



TXAPA Definitions and Terminology

Pertaining to Asphalt Pavement Production and Construction (*ASTM Definitions)

AGGREGATE : A hard inert granular material of mineral composition such as sand, gravel, slag, or crushed stone, used in pavement applications either by itself or for mixing with asphalt mixing in graduated fragments.

COARSE AGGREGATE : Aggregate retained on the 2.36mm (No. 8) sieve.

COARSE-GRADED AGGREGATE : One having a continuous grading in sizes of particles from coarse through fine with a predominance of coarse sizes.

DENSE-GRADED AGGREGATE : An aggregate that has a particle size distribution such that when it is compacted, the resulting voids between the aggregate particles, expressed as a percentage of the total space occupied by the material, are relatively small.

FINE AGGREGATE : That passing the 2.36mm (No. 8) sieve.

FINE-GRADED AGGREGATE : One having a continuous grading in sizes of particles from coarse through fine with a predominance of fine sizes.

OPEN-GRADED AGGREGATE : One containing little or no mineral filler in which void spaces in the compacted aggregate are relatively large.

WELL-GRADED AGGREGATE : Aggregate graded from the maximum size down to filler with the object of obtaining an asphalt mix with a controlled void content and high stability.

AIR VOIDS : Empty spaces (air pockets) in a compacted mix surrounded by asphalt coated particles, expressed as a percentage by volume of total compacted mix.

APPARENT SPECIFIC GRAVITY, (G_{sa}) : The ratio of the mass in air of a unit volume of an impermeable material at a stated temperature to the mass in air of equal density of an equal volume of gas-free distilled water at a stated temperature.

ASPHALT* : A dark brown to black cementitious material in which the predominating constituents are bitumens which occur in nature or are obtained in petroleum processing. Asphalt is a constituent in varying proportions of most crude proportions.

ASPHALT BINDER : A term utilized in the Superpave Mix Design System to classify the grade of asphalt cement used in an asphalt mix based on expected performance under specific environmental conditions (high and low temperatures) and anticipated traffic loading. It can be either modified or unmodified asphalt cement as long as it complies with AASHTO M 320, Specification for Performance Graded Asphalt Binder.

ASPHALT CEMENTS* : A fluxed or unfluxed asphalt specially prepared as to quality and consistency for direct use in the manufacture of asphalt pavements.

ASPHALT LEVELING COURSE : A course of hot mix asphalt (usually a relatively fine graded asphalt aggregate mixture) of variable thickness used to eliminate irregularities in the contour of an existing surface prior to placing the subsequent course.

AUTOMATIC DRYER CONTROL* : A system that automatically maintains the temperature of aggregates discharged from the dryer within a preset range.

AUTOMATIC PROPORTIONING CONTROL* : A system in which proportions of the aggregate and asphalt fractions are controlled by means of gates or valves which are opened and closed by means of self-acting mechanical or electronic machinery without any intermediate manual control. The system includes preset timing devices to control the desired periods of dry and wet mixing cycles.

ASPHALT RUBBER: AR : Used to modify liquid asphalt to increase performance and durability.

BALANCED MIX DESIGN: BMD : Asphalt mix design using performance tests on specimens that address multiple modes of distress include rutting and cracking. TXDOT is currently looking at the Hamburg Wheel Test and Overlay Test.

BASE COURSE : The layer of material immediately beneath the surface or intermediate course. It may be composed of crushed stone, crushed slag, crushed or uncrushed gravel and sand, or hot mix asphalt, typically with larger size aggregate.

BATCH PLANT* : A manufacturing facility for producing asphalt paving mixtures that proportions the aggregate constituents into the mix by weighed batches and adds asphalt binder by weight. The aggregates are first fractionated through a screening deck into hot bins from which they are proportioned into a weigh hopper. The batch of aggregates are emptied into a pugmill where the asphalt binder is weighed in and mixed to form the completed asphalt mixture.

BENDING BEAM RHEOMETER: Known as BBR : Provides a measure of low temperature stiffness and relaxation properties of asphalt binders – Indicates an asphalt binder's ability to resist low temperature cracking.

BITUMEN* : A class of black or dark-colored (solid, semisolid, or viscous) cementitious substances, natural or manufactured, composed principally of high molecular weight hydrocarbons, of which asphalts, tars, pitches, and asphaltites are typical.

BLEEDING (FLUSHING) : Is the upward movement of asphalt in an asphalt pavement resulting in the formation of a film of asphalt on the surface. The most common cause is too much asphalt in one or more of the pavement courses, resulting from too rich a plant mix, an improperly constructed seal coat, too heavy a prime or tack coat, or solvent carrying asphalt to the surface. Bleeding or flushing usually occurs in hot weather.

BULK SPECIFIC GRAVITY, Gsb : the ratio of the mass in air of a unit volume of a permeable material (including both permeable and impermeable voids normal to the material) at a stated temperature to the mass in air of equal density of an equal volume of gas-free distilled water at a stated temperature.

COAL TAR* : A dark brown to black cementitious material produced by the destructive distillation of bituminous coal.

COLD FEED BINS : Bins that store the necessary aggregate sizes and feed them to the dryer drum of the asphalt plant in substantially the same proportions as are required by the Job Mix Formula for the mix being produced.

COLD MIX (Cold Patch) : A mixture of emulsified asphalt and aggregate; produced in a central plant (plant mix) or mixed at the road site (mixed-in-place).

COMPACTION : The act of compressing a given volume of material into a smaller volume. Insufficient compaction of the asphalt pavement courses may result in rutting on the pavement surface and/or early oxidation due to the intrusion of air and water. Compaction is usually accomplished by rolling.

CONSENSUS PROPERTIES : Aggregate characteristics that are critical to well performing hot mix asphalt, regardless of the aggregate source, and whose limiting values are set by the Superpave specification. There are four aggregate consensus properties: 1) coarse aggregate angularity, 2) fine aggregate angularity, 3) flat and elongated particles, and 4) clay content.

CONSISTENCY : Describes the degree of fluidity or plasticity of asphalt binder at any particular temperature. The consistency of asphalt binder varies with temperature; therefore, it is necessary to use a common or standard temperature when comparing the consistency of one asphalt binder with another. The standard test temperature is 140°F (60°C).

CONTINUOUS MIX PLANT : A manufacturing facility for producing asphalt paving mixtures that proportions those aggregate and asphalt constituents into the mix by a continuous volumetric proportioning system without definite batch intervals.

CORRUGATIONS (WASHBOARDING AND SHOVING) : Types of pavement distortion. Corrugation is a form of plastic movement typified by ripples across the asphalt pavement surface. Shoving is a form of plastic movement resulting in localized bulging of the pavement surface. These distortions usually occur at points where traffic starts and stops, on hills where vehicles brake on the downgrade, on sharp curves, or where vehicles hit a bump and bounce up and down. They occur in asphalt layers that lack stability. Lack of stability may be caused by a mixture that is too rich in asphalt, has too high a proportion of fine aggregate, has coarse or fine aggregate that is too round or too smooth, or has asphalt cement that is too soft. It may also be due to excessive moisture, contamination due to oil spillage, or lack of aeration when placing mixes using liquid asphalt.

CRACKS : Breaks in the surface of an asphalt pavement. The common types are:

ALLIGATOR CRACKS : Interconnected cracks forming a series of small blocks resembling an alligator's skin or chicken-wire, caused by excessive deflection of the surface over unstable subgrade or lower courses of the pavement.

EDGE JOINT CRACKS : The separation of the joint between the pavement and the shoulder, commonly caused by alternate wetting and drying beneath the shoulder surface. Other causes are shoulder settlement, mix shrinkage, and trucks straddling the joint.

LONGITUDINAL JOINT CRACKS : Longitudinal separations along the seam between two paving lanes caused by a weak seam between adjoining spreads in the courses of the pavement.

REFLECTION CRACKS : Cracks in asphalt overlays that reflect the crack pattern in the pavement structure underneath. They are caused by vertical or horizontal movements in the pavement beneath the overlay, brought on by expansion and contraction with temperature or moisture changes.

SHRINKAGE CRACKS : Interconnected cracks forming a series of large blocks usually with sharp corners or angles. Frequently they are caused by volume change in either the asphalt mix or in the base or subgrade.

SLIPPAGE CRACKS : Crescent-shaped cracks that are open in the direction of the thrust of wheels on the pavement surface. These result when there is a lack of good bond between the surface layer and the course beneath.

CRUSHER-RUN* : The total unscreened product of a stone crusher.

CUTBACK ASPHALT : Asphalt cement which has been liquefied by blending with a petroleum solvent (also called a diluent). Upon exposure to atmospheric conditions the diluent evaporates, leaving the asphalt cement to perform its function.

DENSITY : The degree of solidity (compaction) that can be achieved in a given mixture, which will be limited only by the total elimination of voids (zero air voids) between particles in the mass. Density is expressed as a percentage of the maximum specific gravity of the mix.

DRUM MIX PLANT : A manufacturing facility for producing asphalt paving mixtures that continuously proportions the aggregate constituents into the mix through its cold feed system, dries the aggregate, and adds a proportional amount of asphalt binder through a metering system into the same drum. The aggregates are fed from calibrated cold feeds into the dryer drum mixer where the aggregates are dried and then asphalt sprayed in and mixed to form the completed asphalt mixture. Variations of this type of plant use several types of drum modifications, separate (and smaller) mixing drums, and coating units (coater) to accomplish the mixing process.

DISTORTION : Pavement distortion is any change of the pavement surface from its original shape.

DRYER : The component of the asphalt plant that dries and heats the aggregates to the specified temperatures. Dryers are large cylindrical drums through which the aggregates pass. An open flame is used to dry and heat the aggregates.

DUCTILITY : The ability of a substance to be drawn out or stretched thin. While ductility is considered an important characteristic of asphalt binder in many applications, the presence or absence of ductility is usually considered more significant than the actual degree of ductility.

DURABILITY : The property of an asphalt paving mixture that describes its ability to resist disintegration by weathering and traffic. Included under weathering are changes in the characteristics of the asphalt, such as oxidation and volatilization, and changes in the pavement and aggregate due to the action of water, including freezing and thawing.

DYNAMIC SHEAR RHEOMETER : Known as DSR – High Temperature rheological properties of asphalt binders. Used to predict the end-use performance of asphalt materials.

EFFECTIVE ASPHALT CONTENT, P_{be} : The total asphalt content of a mix minus the portion of asphalt absorbed into the aggregate particles.

EFFECTIVE SPECIFIC GRAVITY, G_{se} : The ratio of the mass in air of a unit volume of a permeable material (excluding voids permeable to asphalt) at a stated temperature to the mass in air of equal density of an equal volume of gas-free distilled water at a stated temperature.

EMULSIFIED ASPHALT : An emulsion of asphalt cement and water that contains a small amount of an emulsifying agent, a heterogeneous system containing two normally immiscible phases (asphalt and water) in which the water forms the continuous phase of the emulsion, and minute globules of asphalt form the discontinuous phase. Emulsified asphalt may be of either the anionic (electro-negatively charged asphalt globules), or cationic (electro-positively charged asphalt globule types), depending upon the emulsifying agent. Upon exposure to atmospheric conditions the water evaporates, leaving the asphalt cement to perform its intended function.

FATIGUE RESISTANCE : The ability of asphalt pavement to withstand repeated flexing or slight bending caused by the passage of wheel loads. As a rule, the higher the asphalt binder content, the greater the fatigue resistance.

FLEXIBILITY : The ability of an asphalt pavement structure to conform to settlement of the foundation. Generally, flexibility of the asphalt paving mixture is enhanced by high asphalt content.

FULL-DEPTH ASPHALT PAVEMENT : The term FULL-DEPTH (registered by The Asphalt Institute with the U.S. Patent Office) certifies that the pavement is one in which asphalt mixtures are employed for all courses above the subgrade or improved subgrade. A Full-Depth asphalt pavement is laid directly on the prepared subgrade.

HAMBURG : Laboratory wheel-tracking test. Used to determine mix performance in regards to rutting, fatigue, moisture susceptibility and stripping predictions.

HIMA : Highly Modified Asphalt – Used to enhance durability in asphalt pavement applications.

HOT BINS : Bins in a batch plant that store the heated and separated aggregates prior to their final proportioning into the mixer.

HOT MIX ASPHALT (ASPHALT CONCRETE) : A high quality, thoroughly controlled uniform mixture of asphalt binder and well-graded aggregate fractions, thoroughly compacted into a uniform dense mass. The asphalt mixture is normally produced through an asphalt plant, then placed by a paving machine and compacted by asphalt rollers.

IDEAL CRACK TEST : Known as Ideal CT is a test method to determine indirect tensile strengths of bituminous mixtures and is a candidate for a performance cracking test.

IMPERMEABILITY : The resistance an asphalt pavement has to the passage of air and water into or through the pavement.

IRI (INTERNATIONAL ROUGHNESS INDEX) : Used throughout the world as a standard to quantify road surface roughness.

LIFT : A layer or course of paving material applied to a base or a previous layer.

MANUAL PROPORTIONING CONTROL* : A control system in which proportions of the aggregate and asphalt fractions are controlled by means of gates or valves which are opened and closed by manual means. The system may or may not include power assist devices in the actuation of gate and valve opening and closing.

MAXIMUM SPECIFIC GRAVITY G_{mm} : Maximum specific gravity of uncompacted bituminous paving mixtures.

MESH* : The square opening of a sieve.

MINERAL DUST : The portion of the fine aggregate passing the 0.075mm (No. 200) sieve.

MINERAL FILLER : A finely divided mineral product at least 70 percent of which will pass a 0.075mm (No. 200) sieve. Pulverized limestone is the most commonly manufactured filler, although other stone dust, hydrated lime, Portland cement, and certain natural deposits of finely divided mineral matter are also used.

OPEN-GRADED ASPHALT FRICTION COURSE : A pavement surface course that consists of a high-void, asphalt plant mix that permits rapid drainage of rainwater through the course and out the shoulder. The mixture is characterized by a large percentage of one-sized coarse aggregate. This course prevents tire hydroplaning and provides a skid-resistant pavement surface.

OVERLAY TEST : Test method determines the susceptibility of bituminous mixtures to fatigue or reflective cracking. Results are values in Critical Fracture Energy and Crack Resistance Index.

PAVEMENT STRUCTURE : A pavement structure with all its courses of asphalt-aggregate mixtures, or a combination of asphalt courses and untreated aggregate courses placed above the subgrade or improved subgrade.

PENETRATION* : The consistency of a bituminous material expressed as the distance in tenths of a millimeter (0.1 mm) that a standard needle vertically penetrates a sample of the material under specified conditions of loading, time, and temperature.

PERFORMANCE GRADED (PG) : Asphalt binder grade designations used in Superpave; based on the binders mechanical performance at critical temperatures and aging conditions. This system directly correlates laboratory testing to field performance through engineering principles.

PERMANENT DEFORMATION : Deformation that stays even after the removal of the applied force.

PLANT SCREENS : Screens located in a batch plant between the dryer and hot bins which separate the heated aggregates into the proper hot bin sizes.

POISE : A centimeter-gram-second unit of absolute viscosity, equal to the viscosity of a fluid in which a stress of one dyne per square centimeter is required to maintain a difference of velocity of one centimeter per second between two parallel planes in the fluid that lie in the direction of flow and are separated by a distance of one centimeter.

POLYMER MODIFIED ASPHALT BINDER : A conventional asphalt cement to which a styrene block copolymer or styrene butadiene rubber (SBR) latex or neoprene latex has been added to improve performance.

POLYMER MODIFIED ASPHALT: (PMA) : Liquid asphalt modified to increase performance and durability.

QUARTERLY : Occurring once within each quarter of the calendar year; specifically, once during Jan.- Mar., once during Apr.- Jun., once during Jul.-Sep., and once during Oct.- Dec.

RAVELING : The progressive separation of aggregate particles in a pavement from the surface downward or from the edges inward. Raveling is caused by lack of compaction, construction of a thin lift during cold weather, dirty or disintegrating aggregate, too little asphalt in the mix, or overheating of the asphalt mix.

RECYCLED ASPHALT SHINGLES – RAS : Utilized in bituminous mixtures to increase stiffness.

RECYCLED ENGINE OIL BOTTOM – REOB : used to soften hard pen asphalt. No longer being utilized in Texas.

RUTTING : Grooves that develop in the wheel tracks of a pavement. Rutting may result from consolidation or lateral movement under traffic in one or more of the underlying courses, or by displacement in the asphalt surface layer itself. They may develop under traffic in new asphalt pavements that had too little compaction during construction or from plastic movement in a mix that does not have enough stability to support traffic.

SAND ASPHALT : A mixture of sand (natural and/or manufactured) and asphalt cement. It may be prepared with or without special control of aggregate grading and may or may not contain mineral filler. Either mixed-in-place or plant mix construction may be employed. Sand asphalt is used in construction of both base and surface courses.

SEGREGATION : In the asphalt mat -Mechanical Segregation – Thermal Segregation -both can cause poor performance of the finished product.

SIEVE* : In laboratory work an apparatus in which the openings are square for separating sizes of material.

SKID RESISTANCE : The ability of an asphalt paving surface, particularly when wet, to offer resistance to slipping or skidding. The factors for obtaining a high skid resistance are generally the same as those for obtaining high stability. Proper asphalt content and aggregate with a rough surface texture are the greatest contributors. The aggregate must not only have a rough surface texture, but also resist polishing.

SOLUBILITY : A measure of the purity of an asphalt binder. The ability of the portion of the asphalt binder that is soluble to be dissolved in a specified solvent. Inert matter, such as salts, free carbon, or non-organic contaminants are insoluble.

SPECIFIC GRAVITY : The ratio of the density of a substance to the density of water.

STABILITY : The ability of asphalt paving mixture to resist deformation from imposed loads. Stability is dependent upon both internal friction and cohesion.

STOKE : A unit of kinematic viscosity, equal to the viscosity of a fluid in poises divided by the density of the fluid in grams per cubic centimeter.

SUBBASE : The course in the asphalt pavement structure immediately below the base course is called the subbase course. If the subgrade soil is of adequate quality, it may serve as the subbase.

SUBGRADE : The soil prepared to support a structure or a pavement system. It is the foundation of the pavement structure. The subgrade soil sometimes is called "basement soil" or "foundation soil."

STABILIZED SUBGRADE : Subgrade that has been improved as a working platform by: (1) the incorporation of granular materials or stabilizers such as asphalt, lime, or portland cement into the subgrade soil; or (2) any course or courses of select or improved material placed on the subgrade soil below the pavement structure.

STONE MATRIX ASPHALT– SMA : Typically used as a surface mix using liquid polymer modifiers, fibers & mineral filler. Known as the Cadillac of mixes.

SUPERPAVE™ : Short for "Superior Performing Asphalt Pavement" – a performance-based system for selecting and specifying asphalt binders and for developing an asphalt mix design. SUPERPAVE is a product of the Strategic Highway Research Program (SHRP) established by Congress in 1987 to improve the performance and durability of U.S. roads.

SUPERPAVE GYRATORY COMPACTOR (SGC) : A device used during Superpave mix design or field testing activities for compacting samples of hot mix asphalt into specimens used for volumetric analysis. Continuous densification of the specimen is measured during the compaction process.

SUPERPAVE MIX DESIGN : A mix design system that integrates the selection of materials (asphalt, aggregate) and volumetric proportioning with the project's climate and design traffic.

VISCOSITY : Is a measure of the resistance to flow. It is one method of measuring the consistency of asphalt.

ABSOLUTE VISCOSITY : A method of measuring viscosity using the poise as the basic measurement unit. This method utilizes a partial vacuum to induce flow in the viscometer.

KINEMATIC VISCOSITY : A method of measuring viscosity using the stoke as the basic measurement unit.

VOIDS : Empty spaces (air pockets) in a compacted mix surrounded by asphalt coated particles.

VOIDS IN TOTAL MIX (VTM) : Total empty spaces (air pockets) in a compacted mix expressed as a percentage of the total solid volume.

VOIDS in the MINERAL AGGREGATE (VMA) : the volume of void space (air pockets) between the aggregate particles of a compacted mix that includes both the VTM and the effective asphalt content, expressed as a percentage of the total volume of the compacted mix.

VOIDS FILLED WITH ASPHALT (VFA) : The percentage of the voids in the mineral aggregate structure that are filled with asphalt, not including the adsorbed asphalt. It is expressed as a ratio of (VMA – VTM) to VMA.

WARM MIX ASPHALT (WMA) : Asphalt Mixture produced between 215 degrees and 270 degrees.

WET MIXING PERIOD : The interval of time between the beginning of application of asphalt binder and the opening of the mixer gate in a batch plant.

WORKABILITY : The ease with which paving mixtures may be placed and compacted.