GLOSSARY

SOUTH CAROLINA
DEPARTMENT
OF TRANSPORTATION

May 2004

-Acronyms-

AASHTO – American Association of State Highway and Transportation Officials
AGC – Associated General Contractors of America
AMRL – AASHTO Materials Reference Library
ASTM – American Society for Testing and Materials
BAMS – Bid Analysis and Management System
BCA – Bridge Construction Access
BMP – Best Management Practices
BSG – Bulk Specific Gravity
CCRL – Cement and Concrete Reference Laboratory
CFR – Code of Federal Regulations
CSL – Crosshole Sonic Logging
DBE – Disadvantaged Business Enterprise
DWR – Daily Work Report
EEO – Equal Employment Opportunity
EPA – Environmental Protection Agency
FHWA – Federal Highway Administration
HMA – Hot-mix Asphalt
IA – Independent Assurance
MSG – Maximum Specific Gravity
MUTCD – *Manual on Uniform Traffic Control Devices*
NCHRP – National Cooperative Highway Research Program
NHS – National Highway System
NOI – Notice of Intent
NPDES – National Pollutant Discharge Elimination System
OJT – On-the-Job Training
OSHA – Occupational Safety and Health Administration
PCC – Portland Cement Concrete
PG – Performance Grade
QC/QA – Quality Control/Quality Assurance
QC – Quality Control
RAP – Recycled Asphalt Pavement
SCDHEC – South Carolina Department of Health and Environmental Control
SCDOT – South Carolina Department of Transportation
SCPP – South Carolina Partnering Program
SWPPP – Stormwater Pollution Prevention Plan
UST – Underground Storage Tank
WEAV – Wave Equation Analysis Program

Absorbed Moisture (Water). Absorbed moisture is the water that has penetrated the aggregate pores, which is not visible on the surface of the aggregate particle.

Absorption. Absorption refers to the susceptibility of an aggregate to absorb water. Percent absorption is the ratio of the weight of water that fills pores to the oven-dry weight of the aggregate, excluding free moisture. A porous aggregate will absorb asphalt, and if not considered during design, the mixture will be dry. An aggregate with 1% or less absorption is considered good for HMA mixtures. Most South Carolina aggregates, excluding marine limestone, have absorption rates of less than 1%.

Apparent Specific Gravity (ASG). ASG is the ratio of the weight of dry aggregate to the weight of a volume of water equaling the solid volume of the aggregate, excluding its permeable pores (i.e., the volume of water in any permeable pores is excluded in the volume of water used in the ratio calculation). ASG will be higher than the aggregate's BSG and ESG.

Bank Sand. Bank sand is fine aggregate material that is obtained directly from a river bank. Bank sand may be used directly from the river bank or it may be stockpiled for later use. Bank sand that has been stockpiled is considered processed and is sometimes referred to as processed sand.

Base Course. The base course is the layer or layers of specified material of designated thickness or rate of application placed on the subbase or subgrade to support subsequent layers of the pavement structure.

Bulk Specific Gravity (BSG). BSG is the ratio of the weight of dry aggregate to the weight of water having a volume equal to the volume of the aggregate, including both its permeable and impermeable pores (i.e., the volume of water in any permeable and impermeable pores is included in the volume of water used in the ratio calculation). BSG will be lower than the aggregate's ESG and ASG.

Bulk Specific Gravity-Saturated Surface Dry (BSG-SSD). BSG-SSD is the ratio of the weight of the aggregate, including the weight of the water it contains when its permeable voids are saturated, to the weight of an equal volume of water. The free moisture on the surface of the aggregate is removed and not considered in calculating the ratio.

Chemical Reactivity/Resistance. Chemical reactivity refers to the susceptibility of the aggregate structure to change due to a chemical reaction with the asphalt binder. Chemical resistance refers to the ability of the aggregate to resist attack by chemicals.

Coarse Aggregate (CA). Coarse aggregate is generally considered to be crushed stone, crushed gravel or natural gravel of a size that is predominantly retained on the No. 4 sieve.

Coarse-Graded. Coarse-graded aggregate is an aggregate material that consists primarily of coarse particles with few fine particles present.

Compaction. The mechanical densification of a material by packing together the solids and squeezing out the air.

Contract. The term Contract refers to a combined set of documents, including the Plans and Specifications, that defines the agreement between SCDOT and the Contactor for performing the work, furnishing labor and materials, accepting and measuring the work and materials and the basis of payment.

Contract Plans. The term Contract Plans refers to the approved engineering drawings including profiles, cross-sections and supplemental drawings that show the location, character, dimensions and details of the work to be performed.

Contract Specifications. The term Contract Specifications refers to the written technical requirements for the project and include *Standard Specifications*, Supplemental Specifications, Special Provisions and notes on plans that pertain to the method and manner of performing the work or to the quantities and qualities of materials to be furnished under the Contract. It is important to note that the Contract Specifications supplement the Contract Plans by providing information and instructions that are not on the drawings.

Crushed Glass. The use of recycled crushed glass as an aggregate material is permitted in some situations. There are critical administrative and environmental testing requirements associated with managing stockpiles and using crushed glass. The material must meet South Carolina Department of Environmental Control regulations as a non-hazardous material (e.g., lead content) and applicable EPA standards. Ensure that the Contractor's Certification Letter of Material Compliance is retained and that SCDOT assigned stockpile numbers are used to properly track materials from source through production.

Crushed Gravel. Crushed gravel is the product resulting from the artificial crushing of gravel. Its use is limited by the Contract Specifications.

Crushed Stone. Crushed stone is the product resulting from the artificial crushing of rocks, boulders or large stones, which have been obtained through excavation and/or blasting. It is the most common type of coarse aggregate material used in South Carolina for HMA mixtures (e.g., granite, granite gneiss).

Deleterious Material (Cleanliness). Aggregate materials must be free of deleterious materials (e.g., clay, organic materials). Aggregate cleanliness may often be determined by visual inspection, but a washed sieve analysis (SC-T-5) usually provides better results. A sand equivalency test (e.g., AASHTO T 176) is also used to determine the reactive proportion of detrimental fine dust or clay-like materials that are in the portion of the aggregate passing the No. 4 sieve.

Dense-Graded. Dense-graded aggregate is an aggregate material with approximately equal amounts of particles across the entire range of sizes.

Density. The weight of a given volume of material.

Drainage. Features used to control surface and subsurface water flow.

Durability (Aggregate). Durability is related to aggregate hardness and toughness. It is a measured through a series of freeze-thaw cycles or by immersion in a sodium sulfate solution (AASHTO T 104).

Durability (HMA). Durability describes the ability of an HMA mixture to retain its original properties and resist environmental aging induced by the damaging action of air, water, temperature and traffic. Over time, the properties of the asphalt binder can change due to oxidation and volatilization and the binder-aggregate bond can be broken due to water infiltration and freeze-thaw cycles. Such changes can cause pavement failure. Densely graded aggregate, high asphalt binder content and well compacted, watertight mixtures tend to improve pavement durability. However, a high asphalt binder content can cause pavement rutting, shoving, bleeding and flushing to occur.

Dust Ratio. The dust ratio of an aggregate material is the percent material that passes the No. 200 sieve divided by that which passes the No. 40 sieve.

Effective Specific Gravity (ESG). ESG is the ratio of the weight of dry aggregate to the weight of an equal volume of water, excluding the voids permeable to asphalt binder. ESG will be less than the aggregate's ASG, but more than its BSG.

Embankment (Fill). A material used in highway construction to carry traffic over valleys and low areas.

Fatigue Resistance (HMA). Fatigue resistance is the ability of an HMA pavement to resist repeated traffic loading. An HMA mixture with high asphalt binder content and densely graded aggregate material will typically have a greater fatigue resistance than an open-graded mixture.

Fine Aggregate. Fine aggregate is considered to be any material that passes a No. 4 sieve.

Fine-Graded. Fine-graded aggregate is an aggregate material that consists primarily of fine particles with few coarse particles present.

Flexibility (HMA). An HMA pavement should be able to bend slightly without cracking under traffic loading and during moderate movement of the subbase and base course. Flexibility of the HMA mixture is optimized by high asphalt binder content and relatively open-graded mixtures.

Free Moisture. Free moisture is the water on the surface of the aggregate which makes its surface appear shiny.

Gap-Graded. Gap-graded and open-graded aggregates are essentially the same with one important difference. Gap-graded aggregate generally has a greater amount of fine aggregate particles and the amount of medium sized aggregate particles, if present, will be very small.

Gradation. Gradation is the relative distribution of particle sizes in the aggregate. It affects mix workability, compactability, stability, permeability and surface texture. Gradation is determined by mechanically shaking the aggregate over a nest of sieves having decreasingly smaller openings. AASHTO T 27 is used for fine and coarse aggregates, and AASHTO T 11 is used for wet sieve analysis of fine material passing the No. 200 sieve. The percent material retained on

each sieve is plotted (e.g., 0.45 Power Gradation Curve) to classify the gradation of the aggregate as follows: uniform, coarse, fine, dense, open and gap. Gradation will be specified in the Contract for the HMA mixture required, and the *Standard Specifications* will specify the upper and lower limits for the percent material passing each designated sieve size for the various types of HMA mixtures. Note that these values are not gradation design values, but are maximum allowable tolerances.

Gravel. Gravel is considered a coarse aggregate, except that its source is from the natural disintegration and abrasion of rock or weakly bound conglomerate. The production of gravel is different from that of crushed stone in that it is mined from the natural surroundings and no blasting is involved. It goes through a screening and washing process and is separated by size. The use of gravel in HMA mixtures is limited by the Contract Specifications.

Hardness. Hardness refers to an aggregate's ability to resist wear and is typically measured using the Los Angeles Abrasion Test (AASHTO T 96).

Intermediate Course. The term intermediate course refers to the HMA material placed immediately below the surface course.

Laboratory. The term Laboratory refers to, as appropriate, the Research and Materials Laboratory, District Materials Laboratory or any other project materials and testing laboratory that may be approved by the Research and Materials Engineer.

Limestone. The limestone found in South Carolina is predominantly sedimentary in nature. The production is similar to that of crushed stone in that blasting, crushing, screening and blending may be required. The use of limestone is limited by the Contract Specifications.

Low-Tonnage Paving. The term low tonnage paving refers to HMA production as defined in the Contract Specifications.

Main-Line Paving. The term main-line paving refers to the construction of the pavement of the roadway, including shoulders, ramps and acceleration/deceleration lanes.

Materials. Any substance to be incorporated in the work during construction.

Maximum Dry Density. The dry unit weight obtained from a given compactive effort as defined by the peak of a compaction curve.

Maximum Particle Size. Maximum particle size refers to the minimum sieve size of which 100% of the aggregate material will pass.

Mineral Filler. Mineral filler is material that passes the No. 200 sieve that is incorporated in the HMA mixture.

Moisture Content. The ratio of the weight of water in a given mass of material to the weight of solid particles in the mass (expressed as percent).

Moisture Susceptibility. The term moisture susceptibility (i.e., affinity for asphalt) refers to the susceptibility of the aggregate to strip or separate from the asphalt binder coating through the action of water and traffic. Such a tendency may make an aggregate source unsuitable for an HMA mixture. To minimize this tendency, SCDOT HMA mixtures generally require a liquid anti-stripping additive or the addition of 1% hydrated lime by weight of total aggregate.

Muck. A mixture of organic matter, soils and water.

Natural Sand. Natural sand is often referred to as local sand and is considered a fine aggregate. Natural sand comes from the natural disintegration and abrasion of rock or friable sandstone in particular locations in South Carolina and may be processed through a screening operation. When natural sands come directly from a riverbank, they are referred to as bank sands. Natural sands that have been stockpiled prior to use are typically referred to as processed sand. Natural sands typically provide lower stability than manufactured sand due to their rounded particles; however, they are easier to compact than manufactured sand. The use of natural sand in HMA mixtures is limited by the Contract Specifications.

Nominal Maximum Particle Size. The definition of nominal maximum particle size differs depending on its application in construction. In general, for most applications, the nominal maximum particle size is defined as the largest sieve to retain any material. For asphalt mixtures, the nominal maximum aggregate size is defined as one sieve size larger than the first sieve to retain more than 10% material.

Non Main-Line Paving. The term non main-line paving refers to the HMA courses that are not controlled by density requirements, which generally include patching, leveling, less than 8-foot widening, wedges and driveways.

Open-Graded. Open-graded aggregate is an aggregate material that consists primarily of coarse aggregate particles with a minimal amount of fine particles. Its primary purpose is to provide a very open surface texture, which promotes surface water drainage and skid resistance.

Optimum Moisture Content. The amount of water at which the maximum density of a material can be obtained within a given compactive effort (usually established by the Research and Materials Engineer for the given mixture).

Pavement Structure. The term pavement structure refers to the combination of subbase, base course and surface course, as specified, placed on the subgrade to support and distribute the traffic load to the roadbed. See Section 300.2 for additional information on the pavement structure.

Permeability (HMA). Permeability of an HMA mixture is its ability to resist the passage of air and water through the pavement. Air void content, as well as the interconnection of the voids and their access to the pavement surface, are very critical to keep the mixture less permeable and more durable.

Pore Structure. Pore structure refers to the size, volume and shape of the voids in the aggregate. Some pores are permeable, and some are not.

Porosity. Porosity is the percent of the total volume of aggregate that is occupied by pores.

Processed Sand. The term processed sand refers to natural sand that has been excavated from a river, river bank or other natural source and has been stockpiled for use. Processed sands may also be screened and washed.

Recycled Asphalt Pavement (RAP). RAP tends to be a good source of aggregate material for HMA mixtures. The use of reprocessed aggregate material obtained from SCDOT RAP milling projects is permitted in select asphalt courses. There are critical administrative and testing requirements associated with managing RAP stockpiles and using RAP in HMA mixtures. Ensure that the Contractor's Certification Letter of Material Compliance is retained and that SCDOT assigned stockpile numbers are used to properly track materials from source through production.

Roadbed. The roadbed is the graded portion of a roadway between the outside shoulder lines, prepared as a foundation for the pavement structure, median and shoulders. Extensive areas between the roadway of divided highways are not considered roadbed.

Roadway. That portion of highway lying within the limits of construction.

Sample Identification Card. The term Sample Identification Card refers to a Research and Materials Laboratory form (i.e., card) that is used to identify and ship material samples. See Appendix B for additional information on Sample Identification Cards.

Saturated Surface Dry (SSD). Saturated surface dry aggregate refers to aggregate that has its interior pores saturated with absorbed moisture with no free moisture visible on the aggregate's surface.

SC-T-(#). SC-T-(#) is nomenclature that is used to designate SCDOT sampling and testing procedures that must be used where specified in the Contract. See Appendix C for additional information on SCDOT sampling and testing procedures.

SCDOT Construction Forms. The term SCDOT Construction Forms refers to the set of hard copy and electronic forms used by construction personnel during contract administration, inspection and sampling and testing duties. These forms supplement information entered into SiteManager Daily Work Reports. See Appendix A for a list of SCDOT Construction Forms.

Shape. Shape refers to the angularity of aggregate edges. Sharp, angular edges (e.g., crushed stone) tend to increase interlocking of aggregate particles, while rounded edges (e.g., gravel) tend to increase the workability of the HMA mixture.

Shoulders. The term shoulders refers to the portion of the roadway contiguous with the traveled way for accommodation of stopped vehicles, for emergency use and for lateral support of base and surface courses.

Slag. Slag is considered a coarse aggregate, but its use in HMA mixtures is limited in the Contract Specifications. Slag is porous and will readily absorb the asphalt binder. There are critical administrative and testing requirements associated with managing slag stockpiles and using slag in HMA mixtures. Ensure that the Contractor's Certification Letter of Material Compliance is retained and that SCDOT assigned stockpile numbers are used to properly track materials from source through production.

Soil. Any unconsolidated earthen material, excluding bedrock, composed of insoluble minerals, organic matter, water and gases that can be excavated.

Special Provisions. The term Special Provisions refers to provisions that have been inserted into the Contract as a revision or supplement for conditions peculiar to the individual project under Contract.

Specific Gravity (SG). Specific gravity is the ratio of the mass of a given volume of aggregate to the mass of an equal volume of water at 77°F. SCDOT will not approve an HMA mixture if the specific gravity of the aggregate is higher than 2.90. Specific gravity is used to determine the void content in a compacted HMA mixture. If the specific gravity used in the compacted mixture is greater than the actual value, the mixture will have an excessive amount of asphalt binder, which will cause flushing. If the specific gravity used in the compacted mix is less than the actual value, the mixture will have less than optimum asphalt binder content, which can lead to raveling. AASHTO T 85 is used to determine specific gravity for coarse aggregates, and AASHTO T 84 is used to determine specific gravity for fine aggregates.

Stability (HMA). Stability describes the ability of an HMA pavement to resist deformation caused by traffic loading. An improperly designed HMA mixture can cause the pavement to rut or washboard. Stability depends primarily on internal friction and cohesion within the mixture. An increase in internal friction and cohesion tends to increase a mixture's stability. Internal friction depends on the surface texture, particle shape and gradation of the aggregate and the grade and quantity of asphalt binder used in the mixture. Rougher aggregate surfaces and more angular particles tend to increase internal friction. On the other hand, an excessive quantity of asphalt binder will decrease internal friction and lower stability. Cohesion is the internal binding force that is inherent in HMA mixtures and varies with the grade of asphalt binder. Cohesion increases with increasing asphalt binder content up to an optimum point, then decreases.

Standard Specifications. Where referenced, the term *Standard Specifications* refers to the SCDOT publication entitled *South Carolina Department of Transportation Standard Specifications for Highway Construction*.

Stone Screenings (Manufactured Sand). The term stone screenings refers to fine aggregate material that is produced during the crushing operation of coarse aggregate production. This material may be processed through a screening and washing process. Stone screenings that have been through a washing process are typically referred to as washed screenings. Stone screenings that have not gone through this washing process are typically referred to as regular screenings. Stone screenings typically provide higher stability than natural sand due to their angular shaped particles; however, they are more difficult to compact than natural sand.

Subbase. The term subbase refers to the layer or layers of specified material of designated thickness or rate of application placed on the subgrade to support the base course and surface course of the pavement structure.

Subgrade. The term subgrade refers to the top 18 inches of the roadbed upon which the pavement structure and shoulders will be constructed.

Supplemental Specifications. The term Supplemental Specifications refers to work and material specifications adopted after the publication of the *Standard Specifications* that constitute a part of the Contract. When referenced, Supplemental Specifications will prevail over *Standard Specifications*.

Surface Charge. Surface charge refers to the distribution of electric charge on the surface of an aggregate particle.

Surface Course. The surface course is generally the uppermost layer of material placed on the traveled way, shoulders, or both, provided as the riding surface of the pavement structure.

Total Moisture. Total moisture is the sum of the absorbed moisture in and the free moisture on the aggregate.

Toughness. Toughness is the capacity of the aggregate to absorb the energy of an applied force, which is usually measured by impact testing.

Traveled Way. The term traveled way refers to the portion of the roadway that is used for the movement of vehicles, exclusive of the shoulders.

Uniform-Graded. Uniform-graded aggregate is an aggregate material with a large percentage of particles approximately the same size.

Workability (HMA). Workability describes the ease with which an HMA mixture can be placed and compacted. Aggregate properties that tend to promote higher stability (e.g., surface roughness, angularity) will usually decrease the mixture's workability.