



TECHNICAL PAPER

T-138

ASPHALT

PRODUCTION GLOSSARY

Terms related to the production of
hot/warm mix asphaltic concrete

ASTECC encourages its engineers and executives to author articles that will be of value to members of the hot mix asphalt (HMA) industry. The company also sponsors independent research when appropriate and has coordinated joint authorship between industry competitors. Information is disbursed to any interested party in the form of technical papers. The purpose of the technical papers is to make information available within the HMA industry in order to contribute to the continued improvement process that will benefit the industry.

Master Glossary

Click on any underlined term to jump to its definition.

ABRASION. The process of wearing down or rubbing away by means of friction. Most abrasion in asphaltic concrete equipment is caused by aggregate. Special abrasion-resistant (AR) materials are often used in equipment to reduce wear.

AC. (Refer to [ASPHALT CEMENT](#).)

ACOUSTICIAN. A person who specializes in the field of acoustics. Asphaltic concrete plant manufacturers may engage acousticians to assist their engineers and customers in noise control. Acousticians may measure complex acoustical characteristics as well as sound pressure levels at a plant site, analyze the measurements and recommend noise control solutions. (Refer to [NOISE CONTROL](#) and [SOUND PRESSURE LEVEL](#).)

ACOUSTIC TILE. A sound-deadening material commonly used in the ceiling of control houses of asphaltic concrete facilities. (Refer to [CONTROL HOUSE](#) and [NOISE CONTROL](#).)

ADDITIVE TANK. A vertical or horizontal storage tank for liquid additives, often anti-stripping agents, that are blended with AC. (Refer to [ANTI-STRIPPING AGENT](#) and [ANTI-STRIP TANK](#).)

AGGREGATE. Inert material such as sand, gravel, crushed stone and slag used as the chief ingredient of asphaltic concrete. Unwashed aggregates will also contain some amount of dust and process fines material. (Refer to [BAGHOUSE FINES](#).)

A wide variety of aggregates can be used in asphaltic concrete, but the main ones used are sand and stone. The aggregates available vary widely according to geographical location. The following materials are used in asphaltic concrete in various parts of the world:

- CRUSHED GRAVEL is produced by artificially crushing gravel, causing most fragments to have at least one fractured face.
- CRUSHED STONE is produced by artificially crushing rocks, boulders or large cobblestones, causing the fragments to have all fractured faces.
- DOLOMITE is a limestone or marble rich in magnesium carbonate.
- GRANITE is a very hard natural igneous rock formation of visibly crystalline texture formed essentially of quartz and orthoclase or microcline.
- GRAVEL is a coarse granular material (usually larger than ¼ in diameter) produced by natural erosion and disintegration of rock.
- LIMESTONE is formed chiefly by accumulation of organic remains (as shells or coral), consists mainly of calcium carbonate, and yields lime when burned.
- QUARTZITE is a compact granular rock composed of quartz and derived from sandstone by metamorphism.
- SAND is a fine granular material (usually less than ¼ in diameter) produced by natural disintegration of rock or by crushing friable sandstone rock or other suitable rocks.
- SLAG is the air-cooled, non-metallic byproduct of a blast furnace operation. It consists essentially of silicates and alumino-silicates of lime and other bases.
- TRAP ROCK is any of various dark-colored fine-grained igneous rocks, e.g. basalt.

AIR BAG SUSPENSION. Flexible bags pressurized with air are used to support the chassis of portable asphaltic concrete equipment and other trucking equipment. Made of rubber reinforced with fabric and steel wire, they are commonly used in lieu of steel spring suspension systems.

AIR CANNON. A device that “shoots” bursts of compressed air into material to loosen it and enhance flow. Commonly used in bins that hold aggregate and RAP. (Refer to [RAP BINS](#).)

AIR CYLINDER. A mechanical actuator powered by air pressure. Air cylinders are commonly used to operate valves or other components of an asphaltic concrete facility. They consist mainly of a cylinder and an actuating rod. They are available in a wide variety of types and sizes.

AIR-TO-CLOTH RATIO. The ratio of volumetric airflow, in cubic feet per minute (cfm), flowing through the total cloth surface area, in square feet (ft²), contained by a baghouse. This ratio is the filtration velocity, expressed in feet per minute (fpm) through the cloth.

Consider a baghouse with 448 filter bags, each 4½ in x 10 ft, giving a total filter surface area of 5421 ft². Assume that the baghouse has an air flow of 29,960 cfm. Thus, the resulting air-to-cloth ratio is 5.5-to-1.

AIRLOCK. (Refer to [ROTARY VANE FEEDER](#).)

ANNUNCIATOR. (Refer to [FIRST OUT ANNUNCIATOR](#).)

ANTI-STRIPPING AGENT. An additive often used in asphaltic concrete to make it less susceptible to stripping. It improves the adhesive bond between the asphalt cement and aggregate. Additives may be in the form of mineral filler or liquid. Hydrated lime is the most popular anti-stripping agent and can be used as a filler or as a lime slurry. Liquid anti-stripping agents can also be added to the asphalt cement at the asphaltic concrete facility. (Refer to [MINERAL FILLER](#) and [STRIPPING](#).)

ANTI-STRIP TANK. A tank for storing a liquid anti-stripping agent. (Refer to [ANTI-STRIPPING AGENT](#).)

AR-360 STEEL. A high hardness abrasion resistant steel plate commonly used in asphaltic concrete production equipment to minimize erosion from aggregate and dust. It has a Brinell hardness of 360. (Refer to [BRINELL HARDNESS](#).)

ARAMID. The generic name for a type of fiber from which temperature-resistant fabrics are made. Aramid fabrics are used to make filter bags for baghouses used in asphaltic concrete facilities. The bags are virtually unaffected by the high temperatures normally encountered while filtering dust from hot gases of the aggregate drying process. (Refer to [BAGHOUSE](#).)

ASME. American Society of Mechanical Engineers.

ASME CODE. A set of design and fabrication requirements issued by the American Society of Mechanical Engineers for various types of pressure vessels. It applies to hot oil heaters and expansion tanks. (Refer to [HOT OIL HEATER](#) and [EXPANSION TANK](#).)

ASPHALT. Commonly used as a shortened term for asphalt cement, but may also refer to asphalt pavement.

ASPHALT CEMENT. (AC; also known as bitumen.) The binder or “glue” in asphaltic concrete. Commonly abbreviated AC. At ambient temperatures, asphalt cement is a black, sticky, highly-viscous, semi-solid substance. (Refer to [BINDER](#).)

Asphalt cements used in asphaltic concrete are made by distillation of crude oil and are available in various grades. They are more suited for asphaltic concrete than asphalt made from other materials or asphalt obtained from native deposits in various parts of the world. (Refer to [BITUMEN](#).)

Use of coal tar is avoided by the asphaltic concrete industry because its fumes are known to be carcinogenic, posing a health hazard for anyone working with asphaltic concrete. Coal tar and asphalt cement are not the same substance.

ASPHALT COILED TANK. (Refer to [COILED TANK](#).)

ASPHALTIC CONCRETE. A paving mixture comprised of aggregate and asphalt cement. Also called asphaltic concrete or bituminous concrete.

ASPHALT METERING SYSTEM. A system that measures the flow rate of liquid asphalt cement and indicates the total amount used since the meter was reset to zero. The amount used is usually in gallons and the flow rate is usually gpm (gallons per minute). However, other measurement units can be used. A metering system using two pumps is commonly known as “a pump pushing a pump.” The system has proven to be reliable, has the accuracy needed and is cost effective. One pump is active and the other is passive. The active one functions as a conventional pump. The passive one functions solely as a flow meter. Liquid asphalt flowing through the passive pump causes its drive shaft to turn at a speed proportional to the flow rate.

A tachometer on its shaft provides a flow rate signal to the computer and tachometer indicator in the control house. (Refer to TACHOMETER.)

The system has a temperature measuring system that corrects flow rate signals to allow for changes in volume due to temperature changes.

Other types of systems are also used for asphalt metering. (Refer to MASS FLOW METER.)

ASTM A36. A structural-quality carbon steel commonly used for structural components in an asphaltic concrete facility.

ATTENUATE. To to weaken or reduce in force, intensity, effect, quantity or value. For example, it may be necessary to attenuate the noise generated by equipment at an asphaltic concrete facility to comply with noise ordinances or standards for hearing protection. (Refer to NOISE CONTROL and NOISE ORDINANCES.)

AUGER. (Refer to SCREW CONVEYOR.)

BACK-WEIGHING. (Also called differential weighing.) Method of weighing in which an initial weight is measured and then a second weight is measured after removing a volume of material. The difference in the two weights is the weight of the volume of material removed. This method of weighing is used for surge bins. (Refer to SURGE BIN.)

BAGHOUSE. An environmental control device containing filtration media used to remove particulate matter from a gas stream. These devices are used to filter the gas stream from the aggregate drying process at an asphalt mixing plant. The associated exhaust fan provides draft to support the combustion process and evacuate gases from the dryer drum. (Refer to DRAFT and DRYER.)

BAGHOUSE FAN. (Refer to BAGHOUSE.)

BAGHOUSE FINES. Dust and small aggregate particles collected by the baghouse. Baghouses preceded by a primary collector (inertial separator, cyclone, or knockout box) separate most fines with particles larger than 200 mesh from those with particles smaller than that. Portions of the fines can either be returned to the mix or wasted. (Refer to BAGHOUSE, INERTIAL SEPARATOR, CYCLONE, KNOCKOUT BOX, and MESH NUMBERS.)

BALL JOINT. A type of fitting used to connect sections of pipe while allowing them to pivot. They are commonly used in asphalt and hot oil piping to eliminate the need for exact alignment of the pipe segments. That may also be used in applications involving moving components, where the ball joint axis of rotation is aligned with the axis of rotation for the moving component.

BALL VALVE. A type of control valve commonly used in hydraulic and pneumatic circuits. Two-way versions of the valve are often used at asphaltic concrete facilities to either shut off or regulate flow. Three-way versions are sometimes used to switch flow from one circuit to another. All use a slotted ball that rotates 90 degrees to control the flow.

Ball valves are often used in piping of hot oil heaters and asphalt storage tanks. They are used in lines for hot oil, asphalt, fuel oil, or gas. When used for asphalt, the valve usually has a hot oil jacket. (Refer to HOT OIL HEATER and JACKETED ASPHALT VALVE.)

An actuator, such as a pneumatic cylinder, can be used to operate the valve through its 90-degree stroke. (Refer to AIR CYLINDER.)

BAR GRIZZLY. A static grill or network of bars which withholds or separates material larger than the spaces between the bars. Bar grizzlies are available with various bar spacing. (Refer to SCALPING SCREEN for comparison.)

BATCH CYCLE. The standard batch cycle for a batch mixer averages 45 seconds, allowing 3 seconds for introducing and blending the dry materials (dry mix cycle), 34 seconds for introducing and blending the liquid binder (wet mix cycle) and 8 seconds to fully discharge the batch and close the gate. (Refer to BATCH MIXER.)

BATCH FACILITY. A site with equipment designed and set up to produce asphaltic concrete in batches. Batch facilities usually have batch ratings that designate the maximum amount of asphaltic concrete they can produce in a single batch.

The ability to vary the mix formula and batch size from one batch to another makes the batch facility versatile. Thus, a batch facility has an advantage over a continuous-mix facility when making a wide variety of mixes. (Refer to CONTINUOUS-MIX FACILITY.)

BATCH MIXER. The mixing device on a batch tower, typically a timed twin shaft mixer, used to produce a homogeneous mixture of asphaltic concrete in discrete batches. (Refer to TWIN SHAFT MIXER.)

BATCH PLANT. (Refer to BATCH FACILITY.)

BATCH TOWER. A major structural unit of a batch facility. The tower contains screens that separate aggregates into sizes. It has bins that store the hot aggregates. It has a hopper that collects and weighs the aggregates. A batch mixer in the bottom of the tower blends and mixes the aggregates and AC. (Refer to BATCH FACILITY and BATCH MIXER.)

BATCHER. A batcher is a hopper that receives and holds an amount of material, then quickly releases the batch (dose) when signaled.

Surge silos and storage silos use a batcher to interrupt the material stream as a means to mitigate segregation that would otherwise occur as asphalt mix free-falls into a silo. (Refer to STORAGE SILO.)

Surge bins such as the SEB use batchers to interrupt the filling of the surge/weigh-hopper in order to capture a weight measure when using a back-weigh scale system. (Refer to SURGE BIN.)

Weigh batchers are scale-mounted hoppers positioned individually beneath a silo discharge gate. The weigh batcher eliminates the need for a truck scale and facilitates the simultaneous loading of multiple trucks, depending on the number of silos.

A variety of weigh batchers, generally referred to as weigh hoppers, on a batch tower facilitate the drawing of a batch (dose) of specified material to be incorporated in a batch of asphalt mix. (Refer to WEIGH HOPPER.)

BELT CONVEYOR. A continuous moving belt commonly used in an asphaltic concrete facility to transport aggregate or RAP from feed bins to a dryer or mixer. A belt conveyor is not usually inclined more than about 22 degrees to prevent material from sliding back down the conveyor belt. (Refer to RECLAIMED ASPHALT PAVEMENT.)

BELT FEEDER. A belt conveyor located under an aggregate or recycle feed bin that feeds material onto a collecting conveyor. It often has a precision variable-speed drive to ensure accurate mix formulas. A variable-speed drive also permits changing the production rate without changing the mix formula.

On some feeders, a hi-torque AC motor runs at a constant speed. The motor drives the belt through a magnetic clutch. The clutch is powered by eddy currents to precisely vary its slippage. Thus, controlling the eddy currents controls belt speed.

A tachometer on the tail shaft gives a reliable indication of belt speed to ensure accurate blending, even if the belt slips on the head shaft. (Refer to TACHOMETER.)

BELT SCALE. A scale usually incorporated in the incline conveyor of continuous-mix asphaltic concrete facilities. It has a load cell that accurately indicates the weight imposed by a section of the belt running over a weigh idler. This information combined with the belt speed denotes how much material is entering the dryer drum.

The scale incorporates a test weight for initial calibration. Material calibration is done by running sample material across the scale. The sample is diverted to a container and weighed on an independent scale. Scale indications are compared. If necessary, the belt scale is calibrated to agree with the test scale. (Refer to CALIBRATE and LOAD CELL.)

BELT SHEAVES. Pulleys with grooved rims used to transmit power to a rotating shaft via a taut belt along the circumference. The number of grooves is determined by the power required and the strength of individual belts. They are typically used to connect an electric motor to a power transmission gearbox (gear reducer).

BIN. A container for holding and dispensing asphaltic concrete or ingredients used to make asphaltic concrete. (Refer to COLD FEED BIN, SURGE BIN, and STORAGE BIN.)

BINDER. Used alone, binder usually refers to the material used in asphaltic concrete to bind the materials together. The most common binder material is asphalt cement. The binder also prevents the entrance of moisture, and serves as a cushioning agent. In some cases the binder waterproofs the entire road surface. (Refer to ASPHALT CEMENT.)

BINDER COURSE. A grade of asphaltic concrete that contains a high percentage of large stones. The binder (intermediate) course is located between the wearing (surface) course and foundation (base) course of a roadway.

BIN VIBRATOR. A device used on aggregate and recycle feed bins to prevent material from building up on the interior walls or bridging across the bin opening.

BITUMEN. Used in many parts of the world to mean asphalt cement. (Refer to ASPHALT CEMENT.)

BLUE SMOKE. (Also known as asphalt fumes.) Condensed gaseous vapors, comprised predominantly of organic compounds (light ends) generated when asphalt cement is heated. Various methods are used to minimize or eliminate blue smoke. (Refer to LIGHT OILS and FIBERBED MIST COLLECTOR.)

BOOSTER HEATER. A standard hot oil heater sometimes used with a direct-fired tank that incorporates scavenger coils to heat oil for other plant components. The booster heater increases the temperature of the oil after it is heated initially by the scavenger coils in the tank. (Refer to DIRECT-FIRED TANK and HOT OIL HEATER.)

Booster heaters are also being used to increase the temperature of virgin asphalt after it is delivered to an asphaltic concrete facility, before it is used to make polymer-modified asphalt cement (PMAC). Virgin asphalt must be at a temperature of about 410°F when it is mixed with polymers. Thus, its temperature must be increased if the supply truck delivers it at a lower temperature. The booster heater boosts the temperature of the asphalt as it is pumped into the mixing equipment. A conventional helical coil heater can be used for this purpose. Instead of circulating hot oil through the helical coil as in conventional use, the virgin asphalt is heated as it makes a single pass through the helical coil en route to the mixer. (Refer to POLYMER-MODIFIED ASPHALT CEMENT and HELICAL COIL HEATER.)

BOOT END. The foot or bottom of a hot elevator where the hot aggregate or asphaltic concrete enters the elevator. (Refer to BUCKET ELEVATOR.)

BREAKER. (Refer to CIRCUIT BREAKER.)

BRINELL HARDNESS. A commonly used measurement of the relative hardness of metals and alloys. Brinell hardness is determined by forcing a steel ball into a test piece under standard test conditions and measuring the surface area of the indentation. Hardness is an important factor in the ability of steels and liners used in production equipment to resist the abrasion of asphaltic concrete materials.

BRITISH THERMAL UNIT. (BTU) The British thermal unit is a traditional unit of work equal to about 1055 joules. It is the amount of work needed to raise the temperature of 1 lb of water by 1°F.

BTU. (Refer to BRITISH THERMAL UNIT.)

BUCKET ELEVATOR. A bucket elevator receives material at a lower elevation (inlet) and raises the material vertically to discharge at a higher elevation (outlet). The material is carried in a moving line of buckets attached to a continuous strand, either a rubber belt or steel chain. Bucket elevators are classified as either continuous-discharge (minimize segregation) or centrifugal discharge (disregard segregation). (Refer to SEGREGATION, HOT MIX ELEVATOR, and HOT STONE ELEVATOR.)

BULKHEAD. (Also known as a retaining wall.) A wall usually incorporated into cold feed bins and RAP bins to support a dirt ramp for front-end loaders. They are normally made of reinforced steel plate and keep the dirt out of cold feed mechanisms and suspension components. Bulkheads on some units fold for travel. (Refer to RETAINING WALL.)

BURNER. A device that controls combustion of fuel in a dryer or other heating equipment. It may be set up to control various fuel oils, LP, or natural gas.

BURNER CONTROL PANEL. A control panel for monitoring and controlling the burner in a dryer or other heating equipment of an asphaltic concrete facility. The control panel is usually one of several control panels in the control center of an asphaltic concrete facility, but it operates independently of others.

BURNER FLAME MONITORING SYSTEM. The system detects whether there is a flame present in the combustion zone or chamber of a burner. It uses a microprocessor to manage the burner controls and provide proper burner sequencing, ignition, and flame monitoring protection on automatically ignited oil, gas and combination fuel burners. It also provides operating status and lockout information in the event of a safety shutdown. (Refer to BURNER, BURNER CONTROL PANEL, COMBUSTION CHAMBER, and LOCKOUT.)

BYPASS CHUTE. (Refer to DIVERT CHUTE.)

CABLE TRAY. A rigid structural system for supporting electrical cables that interconnect major components of an asphaltic concrete facility. Cable trays help organize cables and provide them with some protection against accidental damage. They are designed to hold cables without collecting dust, water and debris.

CALIBRATE. To adjust equipment in order to make it function accurately or within pre-established limits. Many pieces of equipment used in an asphaltic concrete facility require periodic calibration. The cold feed system and the asphalt metering system are two systems that require regular calibration. (Refer to BELT SCALE, COLD FEED SYSTEM and ASPHALT METERING SYSTEM.)

CALIBRATION TANK. A tank used in calibrating the asphalt metering system used in an asphaltic concrete facility. It is mounted on load cells that indicate the weight of the tank and its contents.

The metering system is checked by filling the tank with liquid AC and comparing its weight with the amount indicated by the metering system for filling the tank. If necessary, the metering system is adjusted to agree with test results. (Refer to ASPHALT METERING SYSTEM.)

CAN VELOCITY. The upward velocity, in feet per minute (fpm), of dust-laden air traveling in the open space between the baghouse hopper and the bottom of the filter bags. It is calculated by dividing the airflow by the baghouse cross sectional area. (Refer to BAGHOUSE and FILTER BAGS.)

CARBON MONOXIDE. (CO) A primary product of incomplete combustion. It is a known health hazard and is subject to strict regulation.

CAVITATION. The sudden formation and collapse or implosion of low-pressure bubbles in a liquid while inside a pump. It can be caused either by "starving" the pump or by an inadequate suction head. Cavitation is a destructive force and can severely damage a pump if allowed to continue. It produces a rattling sound as if the pump were trying to pump gravel. (Refer to NET POSITIVE SUCTION HEAD.)

CENTRIFUGAL DISCHARGE ELEVATOR. (Refer to HOT STONE ELEVATOR.)

CENTRIFUGAL PUMP. A type of pump widely used in the asphaltic concrete industry. It has a rotating impeller that displaces liquid by centrifugal force. If the liquid encounters resistance that equals or exceeds the force created by the pump, the impeller may continue to rotate without immediate damage, but will cease to displace the liquid. (Refer to [GEAR PUMP](#) for comparison.)

CERAMIC TILE. A material commonly used to line certain areas of asphaltic concrete equipment to protect it against rapid wear. It is commonly used to line the entry and discharge chutes of dryers and mixers and to line the cones of storage silos. Each tile has a metal grommet that allows the tile to be secured in place by plug welding.

Tile used for asphaltic concrete equipment is a hard, brittle, heat-resistant, corrosion-resistant material made by shaping and then firing a powdered material (mostly aluminum oxide) at a high temperature. It is more resistant to abrasion than abrasion-resistant steel, but has lower impact resistance. (Refer to [AR-360 STEEL](#) for comparison.)

CFM. (Refer to [CUBIC FEET PER MINUTE](#).)

CHAIN. A series of steel links connected with pins to form a continuous flexible strand. Chain is used for transmitting power and motion in drive assemblies. Power transmission chain used for small and medium sized drives is ANSI style roller chain. Very large drives use an engineered steel roller chain. Conveyor applications use various types of chain with and without rollers to carry loads and move material. (Refer to [ROLLER CHAIN](#).)

CHART RECORDER. An instrument with a pen that draws a continuous line on a 24-hour circular chart to show material temperatures at all times during that period. On drum mix plants the chart shows the temperature of the mix in the discharge chute of the mixer. On batch plants the chart shows the temperature of the aggregate at the discharge chute of the drum dryer. (Refer to [BATCH FACILITY](#) and [DRUM MIX PLANT](#).)

CHECK VALVE. A valve commonly used in hydraulic and pneumatic circuits. It allows liquid or gas to flow only in one direction. A hinged gate in the valve automatically unseats and opens when pressure is applied to one side of it. The gate automatically seats and remains closed when pressure is applied to its opposite side. Some check valves use a spring-loaded ball instead of a hinged gate. Check valves are used in fuel oil and thermal fluid (hot oil) piping of heaters and asphalt storage tanks.

CIRCUIT BREAKER. An electrical switch that breaks or disconnects an electrical circuit when the current in the circuit exceeds the rating of the device. The breaker serves as a safety device to prevent short circuits from damaging wiring or other components in the circuit.

CLAM GATE. A type of gate commonly used on bins and silos to control the material flowing out of them. Clam gates typically consist of two gates that swing over a curved opening to shut off the flow. The clam gate on a cold feed bin usually has a single gate at the opening in the bottom of the bin. It is adjustable and can be set to maintain the desired flow rate. (Refer to [COLD FEED BIN](#).)

CLEAN AIR PLENUM. An enclosure in a baghouse that carries clean air to the exhaust fan after it has passed through the filter bags. (Refer to [BAGHOUSE](#).)

CLOTH. The wire mesh material used in a scalping screen. Cloth may also refer to the fabric used to make filter bags used in a baghouse. (Refer to [FILTER BAGS](#) and [SCALPING SCREEN](#).)

CO. (Refer to [CARBON MONOXIDE](#).)

COATER. (Also known as single-shaft pugmill.) A machine that uses a single mixing shaft with paddles to mix ingredients of asphaltic concrete. (Refer to [PUGMILL](#) and [MIXER](#).)

Coaters used in continuous-mix facilities are known as drum mix coaters. (Refer to [DRUM MIX PLANT](#).) These coaters are freestanding and work in conjunction with a drum dryer. The material leaves the dryer and enters one end of the coater. It is mixed and coated with liquid AC. It travels the length of the coater and is discharged at its other end.

COILED TANK. A type of heated tank for storing asphalt cement. The tank has several layers of pipe running the full length of the tank. Hot oil is pumped through the piping to heat the AC. The heat source for the hot oil is an external heater. (Refer to [HOT OIL HEATER](#).)

COLD FEED BIN. A bin used in an asphaltic concrete facility to hold cold (unheated) virgin aggregate and feed it to a conveyor, which takes it to a screen and on to the dryer. Most asphaltic concrete facilities have several cold feed bins to store three or more sizes of aggregate.

COLD FEED SYSTEM. A group of related components for holding virgin aggregate and delivering it to the dryer. (Refer to BELT SCALE, COLD FEED BIN, FEEDER BELT, COLLECTING CONVEYOR, SCALPING SCREEN, and INCLINED CONVEYOR.)

COLD PLANER. (Also called a milling machine.) A mobile machine that removes old pavement from a roadway by planing or milling. It has cutting teeth affixed to a rotating drum. It also has a belt conveyor that loads the removed material into a truck that moves along the road ahead of the machine.

COLLECTING CONVEYOR. A belt conveyor used under cold feed bins to collect the materials from the feeder belts of the bins. The collecting conveyor may empty onto another conveyor or onto a scalping screen. The end of the conveyor may be angled upwards. (Refer to COLD FEED BIN, FEEDER BELT and SCALPING SCREEN.)

COMBUSTION AIR. The amount of air needed for combustion of a specified fuel. It is the stoichiometric air plus excess air. (Refer to PRIMARY AIR, SECONDARY AIR, TERTIARY AIR, EXCESS AIR and LEAKAGE AIR.)

COMBUSTION AIR PRE-HEATER. A secondary heat exchanger sometimes used on a hot oil heater at an asphaltic concrete facility to increase heating efficiency. It pre-heats the combustion air for the burner and can increase efficiency approximately 3%. It is also known as an air-to-air heater. (Refer to COMBUSTION AIR, HEAT EXCHANGER and HOT OIL HEATER.)

The type most commonly used is a shell and tube heat exchanger, usually mounted in the exhaust stack of the heater. Hot exhaust gases pass through the tubes and heat the combustion air, which passes around the tubes. The fan is usually mounted on the cold air side of the pre-heater. (Refer to ECONOMIZER for comparison.)

COMBUSTION CHAMBER. An enclosed space in fired heating equipment for combustion of fuel-air mixture. Modern drum mixer burners do not require use of a combustion chamber. (Refer to BURNER.)

CONCRETE. A hard, strong manmade construction material consisting of sand, conglomerate gravel, pebbles, broken stone, or slag in a mortar or cement matrix. It is commonly used for building roads, bridges and architectural structures.

The word concrete is sometimes used with other words to designate another type of man-made construction material, for example asphaltic concrete. (Refer to ASPHALTIC CONCRETE.)

Note that concrete does not always refer to manmade construction materials. It can refer to substances formed in nature by the coalescence of separate particles or parts into one solid mass. An example is concreted earthy or mineral matter, such as rock.

CONDENSER. (Refer to VENT CONDENSER.)

CONDUCTION. A process of heat transfer by which heat flows within a medium or between different mediums in direct physical contact. The heat flows from a region of higher temperature to one of lower temperature. The medium may be solid, liquid or gaseous. The transfer is by direct molecular interaction, but with little displacement of the molecules. It is the only method by which heat can flow in opaque solids. The key role of conduction in a helical coil heater is to transfer the heat from the outer walls of the coil to the thermal fluid flowing through the inner walls. (Refer to HELICAL COIL HEATER.)

CONDUIT. Metal tubing through which electrical wiring is run to interconnect electrical parts of units. The wiring from one major unit to another may be interconnected either by wiring run in conduit or by rubber-covered electrical cables.

CONE. A funnel-shaped bottom in a silo or surge bin. Some cones are known as mass-flow cones. Steep side walls allow material above the cone to move en masse or all together. This type of cone minimizes segregation. (Refer to SILO and SURGE BIN.)

CONTAINMENT. A secondary enclosure for tanks that contain liquids, usually fuel or asphalt cement. It functions to keep the liquid from escaping in the event of a leak or rupture in the primary tank. The main concern is for the environment. However, a containment enclosure can also minimize the impact that an accidental spill can have on operation of the asphaltic concrete facility. Containment enclosures are often no more than concrete walls built around a group of tanks. However, an individual tank often has a containment enclosure fabricated from steel. On portable tanks the containment enclosure usually consists of a second tank that fully encloses the main tank—a double-walled tank. On a stationary or relocatable tank the containment enclosure may enclose only the bottom portion of the tank.

CONTINUOUS-DISCHARGE ELEVATOR. (Refer to [HOT MIX ELEVATOR](#).)

CONTINUOUS-MIX FACILITY. A site with equipment designed and set up to produce continuous runs of asphaltic concrete. Such facilities usually have ratings that designate the maximum amount of asphaltic concrete they can produce per hour. Although continuous-mix facilities can run virtually any mix design, they are at their best when making long runs of a single mix and when running at high production rates.

Storage silos greatly increase the versatility of such facilities. They provide surge capacity, enabling the facility to run without interruption. Moreover, a silo can store mix up to four days and, where two or more are used, each can store a different mix design. (Refer to [STORAGE SILO](#).)

CONTROL CONSOLE. A steel cabinet that houses key controls and instrumentation for an asphalt facility. A typical facility has several consoles installed in the control house. Related controls are grouped on the console. (Refer to [CONTROL HOUSE](#).)

CONTROL HOUSE. A special building used to house the controls of an asphaltic concrete facility and to provide accommodations for one or more persons operating the facility. The building usually incorporates heating and cooling facilities. Its windows provide the operator with a good view of truck loadout and key equipment. The house has a welded steel structure capable of withstanding the rigors of travel and being lifted, with all its controls in place, by a crane for permanent installations. Control houses may also be constructed with axles for portable plants.

CONVECTION. A process of heat transfer in a gas or liquid by the circulation of currents from one region to another, i.e. warm currents rise while cool currents sink. It is an important means of energy transfer between a solid surface and a liquid or gas.

The key role of convection in a helical coil heater is the heating of the coil surfaces that are not exposed to radiant energy. These are the coil surfaces that face the outer shell of the heater. Convection heating occurs after the hot combustion gases travel through the center of the coil and then double back into the annular space between the insulation and the coil. (Refer to [HELICAL COIL HEATER](#).)

COUNTERFLOW DRUM MIXER. A combination counterflow drum dryer and drum mixer for making asphaltic concrete. A counterflow drum mixer's inner drum functions as a counterflow dryer and its stationary outer shell functions as a mixer. (Refer to [COUNTERFLOW DRUM DRYER](#) and [DRUM MIXER](#).)

COUNTERFLOW DRUM DRYER. An aggregate dryer in which the aggregate and the hot gas steam flow in opposite directions. Counterflow dryers are inherently more efficient than parallel-flow dryers for making asphaltic concrete. (Refer to [DRYER](#) and [PARALLEL-FLOW DRYER](#).)

CPU. Central processing unit. (Refer to [MICROPROCESSOR](#).)

CRIBBING. Refers to the method of cross-stacking wooden timbers to create a stable support structure that resists tipping, shifting and collapse. The term cribbing is sometimes used to mean a wall of timbers that confine earth and serve as a retaining wall. (Refer to [RETAINING WALL](#).)

CUBIC FEET PER MINUTE. (cfm) A measure of air flow, often used to describe the capabilities of heating, ventilation and air conditioning systems. It describes the rate at which a certain volume of air moves in a certain period of time.

CYCLE TIME. The total time required for a pugmill to make and discharge a batch of asphaltic concrete. (Refer to [PUGMILL](#).)

CYCLONE. A cylindrical chamber that imparts a spiraling motion to the air stream produced during the aggregate drying process to separate coarse dust particles from the air stream before entering the filter section of the baghouse.

(Refer to BAGHOUSE and INERTIAL SEPARATOR.)

Two types of cyclones are commonly used: vertical and horizontal.

Vertical cyclones are usually free-standing units that rely on gravity and the air stream's inertia to force the larger (heavier) particles to move to the outer perimeter of the air stream where they slow down and fall out of the stream before entering the baghouse.

Horizontal cyclones are very similar to vertical cyclones. They are used to eject larger particles from the air stream using gravity, the air stream's inertia, and skimmer plates before entering the baghouse. Unlike vertical cyclones, horizontal cyclones operate with a horizontal axis, and are connected to the baghouse directly.

DAMPER. An adjustable louver incorporated in the exhaust stack, right above the fan housing. Most have opposing blades, which open and close to incrementally adjust the flow of exhaust air. The blades are powered by an actuator. Blade movement is controlled automatically as a result of changes in suction at the dryer burner. (Refer to AIR CYLINDER.)

Alternately, a single-blade damper consisting of a round disc fixed to a turnable shaft within a section of duct, used to regulate the airflow only in that branch of ductwork (usually a scavenge duct).

DB. (dB) (Refer to DECIBEL.)

DEADBAND. Allowable deviation. The range through which an input can be varied without initiating an observable response. (Refer to DEVIATION and SETPOINT.)

DECIBEL. (dB) A unit used to express relative difference in power or intensity, usually between two acoustic or electric signals. A decibel is equal to ten times the common logarithm of the ratio of the two levels.

DEVIATION. The difference between the value of the controlled variable and the value at which it is being controlled. The difference between the process variable and the setpoint. (Refer to PROCESS VARIABLE and SETPOINT.)

DIELECTRIC GREASE. A non-conducting silicone compound grease used to prevent voltage leakage and corrosion around electrical contacts. Also used as a lubricant on rubber, plastic and ceramic surfaces.

DIFFERENTIAL PRESSURE. The difference in pressure between two points in a fluid or hydraulic circuit. It is commonly measured in pounds per square inch (psi) or inches of water column (inWC). It occurs normally in a fluid circuit when fluid flows through its components. The amount of the differential is related to how much resistance is offered by the component and the resistance of the circuit piping. The higher the resistance the higher the differential pressure.

DIRECT-FIRED TANK. A type of heated tank used to store asphalt cement. Air is heated within a sealed passage tube located inside an AC tank. The heat is conducted thru the steel surface of the tube wall to heat the AC in contact with the outer surface of the tube.

A direct-fired tank has the following features: 1. A burner mounted on one end of the tank. 2. Two stacks protruding from the top of the tank.

DIVERT CHUTE. A chute used to divert material from the production stream. The chutes are usually located ahead of screens, drums and silos. For example, material can be diverted into a truck before it enters a dryer or drum mixer so the material can be weighed for calibration of the weigh belt. Divert chutes also allow bins and drag conveyors to be emptied when necessary. The chute is usually actuated by an air cylinder. (Refer to AIR CYLINDER.)
dowel pin. A special pin used to pivot trunnion mechanisms, allowing optimum adjustment. (Refer to TRUNNION.)

DOWNSTREAM. A reference to the direction which something is flowing. In the draft system of an asphalt plant, the exhaust fan (downstream) pulls air from the upstream components of the dryer and the baghouse. (Refer to DRYER, BAGHOUSE, and UPSTREAM.)

DRAFT. The current of air flowing through a drum dryer and baghouse. (Refer to DRYER and BAGHOUSE.)

DRAG. (Refer to DRAG CONVEYOR.)

DRAG CHAIN. A key part of a drag conveyor. The drag chain comprises a large engineered steel roller chain and welded slats. (Refer to DRAG CONVEYOR and ROLLER CHAIN.)

DRAG CONVEYOR. A conveyor commonly used in a continuous-mix facility to transport hot mix from the drum mixer to storage silos. HMA is moved by dragging chain driven slats along the conveyor floor until the HMA reaches the discharge chute. Drag conveyors are heated to help maintain mix temperature. Other terms like "slat conveyor", "drag slat conveyor" or "drag" may be used. (Refer to CONTINUOUS-MIX FACILITY, DRUM MIXER, STORAGE SILO, and HOT MIX ASPHALT.)

DRAG SLAT CONVEYOR. (Refer to DRAG CONVEYOR.)

DROP-OUT CHUTE. A divert chute used to empty a drag conveyor. (Refer to DIVERT CHUTE and DRAG CONVEYOR.)

DRUM MIX PLANT. A continuous-mix plant or facility that uses a drum mixer to make asphaltic concrete. (Refer to BATCH FACILITY for comparison.)

DRUM MIXER. A combination dryer drum and mixer for making asphaltic concrete. (Refer to COUNTERFLOW DRUM MIXER and PARALLEL FLOW DRUM MIXER.)

DRY MIXING TIME. (Refer to MIXING TIME.)

DRYER. A major piece of equipment in an asphaltic concrete facility used to dry aggregate before it is mixed with liquid AC. The type of dryer used in modern asphaltic concrete facilities are dryer drums.

Dryers can be configured as parallel-flow or counterflow. These drums can feed a batch facility or continuous mixer (pugmill or rotary). (Refer to COUNTERFLOW DRUM DRYER, PARALLEL-FLOW DRYER, BATCH FACILITY, and PUGMILL.)

DUST. (Refer to BAGHOUSE FINES.)

DWELL TIME. Usually refers to mixing time. Also known as residence time. The average time required for a material to pass through an enclosed space or to complete the stage of a process. (Refer to MIXING TIME and RESIDENCE TIME.)

ECONOMIZER. (Also known as an air-to-oil heater.) A secondary heat exchanger sometimes used on a hot oil heater at an asphaltic concrete facility to increase the heating efficiency. Increases of about 4% can be expected. It recovers exhaust gas heat, which would otherwise be lost. The recovered heat pre-heats the thermal fluid before it flows through the primary heat exchanger. (Refer to HEAT EXCHANGER and HOT OIL HEATER.)

The economizer usually consists of a finned serpentine coil in an enclosure mounted at the base of the exhaust stack. (Refer to SERPENTINE COIL.) The exhaust gases flow around the coil and heat the fluid flowing through the coil. (Refer to COMBUSTION AIR PRE-HEATER for comparison.)

EDDY CURRENT. The electrical current used to control slippage in the magnetic clutch of a belt feeder. (Refer to BELT FEEDER.)

EFFICIENCY. A rating often used to denote the performance of major components of an asphaltic concrete facility. The thermal efficiencies of asphalt heaters and aggregate dryers are components of primary concern. Their efficiencies affect the amount of fuel they use. Fuel costs are a significant part of the overall operating costs of an asphaltic concrete facility.

The thermal efficiency of a hot oil asphalt heater relates the amount of heat (BTU) the heater produces to the amount of heat actually transferred to the thermal fluid flowing through it. (Refer to BRITISH THERMAL UNIT.)

Thus, a heater that is 85% efficient uses 85% of the heat produced to heat the fluid and wastes 15%. Similarly, the thermal efficiency of an aggregate dryer relates the amount of heat (BTU) the dryer produces to the amount of heat actually transferred to the aggregate flowing through it.

All heat that does not go into the thermal fluid or aggregate is wasted. Consequently, all heat that goes out the exhaust stack is wasted heat. And so is any heat that is lost by air leakage or as the result of poor insulation.

Temperature of the exhaust gas is a good indication of efficiency where most of the heat that is lost goes out the stack. The lower the temperature of the exhaust gas, the higher the efficiency.

Net (LHV) thermal efficiency can be easily calculated using the following formula:

$$E_{th} = [(H_{input} - H_{stack}) / H_{input}] \times 100$$

Where:

E_{th} is percentage thermal efficiency (net)

H_{input} is Heat input BTU (LHV)

H_{stack} Stack loss BTU

(Refer to LOWER HEATING VALUE.)

ELECTROSTATIC PRECIPITATOR. A particulate control device that applies a high-voltage electric charge to particles in a gas stream and then removes them from a gas stream on oppositely charged collection plates.

EMISSIONS. Substances discharged during production operations at an asphaltic concrete facility. The substances may be either gases or particulate. Federal, state, and local environmental codes usually limit the amount of emissions or pollutants that industrial and commercial operations can release into the atmosphere. Accordingly, an asphaltic concrete facility must have provisions to limit specified emissions produced or released.

ENERGIZED. Connected to an energy source or containing residual or stored energy.

ENERGY-ISOLATING DEVICE. A mechanical device that physically prevents the transmission or release of energy, including but not limited to the following: A manually operated electrical circuit breaker; a disconnect switch; a manually operated switch by which the conductors of a circuit can be disconnected from all ungrounded supply conductors, and, in addition, no pole can be operated independently; a line valve; a block; and any similar device used to block or isolate energy. Push buttons, selector switches and other control circuit type devices are not energy isolating devices. (Refer to LOCKOUT and LOCKOUT DEVICE.)

ENERGY SOURCE. Any source of electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other energy.

EMULSION. Emulsified asphalt. A mixture of asphalt cement, water, and an emulsifying agent. Used for surface treatments, penetration macadams, cold asphalt-aggregate mixtures, tack coats, fog seal, and slurry seals.

EXCESS AIR. (Also called excess combustion air.) The air remaining after fuel has been completely burned. Thus, it is the air supplied in addition to the amount required for stoichiometric combustion. (Refer to PRIMARY AIR and SECONDARY AIR.)

EXHAUST STACK. Usually a large vertical duct mounted on the outlet of the baghouse exhaust fan. The duct has sampling ports at its upper end where it exhausts into the atmosphere. (Refer to BAGHOUSE.)

EXPANSION TANK. An expansion tank in a hot oil circuit accommodates the oil's expansion in volume as it is heated. The oil volume can increase up to 25%. A layer of nitrogen gas covers the hot oil in an expansion tank to minimize oxidation of the oil. (Refer to THERMAL FLUID, OXIDATION, and NITROGEN BLANKET.)

FABRIC. (Refer to CLOTH.)

FACILITY. This term is used within the asphalt industry to mean a site with equipment designed and set up to produce asphaltic concrete. Facility and plant mean essentially the same thing. However, the term facility is preferred by NAPA. (Refer to NAPA.)

FACTOR OF SAFETY. (FS) A design scaling factor of unity or greater applied to ensure that a design is at or beyond a calculated value to ensure safety.

FEEDER BELT. (Refer to BELT FEEDER.)

FIBERBED MIST COLLECTOR. Pollution control device that utilizes coalescing fiberglass candle filters to remove liquid particulate matter from a gas stream. They are commonly used to control blue smoke emissions associated with silo filling and truck loading operations. (Refer to BLUE SMOKE.)

FIBERGLASS. A generic word for a material made of fine glass fibers.

FIFTH WHEEL. The coupling on a truck tractor for towing a semitrailer chassis. It couples to a king pin on the gooseneck of the trailer. The fifth wheel is mounted over the rear axles of the tractor and supports the forward end of the trailer. (Refer to GOOSENECK and KINGPIN.)

FILLER. (Refer to MINERAL FILLER.)

FILTER BAGS. Bags made of fiber cloth or fabric for filtering dust particles from the gases of the aggregate drying process. A baghouse may contain over 1000 filter bags. (Refer to BAGHOUSE, REVERSE PULSE BAGHOUSE SYSTEM, and ARAMID.)

FINES. (Refer to BAGHOUSE FINES.)

FINNED PIPE. Pipe with fins. Metal fins are often affixed to pipe to significantly increase the heat conducting surface area of the pipe. Fins increase conduction about 300 percent. Fins are commonly made by spiraling a long strip of metal around the pipe and welding one of its two long edges to the pipe. The fins may be either solid or serrated. A serrated fin is made by making numerous cuts along one edge of the fin. The serrations increase efficiency by increasing the turbulence of liquid flowing around the fin. It also increases its surface area slightly. (Refer to CONDUCTION.)

FIRE TUBE. The heating tube into which the burner fires in a direct-fired tank. The tube conducts heat produced by the burner to the asphalt cement surrounding the outer surfaces of the tube. (Refer to CONDUCTION and DIRECT-FIRED TANK.)

FIRST OUT ANNUNCIATOR. An electrical signaling device used to indicate the source of a problem or abnormal condition in an electrical control system. Annunciators are frequently used in the burner management systems of hot oil heaters and aggregate dryers. When a problem occurs that causes the burner to shut down, the annunciator identifies the limit switch that tripped first, setting off a chain reaction that caused the shutdown. (Refer to BURNER.)

Signal lights are sometimes used as an alternate to an annunciator. The lights come on to denote all switches that have tripped. However, they are less effective because several may come on to denote all switches affected by the shutdown. This leaves no clue as to which one actually tripped first and triggered the shutdown.

FLEXIBLE HOSE. A type of flexible metal pipe having metal bellows covered by a wire braiding commonly used in asphaltic concrete facilities in liquid asphalt and hot oil lines. Flex hoses are used as a connection between components when alignment and spacing cannot be tightly controlled.

Flexible hoses are also used to supply hot oil passages attached to weigh-scale hoppers in order to relieve strain on the weigh-scale.

FLIGHTS. Metal blades that lift, shower, and transport material through a dryer drum as it rotates. Their purpose is to promote heat transfer between the combustion gases and the feed material.

Several types are used. Typical ones are known as screw flights, showering (cup) flights, combustion or T-flights, discharge flights, and reversing screw flights. Flights may include special notches to enhance veiling in the drum.

Some of the showering flights of new drums include bolt-on parts known as kicker flights, or piggybacks. They are extra flights that enhance the effect of the showering flights. The amount of showering needed is affected by the type of materials being dried and its moisture content. So, if necessary, some of the kicker flights can easily be removed when the unit is set up at the plant site. (Refer to DRYER.)

FLOP GATE. A gate commonly used at entry and exit chutes on dryers and mixers to minimize the entry of outside air into the drum. The gate is pivoted and is free to swing or flop. The force of material flowing through the gate causes it to open wide enough for the material to pass. Gates at entry chutes are metal and have weights to help keep them closed. Gates at exit chutes are rubber reinforced with metal. (Refer to DRYER and MIXER.)

Flop gate is also the name for a two-position diverter typically located at the inlet of a traverse conveyor. (Refer to TRAVERSE CONVEYOR.)

FLOW RATE. The amount of a substance that is transferred in a given unit of time. Gas flow rate is expressed in cubic feet per minute (cfm). Fluid flow rate is expressed in gallons per minute (gpm).

FOLDING CHUTE. A movable chute usually located at the inlet of drag which is under a batch tower. Folding chutes can either fold into position or rotate-extend into position. (Refer to DRAG CONVEYOR.)

FRONT-END LOADER. A mobile vehicle equipped with a bucket shovel. Its main use at an asphaltic concrete facility is for scooping up material from stock piles and loading it into feed bins.

FUEL METER. A device that records the amount of fuel used in a given period at an asphaltic concrete facility. It records the amount used since the last time the meter was reset. When used in the main fuel supply line at an asphaltic concrete plant, it records the total amount of fuel used at the facility. Separate fuel meters are recommended for individual burners in order to properly track their fuel usage. (Refer to BURNER.)

Fuel Meters measure the amount of fuel passing through them and typically come in resettable, non-resettable, and instantaneous meters. Resettable fuel meters will accrue the amount of fuel passing through the meter until it is reset to zero. A non-resettable meter will only accrue amount of fuel passing through the meter and cannot be reset. An instantaneous fuel meter will display the amount of fuel passing through the meter at any given moment when fuel is flowing. Instantaneous fuel meters can also totalize the amount of fuel that has passed through it and can be resettable.

Resettable and non-resettable fuel meters read out in gallons or pounds for liquid fuels, such as diesel fuel or waste fuel oil, in U.S. customary units and liters or kilograms in metric units. For gaseous fuels, such as natural gas or propane (LPG), resettable and non-resettable meters will read out in cubic feet or pounds in U.S. customer units and liters or kilograms in metric units.

When instantaneous fuel meters measure liquid fuels, such as diesel fuel or waste fuel oil, the meter will read out in gallons per minute (gpm), gallons per hour (gph), pounds per minute or pounds per hour in U.S. customary units or liters per minute, liters per hour, kilograms per minute or kilograms per hour in metric units. An instantaneous meter will measure gaseous fuels, such as natural gas or propane (LPG), in cubic feet per minute (cfm), cubic feet per hour (cfh), pounds per minute or pounds per hour in U.S. customary units and cubic meter per minute or cubic meter per hour, kilograms per minute or kilograms per hour in metric units. A totalizer on an instantaneous fuel meter will read out in the same units as the resettable and non-resettable fuel meters.

FUEL OIL. Type of liquid fuel derived from petroleum distillation used to operate heating equipment in an asphaltic concrete facility. Fuel oil is classified into one of six grades (No. 1 through No. 6) based on boiling point and viscosity. Burners can be equipped to operate on any of these fuel oils, though preheating is required for heavy or waste (recycled) oils, grade 4 and higher. (Refer to BURNER and HEAVY FUEL PREHEATER.)

FUEL TANK. A container for storing fuel oil used to operate an asphaltic concrete facility. (Refer to FUEL OIL.)

GAS. A state of matter which is neither solid or liquid. Matter in a gaseous state is highly compressible. It has relatively low density and viscosity and undergoes relatively great expansion and contraction with changes in pressure and temperature. (Refer to NATURAL GAS.)

GAS FLOW RATE. Volumetric flow rate of gas per unit of time. (Refer to GAS.)

Gas streams at an asphaltic concrete production facility are often measured in terms of:

- **ACFM.** Actual cubic feet per minute. Gas flow rate at actual conditions (temperature and moisture moisture).
- **SCFM.** Standard cubic feet per minute. Gas flow rate corrected to standard temperature (68°F) including total moisture volume (%).
- **DCFM.** Dry standard cubic feet per minute. Gas flow rate corrected to standard temperature (68°F) less the total moisture volume (%).
- **ACMM.** Actual cubic meters per minute. Gas flow rate at actual conditions (temperature and moisture moisture).
- **SM3/MIN.** Standard cubic meters per minute. Gas flow rate corrected to standard temperature (20°C); moisture volume may or may not be included - must verify local requirements.
- **NM3/MIN.** Normal cubic meters per minute. Gas flow rate corrected to normal temperature (0°C); moisture volume may or may not be included - must verify local requirements.

GAS STREAM. A gas stream is the continuous flow of any gas. Hot gases from the drying process, gases pulled from the pugmill by a RAP scavenge system, and blue smoke and ambient air drafted by a fiberbed system are all considered gas streams. (Refer to GAS.)

GATE VALVE. A type of control valve commonly used in hydraulic and pneumatic circuits to shut off flow. A gate, similar to a guillotine, moves to close passage through the valve as it is actuated. Most gate valves used at asphaltic concrete plants are manually operated, requiring multiple turns of a wheel on a threaded shaft.

Gate valves are sometimes used in piping of hot oil heaters and asphalt storage tanks. They can be used in lines for hot oil, asphalt, fuel oil, or gas. However, they are not recommended for use in lines carrying liquid that normally contains foreign matter or debris that can accumulate in their grooved seats and prevent complete shut off. When used for asphalt, the valve usually has a hot oil jacket. (Refer to JACKETED ASPHALT VALVE.)

Pneumatic or hydraulic actuating cylinders cannot be used to operate a gate valve. (Refer to AIR CYLINDER.)

GEAR PUMP. A gear pump uses the meshing of gears to pump fluid by displacement. As the gears rotate, they separate on the intake side of the pump, creating a void and suction which is filled by fluid. The fluid is carried by the gears to the discharge side of the pump, where the meshing of the gears displaces the fluid. The rigid design of the gears and houses allow for very high pressures and the ability to pump highly viscous fluids. The pump normally continues to displace the liquid, increasing its pressure until it opens a relief valve to bypass the liquid back into the supply line. Gear pumps are one of the most common types of pumps for hydraulic fluid power applications. (Refer to CENTRIFUGAL PUMP for comparison.)

GLAD HANDS. Quick-disconnect air hose connectors used to supply compressed air from a tractor unit to the air brake system on a semi-trailer.

GLOBE VALVE. A type of control valve commonly used in hydraulic and pneumatic circuits to regulate flow. It has a globe-shaped plug that moves to restrict the flow as its spindle is actuated. Most globe valves used at asphaltic concrete plants are manually operated, requiring multiple turns of a wheel on a threaded shaft. A variety of configurations and plug shapes are available. Some plugs are conical-shaped. Others are parabolic-shaped.

Globe valves are used in piping for hot oil heaters. They can be used in lines for thermal fluid (hot oil), fuel oil or gas. They are not recommended for piping carrying liquid asphalt. Pneumatic or hydraulic actuating cylinders cannot be used to operate a globe valve. (Refer to HOT OIL HEATER and AIR CYLINDER.)

GOOSENECK. The forward end of a semitrailer that steps up from the main chassis. It has a tow pin (kingpin) that extends down vertically and connects to the fifth wheel of a tractor. (Refer to FIFTH WHEEL and KINGPIN.)

GPM. Gallons per minute.

GRADATION. A division based on particle size to classify material, especially aggregates.

GRAPHICS PANEL. An optional panel that graphically pictures the major components of an asphaltic concrete facility and the status or operating state of key controls. Although much of the same information can be determined from the standard control panels, a graphics panel is faster and easier to comprehend. (Refer to CONTROL HOUSE.)

GRATED. Describes a surface (usually for walking) that incorporates a steel grating. (Refer to GRATING.)

GRATING. Either a grill or network of steel bars or a special perforated sheet called “expanded metal” used as a directional slip-resistance walking surface for work platforms at asphaltic concrete facilities. Both the bars and the perforated sheet are very slippery in one direction when wet.

GRAVITY CHUTE. A chute that feeds material by gravity. Entry and exit chutes of dryers are usually gravity chutes. (Refer to SLINGER FEEDER.)

GRAVITY TAKE-UP. A mechanism for taking up slack in a conveyor belt to control its tension. The mechanism uses a weight suspended from disk pulleys. This type of take-up is used on long conveyors and on conveyors that incorporate weigh belts. Belt tension on other conveyors is controlled by adjusting the tail pulley.

The gravity take-up mechanism has advantages over tail pulley adjustment. The gravity take-up mechanism has a wider range of adjustment and automatically maintains tension despite belt stretch.

GRIZZLY. (Refer to BAR GRIZZLY.)

GROUND TIRE RUBBER. (GTR) A type of crumb rubber processed either by grinding (ambient process) or chemicals (cryogenic process). It can be introduced to asphaltic concrete in two manners: wet (mixed with liquid AC) or dry (injected directly into the drum mixer). GTR is used to improve certain characteristics of asphaltic concrete. (Refer to ASPHALTIC CONCRETE.)

GTR. (Refer to GROUND TIRE RUBBER.)

HEAD PRESSURE. The pressure at the outlet of a pump. It is the pressure that produces the flow rate required by the circuit. Head pressure is expressed either as feet of head or psi. (Refer to NET POSITIVE SUCTION HEAD for comparison.)

HEAPED. A term used in connection with the capacity of a bin (heaped capacity) to mean its maximum capacity. The bin is filled to its top edges and, near its center, heaped higher than the edges. The edges are limited by the natural angle of repose for the held material. (Refer to STRUCK for comparison.)

HEAT CONDUCTANCE. (Also called thermal conductance.) A measure of the ability of a material to conduct heat flow. It is usually designated by the letter **K**, which denotes the number of BTU per square foot, per hour, per degree F, for a stated thickness, usually either 1 in or 1 ft.

For example, 1 ft² of fiberglass 1 in thick conducts 0.30 BTU per hour for every degree of temperature difference. Dividing the **K** value by six gives 0.05, the conductance when the same material is 6 in thick. (Refer to BRITISH THERMAL UNIT and R-VALUE.)

HEATER. Heaters are used in asphaltic concrete facilities to regulate the temperature of heating oil. The heating oil is used to transfer heat to various equipment and surfaces that must be kept at an elevated temperature.

A heater is used to heat asphaltic concrete in storage tanks and to maintain the heat in asphaltic concrete during transfer and storage. (Refer to DIRECT-FIRED TANK, and HELICAL COIL HEATER.)

Electric resistance heaters are also commonly used to apply heat directly to equipment. Electric strip heaters are formed in a long, narrow metal strip clamped against a smooth surface at each end. Electric blanket heaters are a custom-shaped and rubber-coated blanket that is glued to a smooth surface.

HEAT EXCHANGER. A device that either heats or cools materials flowing through it. Heat exchangers are commonly employed in asphalt storage tanks and hot oil heaters used at asphaltic concrete plants. The type of heat exchanger used in this equipment is usually either a helical coil, serpentine coil or jacketed firebox. (Refer to HELICAL COIL, SERPENTINE COIL, and JACKETED FIREBOX HEATER.)

HEAT LOSS. The difference between the amount of heat energy produced and that used. It is heat produced without getting any benefit from it. Thus, it is wasted energy, which can be costly. Because of the need to avoid wasted cost and to conserve our resources every effort should be made to avoid heat loss. This is especially true at an asphaltic concrete facility because of the large amount of heat energy needed to produce hot mix. Heat losses can be minimized by use of insulation, a very cost effective solution. (Refer to INSULATION.)

HEAT TRANSFER. The passage of heat from one medium to another by means of conduction, convection or radiation. (Refer to CONDUCTION, CONVECTION, and THERMAL RADIATION.)

HEAVY FUEL PREHEATER. A heater used to pre-heat heavy fuel oil so it can be burned by a fuel oil burner. Preheaters are typically used to heat fuel oils and waste/recycled oils for aggregate dryers. The pre-heating lowers the viscosity of the oil so it can be atomized by the burner. (Refer to BURNER.)

A preheater is usually connected in the fuel supply line between the fuel tank and dryer. Or, it can be mounted inside the fuel tank. It may be used to pre-heat the fuel flowing directly to the burner when a single pass through the heater raises its temperature adequately for atomization. The fuel may be recirculated to the fuel tank if additional heating is needed.

The preheater usually consists of a shell-and-tube heat exchanger with a capacity of approximately 80–120 gal. The fuel oil is heated as it passes through the shell surrounding the tubes. The tubes are heated by thermal fluid (hot oil) from a hot oil heater as it circulates through the tubes. (Refer to THERMAL FLUID.)

HELICAL COIL. A pipe formed into a spiral or helix. A helical coil is the primary heat exchanger in a helical coil heater. (Refer to HELICAL COIL HEATER and SERPENTINE COIL.)

HELICAL COIL HEATER. A type of hot oil heater used to heat heat-transfer oil in an asphaltic concrete facility. It has an insulated cylinder that houses a helical coil. A burner mounts on the end of the cylinder and fires through the center axis of the coil. Heat-transfer oil is pumped through the heated coil to heat the oil. The heater has an expansion tank that accommodates fluctuations in the volume of heating oil as the heated oil expands and as cool oil returns to the tank. The expansion tank is vented to atmosphere and allows the primary tank to operate without becoming pressurized while removing trapped air from the flowing stream of heated oil. (Refer to EXPANSION TANK, HOT OIL HEATER, and THERMAL FLUID.)

HELICOID. Generic term for objects that have a spiral or helical shape. The term applies to the screw of a screw conveyor, to the threads of ordinary screws, etc. (Refer to SCREW CONVEYOR.)

HHV. (Refer to HIGHER HEATING VALUE.)

HIGHER HEATING VALUE. (HHV) The gross amount of heat (BTU) produced by a fuel. No. 2 fuel oil, which is widely used in the asphaltic concrete industry, has a HHV of approximately 140,000 BTU per gallon. Natural gas has a HHV of approximately 1040 BTU per cubic foot. (Refer to BRITISH THERMAL UNIT and LOWER HEATING VALUE.)

HMA. (Refer to HOT MIX ASPHALT.)

HOPPER. Container that is typically tapered downward and used to store and discharge bulk materials at the bottom.

HORIZONTAL ASPHALT TANK. A cylindrical tank used at an asphaltic concrete facility to heat and store asphalt cement. The tank is installed so that its long axis is horizontal and it occupies a ground area equal to its diameter times its length. They are sometimes equipped with wheels and suspension for highway travel. (Refer to VERTICAL ASPHALT TANK for comparison.)

HORIZONTAL CYCLONE. (Refer to CYCLONE.)

HOT MIX. (Refer to HOT MIX ASPHALT.)

HOT MIX ASPHALT. Road paving material (asphaltic concrete) produced by mixing hot, dry aggregate and liquid asphalt cement. Basic types of asphaltic concrete are dense-graded and open-graded. There are sub-types within the basic types.

The mixture is made with the ingredients heated to about 300°F, which is the temperature normally used to dry the aggregate. The liquid asphalt cement will adhere to the aggregate only if it is dry. The mix may also include dust or fines from the aggregate, ground rubber, and additives fillers, such as lime. The mixture is maintained close to 300°F until it is applied to the road.

Asphaltic concrete is called by numerous other names, such as asphaltic concrete, asphalt cement concrete, asphalt mix(ture), asphalt paving mix(ture), bituminous concrete, bituminous mix(ture), bituminous paving mix(ture), etc. (Refer to [BITUMEN](#).)

HOT MIX ELEVATOR. A continuous-discharge bucket elevator used to convey asphalt mix from a mixer to fill a surge bin or a storage silo. Continuous-discharge elevators minimize segregation at the discharge. (Refer to [BUCKET ELEVATOR](#), [SURGE BIN](#), [STORAGE SILO](#), and [SEGREGATION](#).)

HOT OIL HEATER. A heater used to heat oil that is piped to various components of an asphaltic concrete facility to keep materials in them hot. Hot oil is usually piped to asphalt coiled tanks, drag conveyors, hot mix elevators, surge bins, and asphaltic concrete storage silos. Hot oil heater designs include helical coil, jacketed firebox and electric. (Refer to [THERMAL FLUID](#).)

HOT OIL MANIFOLD. A component of a hot oil heater for distributing hot oil. It is a pipe chamber that has multiple connections for pumps and hot oil lines that go to various components of an asphaltic concrete plant. (Refer to [HOT OIL HEATER](#) and [THERMAL FLUID](#).)

HOT STONE BIN. (Also called hot bin or hot storage bin.) The batch tower hot stone bin receives hot, dry aggregates by gradation from a classifying screen positioned immediately above the bin section. Individual bin volumes are determined based on the average amount (%-by-weight) that each gradation will be used for making typical asphalt mixes. Each hot bin can selectively dispense a specified dose of hot aggregate into a common weigh hopper. (Refer to [BATCH TOWER](#), [GRADATION](#), and [WEIGH HOPPER](#).)

HOT STONE ELEVATOR. A centrifugal discharge bucket elevator used to convey aggregates from a drying drum to the classifying screen on a batch tower. Centrifugal discharge elevators disregard segregation at the discharge because they feed into classifying screens to separate aggregate gradations. (Refer to [BUCKET ELEVATOR](#), [BATCH TOWER](#), [GRADATION](#), and [SEGREGATION](#).)

HYDROCARBON. Molecules containing hydrogen and carbon atoms arranged in structures that can vary from straight chains to branching chains to rings. The size of the atomic structure determines the properties and behavior of the hydrocarbon. The structure size is a function of the number of carbon atoms present in the molecule. Lighter structures with few carbon atoms are gaseous. Heavier chains with more carbon atoms are predominantly liquids, though some may be semi-solids or solids.

IDLER. A generic term that applies to various types of equipment. It is used to guide and support a moving strand of belting, rope or chain. For belt conveyors, the various styles of idler also forms a contour in the belt to either create a trough or else to flatten the belt surface. (Refer to [BELT CONVEYOR](#).)

IMPACT CRUSHER. A machine commonly used to crush material in stone quarries or metallic mines. They are also used in recycling asphalt or concrete.

One type of crusher is known as a horizontal shaft impactor (HSI). It has long bars, known as blow bars or hammers, fixed on a rotor so they cannot rebound. The bars strike the material breaking it and throw it against hinged aprons which cause further breakage. The hinged aprons are adjustable to control material size.

Another type of impact crusher is known as a hammermill. It is used in asphaltic concrete facilities to reduce milled RAP to the proper feed size for inclusion in asphaltic concrete. It has rows of swinging hammers that are free to rebound when they impact the material. The hammers break the pieces of material and hurl the fragments against a breaker plate reducing their size even further. The hammermill has a screen bar in its bottom section that allows smaller material to pass, but retains oversized material until additional blows reduce its size as needed to pass.

IMPACTOR. (Refer to IMPACT CRUSHER.)

IMPELLER. A rotating device used to force fluid in a desired direction under pressure. They are used in centrifugal pumps. They are also used in asphalt tanks to keep polymers in the asphalt in suspension. (Refer to CENTRIFUGAL PUMP and POLYMER-MODIFIED ASPHALT CEMENT.)

INCLINED CONVEYOR. A belt conveyor used mainly in cold feed and recycle systems to carry aggregate along a slope. (Refer to BELT CONVEYOR.)

INDUSTRIAL GRADE. Sometimes used to designate a special grade of equipment or components. This grade of equipment is designed to perform in environments or under conditions less favorable than regular or standard grades of the equipment.

INERTIAL SEPARATOR. A type of dust control device that uses inertial forces to remove coarse particles from the air stream before entering the filter section of a baghouse. The unit has a high removal efficiency, but low pressure drop. (Refer to BAGHOUSE.)

INSULATION. A material that reduces heat loss from heated materials used in asphaltic concrete facilities. Four types of insulation are commonly used: 1) ceramic fiber blanket; 2) fiberglass blanket; 3) mineral wool blanket; and 4) molded foamglass.

Refractory is also a type of insulation. It is used mainly in combustion chambers and serves a dual purpose. It retains heat to increase burner efficiency and it reduces heat loss. (Refer to BURNER and COMBUSTION CHAMBER.)

INTERSTITIAL VELOCITY. The velocity, in feet per minute (fpm), of dust-laden air traveling upward in the open space between baghouse bags, as measured at the bottom of the bags. This is an important design parameter for pulse-jet baghouses. It is calculated by dividing the airflow by the baghouse cross sectional area after subtracting the cross sectional area of the bags. (Refer to BAGHOUSE.)

JACKETED ASPHALT LINE. An asphalt line that has an outer jacket through which hot oil flows. The hot oil heats the asphalt cement in the line to maintain its temperature as it is used to make asphaltic concrete and to keep it from solidifying when the plant is idle. (Refer to THERMAL FLUID.)

JACKETED ASPHALT VALVE. An asphalt valve that has an outer jacket through which hot oil flows. The hot oil keeps the asphalt cement from solidifying when the plant is idle. (Refer to THERMAL FLUID.)

JACKETED FIREBOX HEATER. A type of hot oil heater used to heat thermal fluid in an asphaltic concrete facility. The thermal fluid flows through channels that surround a jacketed firebox or combustion chamber and is heated by radiant energy. The fluid also flows through a shell-and-tube heat exchanger and is heated by convection. (Refer to HOT OIL HEATER, THERMAL FLUID, COMBUSTION CHAMBER, HEAT EXCHANGER, and CONVECTION.)

JOGGED JOINT. A jogged joint is a welded joint where one of two parts being joined is jogged (stepped), allowing the other part to fit into the jogged area. As a result, one side of the joint is smooth without a protruding surface. The radial joints of silos have joints jogged to the outside to reduce wear on the inside of the joints.

KINGPIN. A pin on the gooseneck of a semitrailer used to connect the trailer to the fifth wheel of a truck tractor for towing. (Refer to FIFTH WHEEL and GOOSENECK.)

KNOCKOUT BOX. A chamber used to separate coarse dust particles from the gas stream produced during the aggregate drying process.

A knockout box works on a different principle than a cyclone and is less efficient. The velocity of the dust-laden gas stream decreases upon entering a knockout box because the cross sectional area of the box is greater than that of the duct entering the box. The direction of airflow is suddenly changed by means of a baffle panel. The larger particles impact the surface of the baffle and are deflected out of the air stream as the airflow makes another sudden and radical turn around the edge of the baffle. The bottom of the knockout box forms a hopper to contain the larger particles. Thus, the larger dust particles do not enter the filter section of the baghouse. This increases the effectiveness and efficiency of the filter bags. (Refer to BAGHOUSE, FILTER BAGS, INERTIAL SEPARATOR and CYCLONE.)

LANDING GEAR. Legs installed at the gooseneck end of a portable unit and used to temporarily support the unit upon separation from the tractor. They are manually raised and lowered with a hand crank. (Refer to GOOSENECK.)

LANDING JACKS. Similar to landing gear, but used as a semi-permanent support for transportable equipment. The landing jack is an extendable support that can be adjusted for raising and leveling equipment that may be erected on slightly uneven surfaces, or retracted to provide adequate road clearance while transporting. Multiple landing jacks may be positioned as required to fully support the equipment. Landing jacks may be extended manually, or with a powered device either hydraulic, or electric. (Refer to LANDING GEAR.)

LEAKAGE AIR. Air drawn in by the exhaust system that does not participate in the drying or production process. It may enter the system at many locations, including holes, inlet or discharge chutes, or loose access doors. It is unwanted and should be minimized or eliminated as much as possible.

LEGS. Upright supports for a major component in an asphaltic concrete facility. Legs are made from structural steel and go between structural members and the foundations, which may be either structural steel or concrete. The legs of portable units are adjustable and can be raised and lowered. This facilitates moving the plant and makes it possible to set up the unit on unlevel ground without the need for shims. (Refer to LANDING JACKS.)

LEGS-TO-GRADE. Legs long enough to reach a grade while maintaining the unit they support at a specified height above the grade. Some components may need legs longer than those normally furnished.

If the unit cannot be shipped with the longer legs in place because of shipping limitations, extensions are furnished. These either bolt or weld onto the normal legs. The longer legs are commonly used to eliminate the need for concrete pillars. (Refer to LEGS.)

LEVEL INDICATOR. Level indicators alert the operator of high and low levels of material in a silo, surge bin or batcher. Three types of level indicators are commonly used, all indicating a point level:

- Radio frequency (RF)
- Electro-mechanical rotary
- Radar/microwave

The RF indicator is mounted on top of the silo or surge bin and has a sensing probe that extends down into the silo. The probe of the high bin indicator is short. The probe of the low bin indicator is long. When the mix rises and touches the probe, a radio-frequency circuit senses the contact and activates an electrical circuit. When the mix goes below the probe, the circuit is de-activated. Thus, the point height of the mix is indicated by whether the circuit is activated or de-activated.

The rotary-type indicator is installed on the sides of lime and dust silos at the height or level it senses. It works in a similar way to the RF indicator. It has a paddle on a rotating shaft that extends down into the batcher or silo. The shaft of the high bin indicator is short. The other is long. When the mix rises to block a paddle its shaft stops turning. When the mix goes below a paddle its shaft starts turning again. Thus, the point height of the mix is indicated by whether the shaft is blocked or turning. Paddle extensions are not needed.

The radar level-type indicator is mounted on top of the silo or surge bin and emits a microwave signal which travels downwards until it reaches the surface of the liquid asphalt. The signal is reflected back to the unit by the surface of the asphalt and is converted to data related to the distance traveled. The electronic displays can not only show the height of the liquid, but also the volume of liquid and the percentage of full tank.

LEVEL SWITCH. A switch used in a tank to activate controls that keep the tank from overflowing. The switch is usually activated by a float supported by the liquid in the tank. Level switches are used in asphalt storage tanks, fuel tanks and the expansion tanks of hot oil heaters. Level switches in asphalt and fuel tanks shut off the unloading pump when activated. Level switches in expansion tanks shut off the heater when activated. (Refer to EXPANSION TANK and LEVEL INDICATOR.)

LHV. (Refer to LOWER HEATING VALUE.)

LIGHT OILS. (Also known as light end distillates.) Petroleum fractions separated from crude oil by atmospheric distillation operations at a refinery. They are hydrocarbon compounds comprising a variety of fuels, such as naphtha and gasoline. Light ends are used to soften virgin asphalt cement to make it suitable for use in paving mixtures. The light ends may separate from the liquid AC during asphaltic concrete production when heated above their boiling point. When light oils are vaporized, they may produce unwanted emissions. Varying amounts of light oils remain in asphalt cement when it is produced by refining crude oil. This is because the properties of crude oil from different sources vary widely. (Refer to [HYDROCARBON](#).)

LIME MIXER. A twin shaft mixer that combines virgin aggregate, lime, and when required, water. When water is added, the mixture is called a slurry. (Refer to [TWIN SHAFT MIXER](#).)

LIME SILO. A silo for storing lime used as an ingredient of asphaltic concrete.

LIMIT SWITCH. An electro-mechanical switch that is activated when certain components of an asphaltic concrete plant reach preset limits. Limit switches are used for a wide variety of purposes. They can be activated by pressure, temperature, or by moving parts.

LIQUID AC. (Refer to [LIQUID ASPHALT CEMENT](#).)

LIQUID ASPHALT CEMENT. Asphalt cement that is heated to a liquid state to make it suitable for mixing with aggregate to make asphaltic concrete. At ambient temperatures, asphalt cement is a semisolid. (Refer to [ASPHALT CEMENT](#).)

LIVE ZONE. The mixing capacity of a pugmill. It is the cubic volume, expressed to the nearest cubic foot, of the zone below a line extending across the top of the paddle arc, minus the volume occupied by the mixing shafts, arms, tips and liners. (Refer to [PUGMILL](#).)

LOAD CELL. A sensing device that modifies an electrical signal in proportion to the amount of weight imposed on it. Thus, when a load is applied to the cell, the resulting electrical signal can be calibrated and displayed to indicate the amount of weight bearing directly on the cell. (Refer to [BELT SCALE](#) and [CALIBRATE](#).)

LOCKOUT. (OSHA 1910.147) To use a mechanical device, employing a locking feature, to isolate and prevent the transmission and release of energy. To prevent the possibility of energizing or releasing potential energy within the controlled system while it is locked out.

Capable of being locked out. An energy isolating device is capable of being locked out if it has a hasp or other means of attachment to which, or through which, a lock can be affixed, or it has a locking mechanism built into it. Other energy isolating devices are capable of being locked out, if lockout can be achieved without the need to dismantle, rebuild, or replace the energy isolating device or permanently alter its energy control capability.

The placement of a lockout device on an energy isolating device, in accordance with an established procedure, ensuring that the energy isolating device and the equipment being controlled cannot be operated until the lockout device is removed. (Refer to [LOCKOUT DEVICE](#) and [ENERGY-ISOLATING DEVICE](#).)

LOCKOUT DEVICE. A device that utilizes a positive means such as a lock, either key or combination type, to hold an energy-isolating device in the safe position and prevent the energizing of a machine or equipment. Included are blank flanges and bolted slip blinds. (Refer to [ENERGY-ISOLATING DEVICE](#).)

LOOP PUMP. Also called a side or auxiliary pump. A pump used to circulate thermal fluid (hot oil) in a secondary or auxiliary circuit for heating components other than those heated by the main circuit. (Refer to [THERMAL FLUID](#).)

LOWER HEATING VALUE. (LHV) The net or useable amount of heat (BTU) produced by a fuel. For example, No. 2 fuel oil has a LHV of approximately 132,300 BTU per gallon. One cubic foot of natural gas has a LVH of approximately 905 BTU. The difference between HHV and LHV is due to hydrogen in the fuel, which is normally lost as water vapor. Both values are sometimes used in calculating the amount of fuel required for heating asphalt and drying aggregate. However, it is usually more appropriate to use LHV. (Refer to [BRITISH THERMAL UNIT](#) and [HIGHER HEATING VALUE](#).)

LUMP BREAKER. A machine widely used in asphaltic concrete facilities to break up loosely compacted lumps of RAP. Unlike an impact crusher it is not capable of breaking rock or hard asphalt. (Refer to [RECLAIMED ASPHALT PAVEMENT](#).)

The typical lump breaker has two 18-inch diameter perforated drums that break up the material as it is squeezed between them. Steel bits on the outer surfaces of the drums help feed and break the material. Each roll is turned by a separate 10-hp motor and a shaft-mounted reducer.

MACADAM. An early improved design of modern road construction developed by Scottish Engineer John Loudon McAdam (1756-1836). The design used a base layer of large stones covered with a layer of crushed stone and gravel to create a smooth road surface that was raised above the surrounding ground.

MAGNETIC CLUTCH. An electro-magnetically controlled clutch with variable slippage used in the drive system of a belt feeder. (Refer to [BELT FEEDER](#) and [EDDY CURRENT](#).)

MANHOLE. (Also known as hatchway or manway.) An opening through which a person can enter a storage tank or silo at an asphaltic concrete facility. Virtually all manholes at asphaltic concrete plants have latched or bolted covers.

MANIFOLD. A pipe chamber that has multiple port connections to distribute fluid pressure and flow in a hydraulic or pneumatic system.

MASS FLOW METER. An electronic measuring system used as an asphalt metering system at an asphaltic concrete facility. The system indicates the asphalt flow rate and the total volume since the system was last reset to zero. Mass flow meters have a high degree of accuracy and virtually no moving parts. However, they are significantly more expensive than other systems used for asphalt metering. The system has a electronic sensor and transmitter that measure flow rate, density, pressure, viscosity and temperature of the asphalt. It compensates for temperature variations in the material. (Refer to [ASPHALT METERING SYSTEM](#).)

MESH NUMBERS. Size designations for wire mesh sieves used to analyze aggregate particles. Two systems are used to designate size. One system designates particles smaller than ¼-inch and uses numbers ranging from 4 to 400. These numbers indicate the number of openings per linear inch of the sieve. The other system designates particles ¼ in and larger and uses either inches or millimeters to directly indicate the clear space between the wires of the mesh.

Sieves typically used for sieve analysis and gradation specifications for asphaltic concrete are shown in the table below. On sieves with numbered designations, the sieve clear opening will change if the wire diameters are changed from those shown.

Typical Sieve Sizes Used for HMA

Sieve Designation	Normal Wire Diameter (in)	Sieve Clear Opening (in)
2 in	0.1988	2.0
1 ½ in	0.1807	1.5
1 in	0.1496	1.0
¾ in	0.1299	0.75
½ in	0.1051	0.5
⅜ in	0.0894	0.375
No. 4	0.0606	0.187
No. 8	0.0394	0.0937
No. 16	0.0256	0.0469
No. 30	0.0154	0.0234
No. 50	0.0085	0.0117
No. 100	0.0043	0.0059
No. 200	0.0021	0.0029

MICROPROCESSOR. A small, but vital part of computer systems that control asphaltic concrete equipment. It is known as the central processing unit (CPU). It is a single chip that contains millions of transistors in an integrated circuit package.

MILLING MACHINE. (Refer to COLD PLANER.)

MINERAL. A natural, homogeneous, inorganic, inert, solid substance that comprises the main component of aggregates used to produce asphaltic concrete.

MINERAL FILLER. A filler material used as an ingredient for asphaltic concrete to meet certain specification requirements. It is usually any mineral that will pass a 200 mesh screen.

MINUS 200 MESH. (Also written as -200 mesh.) An expression used frequently to designate the sizes of the particles in baghouse fines. It refers to the dust particles that can pass through a sieve with 200 wires per linear inch.

The size of these particles will be smaller than 0.0029 in (75 microns), depending upon the size of the wires used in the sieve. Thus, the fines will include many sizes of particles ranging from 0.0029 in (75 microns) down to 0.0015 in (37 microns) or less.

Baghouse fines of this size are, for the most part, those that are captured by the filter bags. After they are collected, some may be added to the asphalt mix. Otherwise, they will be wasted.

Incidentally, for size comparisons a human hair is approximately 100 microns in diameter. Cigarette smoke has 0.3 micron particles. (Refer to MESH NUMBERS.)

MIXER. A key component of an asphalt facility for mixing the ingredients of asphaltic concrete. Most continuous-mix facilities use a drum mixer or a twin shaft mixer. Batch facilities use a twin shaft mixer. (Refer to DRUM MIXER and TWIN SHAFT MIXER.)

MIXING CHAMBER. Area where aggregate, recycle materials, fillers and AC are mixed. (Refer to MIXING ZONE for comparison.)

MIXING PADDLES. Parts within a drum mixer and pugmill for blending asphaltic concrete. Each paddle consists of a shank and tip. (Refer to DRUM MIXER, PUGMILL and MIXING TIPS.)

MIXING TIME. The total amount of time that ingredients of asphaltic concrete are mixed with each other while in the mixing zone. A portion of the mixing time (dry mixing time) takes place before liquid AC is added. The remainder of the mixing time (wet mixing time) is with the liquid AC included. (Refer to MIXING ZONE.)

MIXING TIPS. Cast metal paddles for blending the ingredients of asphaltic concrete in drum mixers and pugmills. (Refer to DRUM MIXER and PUGMILL.)

MIXING ZONE. The area within a drum mixer and twin shaft mixers where the ingredients of asphaltic concrete are mixed with each other. (Refer to DRUM MIXER and TWIN SHAFT MIXER.)

MODEM. A communications device that enables a computer to transmit information over a standard telephone line. Such devices allow service personnel to log in to the control system at customer sites for equipment troubleshooting and software updates.

MODIFIED ASPHALT. Asphalt cement that has been modified by the addition of another material, usually a polymer such as styrene-butadiene-styrene (SBS). The addition of certain polymers to asphalt cement improves the performance of asphaltic concrete made with it. (Refer to STYRENE-BUTADIENE-RUBBER and STYRENE-BUTADIENE-STYRENE.)

MODULAR. A type of construction used in relocatable facilities. Major units of the plant come complete with built-in steel foundations and bulkheads. Related components and parts are mounted, pre-wired, and pre-piped at the factory. Plug-in rubber cables are furnished so the units can be easily interconnected when they are in place. (Refer to RELOCATABLE ASPHALT FACILITY.)

MODULATING BURNER. A burner that can be fired at variable rates. A modulating burner can be fired at a rate that closely matches the heat demand. This conserves fuel, reduces temperature overshooting, and eliminates constant on-off recycling. (Refer to BURNER.)

MOTOR CONTROL CENTER. One of several control panels used to control equipment at an asphaltic concrete facility. Manufactured assembly of starters, breakers and main breaker to start and protect motors and loads of an asphalt plant. (Refer to CONTROL HOUSE.)

NAPA. (Refer to NATIONAL ASPHALT PAVEMENT ASSOCIATION.)

NATIONAL ASPHALT PAVEMENT ASSOCIATION. (NAPA) A trade association representing companies and individuals in the asphalt pavement industry, headquartered in Lanham, Maryland.

NATURAL GAS. Type of gaseous fuel comprised of a mixture of hydrocarbons, primarily methane. It is used to operate heating equipment in an asphaltic concrete production facility. (Refer to GAS and HYDROCARBON.)

NEAT ASPHALT. Unmodified, virgin asphalt cement. (Refer to MODIFIED ASPHALT.)

NET POSITIVE SUCTION HEAD. (NPSH) The static pressure exerted by a liquid at the inlet of a pump. It is created by the pressure of liquid that is piped to the inlet from a container or tank. In an open container the pressure is related to the density and height of the liquid level above the pump. Additional pressure is exerted when the container is closed and pressurized.

Pump manufacturers publish data specifying the minimum NPSH recommended for their pumps. Pumps operated with inlet pressures lower than recommended may be damaged by cavitation.

Adequate NPSH is governed mainly by the design of the fluid system. However, inadequate NPSH may result from abnormal operating conditions, such as low fluid level or an increase in fluid viscosity. (Refer to CAVITATION.)

NI-HARD. An abrasion-resistant (AR) cast steel of very high hardness. Castings made of this steel are used extensively to line components of an asphalt plant to reduce wear. (Refer to ABRASION.)

NITROGEN BLANKET. A layer of nitrogen gas covering the hot oil in an expansion tank of a hot oil heater to minimize oxidation of the oil. Reducing oxidation of the oil can significantly prolong its life. This, in turn, reduces operating costs. (Refer to EXPANSION TANK, HOT OIL HEATER, OXIDATION, and THERMAL FLUID.)

NITROGEN OXIDES. (Nox) A term used to denote nitric oxide (NO) and nitrogen dioxide (NO₂). Such gases are primary products of combustion and a known factor in the formation of smog and acid rain. They are subject to strict regulation. (Refer to EMISSIONS.)

NO-FLOW SWITCH. A switch that controls a circuit with a warning light to signal when there is no flow of material on a belt conveyor, on a feeder belt, or in a screw conveyor. (Refer to BELT CONVEYOR, FEEDER BELT and SCREW CONVEYOR.)

NOISE CONTROL. Any method of either reducing noise levels or limiting its propagation beyond specific boundaries or both. A number of methods are used to control noise at asphaltic concrete plants. Some components are enclosed in a housing that has baffles or sound absorption material or both. Barriers, walls and dirt berms may be constructed to block or to redirect sound. Plant equipment that produces unwanted noise may be located so as to rely on natural attenuation that occurs as the noise travels to controlled zones. (Refer to ATTENUATE.)

NOISE ORDINANCES. Federal, state and local laws that regulate the allowable sound levels based on time of day and zoning classification of the source and receiver properties.

NOISE POLLUTION. Disturbing or excessive noise that may adversely affect human health. There is growing concern in many parts of the world about noise pollution. Consequently, local, state and federal governments are enacting regulations to limit noise pollution from all kinds of industrial activity, including asphaltic concrete plants. (Refer to NOISE CONTROL.)

NO-ROTATION SWITCH. A switch that controls a circuit to signal when a screw conveyor, drag conveyor, hot elevator, or traverse conveyor is not operating.

NOX. (Refer to NITROGEN OXIDES.)

NPSH. (Refer to NET POSITIVE SUCTION HEAD.)

O₂ TRIM SYSTEM. A system that regulates the oxygen content of the flue gases of a heater or dryer. It samples the flue gases for the amount of oxygen it contains and, if necessary, adjusts the burner mixture control to produce an oxygen content within prescribed limits. This causes the heater or dryer to operate more efficiently and minimizes flue gas pollutants.

OPEN-FIRED BURNER. A combination induced/forced air burner used to provide heat for aggregate drying. Up to 60% of the combustion air is forced through the burner by its blower. The balance of air is pulled around the heat shield into the flame by the facility exhaust fan. (Refer to BURNER.)

OVERLOAD. A device that is part of an electrical motor starter which protects motors from thermal overload conditions, which can destroy motor windings.

OXIDATION. A chemical reaction between oxygen and asphalt cement. Oxidation causes the asphalt in asphaltic concrete to become hardened, resulting in a stiffening of the mix. Producers of asphaltic concrete are concerned with oxidation of asphalt cement at four places: in the liquid handling system, in the asphaltic concrete mixing process, in surge bins or storage silos, and on paved surfaces.

The rate of oxidation in asphalt mix increases as its temperature is raised and as exposure to oxygen is increased. For example, at 350°F oxidizes eight times faster than mix at 275°F. Oxidation can be minimized by heating asphaltic concrete only as high as needed for mixing and by limiting its exposure to oxygen. Silos used to store asphaltic concrete should be sealed to prevent atmospheric oxygen from coming into contact with the mix.

PARALLEL-FLOW DRUM MIXER. A combination parallel-flow dryer and drum mixer for making asphaltic concrete. (Refer to PARALLEL-FLOW DRYER, DRUM MIXER, and COUNTERFLOW DRUM MIXER.)

PARALLEL-FLOW DRYER. An aggregate dryer in which the aggregate and the hot gas steam flow in the same direction. A parallel-flow dryer is well suited to soil remediation applications. (Refer to COUNTERFLOW DRUM DRYER for comparison.)

PARTICULATE MATTER. (PM) Liquid or solid particles suspended in the atmosphere. PM is a complex mixture of particles, both natural and man-made, that may contain dust, smoke and pollen. Particles are classified by size. PM10 are inhalable particles measuring 10 microns in diameter and smaller. PM2.5 are fine inhalable particles with diameters of 2.5 microns and less. PM10 and PM2.5 are highly regulated because of their ability to cause serious health hazards.

PAVEMENT. A hard, smooth surface that facilitates pedestrian or vehicular travel. The most common pavement materials used in modern roads are asphaltic concrete and concrete. Pavement can also refer to the paving mixture comprising the surface.

PEEP SIGHT. A glass window in a firing chamber of a heater or dryer that allows one to observe the burner flame. Observing the burner flame can provide a lot of useful information about burner performance. For example, the flame pattern indicates if the burner is properly adjusted, and its color indicates whether the air-to-fuel ratio is optimum. (Refer to BURNER.)

PERFORMANCE-GRADED. (PG) A prefix followed by other numbers that designate an asphalt binder designed to meet certain performance standards. (Refer to PERFORMANCE-GRADED ASPHALT.)

PERFORMANCE-GRADED ASPHALT. An asphalt binder designed to produce asphaltic concrete that meets certain performance standards. Designations for performance-graded asphalt binders are prefixed with PG. Each grade designation also includes two sets of numbers that denote a temperature range. This is a range of climate temperatures to which the road may be exposed and still be expected to give superior performance. The PG numbers do not indicate viscosity as in conventional liquid asphalt designations.

Consider, for example, the binder designated PG 58-46. The first set of numbers refers to the high temperature in degrees C, +58. The second set, -46, refers to the low temperature in degrees C. Thus, this binder should perform well in climates where temperatures range from +58°C to -46°C (+136°F to -51°F).

The points where the temperatures are measured and the average duration of time that the temperatures are sustained are detailed in PG specifications.

Note that both modified asphalts and conventional, unmodified virgin asphalts (commonly known as neat asphalts) are assigned PG designations. The PG designations of the unmodified asphalts reveal that they perform well in a more limited range of climatic temperatures than modified asphalts.

A rule of thumb is sometimes used to indicate whether an asphalt incorporates modifiers. Just add the two sets of numbers of any PG designation. (Disregard the minus sign.) If the sum is 92 or greater, that asphalt probably includes modifiers.

PG. (Refer to PERFORMANCE GRADED.)

PLANT. (Refer to FACILITY.)

PLATE FOUNDATION. (Refer to STEEL FOUNDATION.)

PLC. (Refer to PROGRAMMABLE LOGIC CONTROLLER.)

PLUG VALVE. A process flow control valve. Two way plug valves are used to start and stop flow. Three-way versions are often used to switch flow from one circuit to another. All use a slotted cylindrical plug that rotates 90 degrees to control the flow.

Plug valves are used in piping of hot oil heaters and asphalt storage tanks. They can be used in lines for hot oil, asphalt, or fuel oil. They are not normally used for gas. When used for asphalt, the valve usually has a hot oil jacket. (Refer to THERMAL FLUID and JACKETED ASPHALT VALVE.)

An actuator, such as a pneumatic cylinder, can be used to operate the valve through its 90-degree rotation. (Refer to AIR CYLINDER.)

PM. (Refer to PARTICULATE MATTER.)

PMAC. (Refer to POLYMER-MODIFIED ASPHALT CEMENT.)

POLYMER. Any of numerous natural and synthetic compounds of usually high molecular weight consisting of up to millions of repeated linked units, each a relatively light and simple molecule. When polymer is mixed with asphalt cement, the mixture is known as PMAC or polymer modified asphalt cement. Rubber and plastic are polymers commonly used to produce modified asphalt.

Rubber is an elastomer and includes natural latex, synthetic latex, block copolymer, and reclaimed rubber. Examples are natural rubber, styrene-butadiene-rubber (SBR), styrene-butadiene-styrene (SBS) and recycled tires. (Refer to STYRENE-BUTADIENE-RUBBER and STYRENE-BUTADIENE-STYRENE.)

Plastic polymers include polyethylene, polypropylene, ethyl-vinyl-acetate (EVA), and polyvinyl chloride (PVC).

POLYMER-MODIFIED ASPHALT CEMENT. (PMAC) Asphalt cement that has been modified by the addition of a polymer, such as SBS or ground tire rubber. (Refer to STYRENE-BUTADIENE-RUBBER, STYRENE-BUTADIENE-STYRENE, and GROUND TIRE RUBBER.)

PORTABLE ASPHALT FACILITY. A facility that has its major components built onto one or more chassis equipped with wheels and some form of suspension system. Each chassis can be towed from one location to another over public highways by a conventional fifth-wheel tractor. (Refer to [FIFTH WHEEL](#).) Many portable components are self-erecting and do not require a crane to set up. Each major component is prewired. At the plant site the components interconnect with rubber jacketed electrical cables furnished with the equipment. (Refer to [SELF-ERECT](#).)

POSITIVE DISPLACEMENT PUMP. A type of pump that has an expanding cavity on the suction side and a decreasing cavity of the discharge side. Liquid flows into the expanding cavity and out of the decreasing cavity. Such pumps have a constant volumetric flow rate. The asphaltic concrete industry commonly uses a type of positive displacement pump known as a gear pump. (Refer to [GEAR PUMP](#).)

POST-DRUM MIXER. (Refer to [TWIN SHAFT MIXER](#).)

POWER CENTER. (Refer to [MOTOR CONTROL CENTER](#).)

POWER PANEL. A metal panel that encloses parts used to control and distribute electrical power to an asphaltic concrete facility or one of its major units. Power panels may be installed in the motor control center, control house or mounted on key components depending on the facility configuration. (Refer to [CONTROL HOUSE](#) and [MOTOR CONTROL CENTER](#).)

POWER SUPPLY. An electrical component used to power an electrical device by converting energy from one form to another, typically alternating current (AC) to direct current (DC). An uninterruptible power supply (UPS) is a device capable of providing nearly instantaneous power should the main power source fail. They contain batteries to power critical components until they can be properly shut down or the main power is restored to prevent data loss.

PRESSURE DROP. A decrease in pressure between two points in a current of air (or fluid) caused by resistance to flow.

PRIMARY AIR. For open-fired burners, the part of the combustion air that enters through the burner, atomizes the fuel and combines with it during combustion. (Refer to [OPEN-FIRED BURNER](#) and [SECONDARY AIR](#).)

PRODUCTION RATE. The process output of a component or facility, usually expressed in tons per hour (tph) for aggregates and asphalt mix. (Refer to [GAS FLOW RATE](#) for comparison.)

PROCESS VARIABLE. Actual temperature, level, pressure, flow, etc. that is produced. (Refer to [SETPOINT](#).)

PROGRAMMABLE LOGIC CONTROLLER. (PLC) A small electronic processor that can be programmed to automate controls. It has a wide variety of applications. PLCs can be used to automate production of hot mix at asphaltic concrete plants or virtually any portion of the process. They can also be used to automate a polymer blending process. PLCs provide an economical alternate to a conventional desktop computer system, especially for processes where such a computer is not warranted.

PLCs have modular construction allowing the addition of modules to suit the application. Various modules provide a wide selection in the number of inputs and outputs and whether they are analog or digital.

Each PLC must be programmed for its application. It is usually programmed by a systems engineer and has no provisions for program changes by operators in the field. However, a systems engineer can alter old programs and send new software to users in the field where operators can implement the new program.

PUGMILL. A colloquial term for a single or twin shaft mixer. A pugmill can be freestanding or part of a batch tower. (Refer to [BATCH MIXER](#), [COATER](#) and [TWIN SHAFT MIXER](#).)

PULLEY. Used to drive conveyor belts and to change the angle or direction that the conveyor belt is traveling. Pulleys are used on the head and tail ends of belt conveyors and belt feeders to terminate the length of the conveyor and redirect the direction of travel for the belt. The head pulley is usually the belt driver and material discharges at this end. The tail pulley is often movable as a means to control belt tension. Pulleys are also used on longer belt conveyors as a gravity take-up device, located at an intermediate position, to maintain belt tension. (Refer to [BELT CONVEYOR](#).)

RADIAL JOINT. A joint around the outer circumference of a cylinder, usually where two cylindrical ends are joined. A radial joint is at right angles to the length of the cylinder.

RAKE-OUT FLIGHTS. Discharge flights. (Refer to FLIGHTS.)

RAKE-OUT RINGS. Rings that prevent material from accumulating in the ends of the mixing chamber of the Double Barrel mixer. (Refer to MIXING CHAMBER.)

The one at the burner end catches any dried aggregate that went the wrong way after emerging from discharge ports in the inner drum and diverts it back into the main flow of material.

The one at the other end of the mixer catches any mix that misses the discharge port and diverts it back to the discharge port.

RAM. (Refer to RECLAIMED AGGREGATE MATERIAL.)

RAP. (Refer to RECLAIMED ASPHALT PAVEMENT.) (RAP is sometimes erroneously interpreted to mean recycled asphalt product, which could refer to reclaimed asphalt pavement or recycled asphalt shingles.)

RAP BINS. Bins used in an asphaltic concrete facility to hold RAP and feed it to conveyors, which take it to screens and on to the mixer. Oversized material rejected from the screen may be sent to a lump breaker for resizing. (Refer to RECLAIMED ASPHALT PAVEMENT and LUMP BREAKER.)

RAS. Recycled asphalt shingles.

RECLAIMED AGGREGATE MATERIAL. (RAM) Recycled pavement materials containing no reusable binding agent. (Refer to BINDER.)

RECLAIMED ASPHALT PAVEMENT. (RAP) Asphalt paving material recovered from old road beds either by milling or excavation by ripping. It includes aggregate as well as reusable binding material. (Refer to BINDER.)

RAP produced by milling can be hauled to the asphalt plant and recycled by adding it directly to virgin asphaltic concrete. RAP produced by excavation is usually in the form of large chunks, which must be crushed before it can be used at the asphalt plant. (Refer to LUMP BREAKER.)

RECYCLE. When used as a verb, recycle means to reuse. When used as a noun, recycle is jargon for RAP or RAS. (Refer to RECLAIMED ASPHALT PAVEMENT and RAS.)

RECYCLED MATERIAL. Commonly used to mean RAP, but could also mean RAM or RAS. (Refer to RECLAIMED ASPHALT PAVEMENT, RECLAIMED AGGREGATE MATERIAL, and RAS.)

RECYCLING. Reuse of RAP in construction of new roadways and other structures. (Refer to RECLAIMED ASPHALT PAVEMENT.)

REFRACTORY. A fire-resistant brick or material commonly used to line the inside of a combustion chamber or the area surrounding a burner. Refractory linings are sometimes used to increase the combustion efficiency of a burner. Improved combustion efficiency decreases the amount of combustion by-products, thereby reducing unwanted emissions. (Refer to BURNER and COMBUSTION CHAMBER.)

RELOCATABLE ASPHALT FACILITY. A transportable facility that has fixed steel foundations built into its major components. The components are set up with the steel foundations or skids resting directly on the ground without the use of concrete foundations. (Refer to STEEL FOUNDATION.) The units can be transported from one location to another over public highways on flat bed trailers pulled by a conventional fifth-wheel tractor. Cranes are usually required for erection. (Refer to FIFTH WHEEL.) Each major component is pre-wired. At the plant site the components interconnect with rubber jacketed electrical cables furnished with the equipment.

A relocatable facility provides the advantages of both a stationary and portable facility. (Refer to PORTABLE ASPHALT FACILITY and STATIONARY ASPHALT FACILITY.)

RESIDENCE TIME. (Also known as dwell time.) The average time required for a material to pass through an enclosed space, or to complete the stage of a process. (Refer to DWELL TIME.)

RETAINING WALL. A structural reinforcement (made of steel, stone, concrete or wood) used to prevent collapse and erosion of an earthen or aggregate embankment.

ROLLER. Cylindrical wheels used in roller chain, roller bearings or as trunnions. (Refer to ROLLER CHAIN, ROLLER BEARING and TRUNNION.)

ROLLER BEARING. A type of bearing that carries a load on cylinders or spherical-shaped rollers located between two bearing rings called races. Some types of roller bearings have tapered rollers. Different applications impose different types of loads (thrust or radial or a combination of the two) on the bearing and this governs which type of bearing should be used. (Refer to SPHERICAL ROLLER BEARING.)

ROLLER CHAIN. Type of drive chain that is distinguished by the addition of a barrel sleeve (roller) surrounding a stationary bushing that articulates around a stationary pin and freely rotates, thereby reducing friction and wear between the load transmitting components of the sprocket and chain. (Refer to CHAIN.)

ROTARY AIRLOCK. (Refer to ROTARY VANE FEEDER.)

ROTARY VANE FEEDER. (Also known as airlock or rotary airlock.) A type of regulating valve used in material transfer for baghouse fines, lime or other types of powder-like material. The feeder has rotating vanes that move the material through the device without allowing air to flow with it, even where there is differential air pressure on either side of the valve.

R-VALUE. A measure of the ability of a material, such as insulation, to resist or impede heat flow. Increasing values denote greater resistance to flow. R-value is the most common number used to compare the insulating properties of various materials. It is typically marked on the wrapper or container of the material. The R-value per inch of thickness is the reciprocal of heat conductance (**K**), which is the ability of a material to conduct heat flow. Thus, the R-value is equal to one divided by **K**. (Refer to HEAT CONDUCTANCE.)

For example, a fiberglass batt 1 in thick has a **K** value of 0.30. One divided by 0.30 gives an R-value of 3.33. For a thickness of 6 in multiply the 1 in R-value by six, which gives an R-value of 19.99. For a thickness of 12 in multiply the 1 in R-value by 12, which gives an R-value of 39.96.

SADDLE CHAIN DRIVE. A type of roller chain drive system commonly used to rotate a dryer or drum mixer. The entire chain runs under the drum and makes a loop around two sprockets, a drive sprocket and an idler sprocket. The upper half of the loop engages another sprocket, which encircles the drum. (Refer to DRYER and DRUM MIXER.)

SAMPLING VALVE. A special type of valve that enables an operator to easily take samples of liquid from a tank. They are often used on liquid asphalt storage tanks. In a horizontal asphalt tank the valve is usually installed in one end, about 24 in above the bottom. In a vertical asphalt tank, it is installed in the side, about the same height above the bottom. Sampling valves for use with asphalt tanks are usually manually operated and feature a screw stem operated by a hand crank. They are virtually clog-free because of the way the valve is designed and mounted in the tank. (They do not need a hot oil jacket.) Moreover, they are usually leak-free and provide free-flow. (Refer to JACKETED ASPHALT VALVE.)

Gate valves and other types of valves are sometimes used for taking asphalt samples, even though such valves are not designed for sampling. They often clog and require use of a torch to heat them and their connections to get the material to flow. But valves specifically designed for sampling virtually eliminate the hazards and difficulty associated with valves not designed for that purpose. (Refer to GATE VALVE.)

SBR. (Refer to STYRENE-BUTADIENE-RUBBER.)

SBS. (Refer to STYRENE-BUTADIENE-STYRENE.)

SCALPING SCREEN. A vibrating wire mesh screen which passes material small enough to go through the spaces between the wires and ejects oversized material and large foreign objects (trash). (Refer to BAR GRIZZLY for comparison.)

SCAVENGER COILS. Usually, the coils in a direct-fired tank that scavenge heat from the heated asphalt as a means of providing heat transfer oil to other equipment. (Refer to DIRECT-FIRED TANK and THERMAL FLUID.)

SCR. (Refer to SILICON-CONTROLLED RECTIFIER.)

SCRAPER BLADE. Normally used on the head pulley of a conveyor to clean the belt. Sometimes a brush is used instead. (Refer to BELT CONVEYOR.)

SCREEN DECK. A platform that contains a screen used to separate materials. Cold feed scalping screens normally use one or two screen decks. RAP scalping screens normally use only one. Batch towers use multiple decks to separate combined aggregates into a specified number of gradations. (Refer to SCALPING SCREEN.)

SCREEN MESH SIZES. (Refer to MESH NUMBERS.)

SCREW CONVEYOR. A conveyor with a helical screw (auger) that rotates in a close-fitting housing or trough. It is used mainly to convey dust, lime or other fine material.

SCRUBBER. Air pollution control device that uses water to wash pollutants from a gas stream. This term can also refer to a control system that injects a dry reagent or slurry into the dirty gas stream to remove acidic gases.

Wet scrubbers were commonly used to remove dust particles from the gas stream of the aggregate drying processes. The slurry of dust and water were discharged directly into a retention pond or sent to a collection chamber for water separation. Recovered water could be reused in the scrubber while the agglomerated dust particles were discharged into a retention pond. The dust particles sink to the bottom to form a sediment. Water may be reclaimed from the pond for use in the scrubber. The sediment is not reused to make asphaltic concrete.

In a modern asphaltic concrete facility, scrubbers have largely been replaced by baghouses. Baghouses are more efficient with less environmental impact. Depending upon the mix design, some or all of the baghouse dust or fines can be used in the mix, which is a significant economical advantage. (Refer to BAGHOUSE.)

SECONDARY AIR. The portion of combustion air drawn into the combustion chamber by the system exhaust fan around the heat shield of an open-fired burner. Most of this air is needed to attain complete or stoichiometric combustion. (Refer to COMBUSTION CHAMBER and PRIMARY AIR.)

SEGMENTED SPROCKET. A sprocket that is made in several pieces to facilitate replacement. The sprockets in drag conveyors are usually segmented sprockets, allowing replacement of worn segments while the drag chain remains in place. (Refer to DRAG CONVEYOR and DRAG CHAIN.)

SEGREGATION. An unwanted separation of larger sized aggregate from smaller sized aggregate after the aggregates have been mixed with each other. Segregation usually occurs as a result of moving mixed material from one place to another. When mixed material flows into a pile, the larger pieces tend to roll off the top of the pile to one side while the smaller pieces remain near its center. Special techniques are used to reduce segregation.

SEISMIC. A word often used in connection with building codes that apply to structures at an asphaltic concrete plant to denote the amount of earthquake activity they can withstand without damage.

SELF-ERECT. A term indicating the way in which units of some asphaltic concrete facilities are set up for operation. It means that the unit incorporates mechanisms that erect the unit without the need for cranes. (Refer to PORTABLE ASPHALT FACILITY.)

SENSOR. A device that receives and responds to certain stimuli or conditions. It usually produces or controls an electrical signal that activates other controls or indicators. Several types of sensors are used at asphaltic concrete plants. A thermocouple is a type of sensor used to measure temperature. A photoelectric cell is a type of sensor that reacts to light. A pressure switch is a sensor that reacts to air or fluid pressure. An O₂ sensor measures the amount of oxygen in a gas stream. (Refer to THERMOCOUPLE.)

SERPENTINE COIL. A piece of pipe curved back and forth along its length creating a form resembling a serpent. Serpentine coils are commonly used for heating in asphalt storage tanks and in some hot oil heaters. The coil is sometimes finned to increase its heat conducting surface area. (Refer to HEAT EXCHANGER, HELICAL COIL, HOT OIL HEATER, and FINNED PIPE.)

SETPOINT. The optimum or desired value of the temperature, level, pressure, flow, etc. that a control system is set to produce. This value may differ from the value that the system actually produces or the process variable (pv). The difference between process variable and the setpoint is known as the deviation. For example, if a system is set to produce a temperature of 325°F (the setpoint) and it actually produces a temperature of 330°F (the process variable), the deviation is 5°F. (Refer to PROCESS VARIABLE and DEVIATION.)

SETTLING CHAMBER. A large chamber with a hopper bottom used to remove large particles from the process air stream. The upstream air duct abruptly enters an enlarged space resulting in a decreased velocity of the air flow. The effects of gravity on the larger particles can thus overcome the effects of air pressure due to velocity, and the larger particles drop out of the air stream to be collected in the bottom hopper. At some farther location, the air stream abruptly enters a reduced (previous) size duct to resume downstream travel. (Refer to INERTIAL SEPARATOR.)

SHIM. A shim is a thin part, usually sheet metal, used to increase the height (thickness) of a supporting base. Alternately, used to fill a gap between two joined parts.

SHINGLES. Roofing material containing asphalt materials that can be recycled for use in asphaltic concrete. (Refer to RAS.)

SHIPPING CONTAINER. A large, reusable steel container used to ship various products via different modes of transport (rail, ship, truck) without unloading. (Refer to TANK CONTAINER.)

SHRP. (Refer to STRATEGIC HIGHWAY RESEARCH PROGRAM.)

SIGHT GLASS. A glass tube or lens used to indicate the level of liquid in a tank. It is mounted adjacent to the tank or through the wall of the tank and is piped to the tank in such a way that the liquid level visible in the sight glass is at the same level as the liquid in the tank.

SILENCER. A device used at an asphaltic concrete plant to limit noise propagated by burners, fans or other components. (Refer to NOISE CONTROL.)

SILICON-CONTROLLED RECTIFIER. (SCR) A solid-state electrical device that controls the amplitude of current or voltage in an alternating current circuit. In asphaltic concrete facilities, belt feeder drives have SCRs to control magnetic clutches. The SCR is controlled by an independent control circuit. (Refer to BELT FEEDER and EDDY CURRENT.)

SILO. A tall, cylindrical structure for holding asphaltic concrete or materials used in making asphaltic concrete, such as lime or baghouse fines. (Refer to BAGHOUSE FINES and STORAGE SILO.)

SINGLE-PASS FIRE TUBE. A type of fire tube in a direct-fired asphalt storage tank. A single-pass fire tube runs the length of the tank. It has an exhaust stack on the opposite end of the tank from the burner. Thus, the burner gasses travel the length of the tank once before passing out of the exhaust stack. (Refer to DIRECT-FIRED TANK and TWO-PASS FIRE TUBE.)

SKID. A rectangular structural steel framework that supports multiple parts that make up a major unit of a relocatable or stationary facility. Some parts mount directly on the framework without the use of legs. (Refer to LEGS and STEEL FOUNDATION.)

On relocatable facilities, the framework rests directly on the ground. Its load bearing surfaces are large enough to keep ground loading to no more than 2500 lbs/ft², a load easily supported by most compacted soils. (Refer to RELOCATABLE ASPHALT FACILITY.)

On stationary facilities, the framework rests on concrete foundations. Consequently, its load bearing surfaces are smaller than those on a relocatable unit. (Refer to STATIONARY ASPHALT FACILITY.)

Hot oil heaters and their associated equipment are commonly mounted on skids. (Refer to HOT OIL HEATER.)

SLAT CONVEYOR. (Refer to DRAG CONVEYOR.)

SLINGER FEEDER (CONVEYOR). An aggregate conveyor that is operated at higher than normal speed, causing it to sling the material directly into the drum of a dryer. It is sometimes used instead of a gravity feed chute in areas where the aggregate is usually wet and sticks to gravity chutes. (Refer to GRAVITY CHUTE.)

SMA. (Refer to STONE MASTIC (MATRIX) ASPHALT.)

SOCK FILTER. A fine mesh fabric filter used to remove impurities and debris from hot oil and recycled fuel oil lines. Sock filters are very effective and are highly recommended for use with hot oil heaters to protect the hot oil pump. They are especially recommended for new installations and when replacing an old heater with a new one. (Refer to HOT OIL HEATER and THERMAL FLUID.)

SOUND. A pressure disturbance that propagates through a medium and is detectable by the human ear.

SOUND LEVEL METER. An instrument for measuring sound pressure levels. The instrument is usually calibrated in decibels. Sound level meters are often used to measure sound pressure levels at asphaltic concrete plants to determine whether the plant complies with noise ordinances and hearing standards. (Refer to SOUND PRESSURE LEVEL, CALIBRATE, and NOISE ORDINANCES.)

SOUND PRESSURE LEVEL. (SPL) The ratio of absolute sound power to a reference level, typically the threshold of hearing, which is the lowest intensity sound detectable by the human ear. A source generates sound power, which is the total sound energy radiated and measured in all directions from the source. Sound pressure is the pressure we hear caused by the sound power of the source. Sound power levels (SWLs) are independent of the environment. Sound pressure levels are dependent on distance from the source and the acoustic environment in which the sound is generated. SPLs are typically measure in decibels (dBs). (Refer to DECIBEL.)

SPECIFIC HEAT OF ASPHALT. The amount of heat expressed as 0.5 BTU/lb°F that is required to raise the temperature of one pound of asphalt cement 1°F. (Refer to BRITISH THERMAL UNIT.)

SPHERICAL ROLLER BEARING. A type of bearing with rollers that have a spherical surface instead of a straight cylinder, as on a conventional roller bearing. Spherical bearings are used in pugmills and other heavy-duty applications, where fore-and-aft thrust and radial loads are encountered. (Refer to ROLLER BEARING and PUGMILL.)

SPL. (Refer to SOUND PRESSURE LEVEL.)

SPROCKET. A rotating gear that engages with a chain to guide the chain and to transmit power. Sprockets have teeth that are spaced on a pitch (chord distance) that matches the pitch length of the required chain. Sprockets may drive the chain (driving) or be driven by the chain (driven). Two or more sprockets with different quantity of teeth may be combined to achieve the desired speed of rotation for the driven shaft. (Refer to CHAIN.)

STACK. (Refer to EXHAUST STACK.)

STARTER. A starter is a remote-controlled electrical device that connects electrical power to the motor. The starter incorporates a thermal overload switch that disconnects the motor in the event that the motor draws excessive current. A starter can be an across-the-line, a solid state starter, a wye-delta, etc. An across-the line starter energizes the motor with full voltage once the starter coil is energized. Reduced voltage starting like solid state starters, auto-transformer starting or wye-delta starting, starts motors through a series of steps in increasing voltage to run a motor and are typically used in larger motor applications.

STATIONARY ASPHALT FACILITY. A facility whose major components are designed to set on concrete foundations at the job site.

Major components can be transported from one location to another over public highways on flat bed trailers pulled by a conventional fifth-wheel tractor. However, major components of large facilities may have to be shipped as pieces or as sections. (Refer to FIFTH WHEEL.)

Cranes are required for erection. Although major components are prewired, interconnecting wiring is not usually furnished with the equipment, but is usually installed at the site and run in conduit. (Refer to PORTABLE ASPHALT FACILITY and RELOCATABLE ASPHALT FACILITY.)

STEEL FOUNDATION. A built-in structural steel base that supports all or part of a major unit of a portable or relocatable facility. Some steel foundations use steel plate as the load bearing surface whereas others use rectangular steel tubes. (Refer to RELOCATABLE ASPHALT FACILITY.)

Steel foundations have large bearing surfaces so as to keep ground loading to no more than 2500 lbs/ft², a load easily supported by most compacted soils. Thus, steel foundations eliminate the need for either supporting timbers or concrete foundations. (Refer to SKID for comparison.)

The foundations are joined to the structures of equipment they support via steel legs. Stationary asphaltic concrete facilities do not have built-in steel foundations. Their legs are normally set directly on concrete foundations. (Refer to LEGS.)

STOCKPILE. A pile of material, usually aggregate, RAP or RAS, used as an ingredient of asphaltic concrete. Stockpiles are usually created and maintained by dump trucks unloading material into piles on the ground. In most facilities, front-end loaders scoop up material from the stockpiles and empty it into either cold feed, RAP or RAS bins. (Refer to RECLAIMED ASPHALT PAVEMENT and RAS.)

STOICHIOMETRIC AIR. The exact amount of air needed for a chemically correct fuel-to-air ratio. This is the ratio capable of perfect combustion so that there is no unused fuel or air.

STONE MASTIC (MATRIX) ASPHALT. (SMA) A hot mix asphalt surfacing developed in Germany in the 1960s. This mixture is resistant to deformation, making it a durable pavement for heavily traveled roadways. It contains high coarse aggregate that interlocks to form a stone skeleton filled with a voidless mastic binder that resists permanent deformation. The stone skeleton is filled with a mastic of bitumen and filler to which fibers are added to provide adequate stability of bitumen and to prevent drainage of binder during transport and placement. Typical SMA composition consists of 70–80% coarse aggregate, 8–12% filler, 6.0–7.0% binder, and 0.3% fiber. (Refer to BINDER, BITUMEN and FILLER.)

STORAGE. Storage of asphaltic concrete usually means accumulating and holding it before use for a period of several days. (Refer to SURGE for comparison.)

STORAGE BIN. A term commonly used to mean the same thing as storage silo. Silo usually denotes a cylindrical structure, but the term bin may refer to structures of other shapes. (Refer to STORAGE SILO.)

STORAGE SILO. Although this term may refer to silos for storing a variety of materials, the word storage has special meaning. Storage means the ability to hold the material long term. Long term storage of asphaltic concrete means keeping it without deterioration for several days. Consequently, silos used for storing asphaltic concrete are heated and fully insulated, whereas silos used only for surge or storing unheated materials are not. (Refer to SURGE.)

STORAGE TANK. A tank for storing liquid used in the production of asphaltic concrete. Some liquids are ingredients of asphaltic concrete, such as asphalt cement and anti-stripping agents. Other liquids include fuel oil, used to fire the dryer, burner and hot oil heaters. (Refer to ANTI-STRIPPING AGENT, ASPHALT CEMENT, and FUEL OIL.)

STRAINER. A type of filter used to remove debris or foreign material either from hot oil or liquid asphalt. Strainers are used to protect pumps downstream from the filter. Strainers have a filter basket, either of perforated metal or wire mesh. A common mesh opening is $1/16$ in for hot oil and $9/64$ in for asphalt. (Refer to MESH NUMBERS and THERMAL FLUID.)

Y-strainer is the type most commonly used. In order to replace or clean the basket of a Y-strainer used in a hot oil line, it is necessary to shut down the heater and to shut off the line to the filter. (Refer to HOT OIL HEATER.)

A duplex strainer is another type of strainer sometimes used. It has two independent strainers and a valve that allows switching from one to the other. One can be serviced while the other operates, eliminating the need to shut down the system.

STRATEGIC HIGHWAY RESEARCH PROGRAM. (SHRP) A program led by the Federal Highway Administration to specify, test and design asphalt paving materials for highways in the United States. Testing under this program indicates that roads last remarkably longer when made with asphalt binders that incorporate modifiers. The SHRP also gave birth to a new system of grading asphalt cement or binders known as performance-grading. The use of modified asphalt has begun to increase significantly in the United States and is due mainly to the SHRP. (Refer to BINDER, MODIFIED ASPHALT, and PERFORMANCE-GRADED.)

STRIPPING. A defect that may occur in asphaltic concrete. It is a weakening or loss of adhesive bond between the aggregate surface and the asphalt cement caused by the interaction of moisture. Additives known as anti-stripping agents are often used to improve the bond, making the mix less susceptible to stripping. (Refer to ANTI-STRIPPING AGENT.)

STRUCK. A term used in connection with the capacity of a bin (struck capacity) to mean the capacity of the bin with material filled to its top edges, and material near its center struck or made even with the edges. (Refer to HEAPED for comparison.)

STYRENE-BUTADIENE-RUBBER. (SBR) A polymer that is often mixed with asphalt cement to produce modified asphalt. (Refer to POLYMER-MODIFIED ASPHALT CEMENT.)

STYRENE-BUTADIENE-STYRENE. (SBS) A polymer or common synthetic rubber that is capable of withstanding high temperatures and extreme tearing forces. It is often mixed with asphalt cement to produce modified asphalt. (Refer to POLYMER-MODIFIED ASPHALT CEMENT.)

SUPERPAVE. The name of a system developed by the Strategic Highway Research Program (SHRP). The Federal Highway Administration developed and validated Superpave specifications and test procedures and initiated a national program to encourage the adoption of the Superpave system. The Superpave system primarily addresses two pavement distresses: permanent deformation, which results from inadequate shear strength in the asphalt mix; and low temperature cracking, which is generated when asphalt pavement shrinks and the tensile stress exceeds the tensile strength. (Refer to STRATEGIC HIGHWAY RESEARCH PROGRAM.)

SURGE. A rapid increase in the volume of material in a container caused when the rate of the material coming into the container exceeds the rate of the material going out of the container.

SURGE BIN. A bin for accumulating and containing surges of asphaltic concrete for short periods of time without having to stop production. Surge bins facilitate faster loading of trucks and improve plant efficiency. However, surge bins are not intended for long term storage and must be emptied before the mix loses its ability to flow. (Refer to STORAGE BIN for comparison.)

SURGE POT. A small vessel for accumulating surges of dust or other fine material to provide a reserve of the material and to help maintain a constant flow in its system.

SWING HAMMER. A component in a hammermill. (Refer to IMPACT CRUSHER.)

TACHOMETER. A device that encodes electrical signals to indicate the rpm (revolutions per minute) that a shaft is rotating. Tachometers are used on belt feeders and conveyor belts. Output from a tachometer is combined with output from load cells to indicate feed rate. (Refer to BELT CONVEYOR, BELT FEEDER, and LOAD CELL.)

TACKLE BLOCK. (Refer to WIRE ROPE SHEAVES.)

TANK CONTAINER. A container used to transport liquids, gases, and powders as bulk cargo via different modes of transport (rail, ship, truck) without unloading. (Refer to SHIPPING CONTAINER.)

TELESCOPING LEGS. Legs that are adjustable in length. Major components of portable asphaltic concrete facilities come with telescoping legs that attach to steel plate foundations. When portable units are furnished without steel plate foundations the legs have pads intended to rest on the concrete or supporting timbers. (Refer to LEGS and PORTABLE ASPHALT FACILITY.)

TERTIARY AIR. The portion of combustion air for some total-air burners that is supplied by a tertiary fan and is the equivalent to the secondary air of an open-fired burner. (Refer to SECONDARY AIR and OPEN-FIRED BURNER.)

THERM. The amount of fuel required to produce 100,000 BTU. It takes approximately 0.756 gal of No. 2 fuel oil at LHV to produce one therm. It takes approximately 110.497 ft³ (1.1049 CCF) of natural gas at LHV to produce one therm. Suppliers of natural gas may bill their customers either by the hundred cubic feet (CCF) or by the therm. It is important to note that natural gas suppliers normally calculate a therm based on the HHV of natural gas, which is approximately 96.154 ft³ (0.961 CCF) per therm. (Refer to BRITISH THERMAL UNIT, LOWER HEATING VALUE, and HIGHER HEATING VALUE.)

THERMAL FLUID. (Also called heat transfer oil.) A special fluid used to transfer heat in heating systems for asphaltic concrete facilities. In a typical application, a fired heater heats coils of metal pipe through which the fluid flows. The fluid absorbs heat from the pipe. The fluid circulates to remote equipment through insulated lines that minimize heat loss. As the fluid circulates through the equipment its heat is transferred to the equipment and material inside it. (Refer to HOT OIL HEATER.)

THERMAL RADIATION. The transfer of thermal energy (heat) by means of electromagnetic radiation produced when burning fossil fuels. The key role of radiation in a helical coil heater is that of heating the coil surfaces that directly face the burner flame. The radiant energy and convection heats the coil surfaces, even though the actual flame does not impinge the surfaces. (Refer to HELICAL COIL HEATER, CONDUCTION, and CONVECTION.)

THERMOCOUPLE. A device used in the measurement of temperature. A thermocouple usually consists of two wires of dissimilar metals joined at one end. Heating the joint causes it to produce a small voltage that is in proportion to the temperature.

THRUST ROLLERS. The roller at each end of a dryer to constrain any fore-and-aft movement of the drum. They are also used on the drums of drum mixers. (Refer to DRYER and DRUM MIXER.)

TICKET WINDOW. A window in the control house of an asphaltic concrete facility. The window enables facility operators to pass tickets to truck drivers while they remain in their trucks after they receive a load of asphaltic concrete. (Refer to CONTROL HOUSE.)

TIRE. A large steel ring used on dryers and drum mixers. Two tires are used to support the drum. They encircle the drum and are attached to it by a series of spokes. Each tire rides on two trunnions, one on each side of the frame. (Refer to DRYER, DRUM MIXER, and TRUNNION.)

TONS PER HOUR. (TPH) Describes the rate at which a certain weight is moved in a certain period of time. Unless noted otherwise, a ton in Astec publications refers to a short ton (2000 lbs).

TPH. (Refer to TONS PER HOUR.)

TRACTION WHEEL. A rotating steel wheel with a flat-faced rim that engages with a chain to guide the chain and to transmit power. Commonly used in bucket elevators. The chain must be a roller-less type to gain traction when wrapped around the rim. The power that can be transmitted by a traction wheel is less than the capacity of a sprocket and limited by the number of chain-pin barrels that contact the rim face to develop friction resistance (traction). The diameter of the rim face is sized to achieve the desired chain speed based on the rotation speed (rpm) of the driving shaft. (Refer to BUCKET ELEVATOR and ROLLER CHAIN.)

TRAVERSE CONVEYOR. Traverse conveyors are drag conveyors that operate horizontally. One or more traverse conveyors are used atop multiple storage silos to selectively transfer asphaltic concrete from the single inclined drag conveyor to various silos. (Refer to DRAG CONVEYOR.)

TRUCK SCALE. A weighing platform for weighing trucks before and after they are loaded with asphaltic concrete.

TRUNNION. A steel roller used to support dryers and drum mixers. Two trunnions support each tire. (Refer to DRYER and DRUM MIXER.)

TWIN SHAFT MIXER. A machine that uses two mixing shafts with paddles to mix ingredients of hot or warm mix asphalt. Twin shaft mixers have timing gear boxes that rotate the two shafts in opposite directions. (Refer to COATER and PUGMILL.)

TWO-PASS FIRE TUBE. A type of a fire tube in a direct-fired asphalt storage tank. A two-pass fire tube runs the length of the tank and doubles back towards the burner. It has an exhaust stack on the same end of the tank as the burner. Thus, the burner gasses travel the length of the tank twice before passing out of the exhaust stack. A two-pass fire tube is much more efficient than a single-pass fire tube. (Refer to DIRECT-FIRED TANK, EXHAUST STACK, and SINGLE-PASS FIRE TUBE.)

UHMW. Ultra-high molecular weight. (Refer to ULTRA-HIGH MOLECULAR WEIGHT POLYETHYLENE.)

ULTRA-HIGH MOLECULAR WEIGHT POLYETHYLENE. A special polyethylene material sometimes used as a liner for cold feed bins to enhance the flow of material from the bin. The material has very little sliding resistance and has good wear resistance.

UNLOADING PUMP. A pump used to transfer liquid asphalt from the tank of a delivery truck to a storage tank at an asphaltic concrete facility. On portable plants the pump is usually mounted on the gooseneck of a portable storage tank. On relocatable plants the pump is usually mounted on the same skid as the hot oil heater. On stationary plants the pump is usually independently mounted at a location that will conveniently serve two or more storage tanks. (Refer to STORAGE TANK, GOOSENECK, SKID, HOT OIL HEATER, PORTABLE ASPHALT FACILITY, RELOCATABLE ASPHALT FACILITY, and STATIONARY ASPHALT FACILITY.)

The pumps used are usually positive-displacement gear pumps. They range in size from 3–5 in, providing 200 to 450 gpm, respectively. The time it takes to unload tanker trucks delivering liquid asphalt cement to an asphaltic concrete facility depends upon the size of the unloading pump and connecting lines.

UPS. Uninterruptible power supply. (Refer to POWER SUPPLY.)

UPSTREAM. A reference to the preceding direction from which something is flowing. Alternately, the source or point of origin from which something has come. In a closed circuit hot oil system, a positive displacement pump is the upstream source of oil-flow transferring heat to downstream components. (Refer to DOWNSTREAM and POSITIVE DISPLACEMENT PUMP.)

VARIABLE SPEED DRIVE. An electric variable frequency drive (VFD) with adjustable output speeds. Typically an electric motor with an adjustable electronic controller that varies the frequency of the alternating current (AC) to change the output speed (rpm) of the motor shaft.

VEIL. The effect produced when aggregate is picked up by flights in a dryer and showered through its hot gas stream. The ideal drying condition is produced when the veil stretches across the whole cross section of the drum. (Refer to DRYER.)

VENT. An opening through which air and gases can escape to relieve a buildup of pressure. Vents are commonly used in several components of an asphaltic concrete facility, such as asphalt storage tanks and silos.

VENT CONDENSER. A heat exchanger used on tanks of heated asphalt cement to minimize air pollution. It condenses gas vapors, commonly known as blue smoke, produced by heating light ends (volatile organic compounds) often present in the liquid asphalt cement. Condensers used on asphalt storage tanks usually have a number of tubes with external fins. The tubes are cooled by ambient air circulating around the fins. Thus, gases exiting the tank are cooled as they flow through the tubes. Condensing the vapors turns them into a liquid state wherein they return to the liquid asphalt cement instead of escaping into the atmosphere through the tank vents or exhaust stack. (Refer to EMISSIONS, BLUE SMOKE, LIGHT OILS, VOLATILE ORGANIC COMPOUND, FINNED PIPE, and EXHAUST STACK.)

VERTICAL ASPHALT TANK. A cylindrical tank used at an asphaltic concrete facility to heat and store asphalt cement. The tank is installed so that its long axis is vertical and it occupies a ground area only the size of its diameter. Another advantage is that the surface of asphalt cement in the tank has a smaller area than the same amount of liquid in a horizontal tank. Thus, there is less oxidation of the asphalt cement. Moreover, the liquid in vertical tanks has better flow patterns than in horizontal tanks when mixers are installed to keep polymers in suspension. However, vertical tanks are less suited for portable tanks than horizontal tanks. (Refer to HORIZONTAL ASPHALT TANK and POLYMER-MODIFIED ASPHALT CEMENT.)

VERTICAL CURVE CONVEYOR. A belt conveyor sometimes used in a cold feed system to serve as both a collecting conveyor and inclined conveyor. The belt at the low end of the conveyor is horizontal and runs under the feeder belts of the cold feed bins. The belt extends horizontally for short distance and then turns upward. (Refer to BELT CONVEYOR, COLLECTING CONVEYOR, and INCLINED CONVEYOR.)

The upward turn may be as a radius (a true vertical curve.) Or the turn may take the form of two angular changes of direction to simulate a vertical curve. The conveyor usually empties onto a scalping screen or onto another conveyor. (Refer to SCALPING SCREEN.)

VERTICAL CYCLONE. (Refer to CYCLONE.)

VIBRATOR. A device used on bins and inlet chutes of dryers and drum mixers to prevent material from sticking to them. (Refer to BIN, DRYER and DRUM MIXER.)

VIRGIN AGGREGATE. Aggregate not previously used in paving products. (Refer to RECLAIMED AGGREGATE MATERIAL and RECLAIMED ASPHALT PAVEMENT for comparison.)

VIRGIN ASPHALT. Asphalt cement that has not been modified by additives or contaminants. (Refer to MODIFIED ASPHALT.)

VOC. (Refer to VOLATILE ORGANIC COMPOUND.)

VOLATILE ORGANIC COMPOUND. (VOC) Hydrocarbons with high vapor pressures and low boiling points that readily vaporize at room temperature. They are highly regulated due to their participation with NO_x in the formation of ground-level ozone, or smog. Such compounds typically are not acutely toxic but can cause long-term health issues due to repeated or prolonged exposure. (Refer to EMISSIONS, HYDROCARBON, and NITROGEN OXIDES.)

WARM MIX ASPHALT. (WMA) Pavement material that has been mixed at a lower temperature. Cools more slowly, allowing successful use in lower temperatures.

WMA technologies reduce the viscosity of the asphalt binder with additives (water-based, organic, chemical, or hybrids) so that asphalt aggregates can be coated at lower temperatures. (Refer to BINDER and HOT MIX ASPHALT.)

WASTE. A process that removes something excess, unwanted or unsuitable for use. Alternately, the substance that has been removed by the waste process. Excess fines captured by the baghouse are often wasted (unused), but also may be sold to facilities that have a need of fine material. Contaminated asphalt products are usually deposited in a waste stockpile. (Refer to BAGHOUSE FINES.)

WATER COLUMN. (WC) An indication of the amount of suction (negative pressure) produced by a fan or other device that produces a pressure differential. Usually expressed as a measure of inches that a column of water inside a glass tube is raised, above a static level, due to the pressure differential.

WC. (Refer to WATER COLUMN.)

WEIGH BATCHER. (Refer to BATCHER.)

WEIGH HOPPER. A hopper used to weigh hot aggregates in a batch tower before the aggregate is dropped into a pugmill for mixing. The hopper is mounted on load cells. (Refer to BATCH TOWER, PUGMILL, HOPPER, and LOAD CELL.)

WEIGH IDLER. A part of a belt scale. (Refer to BELT SCALE and IDLER.)

WEIGH POT. A pot used to weigh liquid asphalt cement in a batch tower before the cement is dropped into a pugmill for mixing. The pot is mounted on load cells. (Refer to BATCH TOWER, PUGMILL, and LOAD CELL.)

WET MIXING TIME. (Refer to MIXING TIME.)

WET SCRUBBER. (Refer to SCRUBBER.)

WIRE ROPE SHEAVES. Used as idlers to carry a moving load in the asphalt plant. Multiple sheaves mounted in a unitized block frame, are used to create a multiple-strand device called a tackle block. The multiple strands of rope developed by lacing a single continuous strand of rope through a matched pair of sheave blocks greatly increases the load capacity that can be carried. (Refer to IDLER.)

WMA. (Refer to WARM MIX ASPHALT.)

Trademarks

Following are trademarks held by Astec, Inc., CEI Enterprises, Inc., Heatec, Inc., and Telsmith, Inc. relating to products for asphaltic concrete production. Place a trademark symbol after the first instance of the trademark in your document. Always include the common name for the type of product immediately after the trademark, when written and spoken. Example: ACCU-SWIPE® aggregate sampler.

Registered

ACCU-SWIPE® AGGREGATE SAMPLER. Takes a full cross-sectional sample of aggregate from the conveyor belt without having to stop the belt. (Astec, Inc.)

BARRACUDA® COLLOID MILL. Colloid mill for asphalt emulsions. Mixes virgin asphalt with a water/chemical solution to produce a stable, homogenous material, either cationic or anionic. (Heatec, Inc.)

DOUBLE BARREL® DRYER/DRUM MIXER. A unique counterflow drum mixer capable of producing mix with up to 50% RAP content with no visible emissions. (Refer to COUNTERFLOW DRUM MIXER and RECLAIMED ASPHALT PAVEMENT.)

The Double Barrel mixer combines the functions of a dryer and a pugmill. It has a drum that rotates inside a stationary outer shell. The interior of the drum serves as a highly efficient counterflow dryer. The outside surface of the drum has mixing paddles affixed to it and functions as the rotating shaft of a large pugmill. The bottom half of the stationary outer shell functions as the pugmill housing. The mixing paddles pass through the materials, stirring and mixing them as they travel along the bottom of the shell. (Refer to DRYER and PUGMILL.)

Thus, the mixing takes place in a zone away from the hot gas stream of the dryer. The low oxygen atmosphere in the mixing zone minimizes oxidation of the mix. Long mixing times ensure that materials are blended uniformly and consistently. (Refer to MIXING CHAMBER and MIXING TIME.)

Virtually none of the drying heat is wasted into the atmosphere. Some of the heat is conducted through the drum walls to material that has reached the mixing zone. Moreover, the stationary shell is covered with three inches of fiberglass insulation to keep heat loss from the mixing zone to a minimum. Flexible end seals minimize air leakage. (Astec, Inc.)

DOUBLE BARREL GREEN® DRYER/DRUM MIXER. Combination aggregate dryer and drum mixer using a warm mix system for continuous mix and batch facilities. (Astec, Inc.)

FIRESTORM® WATER HEATER. Direct-contact water heater that heats water on demand for use in asphalt emulsions and for a variety of other industrial processes. Capacity up to 36 million BTU/hour. (Heatec, Inc.)

HEATEC®. Manufacturer of heaters, tanks and related products for a wide variety of industries. Heaters are used mainly for heating liquids and gases. Tanks are used mainly for mixing and storing liquids. A subsidiary of Astec Industries, Inc.

M-PACK® ASPHALTIC CONCRETE PRODUCTION FACILITY. Relocatable facility with a range of capacities from 200 to 600 tons per hour. (Astec, Inc.)

NOMAD® ASPHALTIC CONCRETE PRODUCTION FACILITY. Portable facility with capacities of 80 or 130 tons per hour. (Astec, Inc./Dillman Equipment, Inc.)

PHOENIX® BURNER. Burner used to dry aggregate in asphalt drum mixers and aggregate dryers. (Astec, Inc.) (Refer to [BURNER](#).)

Includes:

- Phoenix® Talon & Phoenix® Fury Burners—capable of burning natural gas, vaporized propane, #2 fuel, recycled fuel oil, and liquid propane
- Phoenix® Phantom Burner—capable of burning natural gas and vaporized propane
- Phoenix® Coal Burner—capable of burning coal, natural gas, vaporized propane, #2 fuel, recycled fuel oil, and liquid propane

PORTA-STOR® BINS. Metal storage bins for asphalt and metal tanks for liquid asphalt. (Astec, Inc.)

RECON® MONITOR SYSTEM. Computer hardware and software for an internet-accessible system for monitoring the operating status of equipment at facilities that store and distribute asphalt cement and at facilities that produce asphalt products for road construction and paving. (Heatec, Inc.)

REVERSE PULSE® BAGHOUSE SYSTEM. Filter bag cleaning system which uses a rotating nozzle assembly with timed indexing and fast acting air doors. (Astec, Inc./Dillman Equipment, Inc.) (Refer to [BAGHOUSE](#).)

SIX PACK® PORTABLE ASPHALTIC CONCRETE PRODUCTION FACILITY. Portable facility with capacities of 200, 300, and 400 tons per hour. Maximum drum diameter is 7 ft. Consists of six transportable loads. (Astec, Inc.)

STACKPACK® HEAT EXCHANGER. A unit that recovers and uses heat from heater exhaust gases to preheat thermal fluid entering the heater. (Heatec, Inc.)

SUPER SIX PACK® ASPHALTIC CONCRETE PRODUCTION FACILITY. Portable facility derived from the Six Pack Facility with a maximum drum diameter of 8 ft. (Astec, Inc.) (Refer to [SIX PACK PORTABLE ASPHALTIC CONCRETE FACILITY](#).)

THERMECON® HEATER. A thermal fluid heater for heating cargo on barges and other work boats. Typical applications include heating asphalt, heavy fuel, sulphur or phosphates. (Heatec, Inc.) (Refer to [THERMAL FLUID](#).)

THERMO-GUARD® TANK. A vertical tank for storage of asphalt cement. (Heatec, Inc.) (Refer to [ASPHALT CEMENT](#).)

TURBO SIX PACK® ASPHALTIC CONCRETE PRODUCTION FACILITY. Portable facility derived from the Six Pack facility with a maximum drum diameter of 7 ft 6 in. (Astec, Inc.)

UNIDRUM® DRYER/DRUM MIXER. The counterflow design of the Unidrum includes a drying section and a mixing section placed end to end within one (unified) drum shell. AC is introduced at the beginning of the mixing section. The Unidrum can produce 200 to 600 tons of mix per hour. (Astec, Inc./Dillman Equipment, Inc.) (Refer to [DRYER](#) and [DRUM MIXER](#).)

VALU-KING® INCLINE SCREEN. Vibrating screen designed for the aggregate, mining and recycle markets. (Telsmith, Inc.)

WHISPER JET® BURNER. Burner used to dry aggregate in asphalt drum mixers and aggregate dryers capable of burning natural gas, vaporized propane, #2 fuel, recycled fuel oil and liquid propane. (Astec, Inc.)

Unregistered

ASTEC™. Manufacturer of continuous and batch-process hot/warm-mix asphaltic concrete production facilities, wood pellet plants, soil remediation plants, and related equipment. A subsidiary of Astec Industries, Inc.

BCIII™ BURNER CONTROL SYSTEM. Constituent component of the complete PMIII Controls that can optionally be used for stand-alone burner control. (Astec, Inc.) (Refer to [PMIII](#).)

BC3300™ BASE BURNER CONTROL SYSTEM. Works with gas, oil, or LP burners. (Astec, Inc.)

BC3800™ BURNER CONTROL SYSTEM. Designed to work specifically with the Phoenix Talon series of gas, oil, or LP burners. (Astec, Inc.) (Refer to [PHOENIX BURNER](#).)

BC4000™ BURNER CONTROL SYSTEM. Includes maximum customization. (Astec, Inc.)

BGA™ BATCH TOWER. Refined version of the batch tower from Barber-Greene. Similar to the TS batch tower but smaller. (Astec, Inc.) (Refer to [BATCH TOWER](#) and [BATCH FACILITY](#).)

CEI ENTERPRISES™. Manufacturer of asphalt heating and storage equipment providing products and technologies for the hot mix asphalt industry and associated industries. Also produces concrete production equipment and plants and ready mix plants. A subsidiary of Astec Industries, Inc.

COATER II™ DRYER/MIXER. Trademark name for a counterflow drum dryer plus a continuous twin shaft mixer. A Coater II used with a batch facility allows conversion to continuous production when desired to supply asphaltic concrete to a silo loadout system. Coaters can produce up to 725 tons per hour. (Astec, Inc.) (Refer to [BATCH FACILITY](#), [CONTINUOUS-MIX FACILITY](#), [COUNTERFLOW DRUM DRYER](#), and [TWIN SHAFT MIXER](#).)

HELI-TANK™ UNIT. A unit that combines a hot oil heater with a portable asphalt storage tank. A Heli-Tank unit is usually portable and mounted on a chassis with suspension and wheels. It is virtually the same as a coiled tank, except it has a hot oil heater mounted on the goose neck of the chassis. The hot oil heater can heat additional coiled tanks. (Heatec, Inc.)

A Heli-Tank unit has the following features that distinguish it from a direct-fired tank:

- A hot oil heater mounted on one end of the tank.
- No stacks protruding from the top of the asphalt tank.

(REFER TO [HOT OIL HEATER](#) AND [DIRECT-FIRED TANK](#).)

MCIII™ MOTOR CONTROL START/STOP SYSTEM. Constituent component of the complete PMIII Controls that can optionally be used for stand-alone motor control. (Astec, Inc.) (Refer to [PMIII](#).)

MPIII™ BLENDING CONTROL SYSTEM. Constituent component of the complete PMIII Controls that can optionally be used for stand-alone blending control. (Astec, Inc.) (Refer to [PMIII](#).)

PMIII™ ASPHALTIC CONCRETE FACILITY CONTROLS. Centralized and modular automated total control system. (Astec, Inc.) (Refer to [BCIII](#), [MCIII](#), [MPIII](#), and [SCIII](#).)

SCIII™ SILO CONTROL SYSTEM. Constituent component of the complete PMIII Controls that can optionally be used for stand-alone silo control. (Astec, Inc.) (Refer to [PMIII](#).)

SILOBOT™ INSPECTION SERVICE. Service using a remote controlled, visual inspection and metal thickness testing device inside hot mix storage silos. Provides a metal thickness map, video, and photos of the inside of a silo. (Astec, Inc.)

SUPER TOWER™ BATCH TOWER. Similar to the TS batch tower but made much larger to incorporate extra-large hot bins. (Astec, Inc.) (Refer to [TS BATCH TOWER](#), [BATCH TOWER](#), and [BATCH FACILITY](#).)

TELSMITH™. Manufacturer of crushing and vibrating equipment for mining and aggregate industries along with modular and portable production facilities for road and in-pit use. A subsidiary of Astec Industries, Inc.

TS™ BATCH TOWER. Consists of a hot elevator assembly, screen decks discharging into four to six hot bins, manual sampling system, an aggregate weigh hopper, liquid asphalt weigh bucket, and a twin-shaft batch mixer with discharge gates used to blend constituent materials into a homogeneous mix. (Astec, Inc.) (Refer to [BATCH TOWER](#) and [BATCH FACILITY](#).)

VOYAGER™ ASPHALTIC CONCRETE PRODUCTION FACILITY. Portable facility with a modular design capable of producing mix with up to 30% RAP content. (Astec, Inc./Dillman Equipment, Inc.) (Refer to [PORTABLE ASPHALT FACILITY](#) and [RECLAIMED ASPHALT PAVEMENT](#).)

V-PAC™ STACK TEMPERATURE CONTROL SYSTEM. Uses v-flights and a drum variable frequency drive to help facilitate producing many different types of mixes, while controlling stack temperature without changing flights. (Astec, Inc.) (Refer to [FLIGHTS](#) and [VARIABLE SPEED DRIVE](#).)

WELBUILT™ TANK. A portable tank for storage of asphalt cement. (Heatec, Inc.) (Refer to [STORAGE TANK](#) and [ASPHALT CEMENT](#).)

WHISTLEBLOWER™ PHONE DIALER. A phone dialer that sends alert messages about the status of heating systems at asphalt plants. (Heatec, Inc.)

WM2000™ TRUCK MANAGEMENT SYSTEM. PC-based control system for supporting up to six scales that can be any mix of platform, back weigh, or weigh batcher. (Astec, Inc.)

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