



## **DEFINITIONS OF TERMS**

## **REFRIGERATION, HEATING AND AIR CONDITIONING**

**BARD MANUFACTURING CO. • BRYAN, OHIO 43508**

*Dependable quality home equipment... since 1914*

## DEFINITIONS OF TERMS

### Refrigeration, Heating and Air Conditioning

1. HEAT - A form of energy causing the agitation of molecules within a substance.
2. SENSIBLE HEAT - Heat that can be measured or felt. Sensible heat always causes a temperature rise.
3. TEMPERATURE - A measurement of heat intensity.
4. FAHRENHEIT - A temperature scale with the freezing point of water 32 degrees and the boiling point 212 degrees at atmospheric pressure.
5. CENTIGRADE - A temperature scale with the freezing point of water 0 degrees and the boiling point 100 degrees at atmospheric pressure.
6. ABSOLUTE TEMPERATURE - A temperature scale expressed in degrees F or C using absolute zero as a base.
7. ABSOLUTE ZERO - The temperature at which molecular activity theoretically ceases.  $-459.69^{\circ}$  For -  $273.16^{\circ}$  C.
8. STATE CONDITION - Substances can exist in three states - Solid, Liquid or Vapor.
9. LATENT HEAT - Heat that produces a change of state without a change in temperature. i.e.: Ice to water at  $32^{\circ}$  F. Water to steam at  $212^{\circ}$  F.
10. TOTAL HEAT - (Enthalpy) - The total heat energy in a substance. The sum of sensible and latent heat.
11. BRITISH THERMAL UNIT (BTU) - The amount of heat necessary to change the temperature of 1 pound of pure water 1 degree Farenheit.
12. BOILING POINT - The temperature at which the addition of any heat will begin a change of state from a liquid to a vapor.
13. CONDENSATION POINT - The temperature at which the removal of any heat will begin a change of state from a vapor to a liquid.
14. FREEZING POINT - The temperature at which the removal of any heat will begin a change of state from a liquid to a solid.
15. MELTING POINT - The temperature at which the addition of any heat will begin a change of state from a solid to a liquid.

16. LATENT HEAT OF VAPORIZATION - The amount of heat energy in BTU's, required to change the state of one pound of a liquid to one pound of vapor at the same temperature.
17. LATENT HEAT OF CONDENSATION - The amount of heat energy in BTU's, that must be removed to change the state of one pound of a vapor to one pound of liquid at the same temperature.
18. LATENT HEAT OF FUSION - The amount of heat energy, in BTU's, required to change the state of one pound of a liquid to one pound of solid at the same temperature.
19. LATENT HEAT OF MELTING - The amount of heat energy, in BTU's, that must be removed to change the state of one pound of solid to one pound of liquid at the same temperature.
20. SPECIFIC HEAT - The amount of heat necessary to change the temperature of one pound of a substance 1 degree F.
21. SUPER HEAT - Heat added to a vapor after all liquid has been vaporized.
22. HEAT OF THE LIQUID - The increase in total heat (Enthalpy) per pound of a saturated liquid as its temperature is increased above a chosen base temperature. (Usually - 40°F for refrigerants). It is expressed in BTU's.
23. SUB-COOLING - Cooling of a liquid, at a constant pressure, below the point at which it was condensed.
24. HEAT FLOW - Heat flows from a warmer to a cooler substance. The rate depends upon the temperature difference, the area exposed and the type of material.
25. HEAT TRANSFER - The three methods of heat transfer are Conduction, Convection and Radiation.
26. CONDUCTION - The transfer of heat from molecule to molecule within a substance.
27. CONVECTION - The transfer of heat by a moving fluid.
28. RADIATION - The transfer of heat without an intervening medium. It is absorbed on contact with a solid surface.
29. HEAT EXCHANGER - A device for the transfer of heat energy from the source to the conveying medium.
30. CONDENSER - A device in which the superheat and latent heat of condensation are removed to effect a change of state from a vapor to a liquid. Some sub-cooling is also usually accomplished.

31. **CONDENSING MEDIUM** - The substance, usually air or water, to which the heat in a condenser is transferred.
32. **EVAPORATOR** - A device in which a liquid refrigerant is vaporized. Some super heating usually takes place.
33. **CONDENSING UNIT** - The portion of a refrigeration system where the compression and condensation of refrigerant is accomplished. Sometimes referred to as the "high side".
34. **LIQUID LINE** - A tube used to convey the liquid refrigerant from the condenser outlet to the refrigerant control device of the evaporator.
35. **SUCTION LINE** - A tube used to convey the refrigerant vapor from the evaporator outlet to the suction inlet of a compressor.
36. **DISCHARGE LINE** - A tube used to convey the compressed refrigerant vapor from the compressor to the condenser inlet.
37. **ATMOSPHERIC PRESSURE** - The weight of a 1 square inch column of the earth's atmosphere. At sea level this pressure is 14.696 pounds per square inch.
38. **ABSOLUTE PRESSURE** - Pressure measured with a base of zero.
39. **GAUGE PRESSURE** - Pressure measured with atmospheric pressure as a base.
40. **TOTAL PRESSURE** - The sum of all partial pressures in a mixture of gases.
41. **PARTIAL PRESSURE** - The pressure exerted by any individual gas in a mixture.
42. **VACUUM** - Any pressure below atmosphere pressure.
43. **INCHES OF MERCURY** - Atmospheric pressure is equal to 29.92 inches of mercury.
44. **MICRON** - A unit used to measure high vacuums. One micron equals  $1/25,400$  of one inch mercury.
45. **MANOMETER** - A tube filled with a liquid used to measure pressures.
46. **MERCURY MANOMETER** - Used to measure vacuum in inches of mercury.
47. **DRAFT GAUGE** - A Manometer calibrated to read very small pressures in inches of water.

48. COMPRESSION - The reduction of volume of a vapor or gas by mechanical means.
49. HEAT OF COMPRESSION - The heat added to a vapor by the work done on it during compression.
50. COMPRESSOR - A mechanical device used to compress gases. Three main types are - Reciprocating, Mechanical and Rotary.
51. REFRIGERANT CONTROL - A device used to meter the amount of refrigerant to an evaporator. It also serves as a dividing point between the high and low pressure sides of the system.
52. THERMOSTATIC EXPANSION VALVE - A refrigerant control which monitors the flow rate according to the superheat at the evaporator outlet.
53. CAPILLARY TUBE - A refrigerant control consisting of a small diameter tube which controls flow by restriction. They are carefully sized by inside diameter and length for each particular application.
54. REFRIGERANT - A substance which produces a refrigerating effect while expanding or vaporizing.
55. SATURATION - A condition of stable equilibrium of a vapor and a liquid.
56. SATURATED VAPOR - Vapor in contact with a liquid.
57. PRESSURE - TEMPERATURE RELATIONSHIP - The change effected in temperature when pressure is changed or vice versa. Only used at saturated conditions. An increase in pressure results in a temperature increase. A decrease in temperature results in a pressure decrease.
58. EVAPORATOR SUPERHEAT - The actual temperature of the refrigerant vapor at the evaporator exit as compared to the saturated vapor temperature indicated by the suction pressure.
59. SUCTION PRESSURE - The pressure read at the inlet side of a compressor. Also called back pressure or low side pressure.
60. DISCHARGE PRESSURE - The pressure read at the compressor outlet. Also called head pressure or high pressure.
61. PRESSURE DROP - The decrease in pressure due to friction, of a fluid or vapor as it passes through a tube or duct.
62. TON OF REFRIGERATION - The amount of heat necessary to completely melt one ton of 32°F ice in 24 hours. 200 BTU's per minute, 12,000 BTU's per hour, 288,000 BTU's in 24 hours. This is based on the latent heat of fusion for ice which is 144 BTU's per pound.

63. CYCLE - The complete course of operation of a refrigerant back to a selected starting point in a system. Also used to describe alternating current through 360 space degrees.
64. REFRIGERATION - The transfer of heat from a place where it is not wanted to a place where its presence is not undesirable.
65. AIR CONDITIONING - The process of controlling the temperature, humidity, cleanliness and distribution of the air.
66. ABSOLUTE HUMIDITY - The weight of water vapor in a given amount of air. Grains per cubic foot.
67. RELATIVE HUMIDITY - The percentage of water vapor present in a given quantity of air compared to the amount it can hold at its temperature.
68. PSYCHROMETRIC CHART - A chart on which can be found the properties of air under varying conditions of temperature, water vapor content, volume, etc.
69. DRY BULB TEMPERATURE - Temperature read with an ordinary thermometer.
70. WET BULB TEMPERATURE - Temperature read with a thermometer whose bulb is encased in a wetted wick.
71. PSYCHROMETER - A device having both a dry and wet bulb thermometer. It is used to determine the relative humidity in a conditioned space. Most have an indexed scale to allow direct conversion from the temperature readings to the percentage of relative humidity.
72. AIR STANDARD CONDITIONS - Conditions at which BTU ratings for summer air conditioning equipment is rated. 95°F dry bulb, 75°F wet bulb at the condenser inlet and 80°F dry bulb 67° wet bulb at the evaporator inlet.
73. DENSITY - Mass or weight per unit of volume, i.e.: Standard air -.075 pounds per cubic foot.
74. STANDARD AIR DENSITY - .075 pounds per cubic foot. Equivalent to dry air at 70°F and at sea level pressure.
75. SPECIFIC VOLUME - The volume of a substance per unit of mass. i.e., Standard air 13.33 cubic feet per pound. The reciprocal of density.
76. EVAPORATIVE COOLING - The cooling effect of vaporization of a liquid in a moving air stream.
77. COMBUSTION - The oxidation of a substance at a rapid enough rate to produce heat and light.

78. COMBUSTIBLE FUEL - A substance which combines readily with oxygen.
79. HYDRO-CARBON FUEL - A substance mainly composed of hydrogen and carbon.
80. AIR - Atmospheric air is composed of approximately 78% Nitrogen, 21% Oxygen and 1% rare gases including Carbon Dioxide, Krypton, Neon, Argon, Ozone, Helium and Ammonia. Over the sea traces of salt are present and over land traces of sulphates. Dust and micro-organisms are also present.
81. ALDEHYDE - A product of the primary combustion process. Chemically related to the alcohol family.
82. CARBON MONOXIDE - A product of incomplete combustion. Odorless, colorless but extremely toxic. It has a greater affinity for the hemoglobin of the blood than oxygen thereby displacing it. Concentration as low as 1 point per 1000 is dangerous to life in 1/2 to 1 hour. 1 part to 10,000 is the maximum permissible concentration.
83. CARBON DIOXIDE - An odorless, colorless gas formed by the complete combustion of carbon.
84. PRIMARY COMBUSTION - The ignition and initial oxidation of a combustible fuel producing carbon monoxide, aldehydes and the release of hydrogen.
85. SECONDARY COMBUSTION - The final combustion process converting carbon monoxide, aldehydes and hydrogen to carbon dioxide and water vapor.
86. PRIMARY AIR - Air mixed with the fuel prior to initial combustion.
87. EXCESS AIR - Air beyond that needed for theoretically perfect combustion.
88. ORIFICE - A device used with gas burners to meter the flow of fuel and induce the flow of primary air.
89. ATMOSPHERIC GAS BURNER - A burner entirely dependent upon atmospheric pressure for the necessary combustion air.
90. DRAFT DIVERTER - A device used to regulate the draft in a gas appliance. It is a non-adjustable device specifically designed for the particular appliance. It also serves to prevent down draft into the combustion chamber area.
91. BREECHING - The flue gas outlet to which the stack or smoke pipe is attached.

92. DRAFT - A pressure below atmospheric in the combustion chamber and connecting flues which induces a flow of secondary air and removes the products of combustion.
93. DRAFT REGULATOR - A barometric device having a counter - weighted hinged gate. When the draft or pressure in the stack drops below the desired level atmospheric pressure will open the gate admitting air and acting to reduce the amount of draft. It is essential on oil fired equipment.
94. STACK TEMPERATURE - The temperature of the flue gases taken at a point between the breeching and the draft regulator.
95. HIGH PRESSURE ATOMIZING BURNER - An oil burner using a high pressure pump and nozzle to break the oil into a fine spray. They incorporate a blower to mix primary air and a high voltage transformer and electrodes for ignition.
96. OIL BURNER NOZZLE - A device for metering the flow of oil, atomizing it and establishing a spray pattern.
97. TURBULATOR - That part of an oil burner imparting a twisting turbulent motion to assist in mixing primary air with the fuel.
98. END CONE - The cone at the end of the burner which helps shape the air pattern to match the nozzle being used.
99. BUSS BARS - The strips at the end of the ignition electrodes used to make contact with the secondary connections of the ignition transformer.
100. IGNITION TRANSFORMER - A transformer whose secondary has a 10,000 volt potential to furnish current for ignition for the air-oil spray.
101. CONSTANT IGNITION - A burner whose ignition circuit is energized so long as the thermostat calls for heat.
102. INTERMITTENT IGNITION - Ignition only occurs at the start of the cycle.
103. ELECTRODE - A conductor having high heat resistance, used to form the spark gap for an oil burner ignition system.
104. PRIMARY CONTROL - An assembly used to start oil burner ignition and operation. Also contains a safety circuit to shut the burner down in the event of flame failure.
105. STACK SWITCH - A device used to sense the temperature of flue gas on oil burning equipment and actuate the primary control safety device in the event of flame failure.



106. CADMIUM CELL - A device whose electrical resistance decreases in the presence of light. Used to actuate the primary control safety circuit in the event of flame failure.
107. BIMETAL - Two metals with different rates of expansion fastened together. When heated or cooled they will warp and can be made to open or close a switch or valve.
108. LIMIT SWITCH - A bimetallic switch used to limit the maximum temperature of a heating device. It is a normally closed switch and opens on a temperature rise. Most have fixed differentials of 25° F.
109. FAN SWITCH - A bimetallic switch used to start and stop the blower on a forced air furnace. A normally open switch, it closes on temperature rise. Fan "On" and "Off" setting may both be adjusted or one of the two adjustable with a fixed or adjustable differential.
110. COMBINATION FAN & LIMIT SWITCH - A combination of the two switches described above operated by a common bimetal.
111. THERMOSTAT - A bimetal actuated switch to close and open a circuit to indicate or terminate operation of a heating or air conditioning system.
112. THERMOSTAT SUBBASE - When installed with a thermostat it permits selection of function for heating, cooling, automatic change over and blower cycling or continuous operation.
113. HEAT ANTICIPATOR - A resistance heater (usually variable) in series with the heat circuit in the thermostat. It adds a small amount of heat during the cycle and causes the thermostat to open the circuit slightly ahead of the set point. This compensates for residual heat in the heat exchanger or time delay on electric heat and prevents thermostat overshoot.
114. COOL ANTICIPATOR - A resistance heater (usually not adjustable) in parallel with the cooling circuit. It is "on" when the current is "off" adding heat to shorten the off cycle.
115. GAS VALVE - An electrically actuated valve to control the flow of gas to the main burners. Most have integral gas cocks, pilot safety valves and pressure regulators.
116. PILOT SAFETY VALVE - A valve which will close when pilot flame failure occurs shutting off the gas supply to the main and pilot burner. Usually integral to the gas valve.

117. PRESSURE REGULATOR - A device used to regulate the manifold pressure of a gas burner. Atmospheric pressure and adjustable spring pressure on one side of a diaphragm oppose valve opening. Gas pressure on the other side will open the valve port. Additional spring pressure will result in increased manifold pressure. Some are part of a main valve.
118. SERVO PRESSURE REGULATOR - A small diaphragm with adjustable spring loading senses the outlet pressure opening or restricting a port and causing the main valve diaphragm to throttle regulating the outlet pressure. Servo regulators give much better regulation at varying inlet pressures and rates of flow.
119. STEP OPENING VALVES - Gas valves so designed as to open partially for a short period to allow smoother ignition before opening to full input.
120. GAS PRESSURE - The pressure measured at the outlet of the valve or at a tapping in the manifold. For natural gas it is 3.5" w.c. and for L.P. gases 11" w.c.
121. TWO STAGE PRESSURE REGULATION - Used with L.P. gases. The main tank regulator is set to a valve higher than 11" w.c. and each appliance has an individual regulator to maintain 11" w.c. pressure.
122. RELAY - A device used to open and close an electrical circuit. The relay may be actuated by a bimetal electrically heated strip, a rod wrapped with a fine resistance wire causing expansion when energized, a bellows actuated by expansion of a fluid or gas or an electromagnetic coil.
123. CONTACTOR - An electro magnetic actuated relay. Usually used to refer to the relay which closes the circuit to a compressor.
124. THERMOCOUPLE - Two dissimilar metals joined together at each end. When one junction is maintained at a higher temperature a low voltage direct current will flow. Used to operate pilot safety valves. Output in the range of 30 millivolts.
125. STATIC PRESSURE - The normal force per unit area at a small hole in the wall of a duct.
126. VELOCITY PRESSURE - In a moving fluid, the pressure capable of causing an equivalent velocity as applied to move the same fluid through an orifice such that all pressure energy expended is converted into kinetic energy.
127. TOTAL PRESSURE - The sum of the static and velocity pressures of a moving air system at the point of measurement.

128. PIZOT TUBE - A device comprising a small diameter orifice projecting directly into an air stream measuring total pressure and surrounded by an annular section with small diameter entrances normal to the flow, measuring static pressure both sections are usually connected to a manometer to indicate velocity pressure.
129. STATIC TAP - A means by which static pressures of a duct system may be read directly, usually consisting of a small diameter hole in the side of the duct connected to a manometer.
130. VAPOR BARRIER - The term applied to an impervious layer of material superimposed upon a layer of insulation. Vapor barriers are always applied on the warm side of the insulation layer.
131. CUBIC FEET PER MINUTE - A common means of assigning quantitative values to volumes of air intransit, usually abbreviated CFM.
132. FEET PER MINUTE - A term assigned to a velocity of a moving air stream, usually expressed FPM.
133. MANOMETER - A device consisting simply of a U-shaped glass tube partially filled with liquid, used for measurement of partial vacuums and low pressure.
134. PERIMETER SYSTEM - A system of duct work associated usually with the air conditioning of homes in which the supply air is directed to the perimeter of the structure discharging beneath windows at the outside wall.
135. SOUND TRAP - An enlargement in a duct section usually containing sound deadening material as a lining or in the form of fins to reduce accoustical transfer.
136. INCHES OF WATER GAUGE - A term used in the measurement of small pressures or vacuums employing a manometer filled with water.
137. AMBIENT - Refers to the temperature surrounding a body or unit under test.