



Additives

Additive (General)

Any of a number of substances that can be added to the asphalt binder to alter the characteristics of the final blend of the asphalt mix.

Amines

A compound derived from ammonia by replacement of hydrogen atoms with organic groups. Amines are commonly used as anti-strip, warm mix additive, and emulsifiers.

Anti-Strip

Additives containing active functional groups that improve the adhesion of the asphalt binder to the surface of the aggregate.

Foamed Asphalt

An asphalt mixture manufacturing process, which involves the introduction of small amounts of water to either the hot asphalt binder or hot mix asphalt which creates a temporary high volume asphalt foam that increases the binder ability to coat the aggregate before the binder returns to its original properties.

H₂S scavengers

Asphalt additive that reacts selectively with hydrogen sulfide and prevents the formation of toxic hydrogen sulfide gas.

Odor Reducers

Additives designed to reduce the odor coming from hot asphalt binder and/or hot mix asphalt by either masking the odor or by chemically neutralizing the odor causing compounds in the asphalt binder.

Phosphate Esters

An asphalt additive made by the reaction of phosphoric acid and an alcohol. Phosphate esters are used as anti-strip and a compaction aid and are compatible with both standard asphalt binder as well as polyphosphoric acid modified binders.

Organosilanes

Additives comprising silicon-containing compounds which have at least one direct bond between a silicon atom and a carbon atom. They can be used to improve adhesion between binder and aggregate at very low dosages, by creating a permanent chemical bond between them.

Silicone (oil)

Silicone that can be added to the asphalt binder to eliminate foaming, reduce tearing of the asphalt mix behind the paver, and help release moisture from asphalt mix

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Stripping (General)

The separation of asphalt binder from an aggregate surface due to the presence and action of moisture in the asphalt mix

Warm Mix Additive

A substance that can be added to either the asphalt binder or asphalt mixture that allows the mixing and placement at temperatures below standard hot mix asphalt.

Warm Mix Asphalt (WMA)

Asphalt mix produced at lower temperatures than traditional hot mix asphalt (HMA) using a variety of technologies that enable the asphalt mix materials to be produced and placed at temperatures 30 to 120 degrees Fahrenheit lower than HMA.

Balance Mix Design

Asphalt Pavement Analyzer (APA)

A loaded wheel moves back and forth across a pressurized linear hose over a compacted asphalt mixture sample in a temperature-controlled air chamber and rut depths along the wheel path are measured for each wheel pass with a sample typically loaded for 8,000-wheel passes. Primarily a rutting potential test.

Disc-Shaped Compact Tension Test (DCT)

A tensile test where an asphalt mix sample is fabricated and crack mouth opening displacement (CMOD) is measured. Samples are tested at 10°C above the low temperature grade. The sample is put in tension, so the CMOD increases at 1mm/min while the load is measured. Test is complete when the post peak load level falls to 0.1 kN. Fracture energy is measured.

Flexural Bending Beam Fatigue

Beam specimen is held by four equally spaced clamps and a sinusoidal controlled-deflection mode of loading is applied at the two inner clamps. The loading frequency is typically 10 Hz. The magnitude of the load applied by the actuator and the deflection measured at center of beam is recorded and used to calculate the flexural stiffness, cumulative dissipated energy, and the cycles to failure (i.e., the point at which the product of the specimen stiffness and loading cycles is a maximum). Multiple peak-to-peak strain levels are often used to characterize the fatigue behavior of asphalt mixtures. (Source:

www.asphaltpavement.org)

Flow Number

The test is conducted by applying repeated haversine axial compressive loads to a cylinder specimen at a specific test temperature. The test may be conducted with or without confining pressure. For each load cycle, the recoverable strain and permanent strain are recorded. The flow number is determined as the number of load cycles corresponding to the minimum rate of change of permanent strain. (Source:

[www.asphaltpavement.org/uploads/documents/2-Flow Number Test UofMD.pdf#:~:text=For%20each%20load%20cycle%2C%20the%20recoverable%20strain%20and,of%20permanent%20strain%20%28i.e.%2C%20onset%20of%20tertiary%20flow%29](http://www.asphaltpavement.org/uploads/documents/2-Flow_Number_Test_UofMD.pdf#:~:text=For%20each%20load%20cycle%2C%20the%20recoverable%20strain%20and,of%20permanent%20strain%20%28i.e.%2C%20onset%20of%20tertiary%20flow%29))

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General BMD

An asphalt mix design using performance tests on appropriately conditioned specimens that address multiple modes of distress taking into consideration mix aging, traffic, climate, and location within the pavement structure

Hamburg Wheel-Tracking Test (HWT)

A loaded wheel moves back and forth across an asphalt mixture sample in a temperature-controlled water bath and rut depths along the wheel path are measured for each wheel pass with a sample typically loaded for 20,000-wheel passes or when 12.5 mm of deformation has been achieved. Rutting and stripping potential can be measured.

IDEAL-CT

The IDEAL-CT test applies a vertical load on a cylinder specimen at a constant rate of 50 mm/min. The test is stopped when the load is reduced to 0.1kN. During the test, the loading head displacement is continuously monitored and recorded. Data analysis is conducted based on the load versus displacement curve. The test parameter CTIndex is calculated as a function of total fracture energy and the slope of the post-peak curve at 25 percent reduction from the peak load.

Illinois Flexibility Index Test (I-FIT)

A semi-circular 150mm diameter by 50 mm thick sample is supported on the flat side while a load is applied at a vertical rate of 50mm/min. Load and vertical displacement are recorded until the load drops below 0.1 kN. Fracture energy is calculated from the area beneath the load displacement curve to 0.1 kN. The post peak load slope of the load displacement curve can indicate brittle or ductile failure. Flexibility index is calculated

Overlay Tester

Test specimens are cut from SGC samples or field cores. Specimens are glued on a set of two steel base plates with one plate fixed and the other moves horizontally back and forth at a specific frequency (0.1 Hz). The maximum opening displacement of 0.025 inch is controlled during the test. The test is stopped when a 93% reduction of the maximum load occurs or after 1,000 cycles.

Reclaimed Asphalt Pavement (RAP)

Pulverized asphalt pavement that is used like an aggregate for recycled asphalt pavements.

Reclaimed Asphalt Shingles (RAS)

Pulverized or shredded asphalt shingles that are used like an aggregate for recycled asphalt pavements.

Cutback

Cutback

Asphalt cement which has been liquefied by blending with a petroleum solvent (also called a diluent), to form one of the following cutback asphalts. Upon exposure to atmospheric conditions the solvents evaporate, leaving behind the asphalt cement. The letters indicate the curing rate, while the numbers indicate the viscosity of the material.

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Medium curing (MC-XX)

A cutback comprised of asphalt cement and a solvent of relatively medium volatility.

Rapid curing (RC-XX)

Cutback asphalt composed of asphalt cement and a solvent of high volatility. Typically, naphtha or gasoline-type solvents.

Slow curing (SC-XX)

A cutback asphalt comprised of asphalt cement and a solvent of relatively low volatility.

Emulsion (Emulsified Asphalt)

Asphalt Emulsion

An asphalt emulsion is a mixture of asphalt and water, which is typically manufactured by cofeeding liquid asphalt and an aqueous solution of an emulsifier (defined below) into a high-shear mechanical mixer. The mechanical mixer breaks the liquid asphalt into micron-sized droplets, which are stabilized in the continuous phase of water by the action of the emulsifier.

Anionic Emulsion

An asphalt emulsion that is manufactured using specific emulsifiers and additive, which impart a negative charge at the surface of the asphalt droplets.

Cationic Emulsion

An asphalt emulsion that is manufactured using specific emulsifiers and additives, which impart a positive charge at the surface of the asphalt droplets.

Emulsifier

A surface-active agent which is used for the manufacture of paving and roofing grade asphalt emulsions. The emulsifier stabilizes the asphalt droplets and controls the breaking time once it contacts either the road or aggregate surface.

High Float

Asphalt emulsions made using special emulsifier systems that form a chemical gel structure in the asphalt residue like "Jell-O" when it cures out.

Latex (SBR)

A water-based emulsion of styrene-butadiene copolymer.

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HMA Production

Batch Plant

A hot mix asphalt plant that runs in batches (pugmill) instead of a continuous fashion like a drum plant. Allows the plant to make many different types of mixes on demand. Usually smaller than a drum plant.

Drum Plant

A hot mix asphalt plant that operates in a continuous fashion usually to produce a larger amount of the same type of mix. Usually larger than a batch plant.

Mix Plant

A central plant where hot liquid asphalt is mixed with proportionally sized and heated aggregates to produce Hot Mix Asphalt

Liquid Supply Points

Blending Terminal

A processing facility that typically converts commodity/neat asphalt binders into finished, performance-grade production (asphalt) by the controlled addition of modifiers, additives, and/or other petroleum stocks

In-Line Blending

Taking two or more products into a single line with mixing abilities (i.e., a static mixer) to produce a finished product grade that can be blended on to a truck. This is also referred to as rack blending.

Refinery

A facility that takes crude oil and refines it to make other petroleum products such as gasoline, diesel, jet fuel, asphalt, etc.

Terminal

A storage facility or production facility where asphalt binder, emulsion, cutback is housed and shipped.

Mix Types

Balanced mix design

An asphalt mixture design protocol to formulate highly durable asphalt paving mixtures by balancing maximum rutting resistance and cracking resistance according to standard laboratory mix performance tests.

Bonded Wearing Course (BWC)

A gap graded asphalt mixture that is applied with a special spray paver which distributes modified tack coat immediately before the laydown of the mix. The emulsion is then immediately wicked up into the mix and broken.

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Gap Graded

A gradation consisting of larger and finer particles but little or no particles in the middle of the gradation band creating a “gap.”

High Performance Thin Overlay (HPTO)

A high-performance type of asphalt mixture that is designed to be applied in a thin layer yet is very crack resistance. Typically contains heavily polymer modified binder, high AC contents, a fine gradation, and sometimes no RAP.

Open Graded Friction Course (OGFC)

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.

Stone Matrix Asphalt (SMA)

A high-performance type of asphalt mixture which has a gradation consisting of larger and finer particles but little or no particles in the middle of the gradation band. Typically contains some combination of polymer modified asphalt, fibers, or mineral fillers.

Superpave

Short for “Superior Performing Asphalt Pavement” – a performance-based system for selecting and specifying asphalt binders and for developing an asphalt mixture design.

Volumetric mix design

An asphalt mixture design protocol that integrates the selection of materials (asphalt, aggregate) and volumetric proportioning with the project’s climate and design traffic.

Modifiers

Asphalt Modifier (General)

A substance that is added to asphalt to enhance the performance grade through chemical or physical alterations. These substances can include polymers (elastomers/plastomers), acids, light oils, GTR, or recycled products.

Crumb Rubber/Ground Tire Rubber (GTR)

Recycled tires that are ground into various gradations. GTR is typically added either directly in the hot mix plant in a “dry process” or to the asphalt binder in the “wet process.”

Elastomers

This is the largest and most common class of materials used to modify asphalt. Included in this group are SBR latex, natural latex, styrene/butadiene block and di-block copolymers, polychloroprene, reactive ethylene terpolymers, and polybutadiene.

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Extender/Extender Oil

A low-viscosity substance (low-density petroleum distillate, bio-based oil, paraffinic base oil, etc.) that is added to asphalt to improve the low temperature properties.

Fibers

Fibers can be added to asphalt mixes to improve rutting and cracking properties. Also used to prevent drain down.

Isocyanates

Family of liquids used to modify asphalt binders. They can reduce H₂S emissions and improve adhesion

Plastomers (for example: PE, PP, EVA):

These materials are plastic in nature and include Polyethylene, Polypropylene, Ethylene Vinyl Acetate (EVA) and Atactic Polypropylene (APP & APAO). They typically increase stiffness as opposed to elasticity.

Polymer Modified Asphalt (PMA) / Polymer Modified Asphalt Cement (PMAC)

Asphalt which has been modified with polymers to increase the Performance Grade and improve field performance.

Polymer Modified Emulsion (PMEM)

An asphalt emulsion modified with polymers to increase performance. PMEM Can be used in a wide variety of applications.

Polymer Modified Emulsion Base (PMEB)

Asphalt which has been modified with polymers before the emulsification process. The resulting emulsion has enhanced elastic properties.

Polyphosphoric Acid (PPA)

An inorganic acid that is added to asphalt in low doses to increase the high performance-grade temperature.

Rejuvenator

A low-viscosity substance that is added to improve the low temperature properties of an asphalt with the goal of enabling mixture formulations containing increased levels of RAP. Rejuvenators also can be spray-applied directly to the surface of aged pavements to reduce the damage from ageing.

Re-recycled Engine Oil Bottoms/Vacuum Tower Asphalt Extender (REOB/VTAE)

Re-recycled Engine Oil Bottoms. The residue after re-refining used engine oil. REOB is used to soften asphalt. Also known as Vacuum Tower Asphalt Extender (VTAE)

Styrene-Butadiene Rubber (SBR)

(Styrene-Butadiene Rubber) SBR is a random copolymer manufactured via an emulsion polymerization process. The final form of this product is a latex which consists of polymer droplets dispersed homogeneously in water.

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Other Associations/Acronyms

AASHTO

The American Association of State Highways and Transportation Officials: is a standard setting body comprised of national Department of Transportation officials, which publishes specifications, test protocols, and guidelines that used in highways design and construction throughout the United States. <https://www.transportation.org/>

AEMA

Asphalt Emulsion Manufacturers Association: is a proactive organization dedicated to the advancement of the asphalt emulsion industry. <https://www.aema.org/>

ARRA

Asphalt Recycling & Reclaiming Association – is an association for the pavement recycling and reclaiming industry with the goal to promote and educate. <https://www.arra.org/>

Asphalt Institute (AI)

The Asphalt Institute is the international trade association of petroleum asphalt producers, manufacturers, and affiliated businesses. <https://www.asphaltinstitute.org/>

ASTM

American Society for Testing and Materials – An international standards Organization that develops and publishes voluntary consensus technical standards for a wide range of materials, products, systems, and services. <https://www.astm.org/>

DOT

State Department of Transportation – Agencies that conduct quality assurance programs on materials used for construction and maintenance of roadways.

FHWA

Federal Highway Administration. The Federal Highway Administration provides stewardship and preservation of the Nation's highways, bridges, and tunnels. <https://highways.dot.gov/>

FP²

Formerly known as Foundation for Pavement Preservation – is a non-profit to growth in pavement preservation. <https://fp2.org/>

ISSA

International Slurry Surfacing Association – is the leading resource for promotion, training, education, and best practices of our pavement preservation technologies. <https://www.slurry.org/>

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MnRoads

A test track made of research materials and pavements owned and operated by the Minnesota Department of Transportation. <https://www.dot.state.mn.us/mnroad/>

NCAT

National Center for Asphalt Technology. A test track which works with states, FHWA, and the construction industry with the focus making better pavements through research. Based at Auburn University. <https://eng.auburn.edu/research/centers/ncat/>

NCHRP

National Cooperative Highway Research Program is a way to study complex problems that cover a wide interest of highway authorities that can be best studied by cooperative research.

<https://www.trb.org/NCHRP/NCHRP.aspx>

TRB

Transportation Research Board is a part of the National Academies of Sciences, Engineering, and Medicine. They provide an information exchange, research, and advice for all means of transportation. They hold their annual meeting every January in Washington D.C.

<https://www.nationalacademies.org/trb/about>

User-Producer Group

A group made up of product producers, ends users, and may include some affiliated businesses that come together to discuss the industry. Typically, every region in the US has a User-Producer Group which meet to discuss issues facing the industry.

PG Binder Tests and equipment

Bending Beam Rheometer (BBR)

A BBR is an automated 3-point loading system used to evaluate for low – temperature thermal cracking performance.

Dynamic Shear Rheometer (DSR)

A DSR is one of the main instruments used in the testing and Superpave performance grading asphalt binder.

Elastic Recovery (ER)

ER is a laboratory test used to measure the ability of an asphalt to return to its original dimensions (volume, length, width, etc.) after application of a tensile load. The ER test can be used to show the effectiveness of elastomeric modifier performance.

Master Curves

Master curves are a graphical representation of the change in rheological properties of a material under various loading conditions, such as shear rate (or frequency), temperature, and time, to name a few. In asphalt studies, master curves often describe the change in complex modulus with shear rate (or

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frequency) and the change in complex modulus with phase angle. Master curves are used to better understand rheological properties as a function of load, frequency, temperature, time, and other variables.

Multiple Stress Creep and Recovery (MSCR)

Multiple Stress Creep and Recovery – Performed with a DSR, the test is used to identify the elastic response of a binder and reported as the Percent Recovery parameter. The non-recoverable creep compliance calculated from this test has been shown to be an indicator of an asphalt binder's ability to resist the formation of permanent rutting under repeated stress loads.

Pressurized Aging Vessel (PAV)

A PAV is used to simulate in-service aging of an asphalt binder by means of pressured air and elevated temperature. Residue can be used to estimate physical and chemical properties of an asphalt binder after 5-10 years of in-service aging.

Rheology

Rheology is the study of how material flows and deforms with viscosity being a resistance to flow.

Rolling Thin Film Oven (RTFO)

An RTFO is used to approximate the changes in asphalt binder properties during conventional batch plant and drum mix plant mixing.

Preservation Treatment/ Emulsions

Central Plant Recycling Treatment (CCPR)

In pavement recycling and reclamation, CCPR is a technique where the pavement is reclaimed without the use of heat, like CIR, however the RAP is taken to a central plant to make the cold mix before re-laying the material on the road.

Cold In Place Recycling (CIPR) or (CIR)

In pavement reclamation, CIPR is a technique where the pavement is reclaimed and reused in place without heat. The RAP can be mixed with a recycling agent such as emulsion, cutback, or a foamed asphalt binder.

Full Depth Reclamation (FDR)

In pavement recycling and rehabilitation, FDR is the process of breaking down and blending all the asphalt binder layers along with some or all the underlying base material and recompacting for a surface or wearing course. Additives can also be added during the blending step to stabilize the base known as Stabilized Full Depth Reclamation (SFDR).

Surface Treatments (Chip seal, fog seal, micro, etc.)

A large group of preventative maintenance applications that can be just an asphaltic material sprayed on the pavement surface or one that also includes aggregate as a wearing course.

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Hot In Place Recycling (HIR)

HIR is a pavement recycling and rehabilitation process where the pavement is heated, scarified, mixed with a recycling agent (emulsion, cutback, or foamed asphalt) in place and recompactd.

Non-Tracking Tack

A tack coat that has a quick cure time and return to traffic to decrease the “tracking” of tack that can occur from vehicles driving over it. Typically made from a harder base asphalt.

Prime Coat

A thin coat asphalt (usually cutback or emulsion) that is applied to the base course prior to the first lift of HMA.

Tack Coat

A thin coat of asphalt (usually cutback or emulsion) that is applied to an existing pavement (concrete or asphalt) prior to putting a new lift of HMA to promote adhesion.

References:

Asphalt Institute: <https://www.asphaltinstitute.org/engineering/glossary-of-terms/>

NAPA: <https://www.asphaltpavement.org/climate/learn-more/glossary>