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Glossary of Terms

The definitions given in this section are only those applying to heating and particularly as used in the [Hoffman Specialty Catalog](#). Some do not define the terms for all usages.

Absolute Humidity: The weight of water vapor in grains actually contained in one cubic foot of the mixture of air and moisture.

Absolute Pressure: The actual pressure above zero. It is the atmospheric pressure added to the gauge pressure. It is expressed as a unit pressure such as lbs.per sq. in. absolute.

Absolute Temperature: The temperature of a substance measured above absolute zero. To express a temperature as absolute temperature add 460° to the reading of a Fahrenheit thermometer or 273° to the reading of a Centigrade.

Absolute Zero: The temperature (-460°F. approx.) at which all molecular motion of a substance ceases, and at which the substance contains no heat.

Air: An elastic gas. It is a mechanical mixture of oxygen and nitrogen and slight traces of other gases. It may also contain moisture known as humidity. Dry air weighs 0.075 lbs. per cu. ft.

One Btu will raise the temperature of 55 cu. ft. of air one degree F.

Air expands or contracts approximately 1/490 of its volume for each degree of rise or fall in temperature from 32° F.

Air Change: The number of times in an hour the air in a room is changed either by mechanical means or by the infiltration of outside air leaking into the room through cracks around doors and windows, etc.

Air Cleaner: A device designed for the purpose of removing air-borne impurities such as dust, fumes, and smokes. (Air cleaners include air washers and air filters.)

Air Conditioning: The simultaneous control of the temperature, humidity, air motion, and air distribution within an enclosure. When human comfort and health are involved, a reasonable air purity with regard to dust, bacteria, and odors is also included. The primary requirement of a good air conditioning system is a good heating system.

Air Infiltration: The leakage of air into a house through cracks and crevices, doors, windows, and other openings, caused by wind pressure and/or temperature difference.

Air Valve: See Vent Valve.

Atmospheric Pressure: The weight of a column of air, one square inch in cross section and extending from the earth to the upper level of the blanket of air surrounding the earth. This air exerts a pressure of 14.7 pounds per square inch at sea level, where water will boil at 212°F. High altitudes have lower atmospheric pressure with correspondingly lower boiling point temperatures.

Boiler: A closed vessel in which steam is generated or in which water is heated by fire.

Boiler Feed Pump: A pump that is governed by a control that monitors the actual boiler water level; and only adds water to the boiler when the boiler needs it. The pump controller is mounted on the boiler.

Boiler Feed Unit: A pre-packaged system consisting of a tank, pump, and makeup water line that returns condensate to the boiler

Boiler Heating Surface: The area of the heat transmitting surfaces in contact with the water (or steam) in the boiler on one side and the fire or hot gases on the other.

Boiler Horsepower: The equivalent evaporation of 34.5 lbs. of water per hour at 212° F. to steam at 212° F. This is equal to a heat output of 33,475 Btu per hour, which is equal to approximately 140 sq. ft. of steam radiation (EDR) .

British Thermal Unit (BTU): The quantity of heat required to raise the temperature of 1 lb. of water 1°F. This is somewhat approximate but sufficiently accurate for any work discussed in this catalog.

BSPT: British Standard Pipe Thread

Bucket Trap (Inverted): A float trap with an open float. The float or bucket is open at the bottom. When the air or steam in the bucket has been replaced by condensate the bucket loses its buoyancy and when it sinks it opens a valve to permit condensate to be pushed into the return.

Bucket Trap (Open): The bucket (float) is open at the top. Water surrounding the bucket keeps it floating and the pin is pressed against its seat. Condensate from the system drains into the bucket. When enough has drained into it so that the bucket loses its buoyancy it sinks and pulls the pin off its seat and steam pressure forces the condensate out of the trap.

Calorie (Small): The quantity of heat required to raise 1 gram of water 1°C (approx.).

Calorie (Large): The quantity of heat required to raise 1 kilogram of water 1°C (approx.).

Cavitation: Term used to describe when condensate flashes into steam as it passes through a negative pressure in the eye of a centrifugal pump impeller. Steam pockets may form in the impeller eye and then implode as they enter a positive pressure in the impeller passage.

Centigrade: A thermometer scale at which the freezing point of water is 0° and its boiling is 100°.

Central Fan System: A mechanical indirect system of heating, ventilating, or air conditioning consisting of a central plant where the air is heated and/or conditioned and then circulated by fans or blowers through a system of distributing ducts.

Chimney Effect: The tendency in a duct or other vertical air passage for air to rise when heated due to its decrease in density.

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Coefficient of Heat Transmission (Over-all)-U-:

The amount of heat (BTU) transmitted *from air to air* in one hour per square foot of the wall, floor, roof, or ceiling for a difference in temperature of one degree Fahrenheit *between the air on the inside and outside of the wall, floor, roof, or ceiling.*

Column Radiator: A type of direct radiator. This radiator has not been sold by manufacturers since 1926.

Comfort Line: The effective temperature at which the largest percentage of adults feel comfortable.

Comfort Zone (Average): The range of effective temperatures over which the majority of adults feel comfortable.

Concealed Radiator: See Convector.

Condensate: Water formed by cooling steam. The capacity of traps, pumps, etc., is sometimes expressed in lbs. of condensate they will handle per hour. One pound of condensate per hour is equal to approximately 4 sq. ft. of steam heating surface (240 BTU per hour per sq. ft.).

Condensate Pump: A pump that is controlled by a switch mounted on the condensate tank. It adds water to the boiler when the condensate tank becomes full, whether the boiler needs water or not.

Condensate Return Rate: The rate at which condensate is returned to the boiler

Condensate Return (unit): A pre-packaged system consisting of a tank, pump, and usually a float switch that is used to pump condensate back to the boiler or boiler feed unit.

Conductance (Thermal)-C-: The amount of heat (BTU) transmitted from surface to surface, in one hour through one square foot of a material or construction for the thickness or type under consideration for a difference in temperature of one degree Fahrenheit between the two surfaces.

Conduction (Thermal): The transmission of heat through and by means of matter.

Conductivity (Thermal)-k-: The amount of heat (BTU) transmitted in one hour through one square foot of a homogenous material one inch thick for a difference in temperature of one degree Fahrenheit between the two surfaces of the material.

Conductor (Thermal): A material capable of readily transmitting heat by means of conduction.

Convection: The transmission of heat by the circulation (either natural or forced) of a liquid or a gas such as air. If natural, it is caused by the difference in weight of hotter and colder fluid.

Convector: A concealed radiator. An enclosed heating unit located either within, adjacent to, or exterior to the room or space to be heated, but transferring heat to the room or space mainly by the process of convection. A shielded heating unit is also termed a convector. If the heating unit is located exterior to the room or space to be heated, the heat is transferred through one or more ducts or pipes.

Converter: A piece of equipment for heating water with steam without mixing the two. It may be used for supplying hot water for domestic purposes or for a hot water heating system.

Cooling Leg: A length of uninsulated pipe through which the condensate flows to a trap and which has sufficient cooling surface to permit the condensate to dissipate enough heat to prevent flashing when the trap opens. A thermostatic trap may require a cooling leg to permit the condensate to drop enough in temperature to permit the trap to open.

Degree-Day: (Standard) A unit which is the difference between 65° F. and the daily average temperature when it is below 65°F. The "degree day" on any given day is equal to the number of degrees F. that the average temperature for that day is below 65° F.

Dew-Point Temperature: The air temperature corresponding to saturation (100 percent relative humidity) for a given moisture content. It is the lowest temperature at which air can retain water vapor.

Direct-Indirect Heating Unit: A heating unit located in the room or space to be heated which is fully or partially closed. The enclosed portion is used to heat air which enters from outside the room.

Direct Radiator: Same as radiator.

Domestic Hot Water: Hot water used for purposes other than house heating such as laundering, dish-washing, bathing, etc.

Down-Feed One-Pipe Riser (Steam): A pipe which carries steam downward to the heating units and into which heating units drain condensation.

Down-Feed System (Steam): A steam heating system in which the supply mains are above the level of the heating units which they serve.

Dry-Bulb Temperature: The temperature of the air as determined by an ordinary thermometer.

Dry Return (Steam): A return pipe in a steam heating system which carries both condensation and air.

Dry Saturated Steam: Saturated steam containing no water in suspension.

Equivalent Direct Radiation (E.D.R.): The amount of heating surface which will give off 240 BTU per hour when filled with a heating medium at 215°F. and surrounded by air at 70° F. The equivalent square foot of heating surface may have no direct relation to the actual surface area.

Extended Heating Surface: Heating surface consisting of ribs, fins, or extended surfaces which receive heat by conduction from the prime surface.

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Extended Surface Heating Unit: A heating unit having a relatively large amount of extended surface which may be integral with the core containing the heating medium or assembled over a core, making good thermal contact by pressure, or by being soldered to the core or by both pressure and soldering. An extended surface heating unit is usually placed within an enclosure and functions as a convactor.

Fahrenheit: A thermometer scale at which the freezing point of water is 32° and its boiling point is 212° above zero.

Flash (Steam): The rapid passing into steam of water at a high temperature when the pressure it is under is reduced so that its temperature is above that of its boiling point for the reduced pressure. For example: If hot condensate is discharged by a trap into a low pressure return or into the atmosphere, a certain percentage of the water will be immediately transformed into steam. It is also called re-evaporation .

Float & Thermostatic Trap: A float trap with a thermostatic element for permitting the escape of air into the return line.

Float Switch: A mechanical switch activated by a float on the end of a rod. This device is used in controlling the condensate pump, makeup valve, low water cutoff, etc.

Float Trap: A steam trap which is operated by a float. When enough condensate has drained (by gravity) into the trap body the float is lifted. In turn, the pin lifts off its seat. This permits the condensate to flow into the return until the float has been sufficiently lowered, to close the port. Temperature does not affect the operation of a float trap.

Furnace: That part of a boiler or warm air heating plant in which combustion takes place. Complete heating unit of a warm air heating system.

Gauge Pressure: The pressure above that of the atmosphere. It is the pressure indicated on an ordinary pressure gauge. It is expressed as a unit pressure such as lbs. per sq. in. gauge.

Head: Unit pressure usually expressed in ft. of water or mil-inches of water.

Heat: That form of energy into which all other forms may be changed. Heat always flows from a body of higher temperature to a body of lower temperature. See also: Latent Heat, Sensible Heat, Specific Heat, Total Heat, Heat of the Liquid.

Heat of the Liquid: The heat (Btu) contained in a liquid due to its temperature. The heat of the liquid for water is zero at 32° F. and increases 1 Btu approximately for every degree rise in temperature.

Heat Unit: In the foot-pound-second system, the British Thermal Unit (Btu) in the centimeter-gram-second system, the calorie (cal.).

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

Heating Surface: The exterior surface of a heating unit. See also Extended Heating Surface.

Heating Unit: Radiators, convectors, base boards, finned tubing, coils embedded in floor, wall, or ceiling, or any device which transmits the heat from the heating system to the room and its occupants.

Horsepower: A unit to indicate the time rate of doing work equal to 550 ft.-lb. per second, or 33,000 ft.-lb. per minute. One horsepower equals 2545 Btu per hour or 746 watts.

Hot Water Heating System: A heating system in which water is used as the medium by which heat is carried through pipes from the boiler to the heating units.

Humidistat: An instrument which controls the relative humidity of the air in a room.

Humidity: The water vapor mixed with air.

Insulation (Thermal): A material having a high resistance to heat flow.

Latent Heat of Evaporation: The heat (Btu per pound) necessary to change 1 pound of liquid into vapor without raising its temperature. In round numbers this is equal to 960 Btu per pound of water.

Latent Heat of Fusion: The heat necessary to melt one pound of a solid without raising the temperature of the resulting liquid. The latent heat of fusion of water (melting 1 pound of ice) is 144 Btu.

Low Pressure Steam: As defined by ASME, low pressure steam is 15 PSIG or less.

Low Water Cutoff: Float switch inside the boiler feed receiver set to prevent pumps from operating at low water level conditions.

Mechanical Equivalent of Heat: The mechanical energy equivalent to 1 Btu which is equal to 778 ft.-lb.

Mil-Inch: One one-thousandth of an inch (0.001").

NPSHR and NPSHA: Are short for Net Positive Suction Head Required and Net Positive Suction Head Available. NPSHR curves for centrifugal pumps are needed because all centrifugal pumps operate at a lower pressure in the impeller eye than the pressure existing at the pump suction flange. The curve identifies the pressure over and above fluid flash point or vaporization pressure, which is needed at the pump impeller eye and takes into account decreased pressures within the pump.

NPT: National Pipe Thread

One-Pipe Supply Riser (Steam): A pipe which carries steam to a heating unit and which also carries the condensation from the heating unit. In an up feed riser steam travels upwards and the condensate downward while in a down feed both steam and condensate travel down.

One-Pipe System (Hot Water): A hot water heating system in which one pipe serves both as a supply main and as a return main. The heating units have separate supply and return pipes but both are connected to the same main.

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One-Pipe System (Steam): A steam heating system consisting of a main circuit in which the steam and condensate flow in the same pipe. There is one connection to each heating unit which serves as both the supply and the return.

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

Panel Heating: A method of heating involving the installation of the heating units (pipe coils) in the walls, floor or ceiling of the room.

Panel Radiator: A heating unit placed on, or flush with, a flat wall surface and intended to function as a radiator. Do not confuse with panel heating system.

Pilot Valve: A valve that uses a small valve to control a large valve.

Pressure: Force per unit area such as lb. per sq. inch. Unless otherwise qualified, it refers to unit static gauge pressure. See Static, Velocity, Total, Gauge and Absolute Pressures.

Pressure Powered Pump: Motorless pump that uses steam or air pressure to move condensate back to the boiler room.

Pressure Reducing Valve: A device used to decrease the pressure of a gas or liquid.

Prime Surface: A heating surface with the heating medium on one side and air (or extended surface) on the other.

Radiant Heating: A heating system in which the heating is by radiation only. Sometimes used in a Panel Heating System.

Radiation: The transmission of heat in a straight line through space.

Radiator: A heating unit located in the room to be heated and exposed to view. A radiator transfers heat by radiation to objects "it can see" and by conduction to the surrounding air which in turn is circulated by natural convection.

Recessed Radiator: A heating unit recessed in a wall but not enclosed.

Reducing Valve: See Pressure Reducing Valve.

Re-Evaporation: See Flash.

Refrigeration, Ton of: See Ton of Refrigeration.

Relative Humidity: The amount of moisture in a given quantity of air compared with the maximum amount of moisture the same quantity of air could hold at the same temperature. It is expressed as a percentage.

Return Mains: The pipes which return the heating medium from the heating units to the source of heat supply.

Reverse-Return System (Hot Water): A two-pipe hot water heating system in which the water from several heating units is returned along paths so that all radiator circuits of the system are of equal length

Sensible Heat: Heat which increases the temperature of objects as opposed to latent heat.

Specific Heat: In the foot-pound-second system, the amount of heat (Btu) required to raise one pound of a substance one degree Fahrenheit. In the centimeter-gram-second system, the amount of heat (cal.) required to raise one gram of a substance one degree C. The specific heat of water is 1.

Split System: A system in which the heating is accomplished by radiators or convectors and ventilation by separate apparatus.

Sparge Tube: Slotted tube inserted in the condensate return tank or boiler feed tank that injects steam to preheat the condensate. Normally uses waste steam to improve efficiency of the system.

Square Foot of Heating Surface: Equivalent direct radiation (EDR). By definition, that amount of heating surface which will give off 240 Btu per hour when filled with a heating medium at 215°F. and surrounded by air at 70° F. The equivalent square foot of heating surface may have no direct relation to the actual surface area.

Static Pressure: The pressure at which a pipe will burst. It is used to overcome the frictional resistance to flow through the pipe. It is expressed as a unit pressure and may be in absolute or gauge pressure. It is frequently expressed in feet of water column or in the case of pipe friction in mil-inches of water column per ft. of pipe.

Steam: Water in the vapor phase. The vapor formed when water has been heated to its boiling point, corresponding to the pressure it is under. See also Dry Saturated Steam, Wet Saturated Steam, Superheated Steam.

Steam Heating System: A heating system in which the heating units give up their heat to the room by condensing the steam furnished to them by a boiler or other source.

Steam Trap: A device for allowing the passage of condensate and air but preventing the passage of steam. See Thermostatic, Float and Thermostatic, Bucket Trap, Thermodisc Traps.

Storage Capacity: The volume of condensate that the condensate receiver is capable of holding.

Superheated Steam: Steam heated above the temperature corresponding to its pressure.

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

Tank Regulator: See Temperature Regulator.

Temperature Regulator: A device for controlling the admission of steam to a hot water or liquid heating device in correct quantities so that the temperature of the liquid will remain constant.

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Thermostat: An instrument which responds to changes in temperature and which directly or indirectly controls the room temperature.

Thermodisc Trap: A steam trap that operates by the cycling of a free-floating disc. The disc cycles in reaction to the inlet pressure of condensate and air against the bottom of the disc and pressure from flash steam that is trapped between the top of the disc and the trap cap chamber. Inlet pressure forces the disc off its seat. Flash steam, created from hot condensate reacting to the lower downstream pressure, builds pressure of top of the disc in the cap chamber and forces the disc down onto its seating surfaces. Pressure in the cap chamber drops due to cooling from natural heat losses. When the inlet pressure becomes greater than the cap chamber pressure, the cycle repeats.

Ton of Refrigeration: The heat which must be extracted from one ton (2,000 lbs.) of water at 32° F. to change it into ice at 32°F. in 24 hours. It is equal to 288,000 Btu/24 hours, 12,000 Btu/hour, or 200 Btu/minute.

Total Heat: The latent heat of vaporization added to the heat of the liquid with which it is in contact.

Total Pressure: The sum of the static and velocity pressures. It is also used as the total static pressure over an entire area, that is, the unit pressure multiplied by the area on which it acts.

Trap: See Steam Trap, Thermostatic Trap, Float Trap, Bucket Trap, Float and Thermostatic Trap and Thermodisc Trap.

Tube Bundle: A single tube (pipe) formed into a tight array so as to present a large surface area in a small space.

Two-Pipe System (Steam or Water): A heating system in which one pipe is used for the supply main and another for the return main. In a two-pipe hot water system each heating unit receives a direct supply of the heating medium.

Unit Heater: A heating unit consisting of a heat transfer element, housing, fan with motor, and outlet deflectors or diffusers. It is usually suspended from the ceiling and its heat output is controlled by starting and stopping the fan by a room thermostat. The circulation of the heating medium (steam or hot water) is usually continuous. It is used primarily for industrial heating.

Unit Pressure: Pressure per unit area as lbs. per sq. in.

Up-Feed System (Hot Water or Steam): A heating system in which the supply mains are below the level of the heating units which they serve.

Vacuum Heating System (Steam): A one- or two-pipe heating system equipped with the necessary accessory apparatus to permit the pressure in the system to go below atmospheric.

Vapor: Any substance in the gaseous state.

Vapor Heating System (Steam): A two-pipe heating system which operates at or near atmospheric pressure and returns the condensation to the boiler or receiver by gravity.

Velocity Pressure: The pressure used to create the velocity of flow in a pipe. It is expressed as a unit pressure.

Ventilation: Air circulated through a room for ventilating purposes. It may be mechanically circulated with a blower system or through circulation with an open window, etc.

Vent Valve (Steam): A device that permits air to be forced out of a heating unit or pipe and closes against water and steam.

Vent Valve (Water): A device that permits air to be forced out of a heating unit or pipe and closes against water.

Warm Air Heating System: A warm air heating plant consists of a heating unit (fuel-burning furnace) enclosed in a casing, from which the heated air is distributed to the various rooms of the building through ducts. If the motive head producing flow depends on the difference in weight between the heated air leaving the casing and the cooler air entering the bottom of the casing, it is termed a gravity system. A booster fan may, however, be used in conjunction with a gravitydesigned system. If a fan is used to produce circulation and the system is designed especially for fan circulation, it is termed a fan furnace system or a central fan furnace system. A fan furnace system may include air washer, filters, etc.

Wet Bulb Temperature: The lowest temperature which a water-wetted body will attain when exposed to an air current.

Wet Return (Steam): That part of the return main of a steam heating system which is completely filled with water of condensation.

Wet Saturated Steam: Saturated steam containing some water particles in suspension.