

COOLING TECHNOLOGY INSTITUTE



Definitions

Access Tunnel - Opening in a natural draft tower used for access to the cold-water basin. It can be large enough for a man only or large sufficient for mechanical equipment.

Airflow - Total amount of dry air and associated water vapor flowing through the tower, measured in cubic feet per minute at the exhaust from the tower, and converted to standard air, which has a density of 0.075 lb. per cu. ft.

Air Horsepower - The measure of usable power required to move a given air rate against a given resistance. The ratio of air horsepower to fan input horsepower is the measure of fan efficiency.

Air Inlet - Opening in the cooling tower through which air enters a tower. On induced draft towers, the air inlet is commonly called the louvered face.

Algae - A common form of plant life that generally requires sunlight and air for existence. Causes plugging of heat exchanger tubes and cooling tower distribution systems, and fill.

Algaecide - A toxic material that will retard or prevent the growth of algae and slimes. Some of the more commonly used algaecides are chlorine, copper sulfate, and phenolic compounds.

Ambient - The atmosphere which is adjacent to but not affected by the cooling tower. Generally, this means the upwind of the tower. The other areas where other heat-producing equipment is located, which supplies outside sources of heat to the air coming to the tower.

Ambient Dew Point - The ambient temperature in °F when dew begins to be deposited.

Ambient Wet-Bulb Temperature - The wet-bulb temperature which is measured per the definition of ambient. Readings are obtained utilizing a mechanically aspirated psychrometer.

Anchor Bolt - A threaded bolt embedded in a concrete basin or fitted to supported members, to which an anchor casting is attached.

Anchor Casting - A device for attaching the tower structure to the foundation; it does not include the anchor bolt. Also known as Column Anchor.

Approach - The difference between the cold-water temperature in °F and the ambient or inlet wet-bulb temperature in °F.

Atmospheric Tower - One in which air movement through the tower is dependent upon atmospheric conditions, not induced by mechanical fans.

Basin - (see Cold Water Basin and Distribution Basin).

Basin Curb - The top level of the retaining wall of the cold-water basin; usually, the datum point from which tower elevation points are measured.

Basin Sump - (see Sump).

Bay - The volume between adjacent columns.

Beam - (see Joist).

Bent - A line of structural framework composed of columns, girts, or ties; a bent may incorporate diagonal bracing members.

Bevel Washer - A metal fitting used to accommodate through-bolts to the angular position of a diagonal member, usually connecting to columns or other framework members.

BHP - (abbr) - (see Brake Horsepower).

Blow Out - Water that is blown or pulled out of the air inlet by the wind.

Blowdown - Water discharged from the system to control the concentration of salts or other impurities in the circulating water.

Blower - A squirrel-cage type of air moving device usually applied for operation at higher than normal static pressures or for sound control reasons.

Brace - (see Diagonal).

Brake Horsepower (bhp) - The actual power output of an engine or a motor.

British Thermal Unit (BTU) - The quantity of heat required to raise the temperature of one lb. of water 1°F.

Caissons - (see Foundation).

Canopy (Natural Draft Tower) - Connects the hyperbolic shell to the cooling section, acting as an air conduit and air seal between the two.

Capacity - (see Thermal Capacity).

Casing - A vertical enclosing sidewall or end wall of a tower, exclusive of the louvers.

Casing Panel - A pre-assembled or pre-cut unit of the casing.

Cell - The smallest tower subdivision can function as an independent unit with regard to air and water flow; exterior walls or partitions bound it. Each cell may have one or more fans or stacks and one or more distribution systems.

Cell Dimensions - (a) Width: dimensions perpendicular to tower longitudinal axis and usually at right angles to the louver area; (b) Length: size parallel to the longitudinal axis and the plane where louvers are usually placed; (c) Height: distance from basin curb to top of fan deck but not including fan stack. Nominal width and length are measured from and to the column center lines.

Circulating Water Rate - Quantity of hot water entering the tower.

Coil Shed - Portion of the tower structure housing atmospheric (tubular) heat exchangers.

Coldwater Basin - A device is underlying the tower to receive the cold water from the tower and direct its flow to the suction line or sump.

Coldwater Temperature (CWT) - Temperature of the water entering the cold-water basin before the addition of make-up.

Column - Framework member; a primary vertical supporting member in the tower framework.

Column Anchor - (see Anchor Casting).

Concentration - (see Water Loading).

Concrete Cooling Tower - Cooling tower in which the structure is made of concrete.

Cooling Range - (see Range).

Counterflow Tower - One in which air, drawn in through the louvers (induced draft) or forced in (forced draft) at the base by the fan, flows upward through the fill material and interfaces counter currently with the falling hot water.

Cross Struts - Framework that holds up the hyperbolic shell of a natural draft tower. The number of cross struts varies according to shell size.

Crossflow Tower - One in which air, drawn or forced in through the air intakes by the fan, flows horizontally across the fill section and interfaces perpendicularly with the falling hot water.

CWT - (abbr.) - (see Cold Water Temperature).

Cycles of Concentration - Compares dissolved solids in make-up water with solids in the circulating water. Since chlorides are soluble in water, the cycles of concentration are equal to the ratio of chlorides in circulating water to chlorides in the make-up water.

Cylinder - (see Fan Stack).

DBT - (abbr.) - (see Dry-Bulb Temperature).

Deck Batt - (see Splash Bar).

Deck Stringer - Holds the splash bars of the fill deck in a fixed position with respect to air and water flow.

Deck Support - A horizontal member is supporting the fill decks.

Design Conditions - Defined as the hot water temperature (HWT), cold water temperature (CWT), water flow, and wet-bulb temperature (WBT) in mechanical draft towers. In natural draft towers, HWT, CWT, GPM, WBT plus either dry bulb temperature (DBT) or relative humidity (RH). The allowable noise level also applies to both.

De-Silting Sump - The area in the cold-water basin, usually at a low point, where silt can be flushed to a drain.

Diagonal - (see Cross Struts for Natural Draft Tower) - A framework member; a load-bearing member transmitting forces other than a right angle concerning columns or horizontal ties. Also known as Brace.

Diffusion Deck - A fill deck which is located directly under the distribution basin or nozzle bank. The purpose of this deck is to receive water from the basin or nozzle and distribute it uniformly over the fill decks.

Discharge Stack - (see also Fan stack) - A walled enclosure is extending upward above the eliminators to direct exhaust air vertically away from fans in a forced draft tower. See Fan Stack for operation in induced draft towers.

Distribution Basin - A shallow pan-shape basin used to distribute hot water over the tower fill.

Distribution Box - Used in conjunction with the manifold and valve assembly in a crossflow tower to disperse the hot water uniformly in all directions thereby increasing the effectiveness of the distribution nozzles.

Distribution Header - Pipe or flume delivering water from inlet connection to lateral headers, troughs, flumes, or distribution basins.

Distribution Nozzle - (see Nozzle and next entry).

Distribution System - Those parts of a tower, beginning with the inlet connection, distribute the hot circulating water within the tower to the points where it contacts the air. In a counterflow tower, this includes the header, laterals, and distribution nozzles. In a crossflow tower, the system includes the header or manifold, valves, distribution box, basin pan, and nozzles.

Double-Flow Water Cooling Tower - A crossflow tower with two fill sections and one plenum chamber, which is common to both.

Downspout - A short vertically placed pipe or nozzle used in a gravity distribution system to divert water from a flume or lateral to a splasher.

Drift - Water lost from the tower as liquid droplets entrained in the exhaust air. It is independent of water lost by evaporation. Units may be in lbs./hr. Or the percentage of circulating water flow. Drift eliminators control this loss from the tower.

Drift Eliminators - An assembly constructed of wood, plastic, cement board, or other material that removes entrained moisture from the discharged air.

Driver - Primary drive for the fan drive assembly. It may be an electric motor, gas engine, steam turbine, hydraulic motor, or other power sources.

Drive Shaft - A device including couplings for transmitting torque from the driver to the speed reducer.

Dry-Bulb Temperature (DBT) - The temperature of the inlet or ambient air adjacent to the cooling tower is measured by a dry-bulb thermometer.

Effective Volume - (see Net Effective Volume).

Eliminator - (see Drift Eliminator).

Eliminator Baffle - (see Eliminator Board).

Eliminator Blade - (see Eliminator Board).

Eliminator Board - The smallest component in a wood drift eliminator assembly, which is usually installed in a fixed position at an angle to the direction of airflow. Also known as Eliminator Baffle (Blade).

End Wall - The wall at the end of the tower structure.

Entering Air - Air from the atmosphere surrounding the cooling tower, which enters through the louvers on an Induced draft tower or is discharged into the tower by a fan on a Forced Draft Tower.

Entering Wet-Bulb Temperature - Average wet-bulb temperature of the entering air. Includes any effects of recirculation.

Evaporation Loss - Water evaporated from the circulating water into the atmosphere by the cooling process.

Exhaust Air - The mixture of air and its associated vapor leaving the tower (see Air Flow).

Exhaust Wet-Bulb Temperature - the average wet-bulb temperature of the air discharged from the tower.

Exit basin temperature - Temperature of the circulating water leaving the cold-water basin if blowdown or make-up is added to the basin, the temperature will be affected accordingly.

Exit Diameter - Diameter of the shell at the top in a hyperbolic natural draft tower or at the top

of a fan stack.

Fan - A device for moving air in a mechanical draft tower. The fan design may be either an axial flow propeller or centrifugal blower. The fan can be applied as induced draft or forced draft.

Fan Deck - The surface enclosing the top of an induced draft tower. In a counterflow tower, the fan deck covers the entire top surface of the tower. In a crossflow tower, the open fan deck covers only the tower plenum area, leaving the distribution system exposed. An extended fan deck encloses the distribution system and covers the entire top surface of the tower.

Fan Drive Assembly - mechanical components furnishing power to the fan, usually consisting of driver, driveshaft, speed reducer, and supporting members.

Fan Driver Input - Power input to the driver. For 3-phase alternating current (ac) motors:

Fan Driver Output - The power output of the driver to the drive shaft. Fan driver input x motor efficiency.

Fan Guard - A protective screen installed either at the inlet of a forced draft fan or at the exit of an induced draft fan.

Fan Pitch - The angle which a fan blade makes with the plane of rotation.

Fan Ring - (see Fan Stack).

Fan Stack - Cylindrical or modified cylindrical structure in which the fan operates. Fan stacks are used on both induced draft and forced draft axial flow propeller fans. Also known as Cylinder.

Fan Stack Height - Distance from top of fan deck to top of fan stack.

Fan Support - (see Mechanical Equipment Support).

Fill Bars - The assembly of splash bars comprising the tower filling. Fill bars intercept the downward fall of water at regular intervals, forming splash surfaces which cause water drops to break into smaller droplets and provide wetted surfaces for air-water contact.

Fill-Deck - The assembly of splash bars comprising the tower filling. (See Fill Bars for a description of the operation in a crossflow tower.)

Fill Hanger - Support system in a crossflow tower for fill bars that hold fill in place.

Fill Support - (see Deck Support).

Filling - That part of a crossflow, counterflow, or natural draft tower consisting of splash bars, vertical sheets of various configurations, or honeycomb assemblies, tile, or other materials, which are placed within the tower to effect heat and mass transfer between the circulating water and the air flowing through the tower.

Firewall - A double wall between cells used to isolate a fire portion system and designed

according to NFPA 214.

Flexible Shaft - (see Drive Shaft).

Float Valve - A valve is actuated by a float, generally used to control the make-up water supply.

Flow Control Valve - A manually controlled valve is generally located in the hot water supply line.

Flume - A trough which may be totally enclosed or open at the top. Flumes are used in counterflow cooling towers for the manifold pipe laterals to distribute the hot water over the fill.

Fogging - A fog condition created when the exhaust air or plume from a cooling tower becomes supersaturated so that part of the water vapor condenses into visible liquid droplets.

Forced Draft Water Cooling Tower - Type of mechanical draft tower in which one or more fans are located at the air inlet to force air into the tower.

Foundation - Support material beneath the tower.

Framework Members - The structural members designed to support all live and dead loads. They consist of columns, horizontal ties, diagonals and joists, and beams. Can also include shear walls if designed accordingly as in a concrete tower.

Gear Reducer - A reduction gear, commonly used on fan drivers to reduce driver speed to fan speed requirements. Also known as Speed Reducer.

Girt - (see Horizontal Tie).

GPM - (abbr.) - Gallons per minute

Handrail - A horizontal or sloping rail placed along an access way or at the edge of a platform. Usually at 3'-6" above the walkway or floor. (See Safety Handrail. See OSHA for design criteria.)

Header - In a counterflow tower, the main pipe is carrying hot water to a series of laterals for distribution over the fill material. In a crossflow tower, it is the main pipe carrying hot water to the distribution basin of each cell. (See Manifold.)

Heat Exchanger - A device for transferring heat from one substance to another. Heat transfer can be by direct contact, as in a cooling tower, or indirect, as in a shell and tube condenser. Also known as filling. It can also be the tube or fin tubed bundles in a wet/dry tower.

Heat Load - Heat removed from the circulating water within the tower. It may be calculated from the range and the circulating water flow. Unit: Btu/hr.= GPM x 500 x (HWT - CWT).

Horizontal Tie - A horizontal connection member in the tower framework. Also known as Girt.

Hot Water Temperature (HWT) - Temperature of circulating water entering the distribution system.

Hydrogen Ion Concentration (pH) - A scale for expressing acidity or alkalinity of the circulating or make-up water. A pH below 7.0 indicates acidity and above 7.0 indicates alkalinity. A pH of 7.0 is neutral.

Hyperbolic Tower - A cooling tower of hyperbolic shape which depends on natural draft for air movement through the tower. Can be either crossflow or counterflow tower. (See Natural Draft Tower.)

Induced Draft Water-Cooling Tower - Type of mechanical draft tower in which one or more fans are located in the air outlet to induce airflow through the air inlets.

Inlet Air - (see Entering Air).

Inlet Connection - Fitting to which the circulating water supply piping is connected to serve the tower distribution system. Also known as Inlet Flange.

Inlet Wet-Bulb Temperature - The average of the wet-bulb temperature obtained from several stations located on both the windward and leeward sides of the tower.

Joist - Supports for fan decking or film fill modules.

Ladder - Typical rung-and-rail device providing access on the outside or inside of the tower.

Ladder Cage - Protective cage parallel with and connecting to a vertical access ladder.

Landing - A horizontal flooring, designed to provide offset clearances for stairways, ladders, or other access arrangements.

Lateral Header - A pipe or flume distributing water from the distribution header to nozzles, or from other points of discharge to the filling area.

Longitudinal - Always measured parallel to air intakes and perpendicular to air flow.

Louvers - Members installed horizontally in a tower wall to provide openings through which the air enters the tower while also containing the falling water within the tower. Usually installed at an angle to the direction of air flow to the tower.

Make-Up - Water added to the circulating water system to replace water lost from the system by evaporation, drift, blow-down, and leakage.

Manifold - The main header pipe in a crossflow tower. (See Header.)

Mastic - A compound is usually made up of asphalt and asbestos fiber with suitable solvents and fillers, which can be used to seal joints and cracks against leakage of water.

Mechanical Draft Water Cooling Tower - A 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; Induced draft with fans located at the air exhaust.

Mechanical Equipment Support - Members which comprise the primary support for the fan

drive assembly. Normally steel or concrete.

Motor Rated Horsepower - Horsepower rating inscribed on nameplate of the motor driving the fan. (See Rated Horsepower.) Unit: hp.

Natural Draft Water Cooling Tower - One in which air movement depends on the difference in density between the entering air and internal air. As the heat of the water is transferred to the air passing through the tower, the warmed air tends to rise and draw in the fresh air at the base of the tower. (See Hyperbolic Tower.)

Net Effective Volume - That portion of the total structural volume within which the circulating water is in intimate contact with the air flow through the tower. Unit: ft.³.

Nominal Tower Dimensions - Width and length measured from and to column centerline or walls; height measured from basin curb to top of fan deck (counterflow design) or to top of distribution basin (crossflow design). Unit: ft.

Nozzle - A device for controlled distribution of water in a cooling tower. Nozzles are designed to deliver water in a spray pattern by pressure or by gravity flow.

Obstruction Lights or Aviation Warning Lights - Warning lights required by FAA regulations, placed on the outside of the hyperbolic shell of a natural draft tower.

Overall Tower Dimensions - (a) width: overall dimensions perpendicular to the tower's longitudinal axis; (b) length: overall dimension parallel to the air inlet louvers and the longitudinal axis; (c) total height: distance from basin curb to top of fan stack. Dimensions measured in feet.

Packing - (see Filling).

Partition - An interior wall subdividing the tower into cells or separate fan plenum areas.

Pedestals - Used as a transition from the cross struts to the foundation of a natural draft tower or fan mount in forced draft towers.

pH - (see Hydrogen Ion Concentration).

Pier - In a wood tower an exterior or interior column support used to elevate column footings above the basic floor or foundation grade. Also known as Internal Pier.

Pilaster - An exterior column support, usually an integral part of the basin wall. Also known as External Pier. Used as a central point to establish the elevation of framework members.

Piles - (see Foundation).

Pitot Tube - An instrument that operates on the principle of differential pressures. The primary use on cooling towers is the measurement of circulating water rate.

Plenum - The enclosed space between the eliminators and the fan stack in induced draft towers or the enclosed space between the fan and the filling in forced draft towers.

Plume - Visible exhaust from a cooling tower. (See Fogging.)

Power Factor - The ratio of true power (watts) to the apparent power, as indicated by the product of amps x volts.

Psychrometer - An instrument used primarily to measure the wet-bulb temperatures. Either a sling or a mechanically aspirated type of psychrometer is acceptable provided the instrument is properly shielded from radiation and the air across the wick is limited to approximately 1,000 ft./min.

Range - Difference between the hot water temperature and the cold-water temperature. Also known as Cooling Range.

Rated Horsepower - Nameplate horsepower of fan drivers. Unit: hp.

Recirculation - This term describes a condition in which a portion of the discharge air enters the tower along with the fresh air. The amount of recirculation is determined by tower design, tower placement, and atmospheric conditions. The effect is generally evaluated on the basis of the increase in the entering wet-bulb temperature compared to the ambient.

Redistribution Bbasin - an elevated basin installed between the hot and cold-water basins in a crossflow tower to maintain correct water distribution throughout the entire height of the fill.

Relative Humidity - the ratio of the mole fraction of water vapor present in the air to the mole fraction of water vapor present in saturated air at the same temperature and barometric pressure.

Ring Beam - Footing that carries the loads from the shell of a Natural Draft Tower.

Riser - Piping connects the circulating water supply line from the level of the base of the tower to the supply header of the tower inlet connection.

Safety Handrail - Railing around the top of tower, platforms, and stairways, usually composed of the top handrail, knee rail, and toe board. (See Handrail.)

Shell Diameter - Diameter of the shell in a natural draft tower at the top of the curb, measured from inside of cross struts to inside of cross struts.

Shell Height - Dimension from top of curb to top of the hyperbolic shell in a natural draft tower.

Single-flow water cooling tower - A crossflow tower having a fill section on one side of the plenum chamber only.

Soffit - The underside of the lintel beam in a natural draft tower forming the bottom part of the hyperbolic shell. Generally, it is thick at the base and is the first portion of the shell above the diagonals or columns which carry the shell.

Speed Reducer - (see Gear Reducer).

Splash Bar - Horizontal component of a fill deck which constitutes the principal splash surface.

Splasher or Splash Plate - Used in a gravity distribution system to receive water from a down spout and effect uniform spreading of the water over the wetted area of the tower.

Spray-Filled Water-Cooling Tower - A tower which has no fill, and water to air contact depends entirely on the break-up of the water through pressure spray nozzles.

Spray Nozzle - Device used in a distribution system to break up the flow of the circulating water into droplets and effect uniform spreading of the water over the wetted area of the tower.

Stairway - typical tread-and-riser device providing angular access to and from the top of the structure.

Standard Air - Dry air having a density of 0.075 lbs./ft.³ at 70°F and 20.92" Hg.

Static Pressure - The pressure of a gas or fluid in a system is referred to as a state of rest or lack of motion. Static pressure is equal to total pressure minus velocity pressure. Unit: lbs./in.².

Sump - The lowest portion of the basin to which cold circulating water flows: usually the point of circulating pump suction connection. Also known as Basin Sump.

Supply Header - Portion of the water supply system, which contains the valves and distribution boxes in a crossflow tower or the lateral pipes in a counterflow tower.

Thermal Capacity - The number of gallons per minute (GPM) a cooling tower will handle for a specified range, wet-bulb temperature, and approach. Also simply known as Capacity.

Throat Diameter - Diameter of the shell in a natural draft tower at its narrowest point.

Total Pumping Head - The total head of water, measured above the basin curb, is required to deliver the circulating water through the distribution system. (See Tower Pumping Head.) Units: ft.

Tower Dimension - (see Nominal or Overall Tower Dimensions).

Tower Pumping Head - that part of the "total pumping head" for which the design of the tower and the piping furnished with it are responsible. It is expressed as the head of water above the basin curb measured at the center of the inlet connecting the tower distribution system with the riser, and consists of the total pressure at the centerline of the inlet plus the vertical distance between the inlet centerline and the basin curb. Unit: ft.

Transverse - Always measured perpendicular to air intakes.