptable.

2.1681 Setpoint — The point at which the desired temperature (°C [°F]) of the heated or cooled space is set.

2.1682 Shading Coefficient — It is the ratio of absorbed and transmitted solar heat relative to fenestration fitted with shading devices to that occurring with unshaded single-strength glass.

2.1683 Shading Coefficient (SC) — It is the ratio of solar heat gain at normal incidence through glazing to that occurring through standard thickness of clear, double-strength glass. Shading coefficient does not include interior, exterior, or integral shading devices.

2.1684 Shaft Ventilation — Natural ventilation by means of a duct mounted vertically or near vertically.

2.1685 Shape Factor — Radiation angle factor.

2.1686 Sharp Freezer — A cold storage freezer room, generally kept at – 34 °C to – 23 °C (– 30 °F to – 10 °F), to receive unfrozen goods and freeze them.

2.1687 Shelf — A shelf is any surface generally horizontal, within the cabinet which is provided for the storage of food.

2.1688 Shelf, Adjustable — An adjustable shelf is one which can have its position changed without the use of tools.

2.1689 Shelf, Average Height — The average shelf height is the average clear height, weighted by area, above all shelves included in the net shelf area.

2.1690 Shelf, Door — It is any surface on the door, which can be used for the storage of food.

2.1691 Shelf, Fractional — It is a shelf which is less than either the width or the depth, or both, of the full shelf.

2.1692 Shelf, Full — It is a shelf, which essentially tills the interior cross-section of the cabinet.

2.1693 Shelf, Net Area, for Household Freezers — A calculated value based on the net areas of main shelves, door shelves, bottoms of suspended containers or dispensers, and the bottom of the liner(s).

2.1694 Shelf, Net Area, for Household Refrigerators, All-Refrigerators and Combination Refrigerator-Freezers — A calculated value based on the net areas of the main shelves, door shelves, bottoms of suspended containers or dispensers, and the bottom of the liner(s) of the general refrigerated and freezer compartments.

2.1695 Shelf, Revolving — It is a shelf, which can be either partially or fully rotated.

2.1696 Shelf, Roll Out, Sliding, or Swing Out — It is a shelf, which can roll, slide, or pivot forward on its support(s).

2.1697 Shell and Tube — It is pertaining to heat exchangers in which a nest of tubes or pipes, or a coil of tube or pipe, is contained in a shell or container. The pipe (or pipes) carries a fluid through it, while the shell is also provided with an inlet and outlet for fluid flow.

2.1698 Silencer — A device or unit installed in air duct systems to reduce air noise in the duct.

2.1699 Silica Gel — A form of silicon dioxide which absorbs moisture readily and is used as a drying agent (*See* Sound Attenuator).

2.1700 Simulation Model — A computer model that provides information on the energy-using systems in a building (for example, HVAC, lighting, occupancy, plug loads, building envelope). The model serves as the input data for a specific computer building energy simulation program, along with weather data. When run, the computer simulation program will predict the energy use and demand in the described building for a time interval specified in the simulation model. Depending on the kind of simulation program and how it is set up to run, various kinds of output may be produced.

2.1701 Simulation Program — A computer program that is capable of simulating the energy performance of building systems.

2.1702 Single-Duct Air-Handling System — The system in which the air, having been conditioned, is distributed to various zones through a single duct.

2.1703 Single-Duct Unit — Air-terminal unit assembly having one ducted air inlet and a device for regulating the airflow rate so it is independent of inlet pressure changes.

2.1704 Single-Stage Compression — The compression from evaporator to condenser pressure by passing through one compressor stage only.

2.1705 Single-Zone System — An HVAC system serving a single HVAC zone.

2.1706 Slab Insulation — Thermal insulation applied under slab on ground construction.

2.1707 Slab Thermal Insulation — Semi-rigid insulation performed into rectangular units having a degree of suppleness particularly related to their geometrical dimensions.

2.1708 Sling Psychrometer — It is a hygrometer of two matched thermometers, one with its bulb wetted and the other dry, capable of being whirled rapidly on a sling to indicate the temperature differences related to relative humidity.

2.1709 Sludge — It is a product of decomposition of oil resulting from impurities, moisture, or chemical reactions and favoured by excessive temperature. Sludge may be mushy, gummy, or hard.

2.1710 Slugging — It is the effect produced by droplets of liquid refrigerant or oil, or a mixture of both, that reach the cylinder of a compressor.

2.1711 Slurry — Suspension of a solid in a liquid (*see* ice slurry).

2.1712 Smoke

a) Small solid and/or liquid particles produced by incomplete combustion of organic substances, varying in size often in the range of 0.1 to 0.3 µm; and

b) The airborne solid and liquid particulates and gases evolve when a material undergoes pyrolysis or combustion, together with the quantity of air that is entrained or otherwise mixed into the mass.

2.1713 Smoke Barrier — An approved opening protection device designed to resist the passage of air or smoke that meets the requirements of UL Standard 555S-1983, leakage rated dampers for use in smoke control systems. a combination fire and smoke damper should also meet the requirements of UL Standard 555-1990, fire dampers.

2.1714 Smoke Control System — An engineered system that uses mechanical fans to produce airflows and pressure differences across barriers to limit smoke movement.

2.1715 Smoke Control Zone — A space within a building enclosed by smoke barriers, including the top and bottom, that is, a part of a zoned smoke control system.

2.1716 Smoke Exhaust System — A mechanical or gravity system intended to move smoke from the smoke zone to the exterior of the building, including smoke removal, purging, and venting systems, as well as the function of exhaust fans used to reduce the pressure in a smoke zone.

2.1717 Smoke Management System — An engineered system that includes all methods that can be used singly or in combination to modify smoke movement.

2.1718 Smoke Zone — The smoke control zone in which the fire is located.

2.1719 Smudging — The black marks on ceilings and air outlets, generally caused by dirt particles suspended in the room air. This dirt is entrained in the mixed airstream and is deposited on the ceiling and outlet.

2.1720 Solar Absorptance — It is the ratio of the solar spectrum radiant flux absorbed by a body to that incident on it.

2.1721 Solar Energy — Energy derived directly from the sun's rays, both as diffuse and beam radiation (excludes indirect methods such as photosynthesis, wind, etc).

2.1722 Solar Energy Source — The source of thermal, chemical, or electrical energy derived from direct conversion of incident solar radiation at the building site.

2.1723 Solar Heat Gain — The solar energy flowing into a space or structure. Units are expressed in kilowatts (Btu/h).

2.1724 Solar Heat Gain Coefficient (SHGC) — The ratio of the solar heat gain entering the space through the fenestration area to the incident solar radiation. Solar heat gain includes directly transmitted solar heat and absorbed solar radiation, which is then reradiated, conducted, or convected into the space.

2.1725 Solar Irradiance — It is the rate at which solar energy is received, per unit area. *See also* Irradiance.

2.1726 Solar Loss through Window — The fraction of total solar radiation transmitted through the window(s) that is reflected by opaque surfaces and retransmitted back out the window(s).

2.1727 Solar Noon — The instant at which the sun reaches its maximum altitude on the horizon at any given location.

2.1728 Solar Radiation — The transmission of radiant energy from the sun.

2.1729 Solar Simulator — A source of radiant energy simulating solar radiation.

2.1730 Solar Time — The time of the day as indicated by the apparent position of the sun.

2.1731 Solar-Optical Properties — The spectral, radiant, or luminous transmittance, reflectance, and absorptance within the range of wavelengths characterizing solar radiation, that is, 300 nm to 3 000 nm.

2.1732 Solidification Point — The temperature at which a liquid substance will solidify, but not necessarily crystallize, on removal of heat (usually at standard atmospheric pressure). Compared to freezing point.

2.1733 Solution, Eutectic — It is a mixture which melts or freezes, normally at constant temperature and with constant composition. Its melting point is usually the lowest possible for mixtures of the given substances.

2.1734 Solution, Strong (Rich) — It is a solvent with relatively high concentration of solute.

2.1735 Solution, Weak — It is a solvent with relatively low concentration of solute.

2.1736 Sorbant — An absorbent or adsorbent medium that remains completely or substantially in a single phase during the process of absorbing or releasing heat by means of a refrigerant. Such media include liquids and solids.

2.1737 Sorbate — The substance absorbed by or adsorbed on a sorbent.

2.1738 Sorbent — It is 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.

2.1739 Sorption — It is a general term covering both absorption and adsorption.

2.1740 Space-Cooling-Only Mode — An operating mode that occurs during space cooling when either the desuperheater water pump has automatically cycled off or the rate of heat transfer to the domestic water has become negligible. With respect to seasonal performance calculations, this mode occurs when the water heating load is satisfied but a space-cooling load remains.

2.1741 Specific Enthalpy — Enthalpy per unit mass of substance.

2.1742 Specific Entropy — Entropy per unit mass of a substance.

2.1743 Specific Heat (CP) — The ratio of the quantity of heat required to raise the temperature of a given mass of any substance one degree to the quantity required to raise the temperature of an equal mass of a standard substance one degree (usually water at 15 °C [59 °F]). The units are expressed in J/(kg.K) [Btu/lb.°F].

2.1744 Specific Humidity

a) It is the he ratio of the mass of water to the total mass of a moist air sample; and

b) The ratio of the mass of water vapor to the total mass of a moist air sample (including water vapor and dry air) in a particular volume. Specific humidity is expressed as a ratio in units of lb of moisture/lb of dry air or grains of moisture/lb of dry air (kilograms of water vapor per kilogram of mixture). *See* absolute humidity.

2.1745 Specific Infiltration Ratio — It is the ratio of infiltration to leakage area; a normalized quantity that indicates the intensity of the weather relative to infiltration.

2.1746 Specific Refrigerant Flow Rate — The refrigerant flow rate in lb/min (g/s) required to produce one ton (one kW) of refrigeration.

2.1747 Specific Superheat

a) Difference in specific enthalpies of a pure condensable fluid between vapor at a given temperature above saturation and vapor at the dry saturated state at the same pressure; and

b) Superheat in a unit quantity of fluid.

2.1748 Specific Volume (SV) — The volume of a unit mass of a material. Usually expressed in m^3/kg (ft^3/lb). The reciprocal of density.

2.1749 Split Air-conditioning System — The air-conditioning system consisting of equipment provided in more than one assembly or enclosure, usually with supply air-distribution equipment housed separately from refrigerant-condensing equipment.

2.1750 Split Condenser — The condenser comprising several heat-exchanging components operating on one or several refrigeration systems.

2.1751 Spot Cooling — Cooling the air of a limited portion of an enclosed space without the use of walls or partitions.

2.1752 Spray Deck — It is an overhead bunker where air is cooled and circulated by brine sprays.

2.1753 Spray Pond — It is an arrangement for lowering the temperature of water by evaporative cooling of the water in contact with outside air. The water to be cooled is sprayed by nozzles into the space above a body of previously cooled water and allowed to fall by gravity into it.

2.1754 Spray-Type Air Cooler — It is a forced circulation air cooler, wherein the coil surface capacity is augmented by a liquid spray during the period of operation.

2.1755 Stabilized Temperature — A condition in which a temperature is considered to be stabilized when three successive readings taken at intervals of 10 percent of the previously elapsed duration of the test, but not less than five-minute intervals, vary no more than 3 °C (5 °F).

2.1756 Stack — The portion of the exhaust system downstream of the draft diverter, draft hood, or barometric draft regulator.

2.1757 Stack Effect

a) The movement of air into and out of buildings, chimneys, flue gas stacks, or other containers is driven by buoyancy. Buoyancy occurs due to a difference in indoor to outdoor air density resulting from temperature and moisture differences. The result is either a positive or negative buoyancy force. The greater the thermal difference and the height of the structure, the greater the buoyancy force, and thus the stack effect. The stack effect is also referred to as the chimney effect, and it helps drive natural ventilation and infiltration; and

b) The movement of air or other gas in a vertical enclosure (for example, duct, chimney, building), induced by the density difference between the air or other gas in the enclosure and the ambient atmosphere;

NOTE — Stack effect is a significant concern in heating-system design for tall buildings in cold climates. Sometimes referred to as the chimney effect.

c) Pressure difference caused by the difference in density between indoor and outdoor air due to an indoor/outdoor temperature difference; and

d) The vertical airflow within buildings is caused by temperature differences between the building's interior and exterior.

2.1758 Stagnation Temperature — The temperature that exists at a stagnation point in a fluid flow. At a stagnation point, the speed of the fluid is zero, and all of the kinetic energy has been converted to internal energy. In incompressible fluid flow and in isentropic compressible flow, the stagnation temperature is equal to the total temperature at all points on the streamline leading to the stagnation point.

2.1759 Standard Atmosphere for Reference — Air at a temperature of 15 °C, a relative humidity of 65 percent, and a pressure of 101.3 mbar.

2.1760 Standard Rating — A rating based on tests performed at standard rating conditions.

2.1761 Standard Rating Conditions — Rating conditions used as the basis for comparison of performance characteristics.

2.1762 Stanton Number — A dimensionless number used in calculation of forced convection, equal to the heat transfer coefficient of a fluid divided by the product of the specific heat at constant pressure, the fluid density, and the fluid velocity. Symbol St or NSt. Also known as the margoulis number M.

2.1763 Static Discharge Head — The static pressure of a fluid at the outlet of the pumping device, expressed in terms of the height of a column of the fluid or of the height of some manometric fluid that it would support.

2.1764 Static Gage Pressure — Static pressure relative to the atmosphere.

2.1765 Static Head — The pressure due to the weight of the fluid above the point of measurement. In a closed system, the static head is equal on both sides of the pump.

2.1766 Static Pressure — The actual pressure of the fluid, which is associated not with its motion but with its state. The pressure is exerted uniformly throughout the entire fluid. The portion of the fluid pressure which exists by virtue of the degree of compression only. If expressed as gauge pressure, it may be negative or positive. In a dynamic system, static pressure is the difference between total and velocity pressures, in water H_2O (kPa).

2.1767 Static Pressure Loss

a) External static pressure loss for forced-air systems using packaged air-handling equipment; the static pressure loss resulting from airflow through the supply and return ductwork and other elements external to the packaged air-handling unit (compared to internal static pressure loss and total static pressure loss);

b) Internal static pressure loss for forced-air systems; the static pressure loss resulting from airflow through the internal elements of the packaged air-handling unit. These internal elements may include such items as filters, coils, dampers, mixing sections, etc (compared to internal static pressure loss] and total static pressure loss); and

c) Total static pressure loss for forced-air systems; the sum of the external static pressure loss and the internal static pressure loss. The term is not applicable to an individual fan or a fan located within a built-up air-handling unit. Fans are rated by the term fan total static pressure, which is not the same as fan total pressure (compared to fan total pressure).

2.1768 Static Regain Method Duct Sizing — The method in which ducts are sized so that the regain in static pressure due to decreased velocity between two points totally or partially compensates for the frictional resistance between the points.

2.1769 Static Suction Head — The static pressure of a fluid at the inlet of the pumping device, expressed in terms of the height of a column of the fluid or of the height of some manometric fluid that it would support. It is a positive value. *See* static suction lift.

2.1770 Static Suction Lift — The static pressure of a fluid at the inlet of the pumping device, expressed in terms of the height of a column of the fluid or of the height of some manometric fluid that it would support. It is a negative value (*See* static suction head).

2.1771 Static Temperature — The temperature which exists by virtue of the internal energy of the air only. If a portion of the internal energy is converted into kinetic energy, the static temperature is decreased accordingly.

2.1772 Steady State — It is a state of a system in which movement of matter or energy phenomena are taking place when the various physical phenomena are independent of time.

2.1773 Steady-State Condition — The condition existing when a uniform renewal cycle of a self-renewable air cleaner maintains essentially constant performance. Steady state is reached when the system is operating in a uniformly repetitive manner, for example, cycling between two resistance levels.

2.1774 Steam, Dry Saturated — Steam at the saturation temperature corresponding to the pressure and containing no water in suspension.

2.1775 Steam, Superheated — Steam at a temperature higher than the saturation temperature corresponding to the pressure.

2.1776 Steam, Wet Saturated — Steam at the saturation temperature corresponding to the pressure and containing water particles in suspension.

2.1777 Stefan-Boltzmann Law — Total energy radiated from a blackbody is proportional to the fourth power of the temperature of the body. Also known as the fourth power law.

2.1778 Sterilization — Heating foods or other materials to kill microorganisms, usually to a temperature of 100 °C (212 °F) or higher.

2.1779 Still Air Freezing — Freezing of produce in a room without mechanical movement of air.

2.1780 Stirling Cycle — Theoretical thermodynamic cycle comprising two isothermal processes and two isochoric processes.

2.1781 Stokes' Laws — The wavelength of luminescence excited by radiation is always greater than that of the exciting radiation.

2.1782 Storage Capacity — The amount of thermal energy required to complete one charging cycle of a thermal storage device. The storage capacity will always be a greater value than the usable discharge capacity of the thermal storage device. Compared to discharge capacity.

2.1783 Storage Efficiency — Discharge capacity divided by charge capacity.

2.1784 Storage Inventory — The amount of usable cooling energy remaining in a thermal storage device at any given time.

2.1785 Storage Medium — The material in the storage device, independent of the containing structure, in which the major portion of the energy is stored.

2.1786 Storage Water Heater — A closed vessel in which water is heated by the combustion of fuels, electricity, or any other source and is stored and withdrawn for use external to the system at pressures not exceeding 1 102.4 kPa (160 psig), including the apparatus by which heat is generated and all controls and devices necessary to prevent water temperatures from exceeding 98.9 °C (210 °F).

2.1787 Stored Heat — The heat from external or recovered heat sources that is held in reserve for later use.

2.1788 Straddle Refrigerating Unit (Saddle Unit; Plug Unit) — The factory assembled refrigerating system mounted at high level in the insulated wall of a cold store with the evaporator inside the store and the rest of the unit outside.

2.1789 Strainer — It is a device for withholding foreign matter from a flowing liquid or gas.

2.1790 Stratification — The division into a series of layers, as with thermal gradients across a fluid in motion or at rest.

2.1791 Stratification Index — A parameter that indicates the degree of thermal stratification in a storage device.

2.1792 Stratified Airflow — Layers of air at different temperatures or different velocities flowing through a duct or plenum system and affect fan and/or pump performance in the distribution system.

2.1793 Stratified Fluid — A region of fluid in which the density decreases monotonically in the upward direction and is stably stratified.

2.1794 Stratified Storage — A thermal storage vessel in which a thermocline exists.

2.1795 Stratified System — An air-distribution system that, during the cooling operation, limits the amount of mixing in the space and instead relies on thermal plumes to produce a stratified environment with cooler and fresher air near the floor and warmer and less fresh air near the ceiling. Examples are underfloor air-distribution systems (UFAD) and DV systems.

2.1796 Strong Liquor (Rich Liquor; Strong Solution) — A solvent with a relatively high concentration of dissolved refrigerant.

2.1797 Structural Thermal Insulation — Insulation used as a part of the load carrying frame of a structure, such as the walls of a cold room or the body of a refrigerated vehicle.

2.1798 Subcooled Liquid — The liquid whose temperature is lower than the condensation temperature at its given pressure.

2.1799 Subcooler — A heat exchanger for cooling liquid refrigerant below its condensing temperature at a given pressure.

2.1800 Subcooling — At a defined pressure, the difference between a given liquid temperature and the bubble point temperature.

2.1801 Subcooling Heat Rejection Effect — Total refrigerant heat rejection effect less the condensing heat rejection effect.

2.1802 Subcooling Refrigerating Effect — The additional refrigeration effect made available by subcooling the refrigerant liquid in the condenser.

2.1803 Subcooling, Heat of (Specific) — The difference in specific enthalpies of a pure condensable fluid between the saturated (not sub-cooled) liquid state and the cooled liquid at a given temperature below its condensation temperature at the same pressure.

2.1804 Sublimation — It is a change of stale directly from solid to gas without the appearance of liquid.

2.1805 Submerged Coil Condenser/Submerged Condenser — A condenser in which the piping is submerged in a vessel containing cooling water (also known as submerged condenser).

2.1806 Suction Inlet — It is the port through which gas enters.

2.1807 Suction Line — It is the tube or pipe which carries the refrigerant vapour from the evaporator to the compressor inlet.

2.1808 Sun Effect — Solar energy transmitted into space through windows and building materials.

2.1809 Superchilling — Chilling a product to a temperature very near or sometimes below its freezing point.

2.1810 Supercooled Liquid — The liquid in which the existing temperature is lower than the saturation temperature for the given pressure.

2.1811 Supercooling — Cooling a substance below the normal freezing point without solidification.

2.1812 Supercritical — The state of fluids at pressures and temperatures above their critical values. Also used loosely, and especially for helium, for the state of the liquid at pressures exceeding the vapor pressure.

2.1813 Superheat (Specific) — It is the difference in specific enthalpies of a pure condensable fluid between vapour at a given temperature above saturation and vapour at the dry saturated state at the same pressure.

2.1814 Superheated Steam — Steam at a temperature higher than the atmospheric pressure boiling temperature.

2.1815 Superheated Vapor — Vapor at a temperature greater than the saturation temperature. The pressure and temperature of superheated vapor are independent properties, since the temperature can increase while the pressure remains constant. *See* superheat.

2.1816 Superheater — A heat exchanger used on flooded evaporators, wherein hot liquid on its way to enter the evaporator is cooled by supplying heat to dry and superheat the wet vapour leaving the evaporator.

2.1817 Supersaturated Air — The humid air that contains in a unit mass of dry air a mass of water vapor greater than would be contained in saturated air at the same temperature; the excess water may remain in the form of fog.

2.1818 Supersaturated Vapor — Vapor in a metastable equilibrium at a pressure higher than the saturation pressure corresponding to its temperature. *See* supersaturation.

2.1819 Supersaturation

a) It is the condition of metastable equilibrium in a solution where the solute remains dissolved at a temperature lower than the initial solidification temperature; and

b) Condition of metastable equilibrium in which a vapor is at a pressure higher than the saturation pressure corresponding to its temperature.

2.1820 Supply Air

a) The air delivered by mechanical or natural ventilation to a space, composed of any combination of outdoor air, recirculated air, or transfer air; and

b) Air entering a space from an air-conditioning, heating, or ventilating

apparatus for the purpose of comfort conditioning. Supply air is generally filtered, fan forced, and either heated, cooled, humidified, or dehumidified as necessary to maintain specified conditions. Only the quantity of outdoor air within the supply airflow may be used as replacement air.

2.1821 Supply Mains

a) (Pneumatic) The air supply piping to all controllers or other devices requiring a main air supply;

b) Pipes through which the heating or cooling medium of a system flows from the source of heat or refrigeration to the runouts and risers leading to the heating or cooling units; and

c) Source of electric power to a system.

2.1822 Supply Pressure

a) Energy source to a controller or auxiliary device; and

b) Pressure of supply mains of a pneumatic control system.

2.1823 Surface Cooling — It is a method of cooling air or other gas by passing over cold surfaces.

2.1824 Surge Drum — *See* accumulator

2.1825 Surroundings — Immediate outside space of a thermodynamic system.

2.1826 Swamp Cooler — Slang for evaporative cooler

2.1827 Sweating — It is the condensation of moisture from air on a surface which is below the dew-point temperature.

2.1828 System — A heating or refrigerating scheme or machine usually confined to those parts in contact with the heating or refrigerating medium.

2.1829 System Absorption — A refrigeration system in which the refrigerant gas evolved in the evaporator is taken up in an absorber and released in a generator upon the application of heat.

2.1830 System, Air Agitation — A combination consisting of a power-driven blower, distributing piping, and flexibly connected fittings for delivering air to the water in ice cans for the purpose of agitating the water and promoting the production of clear ice.

2.1831 System Brine Spray — It is a refrigerating scheme for cooling by a mist or spray of brine.

2.1832 System Cascade — It is that system having two or more refrigerant circuits, each with a pressure imposing element, condenser, and evaporator, where the evaporator of one circuit cools the condenser of another (lower temperature) circuit.

2.1833 System, Central Fan — A mechanical indirect system of heating, ventilating, or air conditioning, in which the air is treated or handled by equipment located outside the rooms served, usually at a central location, and conveyed to and from the rooms by means of a fan and a system of distributing ducts.

2.1834 System, Central Plant — A system with two or more low sides connected to a single, central high side; a multiple system.

2.1835 System, Closed Brine — A refrigerating system in which the circulating brine is completely enclosed and shut off from the atmosphere throughout the cycle except for a vented expansion tank at the high point of the system.

2.1836 System, Commercial — A refrigeration system used in a commercial and/or a business place, such as a meat market, store, florist shop, hotel, office building, restaurant, candy shop, bakery, or other place of similar commercial enterprise, assembled and installed in the manufacturing and/or business portion of any building.

2.1837 System, Compression — It is a refrigerating system in which the pressure imposing element is mechanically operated.

2.1838 System, Cycle Defrost — In household refrigerators and combination refrigerator-freezers only, a system in which the refrigerated surfaces of the general refrigerated compartment are defrosted by an automatic defrost system. Defrost water is disposed off automatically or collected in a container for subsequent manual removal. A characteristic of a cycle defrost system is that nominal refrigerated food temperatures are maintained during operation of the automatic defrost system.

2.1839 System, Dense Air — A cold air system maintained under pressure greater than atmospheric in which air is compressed, heat of compression dissipated, and the air, chilled by expansion and performance of work, can create useful refrigeration.

2.1840 System, Direct Expansion — A refrigerating system in which the evaporator is in direct contact with the refrigerated material or space or the evaporator is located in air circulating passages communicating with such spaces.

2.1841 System, Dual Temperature Brine — In chilling, the use of an initial brine temperature, followed by a lower brine temperature.

2.1842 System Duct — It is a series of ducts, elbows, and connectors to convey air from one location to another.

2.1843 System, Flooded — A system in which only part of the refrigerant passing over the heat transfer surface is evaporated, and the portion not evaporated is separated from the vapour and recirculated.

2.1844 System, Indirect — It is a refrigerating system in which a liquid, such as brine or water, cooled by the refrigerant, is circulated to the material or space refrigerated or is used to cool air.

2.1845 System, Industrial — A system used in the manufacture or processing of materials, such as ice making plants, cold storage warehouses, ice cream plants, dairy plants, packing houses, chemical plants, and other places of similar industrial enterprise.

2.1846 System, Low Pressure — In air conditioning, a distributing system delivers air to ordinary ventilating grills at low velocities with low static losses through the supply grills.

2.1847 System, Mechanical Refrigerating — A refrigerating system employing a mechanical compression device to remove the low-pressure refrigerant enclosed in the low-pressure side and to deliver it to the high-pressure side of the system.

2.1848 System, Multiple — A system using the direct method in which refrigerant is delivered to two or more evaporators in separate rooms or refrigerators.

2.1849 System, No-frost — A system in which all the refrigerated surfaces in the cabinet are defrosted by an automatic defrost system. Characteristics of a no-frost system are:

a) System is automatically operated to prevent formation of frost on all refrigerated surfaces;

b) No accumulation of ice or frost forms on the stored food;

c) Nominal refrigerated food temperatures are maintained during operation of the automatic defrost system(s); and

d) Water from defrosting is disposed off automatically.

2.1850 System, Off-Peak — It is a system with control which normally avoids use of power during peak load periods, usually having eutectic or water-ice hold-over means.

2.1851 System, Open Brine — A refrigerating system in which the circulating brine returns to an open tank which serves as a reservoir for the pump suction and as an inspection tank for the condition and flow of brine.

2.1852 System, Refrigerating — Any system which, in operation between a heat source and a heat sink (in the thermodynamic sense) at two different temperatures, is able to absorb heat from the heat source at the lower temperature and reject heat to the heat sink at the higher temperature.

2.1853 System, Refrigerating, Absorption-Type — A refrigerating system in which refrigeration is affected by evaporation of a refrigerant in a heat exchanger (evaporator), the resulting vapour being then absorbed by an absorbent medium from which it is subsequently expelled by heating at a higher partial vapour pressure and condensed by cooling in another heat exchanger (condenser).

2.1854 System, Refrigerating, Compression-Type — It is a refrigerating system in which the temperature and pressure of gaseous refrigerant are increased by a mechanically operated component. In most cases, the refrigerant undergoes changes of state in the system.

2.1855 System, Refrigerating, Hermetically Sealed Compression — It is a refrigerating system utilizing a hermetic refrigerant compressor.

2.1856 System, Removable Unit — A refrigerating system which is readily removable as one unit from the cabinet or space which it cools and from the building in which it is used without disconnecting any refrigerant-containing part of the system.

2.1857 System, Run-Around — A regenerative-type closed secondary system in which a continuously circulated fluid abstracts heat from the primary system fluid at one place, returning this heat to the primary system fluid at another place.

2.1858 System, Self-Contained (Single Packaged) Refrigerating — It is a completely factory-assembled and factory-tested refrigerating system in a suitable frame or enclosure, in which all of the refrigerant containing parts are permanently connected at the factory.

2.1859 System, Steam Jet — A refrigerating system in which high pressure steam, supplied through a nozzle and acting to eject vapour from the evaporator, maintains the requisite low pressure on one side and produces a higher pressure on the other by virtue of compression followed by circulation/ distribution of passage.

2.1860 System, Unitary Refrigerating — A complete factory-assembled and factory-tested refrigerating system comprising one or more assemblies which may be shipped as one unit or separately but which are designed to be used together.

2.1861 System Vapour — It is a refrigerating system employing a condensable vapour as the refrigerant.

2.1862 System, Water Vacuum — In refrigeration, one which employs a vacuum to bail water at the temperature desired; one which employs evaporating water vapour as the refrigerant.

2.1863 System, Welded — One in which all refrigerant joints are brazed or welded.

2.1864 System, Year-Round Air Conditioning — It is an air-conditioning system which ventilates, heats, and humidifies in winter, cools and dehumidifies in summer the spaces under consideration, and provides the desired degree of air motion and cleanliness. The system includes the following equipment, whether it is located within the structure served or external to it: the refrigerating system and the heat generating system; any piping systems used to convey the heating and cooling media to suitable heat transfer surfaces; pumps, accessories, automatic controls, and interrelated electrical work. The heat transfer portions of the system generally include, as required, preheater, fans, systems of distributing ducts, piping, and necessary means of manual or automatic control.

2.1865 Tank, Brine

a) In an ice plant, the main freezing tank, in which the cans are immersed while ice is being produced;

b) In a brine-circulating system, a storage tank or balance tank for brine; and

c) In domestic and commercial fields, a container surrounding the evaporator is filled with brine for storing refrigerant or for equalizing temperature at various points of the evaporator, especially in ice cream cabinets.

2.1866 Tank Brine Expansion — It is a vented reservoir in a closed circulating brine system for the accommodation of volume expansion of brine due to temperature change.

2.1867 Tank, Brine Return — It is a reservoir in an open circulating brine system for the storage of brine at the pump suction and for inspection of the condition and flow of brine.

2.1868 Tank, Dip — A tank located conveniently to the can dump and supplied with water, in which the ice can be immersed to thaw the ice block loose from the can.

2.1869 Tank, Freezing — A container kept at low temperatures for storing foodstuffs or for freezing foodstuffs.

2.1870 Tank, Tee-Making — A tank arranged with proper accessories to hold an evaporator and antifreeze solution and ice cans, the cans being immersed in the solution which usually is in circulation around the evaporator and the cans.

2.1871 Tank, Water Fore Cooling — It is a tank where inlet water is cooled prior to freezing.

2.1872 Tankless Heater — A heat exchanger for indirect heating of water, typically for domestic use, which is designed to be used without a water storage tank. *See* Instantaneous Heater.

2.1873 Task/Ambient Conditioning (TAC) System — Any space-conditioning system that allows occupants to individually control the thermal environment in the localized zone of their workspace while still maintaining acceptable environmental conditions in the surrounding ambient spaces.

2.1874 Temperature — It is 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.

2.1875 Temperature Difference, Diffusion — It is the temperature difference between the air temperature at supply opening and design indoor temperature.

2.1876 Temperature Difference, Effective — It is the difference between the room air temperature and the supply air temperature at the outlet to the room.

2.1877 Temperature Difference, Mean — Mean of difference between temperatures of a fluid-receiving and a fluid-yielding heat.

2.1878 Temperature, Absolute — Temperature expressed in degrees above absolute zero.

2.1879 Temperature, Absolute Zero — The zero point on the absolute temperature scale 273.16° below zero of the centigrade scale.

2.1880 Temperature, Critical — The saturation temperature corresponding to the critical state of the substance at which the properties of the liquid and vapour are identical.

2.1881 Temperature, Dew-Point — The temperature at which the condensation of water vapour in a space begins for a given state of humidity and pressure as the temperature of the, vapour is reduced; the temperature corresponding to saturation (100 percent relative humidity) for a given absolute humidity at constant pressure.

2.1882 Temperature, Dry-Bulb — It is the temperature of a gas or mixture of gases indicated by an accurate thermometer after correction for radiation.

2.1883 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.

2.1884 Temperature, Low — Temperature below ordinary refrigerating plant requirements, for example, from – 1 °C down, also any pan of a system below another parallel refrigerating level of temperature.

2.1885 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.

2.1886 Temperature, Room — The temperature of any room, for example:

a) A room in which a refrigerator is being operated or tested; and

b) A room being conditioned for the comfort of occupants.

NOTE — Room temperature used colloquially to mean the ordinary temperature one is accustomed to find in dwellings.

2.1887 Temperature, Saturation — Temperature, saturation of a fluid, the boiling point corresponding to a given pressure; evaporation temperature; condensation temperature.

2.1888 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.

2.1889 Temperature, Wet-Bulb Depression — It is the difference between dry-bulb and wet-bulb temperatures.

2.1890 Terminal Casing Leakage — The amount of air in ft^2/min (l/s at standard conditions) escaping from the terminal at a given inlet pressure with only the outlet(s) blocked and with the damper/valve fully opened.

2.1891 Terminal Damper Leakage — The amount of air in ft^2/min (l/s at standard conditions) passing through a fully closed damper/valve at a given inlet pressure.

2.1892 Terminal Unit — A device that regulates the volumetric flow rate and/or the temperature of the controlled medium.

2.1893 Test Air — The air that flows through the device being tested. During the test, test air should be at the temperature, humidity, pressure, and atmospheric dust concentration prevailing at the time of the test. Test air for arrestance and dust-holding capacity measurement may be indoor ambient air.

2.1894 Test Panel — Any sensible heating or cooling panel that is used in testing for performance and/or rating purposes.

2.1895 Test Period — The time over which quasi-steady-state conditions are maintained for each measured point.

2.1896 Test Pressure — Pressure, usually higher than the design working pressure, to which a piece of equipment is subjected for testing according to specified procedures.

2.1897 Test Pressure Loss — The differential in total pressure between the inlet and the outlet sections of a test duct or across a test fitting. For test fittings, the fitting is assumed to have zero length. For multi flow fittings, the total pressure loss shall be determined for each stream separately.

2.1898 Test Rooms — The two environmental chambers where all components of the combined appliance are installed and tested; one chamber is used to maintain specified indoor ambient conditions, while the second chamber is used to maintain specified outdoor ambient conditions.

2.1899 Testing — The use of specialized and calibrated instruments to measure conditions such as temperatures, pressures, rotational speeds, electrical characteristics, velocities, fluid flows, etc., used in HVAC and R.

2.1900 Testing, Adjusting, and Balancing — A systematic process or service applied to heating, ventilating, and air-conditioning (HVAC) systems and other environmental systems to achieve and document air and hydronic flow rates. The adjustment of fluid flow rates through distribution systems by manually adjusting the position of dampers, valves, etc., or by using automatic control devices to control the position of dampers, actuators, valves, etc.

2.1901 Thaw Needle — A small tube with a valve head, connected by hose to a source of warm water or steam, which may be inserted in the air agitation tube in an ice can for the purpose of thawing the air agitation tube loose from the ice block.

2.1902 Thawing — Changing free water, or contained water as in foods, from the solid phase to the liquid phase by the addition of heat.

2.1903 Theoretical Storage Capacity — The sum of the products of masses and heat capacities of all components (including the transfer fluid) contained within the insulating envelope of the thermal storage device.

2.1904 Therm — Quantity of heat equivalent to 100 000 Btu.

2.1905 Thermal Absorptance — Ratio of the radiant flux absorbed by a physical surface to that incident on it.

2.1906 Thermal Anemometer — A device that relies on the cooling effect of the airflow to change the temperature of a heated body in proportion to the air speed. Types include hot-wire anemometer, heated-bulb thermometer, heated-thermocouple anemometer, and heated-thermistor anemometer.

2.1907 Thermal Anomalies — Heat loss characteristics of a physical condition or structure that are not in accordance with intended design or calculated characteristics.

2.1908 Thermal Boundary Resistance —It is the ratio of temperature difference to heat flux across the boundary between two distinct media (solid/solid or solid/fluid). Also known as Thermal Contact Resistance.

2.1909 Thermal Break — The non-conducting physical structure, such as a frame around a door or window acting to retard heat flow.

2.1910 Thermal Bridge — It is a low thermal resistance path connecting two surfaces.

2.1911 Thermal Comfort — The condition of mind which expresses satisfaction with the surrounding thermal environment and is assessed by subjective evaluation. Thermal comfort is affected by heat conduction, convection, radiation, evaporative heat loss, and relative air motion.

2.1912 Thermal Conductance — (C-factor), Thermal conductance is the heat flux through a flat body induced by a unit temperature difference between the surfaces of that body. Units are $W/[m^2 \cdot K]$ $(Btu/h \cdot ft^2 \cdot °F)$.

2.1913 Thermal Conductivity — (k-factor), The time rate of steady-state heat flow through unit thickness of unit area of a homogeneous material, induced by a unit temperature gradient in a direction perpendicular to the isothermal planes of that unit. Units of k are in $Btu.in/(h.ft^2.°F)$, $Btu.ft/(h.ft^2.°F)$, or W/(m.K). Thermal conductivity must be evaluated for a specific mean temperature, thickness, age, and moisture content. *See also* Thermal Conductance.

2.1914 Thermal Conductor — It is a material that transmits heat by conduction.

2.1915 Thermal Convection — Transfer of heat by a fluid moving by natural variations in density (in the absence of conduction and radiation).

2.1916 Thermal Delay — The time period between the energization of a heat-producing device and the measurable effect of the heat produced until equilibrium conditions are reached.

2.1917 Thermal Diffusion — It is the phenomenon in which a temperature gradient in a mixture of fluids gives rise to a flow of one constituent relative to the whole mixture.

2.1918 Thermal Diffusivity — It is the physical quantity that determines the rate of heat propagation in transient state processes. Thermal conductivity divided by the product of density and specific heat. Units are ft^2/s or m^2/s.

2.1919 Thermal Efficiency — Energy output as a percentage of the energy input of a machine or process.

2.1920 Thermal Emissivity — It is the radiation property of a material, evaluated with its surface optically smooth and clean, and of sufficient thickness to be opaque.

2.1921 Thermal Emittance — A surface property of a material governing the emission of thermal radiation relative to that emitted by a perfect emitter, or black body, at the same surface temperature.

2.1922 Thermal Energy — Energy possessed by a system caused by the motion of the molecules and/or intermolecular forces; that is, heat.

2.1923 Thermal Energy Meter — *See* btu meter or watt meter.

2.1924 Thermal Energy Storage

a) Thermal energy storage may refer to a number of technologies that store energy in a thermal reservoir for later reuse. They can be employed to balance energy demand between day time and night time. The thermal reservoir may be maintained at a temperature above (hotter) or below (colder) than that of the ambient environment. The principal application today is the production of ice, chilled water, or eutectic solution at night, which is then used to cool environments during the day; and

b) Thermal energy storage technologies store heat, usually from active solar collectors in an insulated repository for later use in space heating, domestic or process hot water, or to generate electricity. Most practical active solar heating systems have storage for a few hours to a day's worth of heat collected. There are also a small but growing number of seasonal thermal stores used to store summer heat for space heating during winter.

2.1925 Thermal Envelope — The elements of a structure that enclose conditioned spaces and that control transmission of heat, air, and water vapor between the conditioned spaces and the exterior. *See also* Building Thermal Envelope.

2.1926 Thermal Environment — The surrounding atmosphere is characterized by parameters such as air temperature, wet-bulb temperature, dew-point temperature, water vapor pressure, total atmospheric pressure, relative humidity, and specific humidity.

2.1927 Thermal Equilibrium — Equilibrium obtained in a system when the temperatures are non-varying.

2.1928 Thermal Expansion — Increase in one or more of the dimensions of a solid body or a liquid volume, caused by a temperature rise.

2.1929 Thermal Frequency Response — The response of a thermal system to a periodic thermal excitation expressed as a function of frequency.

NOTE — Thermal frequency response usually is displayed by polar plot of amplitude attenuation and time lag versus frequency.

2.1930 Thermal Inertia — It is the ability of a material, depending on its density and specific heat, to store heat and to resist temperature change.

2.1931 Thermal Input — It is the heating or cooling effect delivered to a product or space.

2.1932 Thermal Insulation — The material or assembly of materials used to provide resistance to heat flow. *See also* Blanket Thermal Insulation.

2.1933 Thermal Insulation Fill — Insulation in granular, nodular, fibrous, powdery, or similar form designed for installation by pouring, blowing, or hand placement. Examples are mineral or glass fiber, cellulosic fiber, diatomaceous silica, perlite, silica aerogel, and vermiculite.

2.1934 Thermal Lag — Delay in action of the sensing element of a control device due to the time required for the sensing element to reach equilibrium with the property being controlled or measured.

2.1935 Thermal Load — Thermal requirement of a system under specified conditions.

2.1936 Thermal Neutrality — The indoor thermal index value corresponding with a mean vote of neutral on the thermal sensation scale.

2.1937 Thermal Output — Heating or cooling effect put out by a source or removed from a storage device.

2.1938 Thermal Plume — The airflow created by a convective heat source that rises due to natural thermal buoyancy. Plume formation and growth are dependent on the intensity of the heat source and on the degree of stratification of the ambient air.

2.1939 Thermal Radiance — It is the rate of radiant emission through unit solid angle over unit projected area of a source in a stated angular direction from the surface (usually the normal). Units are watts per square metre.

2.1940 Thermal Radiant Flux Density — The rate of radiant energy emitted from the unit area of a surface in all radial directions of the overspreading hemisphere. *See also* Radiant Flux Density.

2.1941 Thermal Radiation — The transmission of energy by means of electromagnetic waves emitted due to temperature. Radiant energy of any wavelength when absorbed may become thermal energy that increases the temperature of the absorbing body (*See also* Heat Transfer Radiation Coefficient).

2.1942 Thermal Reflectance — Fraction of the incident radiation on a surface that is reflected from that surface.

NOTE — For an opaque surface, the sum of reflectance, transmittance, and absorptance is unity at any wavelength of radiation.

2.1943 Thermal Regain — The fraction of distribution system losses (gains for cooling) that are returned to the conditioned space.

2.1944 Thermal Relay

a) The relay which is activated by change in temperature; and

b) The relay in which the displacement of the moving contact member is produced by heating of a part of the relay under the action of electric currents.

2.1945 Thermal Resistance (R-value) — It is the reciprocal of the time rate of heat flow through a unit area induced by a unit temperature difference between two defined surfaces of material or construction under steady-state conditions. Units of thermal resistance are $h \cdot ft^2 \cdot °F/Btu$ ($m^2 \cdot °K/W$). Thermal resistance is the reciprocal of the thermal conductance.

2.1946 Thermal Sensation — A conscious feeling commonly graded into the categories cold, cool, slightly cool, neutral, slightly warm, warm, and hot; it requires subjective evaluation.

2.1947 Thermal Storage

a) Accumulation of energy in a body or system in the form of sensible heat (temperature rise) or latent heat (change of phase);

b) Full storage: Thermal storage system having capacity to meet all on-peak cooling or heating requirements by being charged off peak, and without energy added on peak;

c) Fully charged condition: The state of a thermal storage device at which, according to the design, no more heat is to be removed from the thermal storage device. This state is generally reached when the control system stops the charge cycle as part of its normal control sequence;

d) Fully discharged condition: The state of a thermal storage device at which no more usable cooling energy can be recovered from the storage device;

e) Normally interchangeable term with cool storage or ice storage when addressing air-conditioning thermal storage systems;

f) Technology or systems of accumulating cooling or heating capacity for subsequent use; and

g) Temporary storage of high or low-temperature energy for later use.

2.1948 Thermal Storage Charge — To supply cooling or heating to storage.

2.1949 Thermal Storage Efficiency —It is the ratio of the integrated discharge capacity to the hypothetical maximum available capacity for a single cycle of operation (also known as cycle figure of merit).

2.1950 Thermal Storage Load Levelling — The charging of a thermal storage system at a constant rate during a complete cycle.

2.1951 Thermal Storage Medium — The substance in which cooling or heating energy is stored.

2.1952 Thermal Superinsulation — Insulation of very high thermal resistance. Usually refers to that used in cryo-engineering.

2.1953 Thermal Time Lag

a) Phase difference in hours between the exterior and interior surface temperatures when the exterior surface is subjected to a sine wave temperature change having a 24 h period; and

b) Time interval by which the peak thermal response falls behind (lags) the peak thermal excitation in a thermal system.

2.1954 Thermal Transmittance —Heat transmission in unit time through unit area of a material or construction and the boundary air films, induced by unit temperature difference between the environments on each side (also known as U-factor).

NOTE — This heat transmission rate is also called the overall coefficient of heat transfer. U, in Btu/h.ft^2.°F (W/[m^2.K]). Thermal transmittance is sometimes called the overall coefficient of heat transfer or U-factor. Thermal transmittance includes surface film conductance.

2.1955 Thermal Unit — The quantity or rate of heat energy or equivalent in work or electrical energy.

2.1956 Thermistor — It is a thermo-electrical element in which the electrical resistance falls appreciably with a rise in temperature; often used as a temperature sensor.

2.1957 Thermocouple — It is a device for measuring temperature, utilizing the fact that an electromotive force is generated whenever two junctions of two dissimilar metals in an electric circuit are at different temperature levels.

2.1958 Thermodynamic Equilibrium — Equilibrium in a system when the physical variables have uniform values that do not change in time. Furthermore, if the system is not an isolated one, these variables should have the same values for both the system and its surroundings.

2.1959 Thermodynamic Properties — Those data needed to calculate the equilibrium relations among pressure, volume, and temperature along with the enthalpy and entropy of the fluid in the liquid and vapor states.

2.1960 Thermodynamic Shock — The implosive impact in liquid, caused by sudden condensation of vapor into its subcooled liquid. This phenomenon can occur when the liquid is about 33 °C to 47 °C (60 °F to 85 °F) cooler than the saturation temperature of the contact vapor. It creates a loud sound and can cause severe local pressure stresses in the container or piping system.

2.1961 Thermodynamic System — In thermodynamics, a region in space or a quantity of matter bounded by a closed surface in which thermal actions occur. The surroundings include everything external to the system, and the system is separated from the surroundings by the system boundaries. These boundaries can be either movable or fixed, either real or imaginary.

2.1962 Thermodynamic Trap — The steam (disk) trap constructed with a cap containing a steel disc, which fits against a flat seat. Condensate, discharging at close to saturation temperature, increases in velocity and draws the disc down toward the seat, due to the lower pressure caused by the increased velocity (Bernoulli effect). Condensate discharging from high to low pressure flashes off and creates the closing pressure above the disc within the cap. As this flash steam condenses, pressure is dissipated, and the cycle repeats. The trap has limited air venting capabilities.

2.1963 Thermodynamic Work — The mechanism that transfers energy from one system to another without accompanying transfer of entropy. Units of thermodynamic work are Btu (W.h).

2.1964 Thermodynamics — It is the science of heat energy and its transformations to and from other forms of energy.

2.1965 Thermoelectric Refrigeration — It is a method for cooling by the peltier effect.

2.1966 Thermometer — It is an instrument for measuring temperature.

2.1967 Thermometry — The part of applied physics relating to the measurement of temperature.

2.1968 Thermophysical Properties — Those data needed to calculate heat transfer and fluid flow characteristics of the fluid. Thermophysical properties include both thermodynamic (equilibrium) and transport properties.

2.1969 Thermophysics — The study of physical phenomena related to heat.

2.1970 Thermopile — A number of thermocouples wired consistently in series or parallel to measure small or average temperature differences.

2.1971 Thermosiphon — Circulation by the forces induced by the differences in densities of cooler and warmer fluids.

2.1972 Thermosiphon Exchanger — A tube, or coils with interconnecting piping, placed in supply and exhaust airstreams and filled with a refrigerant heat transfer fluid.

2.1973 Thermostat — An automatic control device actuated by temperature and designed to be responsive to temperature.

2.1974 Thermostat, Direct-Acting — It is an instrument for activating a control circuit upon sensing a predetermined low temperature.

2.1975 Thermostat, Reverse-Acting — It is an instrument for activating a control circuit upon sensing a predetermined high temperature.

2.1976 Thermostat, Room — It is a thermostat properly located in a room so as to respond to representative room temperature and thereby control heating or cooling devices.

2.1977 Thermostatic Balanced Pressure Steam Trap — The trap installed on the discharge side of a heating unit and designed to pass air freely on start-up and condensate at a subcooled temperature, but to prevent steam vapor passing into the return. It can have a bellows or encapsulated metallic diaphragm containing a small quantity of volatile liquid. At the bottom of the diaphragm or bellows is attached a hardened, self centering valve head operating on the pressure side of the valve seat. At ordinary temperatures and atmospheric pressure, the valve is fully open to permit free passage of air and cold condensate. The trap discharges at a fixed temperature below that of steam saturation temperature and closely follows the steam pressure/temperature curve.

2.1978 Thermostatic Bimetallic Steam Trap — The trap installed where low-temperature discharge is required. It incorporates a bimetallic element that, when heated, deflects and causes a downstream valve head to be drawn up, closing the orifice. It discharges air and cold condensate freely on start-up.

2.1979 Thermostatic Control — An automatic control device or system used to maintain temperature at a fixed or adjustable setpoint.

2.1980 Thermostatic Expansion Valve — A device for controlling superheat by regulating the mass flow of refrigerant to a refrigeration load, actuated by changes in equalizer pressure and temperature sensing element temperature.

2.1981 Thermostatic Regulator — A evaporator pressure regulator that is sensitive to temperature.

2.1982 Thermostatic Switch — A device within an electric controller for completing or interrupting an electrical circuit in response to a temperature change.

2.1983 Three-Pipe Air-Conditioning System — The multipipe arrangement in which each unit is fitted with two supply pipes (hot and chilled water) and a single return pipe common to the central heater and refrigerating system.

2.1984 Throttling of a Fluid — It is an irreversible adiabatic process which consists of lowering pressure by an expansion without work.

2.1985 Throw — The horizontal or vertical axial distance an airstream travels after leaving an air outlet before the maximum stream velocity is reduced to a specified terminal level.

2.1986 Ton of Refrigeration — The quantity of heat absorbed in the melting of 1 ton (2 000 lb) of water ice per 24 h, that is, 72 575 kcal/day, or 3 024 kcal/ h.

2.1987 Total Heat (*See* Enthalpy) — A thermodynamic property of a substance defined as the sum of its internal energy plus the quantity Pv/J.

where

P = Pressure of the substance;

v = Volume; and

J = Mechanical equivalent of heat.

2.1988 Tower, Water-Cooling — It is an enclosed device for evaporative cooling water by contact with air.

2.1989 Tower, Water-Cooling, Atmospheric — One in which the air movement through the tower is dependent only upon atmospheric conditions; also known as natural draft cooling tower.

2.1990 Tower, Water-Cooling, Forced-Draft — It is a mechanical draft water-cooling tower having one or more fans located in the air entering the tower.

2.1991 Tower, Water-Cooling, Induced-Draft — It is a mechanical draft water-cooling tower having one or more fans located in the air leaving the tower.

2.1992 Tower, Water-Cooling, Mechanical-Draft — It is a water-cooling lower utilizing one or more fans to move the air through the tower, the fans being an integral part of the tower.

2.1993 Transfer Air — Air transferred from one room to another through openings in the room envelope, whether it is transferred intentionally or not. The driving force for transfer air is generally a small pressure differential between the rooms, although one or more fans may be used.

2.1994 Transfer Fluid — The fluid that carries energy between two heat transfer devices.

2.1995 Transmission — In thermodynamics, a general term for heat travel; properly, heat transferred per unit of time.

2.1996 Transmittance, Thermal (U-Factor) — It is the time rate of heat flow per unit area under steady conditions from the fluid on the warm side of a barrier to the fluid on the cold side, per unit temperature difference between the two fluids.

2.1997 Transpiration Cooling — The cooling produced by evaporation of fluid lost by a body or material.

2.1998 Traverse — The method of measuring air and fluid volumetric flow in ductwork and piping systems.

2.1999 Trombe Wall — Wall that is sun facing and built from material that can act as a thermal mass (such as stone, metal, concrete, adobe, or water tanks). A high mass wall that stores heat from solar gain during the day and slowly radiates the heat.

2.2000 Trough, Drip (Drain) — It is a device for channelling water.

2.2001 True Solar Time — The local standard time adjusted by the equation of time (determined from an astronomical almanac) and the longitude correction (four times the difference between the standard longitude of the observer's time zone and the observer's actual longitude). A time reference used to compute the apparent position of the sun.

2.2002 Tube, Capillary — In refrigeration practice, a tube of small internal diameter used as a liquid refrigerant flow control or expansion device between high and low sides; also used to transmit pressure from the sensitive bulb of some temperature controls to the operating clement.

2.2003 Tunnel Cooler — Chilled, elongated space for cooling foodstuffs on a movable transport system by rapid circulation of cold air.

2.2004 Tunnel Freezer — Elongated enclosure provided with rapid cold air circulation for the freezing of foodstuffs. Also called a freezing tunnel or blast freeze tunnel.

2.2005 Turboexpander (Expansion Turbine) — In cold air or gas refrigeration cycles, a turbine in which the compressed gas expands and produces mechanical energy.

2.2006 Turbulator — The flow-enhancing device to increase coil heat transfer efficiency.

2.2007 Turbulent Flow — Fluid flow in which the velocity varies in magnitude and direction in an irregular manner throughout the mass. Turbulent flow exists when the Reynolds Number exceeds a value of 2 000 to 4 000.

2.2008 Turning Vane — A series of single thickness of airfoil radius sheet metal guides placed within a rectangular duct elbow to reduce turbulence and associated pressure drop within the elbow and to direct air around the bend.

2.2009 Type I Hood — A hood designed to capture smoke and/or grease-laden vapor produced by a cooking process, incorporating listed grease removal devices and fire suppression equipment. Type I hoods fall into two categories: listed and unlisted. Listed hoods have been tested in accordance with UL Standard 710.1. Conventional, or non-listed hoods are hoods that meet the design, construction, and performance criteria of the applicable national and local codes.

2.2010 Type II Hood — A hood designed to capture heat, odors, products of combustion, and/or moisture where smoke or grease laden vapor is not present. A Type II hood may or may not have filters or baffles and does not have a fire suppression system.

2.2011 U — Unit thermal conductance or overall heat transfer coefficient, $W/(m^2.K)$ $(Btu/(h.ft^2.°F)$.

2.2012 Unconditioned Space — A space within a building that is not conditioned space.

2.2013 Underfloor Air-Distribution System (UFAD) — An air-distribution system that uses an underfloor plenum (open space between the structural concrete slab and the underside of a raised-floor system) to deliver conditioned air into the space, typically through floor diffusers. Air is returned at a level above the occupied zone (typically at the ceiling level). Under cooling operation, UFAD systems produce a stratified environment, similar in principle to that of displacement systems. The primary difference between these systems is that UFAD outlets deliver air at higher velocity, producing greater mixing in the area near the outlet discharge.

2.2014 Unit Cooler

a) An assembly of cooling coils with drain pan, fan, and enclosure; and

b) Direct cooling, factory made encased assembly including an air-cooling coil, refrigerating compressor and condenser, fan and motor (usually), and directional outlet, including the necessary automatic controls.

2.2015 Unit Heater — A heater consisting of a fan for circulating air over a heat exchange surface, all enclosed in a common casing.

2.2016 Unit Ventilator — A fan coil unit package devised for applications in which the use of outdoor and return air mixing is intended to satisfy tempering requirements and ventilation needs.

2.2017 Unitary System — One or more factory-made assemblies that normally include an evaporator or cooling coil and a compressor and condenser combination.

2.2018 Unloader — A device on or in a compressor for equalizing the high- and low-side pressures for a brief period during starting in order to decrease the starting load on the motor, also a device for controlling compressor capacity by rendering one or more cylinders ineffective.

2.2019 Upfeed System — The piping arrangement for a heating, air-conditioning, or refrigerating system in which heat transfer fluid is circulated through supply mains that are below the levels of heating or cooling units they serve.

2.2020 Usable Storage Capacity — Total amount of cooling discharged from a thermal storage device, at or below the maximum usable discharge temperature, for a particular storage cycle.

2.2021 Useful Refrigerating Effect — The rate at which heat is removed by the primary refrigerant, or by the secondary refrigerant, between two specified points, considering the conditions of use.

2.2022 Vacuum — The state in which the fluid, usually gas, pressure is lower than atmospheric pressure.

2.2023 Vacuum Cooling (Vacuum Chilling) — Cooling by vaporization under vacuum of part of the water contained in the material to be cooled.

2.2024 Vacuum Freezing — The freezing of a substance by lowering pressure to induce vaporization of a part of the solvent (usually water).

2.2025 Valve Seat — The stationary portion of the valve which, when in contact with the movable portion, stops flow completely.

2.2026 Valve, Back Pressure (Evaporator Pressure Regulator) — An automatic valve located between the evaporator outlet and compressor inlet that is responsive to its own inlet pressure or to the vapour flow when necessary to prevent the evaporator pressure from falling below a selected value.

2.2027 Valve, Charging — A valve used to charge or add refrigerant to the system or add oil to the compressor crankcase

2.2028 Valve, Check — It is a valve allowing fluid flow in one direction only.

2.2029 Valve, Constant Pressure Expansion — It is a controlling device for regulating the flow of volatile refrigerant into a cooling unit, actuated by changes in pressure of the low side.

2.2030 Valve, Diaphragm — A form or packless valve, manually or mechanically actuated; also, a valve actuated by pressure of a motivating fluid on one side of the diaphragm which seals the motivating fluid from the flowing fluid controlled by the valve. Flowing and motivating fluids may, but need not, be the same.

2.2031 Valve, Direct-Acting Diaphragm — It is one which closes with the admission of fluid pressure to a diaphragm and opens when pressure is released.

2.2032 Valve, Discharge — On a compressor, the valve which allows compressed refrigerant to flow from the cylinder to the discharge main.

2.2033 Valve, Emergency Relief — It is a manually operated valve for the discharge of refrigerant in case of fire or another emergency.

2.2034 Valve, Expansion — It is a valve for controlling the flow of refrigerant to the cooling element.

2.2035 Valve, Expansion, Automatic — It is a device which regulates the flow of refrigerant from the liquid line into the evaporator to maintain a constant evaporator pressure.

2.2036 Valve, Expansion, Hand — It is a manually operated needle-type valve for controlling the flow of liquid refrigerant to an evaporator.

2.2037 Valve, Expansion, Thermostatic — It is a controlling device for regulating the flow of volatile refrigerant into a cooling unit, actuated by changes in evaporator pressure and superheat of the refrigerant leaving the cooling unit. The basic response is to superheat.

2.2038 Valve, Float Refrigerating — Valve controlled by liquid level and valve actuated by float in a liquid container.

2.2039 Valve, Low-Side Float — A float valve, operating by changes in level of low-pressure liquid, that opens at low level and closes at high level.

2.2040 Valve, Packless — It is a valve which does not use packing to prevent leaks around the valve stem. Flexible material is generally used to seal against leaks and still permit valve movement.

2.2041 Valve, Pressure Relief — A valve held closed by a spring or other means and designed to relieve automatic pressure in excess of its setting; also called a safety valve.

2.2042 Valve, Purge — A device to allow fluid to flow out of a system, particularly non-condensable gases; also called a drain valve.

2.2043 Valve, Reducing — It is a valve, which maintains a uniform pressure on its outlet side irrespective of how the pressure on its inlet side may vary above the pressure to be maintained.

2.2044 Valve, Reverse-Acting Diaphragm — It is a valve, which opens with the admission of fluid pressure to a diaphragm and closes when pressure is released.

2.2045 Valve Service — A valve intended to help isolate an apparatus from the rest of the system; may be a stop valve.

2.2046 Valve, Solenoid — A valve which is closed by gravity, pressure, or spring action and opened by the movement of a plunger due to the magnetic action of an electrically energized coil, or vice versa.

2.2047 Valve, Stop — It is a shut-off valve, other than a valve for controlling the flow of refrigerant.

2.2048 Valve, Suction — In a compressor, the valve which allows refrigerant to enter the cylinder from the suction line and prevents return flow.

2.2049 Valve, Suction Pressure Regulating — An automatic valve located between the evaporator outlet and the compressor inlet that is responsive to its own outlet pressure and functions to throttle the vapour flow so as to prevent; the suction pressure at the compressor inlet from exceeding a selected value. It is used primarily to prevent overload on compressor motors.

2.2050 Valve, Thermal — A valve controlled by a thermally responsive element, for example, a thermostatic expansion valve which is usually responsive to suction or evaporator temperature.

2.2051 Valve, Water Regulator — It is an automatic valve to control the flow of cooling water through a condenser.

2.2052 Vane, Ratio — In air distributing devices, it is the ratio of depth of vane to shortest opening width between two adjacent grill bars.

2.2053 Vapor

a) Gas, particularly one near equilibrium with its liquid phase and one that does not follow the gas laws. The term is usually used instead of gas to refer to a refrigerant, or in general, to any gas below the critical temperature; and

b) Substance in the gaseous state that can also exist as a liquid or solid at normal atmospheric conditions. Compared to Gas.

2.2054 Vapor Concentration — (Also known as absolute humidity or water vapor density number), In a mixture of water vapor and dry air, the mass of water vapor in a specific volume of the mixture. Compared to relative humidity.

2.2055 Vapor Jet — The refrigerating cycle using an ejector to compress the refrigerant vapor from the evaporator to the condenser. The term steam jet is used when water is the refrigerant.

2.2056 Vapor Lock — Formation of vapor in a liquid line that reduces mass flow compared to the flow of the total liquid at the same pressure differential.

2.2057 Vapor Pressure — 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 with the temperature constant, the vapor pressure reaches a maximum called the saturated vapor pressure.

2.2058 Vapor Refrigerating System — The system using a condensable vapor as the refrigerant.

2.2059 Vaporization — Change of phase from liquid to vapor.

2.2060 Vapour — It is a gas, particularly one near equilibrium with the liquid phase of the substance and which does not follow the gas laws. It is usually used instead of gas for a refrigerant and, in general, for any gas below the critical temperature.

2.2061 Vapour Barrier — A moisture impervious layer applied to the surfaces enclosing a humid space to prevent moisture travel to a point where it may condense due to lower temperature.

2.2062 Vapour Lock — The formation of some vapour or all vapour in a liquid line reducing weight flow as compared to weight flow in liquid phase with the same pressure differential.

2.2063 Vapour Lock Device — An orifice, capillary tube, or other device having a restricted passage of fixed size for liquid refrigerant. It restricts flow of vapour of that same liquid to a lower rate of flow with the same pressure difference.

2.2064 Vapour Wet, Quality of — It is the fraction by weight of vapour in a mixture of liquid and vapour.

2.2065 Vapour, Saturated — Vapour in equilibrium with its liquid that is, when the numbers per unit time of molecules passing in two directions through the surface dividing the two phases are equal.

2.2066 Vapour, Superheated — Vapour at a temperature which is higher than the saturation temperature (that is, boiling point) at the existing pressure.

2.2067 Vapour, Water — It is used commonly in air conditioning parlance to refer to steam in the atmosphere.

2.2068 Variable Flow — Throttling control of water during a cooling or heating process.

2.2069 Variable Output — For each element of a control system, a physical quantity whose changes are governed ultimately by the functioning of the element.

2.2070 Variable Refrigerant Flow (VRF) System — An engineered direct-expansion (DX) multi-split system incorporating at least one variable capacity compressor distributing refrigerant through a piping network to multiple indoor fan-coil units, each capable of individual zone temperature control, through integral zone temperature control devices and common communications network. Variable refrigerant flow utilizes three or more steps of control on common, interconnecting piping.

2.2071 Variable Volume, Variable Temperature (VVT) — The combination of varying both airflow and temperature in response to space load, for the purpose of resetting temperature to maintain greater low-load airflow to the space than in a true variable volume system.

2.2072 Variable-Capacity Equipment — The heating and cooling equipment that operates in stages of different capacity depending on building load, for example, electric furnaces with several separate heater elements.

2.2073 Variable-Frequency Drive (VFD) — An electronic device that varies its output frequency to vary the rotating speed of a motor, given a fixed input frequency. Used with fans or pumps to vary the flow in the system as a function of a maintained pressure.

2.2074 Variable-Speed Control of a Fan — A method of controlling airflow produced by a fan by means of adjusting the speed or revolutions per minute (rpm) of the fan.

2.2075 Variable-Speed Drive — *See* variable-frequency drive

2.2076 VAV Box — Variable-air volume terminal device.

2.2077 Velocity — A measurement of the distance travelled per unit of time. This quantity is defined by its magnitude and direction at any point of the flow.

2.2078 Velocity Coefficient — It is the ratio of the actual velocity of gas emerging from a nozzle to the velocity calculated under ideal conditions; it is less than one because of friction losses.

2.2079 Velocity Pressure

a) In a moving fluid, the pressure that would induce an equivalent velocity if applied to move the same fluid through an orifice, so that all pressure energy is converted into kinetic energy. Velocity pressure is always a positive value, in water H_2O (kPa); and

b) It is the difference between the total pressure and static pressure (relative to the same datum).

2.2080 Velocity Reduction Method Duct Sizing — The method in which ducts are sized so that selected velocities occur in specific duct lengths.

2.2081 Vent — A connection in any system or enclosure that may be open to atmosphere or to a lower pressure, space, or vessel and is intended for the transfer of any fluid. A vent can be used for either intake or relief purposes.

2.2082 Vent Connector — The portion of the venting system that connects the gas appliance or its draft hood to the chimney or vent terminal.

2.2083 Vent Damper — A device intended for installation in the venting system of an individual, automatically operated, fossil-fuel-fired appliance in the outlet or downstream of the appliance draft control device, which is designed to automatically open the venting system when the appliance is in operation and to automatically close off the venting system when the appliance is in a standby or shutdown condition.

2.2084 Vent Gas — All gases in a flue during combustion in the combustion chamber, including reaction products such as excess air, carbon dioxide, carbon monoxide, oxygen, water vapor, nitrogen, and other inerts. *See* flue gas.

2.2085 Vent Limiter — A device that limits the flow of air from the atmospheric diaphragm chamber of a gas pressure regulator to the atmosphere. A vent limiter may be a limiting orifice or other limiting device.

2.2086 Vent or Air Intake Terminal — A device that is located on the outside of a building and may be connected to a furnace or boiler by a system of conduits. It is composed of an air intake terminal through which the air for combustion is taken from the outside atmosphere and an exhaust terminal from which flue gases are discharged.

2.2087 Vent Pipe

a) Discharge piping connected to a safety or relief valve; and

b) The passages and conduits in a direct vent or direct exhaust system through which gases pass from the combustion chamber to the outdoor air.

2.2088 Vent Relief

a) Opening in a tank, duct, or other piece of equipment, sealed to prevent escape of material within normal pressures, but arranged to open automatically to relieve excessive pressure; and

b) Relief opening in a pressure regulator, normally open to the atmosphere.

2.2089 Vented Crawlspace — A crawlspace with an open vent area $1/150^{th}$ of its floor area with vents distributed over all exterior surfaces.

2.2090 Ventilation — It is the process of supplying or removing air by natural or mechanical means to or from any space. Such air may or may not have been conditioned.

2.2091 Viscosity — It is that property of semi-fluids, fluids, and gases by virtue of which they resist an instantaneous change of shape or arrangement of parts. It is the cause of fluid friction whenever adjacent layers of fluid move with relation to each other.

2.2092 Viscosity, Absolute — The force per unit area required to produce unit relative velocity between two parallel areas of fluid unit distance apart; also called coefficient of viscosity.

2.2093 Viscosity, Kinematic — It is the ratio of absolute viscosity to density of a fluid.

2.2094 Volatile Organic Compounds (VOC) — Organic compounds in the vapor state present in an indoor atmosphere.

2.2095 Volatile Refrigerant — A refrigerant that changes from the liquid to the vapor state in the process of absorbing heat.

2.2096 Volume, Refrigerated, Net — The net refrigerated volume of household refrigerators and combination refrigerator-freezers is the sum of the net general refrigerated volume and the net freezer refrigerated volume. The net refrigerated volume of a household ‘all-refrigerator’ is the net general refrigerated volume. The net refrigerated volume of a household freezer is the net freezer refrigerated volume.

2.2097 Volume, Refrigerated, Net Freezer — It is that portion of the net refrigerated volume below 0 °C average for household refrigerators (exception, see volume, refrigerated, net general) and – 13.3 °C average or below for household combination refrigerator- freezers and household freezers.

2.2098 Volume, Refrigerated, Net General — That portion of the net refrigerated volume above 0 °C average for household refrigerators and 'all refrigerators' or above – 12 °C average for household combination refrigerator-freezers. Regardless of its temperature, the volume of the refrigerated chiller tray and other special compartment(s) for storage of fresh food near 0 °C is to be included in the net general refrigerated volume.

2.2099 Volume, Specific — It is the volume of a substance per unit mass; the reciprocal of density.

2.2100 Volumetric Air Flow Rate — Volumetric flow of air over specified time, usually expressed in l/s or m^3/h.

2.2101 Volumetric Efficiency Due To Cylinder Heating — It is the ratio of the total to the apparent volumetric efficiency. Also called real or no-clearance volumetric efficiency.

2.2102 Volumetric Heat Capacity — The change in heat stored in unit volume of material for unit change of temperature.

2.2103 Volumetric Moisture Capacity — The change in stored moisture per unit volume of porous material and per unit moisture potential change.

2.2104 Volumetric Total Efficiency — It is the ratio of the actual volume of gas moved by the compressor or pump to actual displacement of the compressor or pump.

2.2105 Wall Section — A cross section of wall arranged chiefly to reveal conductivity characteristics.

2.2106 Walls — Those portions of the building envelope that are vertical or tilted at an angle of 30 degrees or less from the vertical plane.

a) Above Grade — All the exterior walls of any given story if 50 percent or more of the gross exterior wall area of the story is exposed to outside air;

b) Below Grade — All the exterior walls of any given story if more than 50 percent of the gross exterior wall area of the story is below grade; and

c) Mass Wall — A wall constructed of concrete, concrete masonry, insulating concrete form (ICF), masonry cavity, brick (other than brick veneer), earth (adobe, compressed earth block, rammed earth), and solid timber or logs.

2.2107 Waste Heat

a) Heat rejected from the building (or process) because its temperature is too low for economic recovery or direct use; and

b) Unused heat rejected from a system, usually a heat engine or combustion furnace, to its surroundings.

2.2108 Water, Circulating — In a water-cooled or water-cooling device, it is the quantity of water entering the device per unit of time.

2.2109 Water, Cooling — Water used for condensation of refrigerant; condenser water.

2.2110 Water, Make-Up — Water supplied to replenish, as water replacing that lost by evaporation.

2.2111 Water, Raw — In ice making, any water used for ice making except distilled water.

2.2112 Waterside Economizer — A heat exchanger that uses the condenser water side of the system for cooling without requiring the operation of the chiller. Also a coil on the air entering side of a heat pump or HVAC unit that uses condenser water flow to precondition the entering air when conditions are favourable (*See also* Cooling).

2.2113 Waterside Economizer Cooling — Economizer process that uses cooling tower-water directly or indirectly in the cooling coils, permitting the chiller to be shut down when the outside wet-bulb temperature is sufficiently low.

2.2114 Wax — It is a solid material which may separate on cooling of oil-refrigerant mixtures.

2.2115 Weep — Drip from frozen foods.

2.2116 Weight Factor, Frozen Food — The conversion factor for a net freezer space weight rating is kg/m. It is recognized that many commercially available packaged frozen foods weigh less than kg/m.

2.2117 Wet Compression System — The system of refrigeration in which some liquid refrigerant is mixed with vapor entering the compressor to cause the discharge vapor from the compressor to be saturated, rather than superheated.

2.2118 Wet Return

a) In a refrigeration system, where the connections between the evaporator outlets and the low-pressure receiver through which the mixture of vapor and overfeed liquid is drawn; and

b) In a steam system, where a return pipe carries condensate, the pipe is usually located below the level of the waterline in the boiler.

2.2119 Wet Saturated Steam — Steam at the saturation temperature corresponding to the pressure and containing water particles in suspension (compared to dry saturated steam).

2.2120 Wet Ton (Moisture Ton) — Latent heating or cooling load (*see* ton of refrigeration).

2.2121 Wet-Bulb Depression — The difference between the dry-bulb and wet-bulb temperatures at the same location.

2.2122 Wet-Bulb Temperature — The temperature indicated when a thermometer bulb is covered with a water saturated wick over which air is caused to flow at approximately 4.5 m/s (900 ft/min) to reach the equilibrium temperature of water evaporating into the air when the heat of vaporization is supplied by the sensible heat of the air.

2.2123 W-Factor — U-factor converted into electrical terms for calculations in electric heating. The amount of heat flow, in watts per square foot per degree Fahrenheit temperature difference ($W/ft^2 \cdot F$) between air on the inside and air on the outside of the building section (wall, floor, roof, or ceiling). For conversion, W = 0.293U.

2.2124 Wien's Displacement Law — When the temperature of a radiating blackbody increases, the wavelength corresponding to maximum energy decreases in such a way that the product of the absolute temperature and the wavelength is constant.

2.2125 Wien's Radiation Law — The intensity of radiation emitted by a blackbody per unit wavelength, at that wavelength at which this intensity reaches a maximum, is proportional to the fifth power of the temperature.

2.2126 Wind Chill — The apparent temperature felt on exposed skin due to wind. The degree of this phenomenon depends on both air temperature and wind speed. The wind chill temperature (often popularly called the wind chill factor) is always lower than the air temperature for values where the wind chill formula is valid. In cases where the apparent temperature is higher than the air temperature, the heat index is used instead. Wind chill is always expressed as a temperature. Compared to the chill factor, which is always expressed as time.

2.2127 Window Air Conditioner — It is a room air conditioner designed for mounting in the window.

2.2128 Wire Drawing — It is restriction of area for a flowing fluid, causing a loss in pressure by (internal and external) friction without loss of heat or performance of work, throttling.

2.2129 Work, Effective — The net mechanical energy required by, or load imparted to, the piston of a compressor.

2.2130 Work, Indicated — Work equivalent of indicator card area for a reciprocating compressor or engine.

2.2131 Working Fluid — A medium evolving within a thermodynamic cycle.

2.2132 Working Pressure Range — The range of pressures the system is expected to experience during normal operation.

2.2133 Wort — The unfermented infusion of malt that, when fermented, produces beer.

2.2134 Zeotrope — Blend comprising multiple components of different volatilities that, when used in refrigeration cycles, change volumetric composition and saturation temperatures as they evaporate (boil) or condense at constant pressure.

2.2135 Zeotropic — It refers to blends comprising multiple components of different volatility that, when used in refrigeration cycles, change volumetric composition and saturation temperatures as they evaporate (boil) or condense at constant pressure. The word is derived from the Greek words zein (to boil) and tropos (to change).

2.2136 Zeotropic Refrigerant — A zeotropic refrigerant contains two or more components whose equilibrium vapor phase and liquid phase compositions differ. The temperature of a zeotropic refrigerant changes as it evaporates or condenses at constant pressure (compare to azeotropic refrigerant).

2.2137 Zeroth Law of Thermodynamics — If two systems are both in thermal equilibrium with a third one, they are in mutual thermal equilibrium.

2.2138 Zone

a) A separately controlled heated or cooled space;

b) One occupied space or several occupied spaces with similar occupancy category, occupant density, zone air distribution effectiveness, and zone primary airflow per unit area; and

c) Space or group of spaces within a building for which the heating, cooling, or lighting requirements are sufficiently similar that desired conditions can be maintained throughout by a single controlling device.

2.2139 Zone Valve — The valve that modulates water flow to a thermal zone in response to a downstream temperature signal.

ANNEX A

(*Foreword*)

COMMITTEE COMPOSITION

Refrigeration and Air Conditioning Sectional Committee, MED 03

Organization	*Representative*(*s*)
Indian Institute of Technology Roorkee, Roorkee	PROF RAVI KUMAR **(*Chairperson*)**
Blue Star Limited, Mumbai	SHRI JITENDRA BHAMBURE SHRI SUNIL KUMAR JAIN (*Alternate*)
BSH Household Appliances Manufacturing Private Limited, Chennai	SHRI LOGANATHAN VIJAY KUMAR SHRI BALASUBRAMANIAN ANAND (*Alternate*)
Bureau of Energy Efficiency, New Delhi	MS PRAVATANALINI SAMAL MS DEEPSHIKHA WADHWA (*Alternate* I) SHRI KAMRAN SHAIKH (*Alternate* II) SHRI DHEERAJ PANDEY (*Alternate* III)
Carrier Air Conditioning and Refrigeration Limited, Gurugram	SHRI MUNISH KUMAR SHARMA SHRI BIMAL TANDON (*Alternate* I) SHRI JATINDER SHARMA (*Alternate* II)
Central Power Research Institute, Bengaluru	DR P. CHANDRA SEKHAR SHRI GUJJALA B. BALARAJA (*Alternate*)
CEPT University, Ahmedabad	SHRI YASH SHUKLA
Copeland India Private Limited, Pune	SHRI S. CHETHAN THOLPADY
Daikin Air Conditioning India Private Limited, Gurugram	SHRI GAURAV MEHTANI
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