Table A.01 Conversion Factors (Customary to Metric Units)

To convert from	To	Multiply by
acre	meter² (m^2)	4046.856
acre	hectometer² (hm^2)	0.404686
Atmosphere (technical = 1kgf/cm^2)	kilopascal (kPa)	98.0665
barrel (42 gal.)	decimeter³ (dm^3) or liter (l)	158.987.3
BTU (international Table)	kilojoule (kJ)	1.055056
bushel	decimeter³ (dm^3)	35.2391
dyne	micronewton (μN)	10.0
dyne/centimeter²	pascal (Pa)	0.1
Fahrenheit (temperature)	Celsius (°C)	$t_c = (t_f-32)/1.8$
foot	meter (m)	0.3048
foot²	meter² (m^2)	0.092903
foot³	meter³ (m^3)	0.028317
	liter (l)	28.317
foot-pound-force	joule (j)	1.355818
foot/minute	meter/second (m/s)	0.00508
foot/second	meter/second² (m/s^2)	0.3048
gallon (U.S. liquid)	decimeter³ (dm^3) or liter (l)	3.785412
	meter³ (m^3)	0.003785
gallon/minute	decimeter³/second (dm^3/s) or liter/second (l/s)	0.06309
gallon/yard²	decimeter³/meter² (dm^3/m^2) or liter/meter² (l/m^2)	4.527314
horsepower (electric)	kilowatt (kW)	0.746
inch	millimeter (mm)	25.4
inch²	centimeter² (cm^2)	6.4516
inch²	millimeter² (mm^2)	645.16
inch³	centimeter³ (cm^3)	16.38706
inch/second	meter/second (m/s)	0.0254
inch of mercury (60? F)	pascal (Pa)	3376.85
inch/second²	meter/second² (m/s^2)	0.0254
kilogram (kg)	ton (metric	0.001
kip (1000 lbf)	kilonewton (kN)	4.448222
kip/inch²	megapascal (MPa)	6.894757
mile (U.S. statute)	kilometer (km)	1.609344
mile²	kilometer² (km^2)	2.589988
mile/hour	kilometer/hour (km/hr)	1.609344
minute (angle)	radian (rad)	0.00029089
ounce-force	newton (N)	0.278 0139
ounce-mass	gram (g)	28.34952
ounce-fluid	centimeter³ (cm^3)	29.57353
	liter(l)	0.029574
pint (U.S. liquid)	liter (l)	0.4731765
poise (absolute viscosity)	pascal-second (Pa-s)	0.1
pound-force (lbf)	newton (N)	4.448222
	kilonewton (kN)	0.004448
pound-force-inch	newton-meter (N.m)	0.1129848
pound-force/foot²	pascal (Pa)	47.88026
pound-force/inch² (psi)	kilopascal (kPa)	6.894757
pound-mass	kilogram (kg)	0.4535924
pouond-mass/foot²	kilogram/meter² (kg/m^2)	4.882428
pound-mass/foot³	kilogram/meter³ (kg/m^3)	16.01846
	megagram/meter³(Mg/m^2)	0.-016018
pound-mass/inch³	kilogram/decimeter³ (kg/dm^3)	27.67990
pound-mass/gallon (U.S. liquid)	kilogram/meter³ (kg/dm^3)	119.8264
	kilogram/decimeter³ (kg/dm^3)	0.119.826
psi	kilopascal (kPa)	6.894757
quart (U.S. liquid)	decimeter³ (dm^3) or liter (l)	0.9463529
ton (metric)	kilogram (kg)	1000.0
ton (short-2000 lb)	kilogram (kg)	907.1847
ton (long-2240 lb)	kilogram (kg)	1016.0461
ton-mass/yard³	kilogram/meter³ (kg/m^3)	1186.5527
yard	meter (m)	0.9144
yard²	meter² (m^2)	0.8361274
yard³	meter³ (m^3)	0.7645549

Table A.02 Weight and Volume Relations for Various Types Of Compacted Asphalt Pavements

kg/m³	kg/dm³	kg/m²/cm depth	lb/ft³	lb/yd³	lb/yd²/in depth
1600	1.6	16	100	2700	75
1700	1.7	17	105	2835	79
1800	1.8	18	110	2970	82
1900	1.9	19	115	3105	86
2000	2.0	20	120	3240	90
2100	2.1	21	125	3375	94
2200	2.2	22	130	3510	97
2300	2.3	23	135	3645	101
2400	2.4	24	140	3780	105
2500	2.5	25	145	3915	109
2600	2.6	26	150	4050	112
			155	4185	116
			160	4320	120

Range for Various Pavement Types

Pavement Type	kg/m³	kg/dm³	kg/m²/cm depth	lb/ft³	lb/yd³	lb/yd²/in depth
Open Graded	1850-2250	1.85-2.25	18.5-22.5	115-140	3105-3780	86-105
Coarse Graded	2100-2400	2.10-2.40	21.0-24.0	130-150	3510-4050	97-112
Dense Graded	2150-2500	2.15-2.50	21.5-25.0	135-155	3645-4185	101-116
Fine Graded	2100-2400	2.10-2.40	21.0-24.0	130-150	3510-4050	97-112
Stone Sheet	2100-2400	2.10-2.40	21.0-24.0	130-150	3510-4050	97-112
Sand Sheet	1900-2250	1.90-2.25	19.0-22.5	120-140	3240-3780	90-105
Fine Sheet	1900-2250	1.90-2.25	19.0-22.5	120-140	3240-3780	90-105
Mixed-in-Place Macadam	1750-2150	1.75-2.15	17.5-21.5	110-135	2970-3645	82-101
Mixed-in-Place Dense Graded	1750-2150	1.75-2.15	17.5-21.5	110-135	2970-3645	82-101
Mixed-in-Place Sand Asphalt	1600-2000	1.60-2.00	16.0-20.0	100-125	2700-3375	75-94

Note:
Because of the considerable variations in specific gravity, gradation, and other characteristics of mineral aggregates, weight per unit volume of compacted asphalt pavement varies considerably. Exact weights per unit volume should be determined in the laboratory from samples taken from the same materials as used in the field.

Preliminary Estimating

kg/m²/cm depth	lb/yd²/in depth
21.0	100
22.5	105
23.5	110
22.5	105
22.5	105
21.0	100
21.0	100
20.0	95
20.0	95
18.0	95

Table A.03 Composition of Asphalt Concrete

Sieve Size	Mix Designation and Nominal Maximum Size of Aggregate				
	37.5 mm (1-1/2 in.)	25.0 mm (1 in.)	19.0 mm (3/4 in.)	12.5 mm (1/2 in.)	9.5 mm (3/8 in.)
	Total Percent Passing (by weight)				
50.0 mm (2 in.)	100	—	—	—	—
37.5 mm (1-1/2 in)	90 to 100	100	—	—	—
25.0 mm (I in.)	—	90 to 100	100	—	—
19.0 mm (3/4 in.)	56 to 80	—	90 to 100	100	—
12.5 mm (1/2 in.)	—	56 to 80	—	90 to 100	100
9.5 mm (3/8 in.)	—	—	56 to 80	—	90 to 100
4.75 mm (No. 4)	23 to 53	29 to 59	35 to 65	44 to 74	55 to 85
2.36 mm (No. 8)*	15 to 41	19 to 45	23 to 49	28 to 58	32 to 67
1.18 mm (No. 16)	—	—	—	—	—
0.60 mm (No. 30)	—	—	—	—	—
0.30 mm (No. 50)	4 to 16	5 to 17	5 to 19	5 to 21	7 to 23
0.15 mm (No. 100)	—	—	—	—	—
0.075 mm (No. 200)**	0 to 5	1 to 7	2 to 8	2 to 10	2 to 10
Asphalt Cement, weight percent of Total Mixture†	4 to 11	3 to 8	3 to 9	4 to 10	5 to 12

*In considering the total grading characteristics of an asphalt paving mixture, the amount passing the 2.36 mm (No. 8) sieve is a significant and convenient field control point between fine and coarse aggregate. Gradings approaching the maximum amount permitted to pass the 2.36 mm (No. 8) sieve will result in pavement surfaces having comparatively fine texture, while gradings approaching the minimum amount passing the 2.367 mm (No. 8) sieve will result in surfaces with comparatively coarse texture.

**The material passing the 0.075 mm (No. 200) sieve may consist of fine particles of the aggregates or mineral filler or both. It shall be free from organic matter and clay particles and have a plasticity index not greater than 4 when tested in accordance with Method T 89 and Method T 90.

†The quantity of asphalt cement is given in terms of weight percent of the total mixture. The wide difference in the specific gravity of various aggregates, as well as a considerable difference in absorption, results in a comparatively wide range in the limiting amount of asphalt cement specified. The amount of asphalt required for a given mixture should be determined by appropriate laboratory testing or the basis of past experience with similar mixtures or by a combination of both.

APPENDIX B

GLOSSARY OF TERMS PERTAINING TO ASPHALT PAVEMENT CONSTRUCTION

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

Types:

Coarse Aggregate: Aggregate retained on the 2.36 mm (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 2.36 mm (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 and in which the void space in the compacted aggregate are relatively large.

Well-Graded Aggregate : Aggregate graded with relatively uniform proportions from the maximum size down to filler with the object of obtaining an asphalt mix with a controlled void content and high stability.

Aggregate Storage Bins*: Bins that store the necessary aggregate sizes and feed them to the dryer in substantially the same proportions as are required in the finished mix.

Air Voids: Empty spaces in a compacted mix surrounded by asphalt-coated particles, expressed as a percentage by volume of the total compacted mix.

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 petroleums.

Asphalt Binder: Asphalt cement that is classified according to the Standard Specification for Performance Graded Asphalt Binder, AASHTO Designation MP 1. It can be either unmodified or modified asphalt cement, as long as it complies with the specifications.

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

Asphalt Concrete: See Hot Mix Asphalt.

Asphalt Leveling Course: A course of hot mix asphalt of uniform or variable thickness used to eliminate irregularities in the contour of an existing surface prior to placing the subsequent course.

Asphaltenes*: The high molecular weight hydrocarbon fraction precipitated from asphalt by a designated paraffinic naphtha solvent at a specified solvent-asphalt ratio.

Automatic Cycling Control*: A control system in which the opening and closing of the weigh hopper discharge gate, the bituminous discharge valve, and the pugmill discharge gate are actuated by means of self-acting mechanical or electrical machinery without any intermediate manual control. The system includes preset timing devices to control the desired periods of dry and wet mixing cycles.

* ASTM Definitions

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.

Bank Gravel*: Gravel found in natural deposits, usually intermixed with fine material such as sand or clay or combinations thereof; includes gravelly clay, gravelly sand, clayey gravel, and sandy gravel (the names indicate the relative proportions of the materials in the mixture).

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 of 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 material by either weight or volume.

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.

Blast-Furnace Slag*: The nonmetallic product, consisting essentially of silicates and alumino-silicates of lime and of other bases, that is developed simultaneously with iron in a blast furnace.

Bleeding or Flushing: 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.

Clinker*: Generally a fused or partly fused by-product of the combustion of coal. Also includes lava and portland-cement clinker and partly vitrified slag and brick.

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

Compaction: The act of compressing a given volume of material into a smaller volume. Insufficient compaction of the asphalt pavement courses may accelerate the onset of pavement distresses of various types.

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.

Consistency: The degree of fluidity of asphalt cement at any particular temperature. The consistency of asphalt cement varies with its temperature; therefore, it is necessary to use a common or standard temperature when comparing the consistency of one asphalt cement with another.

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 a 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 and/or contamination due to oil spillage.

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, and 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 the alternate wetting and drying beneath the shoulder surface. Other causes are shoulder settlement, mix shrinkage, and trucks straddling the joint.

Lane 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 and 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. They result when a severe or repeated shear stresses are applied to the surface and 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), to form one of the following cutback asphalts. Upon exposure to atmospheric conditions the diluents evaporate, leaving the asphalt cement to perform its function.

Rapid-Curing (RC) Asphalt: Cutback asphalt composed of asphalt cement and a naphtha or gasoline-type diluent of high volatility.

Medium-Curing (MC) Asphalt: Cutback asphalt composed of asphalt cement and a kerosene-type diluent of medium volatility.

Slow-Curing (SC) Asphalt: Cutback asphalt composed of asphalt cement and oils of low volatility.

Road Oil: A heavy petroleum oil, usually similar to one of the slow-curing (SC) grades.

Delivery Tolerances*: Permissible variations from the exact desired proportions of aggregate and bituminous material as delivered into the pugmill.

Density: The degree of solidity that can be achieved in a given mixture, which will be limited only by the total elimination of voids between particles in the mass.

Densification: The act of increasing the density of a mixture during the compaction process.

Distortion: Any change of the pavement surface from its original shape.

Drum Mix Plant: A manufacturing facility for producing asphalt paving mixtures that proportions the aggregate, then dries and mixes the aggregate with a proportional amount of asphalt in the same drum. 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.

Dryer*: An apparatus that will dry the aggregates and heat them to the specified temperatures.

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

Durability: The property of an asphalt paving mixture that represents 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.

Emulsified Asphalt: A combination of asphalt cement, water and a small amount of an emulsifying agent. It is a heterogeneous system (containing two normally immiscible substanous 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 either anionic – electronegatively charged asphalt globules – or cationic – electropositively charged asphalt globules – depending upon the emulsifying agent.

Emulsified Asphalt Mix (Cold Mix): A mixture of emulsified asphalt and aggregate produced in a central plant (plant mix) or mixed at the road site (mixed-in-place).

Fatigue Resistance: The ability of asphalt pavement to withstand slight repeated flexing, or bending, caused by the passage of wheel loads. As a rule, the higher the asphalt 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 prepared subgrade.

Grade Depressions: Localized low areas of limited size, which may or may not be accompanied by cracking.

Hot Aggregate Storage Bins*: Bins that store heated and separated aggregates prior to their final proportioning into the mixer.

Hot Mix Asphalt (Asphalt Concrete): High quality, thoroughly controlled hot mixture of asphalt binder (cement) and well-graded, high quality aggregate, which can be thoroughly compacted into a uniformly dense mass.

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

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

Mesh*: The square opening of a sieve.

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

Mineral Filler: A finely divided mineral product, at least 70 percent of which will pass a 0.075 mm (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.

Natural (Native) Asphalt: Asphalt occurring in nature, which has been derived from petroleum through natural processes of evaporation of volatile fractions, leaving the asphalt fractions. The native asphalt of most importance is found in the Trinidad and Bermudez Lake deposits. Asphalt from these sources is often called lake asphalt. Practically none of this asphalt is used in the United States today.

Open-Grade 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.

Pavement Structure: A pavement, including all of 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) that a standard needle penetrates a sample vertically under specified conditions of loading, time and temperature.

Penetration Grading: A classification system of asphalt cements based on penetration in 0.1 mm at 25°C (77°F). There are five standard penetration grades for paving: 40-50, 60-70, 85-100, 120-150, and 200-300.

Performance Graded (PG): Asphalt binder grade designation used in Superpave; based on the binder's mechanical performance at critical temperatures and aging conditions. This system directly correlates laboratory testing to field performance through engineering principles.

Plant Screens*: Screens located between the dryer and hot bins which separate heated aggregates into 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.

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.

Ruts (Channels): Grooves that develop in the wheel tracks of a pavement. Channels 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 the traffic.

Sand Asphalt: A mixture of sand and asphalt cement, cutback asphalt or emulsified asphalt. It may be prepared with or without special control of aggregate grading and may or may not contain mineral filler. Either mixing-in-place or plant mix construction may be employed. Sand asphalt is used in construction of both base and surface courses.

Sheet Asphalt: A hot mixture of asphalt binder with clean, angular, graded sand and mineral filler. Its use is ordinarily confined to reservoir liners and land fill caps; usually laid on an intermediate or leveling course.

Sieve: In laboratory work, an apparatus in which the openings in the mesh 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 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 cement. The ability of the portion of the asphalt cement that is soluble to be dissolved in a specified solvent.

Source Properties: Critical aggregate characteristics, which because of their nature, are source specific and whose use and limiting values are source dependent and established by the using agency.

Stability: The ability of an asphalt paving mixtures 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. If the subgrade soil has adequate support, it may serve as the subbase.
Subgrade: The soil prepared to support a pavement structure or a pavement system. It is the foundation of the pavement structure.
Subgrade, Improved: 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. Subgrade improvement does not affect the design thickness of the pavement structure.
Superpave™: Short for "Superior Performing Asphalt Pavement" – a performance-based system for selecting and specifying asphalt binders and for developing an asphalt mixture design.
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 mixture design system that integrates the selection of materials (asphalt, aggregate) and volumetric proportioning with the project's climate and design traffic.
Viscosity: A measure of the resistance to flow of a liquid. It is one method of measuring the consistency of asphalt.

Absolute Viscosity: A measure of the viscosity of asphalt, measured in poises, conducted at a temperature of 60°C (140°F). The test method utilizes a partial vacuum to induce flow in the viscometer.

Kinematic Viscosity: A measure of the viscosity of asphalt, measured in centistokes, conducted at a temperature of 135°C (275°F).

Viscosity Grading: A classification system of asphalt cements based on viscosity ranges at 60°C (140°F). A minimum viscosity at 135°C (275°F) is also usually specified. The purpose is to prescribe limiting values of consistency at these two temperatures. 60°C (140°F) approximates the maximum temperature of an asphalt pavement surface in service in the U.S.; 135°C (275°F) approximates the mixing and laydown temperatures for hot mix asphalt pavements.
Wet Mixing Period: The interval of time between the beginning of application of asphalt material into a pugmill and the opening of the discharge gate.
Workability: The ease with which paving mixtures may be placed and compacted.

APPENDIX C

RANDOM NUMBER TABLES

See examples in Chapter 7 for discussion of using random number tables.

Table C.01 Random Number Table

Col No. 1			Col. No. 2			Col. No. 3			Col. No. 4			Col. No. 5			Col. No. 6			Col. No. 7		
A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
15	.033	.576	05	.048	.879	21	.013	.220	18	.089	.716	17	.024	.863	30	.030	.901	12	.029	.386
21	.101	.300	17	.074	.156	30	.036	.853	10	.102	.330	24	.060	.032	21	.096	.198	18	.112	.284
23	.129	.916	18	.102	.191	10	.052	.746	14	.111	.925	26	.074	.639	10	.100	.161	20	.114	.848
30	.158	.434	06	.105	.257	25	.061	.954	28	.127	.840	07	.167	.512	29	.133	.388	03	.121	.656
24	.177	.397	28	.179	.447	29	.062	.507	24	.132	.271	28	.194	.776	24	.138	.062	13	.178	.640
11	.202	.271	26	.187	.844	18	.087	.887	19	.285	.899	03	.219	.166	20	.168	.564	22	.209	.421
16	.204	.012	04	.188	.482	24	.105	.849	01	.326	.037	29	.264	.284	22	.232	.953	16	.221	.311
08	.208	.418	02	.208	.577	07	.139	.159	30	.334	.938	11	.282	.262	14	.259	.217	29	.235	.356
19	.211	.798	03	.214	.402	01	.175	.641	22	.405	.295	14	.379	.994	01	.275	.195	28	.264	.941
29	.233	.070	07	.245	.08	23	.196	.873	05	.421	.282	13	.394	.405	06	.277	.475	11	.287	.199
07	.260	.073	15	.248	.831	26	.24	.981	13	.451	.212	06	.410	.157	02	.296	.497	02	.336	.992
17	.262	.308	29	.261	.087	14	.255	.374	02	.461	.023	15	.438	.70	26	.311	.144	15	.393	.488
25	.271	.180	30	.302	.883	06	.31	.043	06	.487	.539	22	.453	.635	05	.351	.141	19	.437	.655
06	.302	.372	21	.318	.088	11	.316	.653	08	.497	.396	21	.472	.824	17	.370	.811	24	.466	.773
01	.409	.406	11	.376	.936	13	.324	.585	25	.503	.893	05	.488	.118	09	.388	.484	14	.531	.014
13	.507	.693	14	.43	.814	12	.351	.275	15	.594	.603	01	.525	.222	04	.410	.073	09	.562	.678
02	.575	.654	27	.438	.676	20	.371	.535	27	.620	.894	12	.561	.980	25	.471	.530	06	.601	.750
18	.591	.318	08	.467	.205	08	.409	.495	21	.629	.841	08	.652	.508	13	.486	.779	10	.612	.859
20	.610	.821	09	.474	.138	16	.445	.740	17	.691	.583	18	.668	.271	15	.515	.867	26	.673	.112
12	.631	.597	10	.492	.474	03	.474	.929	09	.708	.689	30	.736	.634	23	.567	.798	23	.738	.770
27	.651	.281	13	.499	.892	27	.543	.387	07	.709	.012	02	.763	.253	11	.618	.502	21	.753	.614
04	.661	.953	19	.511	.520	17	.625	.171	11	.714	.049	23	.804	.140	28	.636	.148	30	.758	.851
22	.692	.089	23	.591	.770	02	.699	.073	23	.720	.695	25	.828	.425	27	.65	.741	27	.765	.563
05	.779	.346	20	.604	.730	19	.702	.934	03	.748	.413	10	.843	.627	16	.711	.508	07	.780	.534
09	.787	.173	24	.654	.330	22	.816	.802	20	.781	.603	16	.858	.849	19	.778	.812	04	.818	.187
10	.818	.837	12	.728	.523	04	.838	.166	26	.830	.384	04	.903	.327	07	.804	.675	17	.837	.353
14	.895	.631	16	.753	.344	15	.904	.116	04	.843	.002	09	.912	.382	08	.806	.952	05	.854	.818
26	.912	.376	01	.806	.134	28	.969	.740	12	.884	.582	27	.935	.162	18	.841	.414	01	.867	.133
28	.920	.163	22	.878	.884	09	.974	.046	29	.926	.700	20	.970	.582	12	.918	.114	08	.915	.538
03	.945	.14	25	.939	.162	05	.977	.494	16	.951	.601	19	.975	.327	03	.992	.399	25	.975	.584

Col No. 8			Col. No. 9			Col. No. 10			Col. No. 11			Col. No. 12			Col. No. 13			Col. No. 14		
A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
09	.042	.071	14	.061	.935	26	.038	.023	27	.074	.779	16	.073	.987	03	.033	.091	26	.035	.175
17	.141	.411	02	.065	.097	30	.066	.371	06	.084	.396	23	.078	.056	07	.047	.391	17	.089	.363
02	.143	.221	03	.094	.228	27	.073	.876	24	.098	.524	17	.096	.076	28	.064	.113	10	.149	.681
05	.162	.899	16	.122	.945	09	.095	.568	10	.133	.919	04	.153	.163	12	.066	.360	28	.238	.075
03	.285	.016	18	.158	.43	05	.180	.741	15	.187	.079	10	.254	.834	26	.076	.552	13	.244	.767
28	.291	.034	25	.193	.469	12	.200	.851	17	.227	.767	06	.284	.628	30	.087	.101	24	.262	.366
08	.369	.557	24	.224	.572	13	.259	.327	20	.236	.571	12	.305	.616	02	.127	.187	08	.264	.651
01	.436	.386	10	.225	.223	21	.264	.681	01	.245	.988	25	.319	.901	06	.144	.068	18	.285	.311
20	.450	.289	09	.233	.838	17	.283	.645	04	.317	.291	01	.320	.212	25	.202	.674	02	.340	.131
18	.455	.789	20	.29	.120	23	.363	.063	29	.350	.911	08	.416	.372	01	.247	.025	29	.353	.478
23	.488	.715	01	.297	.242	20	.364	.366	26	.380	.104	13	.432	.556	23	.253	.323	06	.359	.270
14	.496	.276	11	.337	.760	16	.395	.363	28	.425	.864	02	.489	.827	24	.320	.651	20	.387	.248
15	.503	.342	19	.389	.064	02	.423	.540	22	.487	.526	29	.503	.787	10	.328	.365	14	.392	.694
04	.515	.693	13	.411	.474	08	.432	.736	05	.552	.511	15	.518	.717	27	.338	.412	03	.408	.770
16	.532	.112	20	.447	.893	10	.476	.468	14	.564	.357	28	.524	.998	13	.356	.991	27	.440	280
22	.557	.357	22	.478	.321	03	.508	.774	11	.572	.306	03	.542	.362	16	.401	.792	22	.461	.830
11	.559	.620	29	.481	.993	01	.601	.417	21	.594	.197	19	.585	.462	17	.423	.117	16	.527	.003
12	.650	.216	27	.562	.403	22	.687	.917	09	.607	.524	05	.695	.111	21	.481	.838	30	.531	.486
21	.672	.320	04	.566	.179	29	.697	.862	19	.650	.572	07	.733	.838	08	.560	.401	25	.678	.360
13	.709	.273	08	.603	.758	11	.701	.605	18	.664	.101	11	.744	.948	19	.564	.190	21	.725	.014
07	.745	.687	15	.632	.927	07	.728	.498	25	.674	.428	18	.793	.748	05	.571	.054	05	.797	.595
30	.780	.285	06	.707	.107	14	.745	.679	02	.697	.674	27	.802	.967	18	.587	.584	15	.801	.927
19	.845	.097	28	.737	.161	24	.819	.444	03	.767	.928	21	.826	.487	15	.604	.145	12	.836	.294
26	.846	.366	17	.846	.13	15	.84	.826	16	.809	.529	24	.835	.832	11	.641	.298	04	.854	.982
29	.861	.307	07	.874	.491	25	.863	.568	030	.838	.294	26	.855	.142	22	.672	.156	11	.884	.928
25	.906	.874	05	.880	.828	06	.878	.215	013	.845	.470	14	.861	.462	20	.674	.887	19	.886	.832
24	.919	.809	23	.931	.659	18	.93	.601	08	.855	.524	20	.874	.625	14	.752	.881	07	.929	.932
10	.952	.555	26	.960	.365	04	.954	.827	07	.867	.718	30	.929	.056	09	.774	.560	09	.932	.206
06	.961	.504	21	.978	.194	28	.963	.004	12	.881	.722	09	.935	.582	29	.921	.752	01	.970	.692
27	.969	.811	12	.982	.183	19	.988	.02	23	.937	.872	22	.947	.797	04	.959	.099	23	.973	.082

Table C.01 Random Number Table (Continued)

Col No. 15			Col. No. 16			Col. No. 17			Col. No. 18			Col. No. 19			Col. No. 20			Col. No. 21		
A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
15	.023	.979	19	.062	.588	13	.045	.004	25	.027	.290	12	.052	.075	20	.030	.881	01	.010	.946
11	.118	.465	25	.080	.218	18	.086	.878	06	.057	.571	30	.075	.493	12	.034	.291	10	.014	.939
07	.134	.172	09	.131	.295	26	.126	.990	26	.059	.026	28	.120	.341	22	.043	.893	09	.032	.346
01	.139	.230	18	.136	.381	12	.128	.661	07	.105	.176	27	.145	.689	28	.143	.073	06	.093	.180
16	.145	.122	05	.147	.864	30	.146	.337	18	.107	.358	02	.209	.957	03	.150	.937	15	.151	.012
20	.165	.520	12	.158	.365	05	.169	.470	22	.128	.827	26	.272	.818	04	.154	.867	16	.185	.455
06	.185	.481	28	.214	.184	21	.244	.433	23	.156	.440	22	.299	.317	19	.158	.359	07	.227	.277
09	.211	.316	14	.215	.757	23	.270	.849	15	.171	.157	18	.306	.475	29	.304	.615	02	.304	.400
14	.248	.348	13	.224	.846	25	.274	.407	08	.220	.097	20	.311	.653	06	.369	.633	30	.316	.074
25	.219	.890	15	.227	.809	10	.290	.925	20	.252	.066	15	.348	.156	18	.390	.536	18	.328	.799
13	.252	.577	11	.280	.898	01	.323	.490	04	.268	.576	16	.381	.710	17	.403	.392	20	.352	.288
30	.273	.088	01	.331	.925	24	.352	.291	14	.275	.302	01	.411	.607	23	.404	.182	26	.371	.216
18	.277	.689	10	.399	.992	15	.361	.155	11	.297	.589	13	.417	.715	01	.415	.457	19	.448	.754
22	.372	.958	30	.417	.787	29	.374	.882	01	.358	.305	21	.472	.484	07	.437	.696	13	.487	.598
10	.461	.075	08	.439	.921	08	.432	.139	09	.412	.089	4	.478	.885	24	.446	.546	12	.546	.640
28	.519	.536	20	.472	.484	04	.467	.266	16	.429	.834	25	.479	.080	26	.485	.768	24	.550	.038
17	.520	.090	24	.498	.712	22	.508	.880	10	.491	.203	11	.566	.104	15	.511	.313	03	.604	.780
03	.523	.519	04	.516	.396	27	.632	.191	28	.542	.306	10	.576	.659	10	.517	.290	22	.621	.930
26	.573	.502	03	.548	.688	16	.661	.836	12	.563	.091	29	.665	.397	30	.556	.853	21	.629	.154
19	.634	.206	23	.597	.508	19	.675	.629	02	.593	.321	19	.739	.298	25	.561	.837	11	.634	.908
24	.635	.810	21	.681	.114	14	.680	.890	30	.692	.198	14	.749	.759	09	.574	.599	05	.696	.459
21	.679	.841	02	.739	.298	28	.714	.508	19	.705	.445	08	.756	.919	13	.613	.762	23	.710	.078
27	.712	.366	29	.792	.038	06	.719	.441	24	.709	.717	07	.798	.183	11	.698	.783	29	.726	.585
05	.780	.497	22	.829	.324	09	.735	.040	13	.820	.739	23	.834	.647	14	.715	.179	17	.749	.916
23	.861	.106	17	.834	.647	17	.741	.906	05	.848	.866	06	.837	.978	16	.770	.128	04	.802	.186
12	.865	.377	16	.909	.608	11	.747	.205	27	.867	.633	03	.849	.964	08	.815	.385	14	.835	.319
29	.882	.635	06	.914	.420	20	.850	.047	03	.883	.333	24	.851	.109	05	.872	.490	08	.870	.546
08	.902	.020	27	.958	.856	02	.859	.356	17	.900	.443	05	.859	.935	21	.885	.999	28	.871	.539
04	.951	.482	26	.981	.976	07	.870	.612	21	.914	.483	17	.863	.220	02	.958	.177	25	.971	.369
02	.977	.172	07	.983	.624	03	.916	.463	29	.950	.753	09	.863	.147	27	.961	.980	27	.984	.252

Col No. 22			Col. No. 23			Col. No. 24			Col. No. 25			Col. No. 26			Col. No. 27			Col. No. 28		
A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
12	.051	.032	26	.051	.187	08	.015	.521	02	.039	.005	16	.026	.102	21	.050	.952	29	.042	.039
11	.068	.980	03	.053	.256	16	.068	.994	16	.061	.599	01	.033	.886	17	.085	.403	07	.105	.293
17	.089	.309	29	.100	.159	11	.118	.400	26	.068	.054	04	.088	.686	10	.141	.624	25	.115	.420
01	.091	.371	13	.102	.465	21	.124	.565	11	.073	.812	22	.090	.602	05	.154	.157	09	.126	.612
10	.100	.709	24	.110	.316	18	.153	.158	07	.123	.649	13	.114	.614	06	.164	.841	10	.205	.144
30	.121	.744	18	.114	.300	17	.190	.159	05	.126	.658	20	.136	.576	07	.197	.013	03	.210	.054
02	.166	.056	11	.123	.208	26	.192	.676	14	.161	.189	05	.138	.228	16	.215	.363	23	.234	.533
23	.179	.529	09	.138	.182	01	.237	.030	18	.166	.040	10	.216	.565	08	.222	.520	13	.266	.799
21	.187	.051	06	.194	.115	12	.283	.077	28	.218	.171	02	.233	.610	13	.269	.477	20	.305	.603
22	.205	.543	22	.234	.480	03	.286	.318	06	.255	.117	07	.278	.357	02	.288	.012	05	.372	.223
28	.230	.688	20	.274	.107	10	.317	.734	15	.261	.928	30	.405	.273	25	.333	.633	26	.385	.111
19	.243	.001	21	.331	.292	05	.337	.844	10	.301	.811	06	.421	.807	28	.348	.710	30	.422	.315
27	.267	.990	08	.346	.085	25	.441	.336	24	.363	.025	12	.426	.583	20	.362	.961	17	.453	.783
15	.283	.440	27	.382	.979	27	.469	.786	22	.378	.792	08	.471	.708	14	.511	.989	02	.460	.916
16	.352	.089	07	.387	.865	24	.473	.237	27	.379	.959	18	.473	.738	26	.540	.903	27	.461	.841
03	.377	.648	28	.411	.776	20	.475	.761	19	.420	.557	19	.510	.207	27	.587	.643	14	.483	.095
06	.397	.769	16	.444	.999	06	.557	.001	21	.467	.943	03	.512	.329	12	.603	.745	12	.507	.375
09	.409	.428	04	.515	.993	07	.610	.238	17	.494	.225	15	.640	.329	29	.619	.895	28	.509	.748
14	.465	.406	17	.518	.827	09	.617	.041	09	.620	.081	09	.665	.354	23	.623	.333	21	.583	.804
13	.499	.651	05	.539	.620	13	.641	.648	30	.623	.106	14	.680	.884	22	.624	.076	22	.587	.993
04	.539	.972	02	.623	.271	22	.664	.291	03	.623	.777	26	.703	.622	18	.670	.904	16	.689	.339
18	.560	.747	30	.637	.374	04	.668	.856	08	.651	.790	29	.739	.394	11	.711	.253	06	.727	.298
26	.575	.892	14	.714	.364	19	.717	.232	12	.715	.599	25	.759	.386	01	.790	.392	04	.731	.814
29	.756	.712	15	.730	.107	02	.776	.504	23	.782	.093	24	.803	.602	04	.813	.611	08	.807	.983
20	.760	.920	19	.771	.552	29	.777	.548	20	.810	.371	27	.842	.491	19	.843	.732	15	.833	.757
05	.847	.925	23	.780	.662	14	.823	.223	01	.841	.726	21	.870	.435	03	.844	.511	19	.896	.464
25	.872	.891	10	.924	.888	23	.848	.264	29	.862	.009	28	.906	.367	30	.858	.299	18	.916	.384
24	.874	.135	12	.929	.204	30	.892	.817	25	.891	.873	23	.948	.367	09	.929	.199	01	.948	.610
08	.911	.215	01	.937	.714	28	.943	.19	04	.917	.264	11	.956	.142	24	.931	.263	11	.976	.799
07	.946	.065	25	.974	.398	15	.975	.962	13	.958	.990	17	.993	.989	15	.939	.947	24	.978	.633

APPENDIX D

AASHTO AND ASTM TEST METHODS

Table D.01 AASHTO and ASTM Test Methods As Commonly Specified

	AASHTO	ASTM
ASPHALTS		
Asphalt Binder/Cement		
Performance Graded Asphalt Binder	MP 1	——
Viscosity, Kinematic	T 201	D 2170
Viscosity, Absolute	T 202	D 2171
Penetration T 49	D 5	
Flash Point, Cleveland Open Cup	T 48	D 92
Flash Point, Pensky-Martens	T 73	D 93
Solubility	T 44	D 2042
Thin Film Oven	T 179	D 1754
Rolling Thin Film Oven	T 240	D 2872
Ductility	T 51	D 113
Specific Gravity	T 228	D 70
Softening Point	T 53	D 2398
Cutback Asphalt		
Viscosity, Kinematic at 60°C	T 201	D 2170
Flash Point, Tag Open Cup	T 79	D 1310
Distillation	T 78	D 402
Tests on Residue:		
Viscosity, Absolute	T 202	D 2171
Ductility	T 51	D 113
Solubility	T 44	D 2042
Water in Asphalt	T 55	D 95
Specific Gravity	T 227	D 1298
Emulsified Asphalt		
Viscosity, Saybolt Furol	T 59	D 244
Storage Stability	T 59	D 244
Demulsibility	T 59	D 244
Coating Ability and Water Resistance	T 59	D 244
Particle Charge Test	T 59	D 244
Sieve Test	T 59	D 244
Residue by Distillation	T 59	D 244
Oil Distillate	T 59	D 244
Tests on Residue:		
Penetration	T 59	D 244
Ductility	T 59	D 244
Solubility	T 59	D 244
Float Test	T 59	D 244
MINERAL AGGREGATES		
Sieve Analysis of Fine and Coarse Aggregates	T 27	C 136
Sieve Analysis of Mineral Filler	T 37	D 546
Sand Equivalent	T 176	D 2419
Resistance to Abrasion (Los Angeles Machine)	T 96	C 131
Soundness (Sodium Sulfate or Magnesium)	T 104	C 88

Table D.01 AASHTO and ASTM Test Methods as Commonly Specified (Continued)

	AASHTO	ASTM
Specific Gravity:		
Coarse Aggregate	T 85	C 127
Fine Aggregate	T 84	C 128
Filler	T 100 or T 133	D 854 or C 188
Unit Weight	T 19	C 29
Moisture Content	T 255	C 566
HOT MIX ASPHALT		
Superpave Volumetric Mix Design	MP 2	——
Marshall Mix Design:		
Resistance to Plastic Flow (Stability and Flow)	T 245	D 1559
Bulk Specific Gravity of Compacted Specimens	T 166	D 2726
Percent Air Voids	T 269	D 3203
Maximum Specific Gravity	T 209	D 2041
Extraction of Bitumen	T 164	D 2172
Recovery of Asphalt (Abson Method)	T 170	D 1856
Moisture or Volatile Distillates	T 110	D 1461
Hveem Mix Design:		
Preparation of Test Specimens with Kneading Compactor	T 247	D 1561
Resistance to Deformation and Cohesion	T 246	D 1560

Performance Grade	PG 46			PG 52							PG 58					PG 64						PG 70						PG 76					PG 82				
	-34	-40	-46	-10	-16	-22	-28	-34	-40	-46	-16	-22	-28	-34	-40	-10	-16	-22	-28	-34	-40	-10	-16	-22	-28	-34	-40	-10	-16	-22	-28	-34	-10	-16	-22	-28	-34
Average 7-day Maximum Pavement Design Temperature, °C [a]	<46			<52							<58					<64						<70						<76					<82				
Minimum Pavement Design Temperature, °C [a]	>-34	>-40	>-46	>-10	>-16	>-22	>-28	>-34	>-40	>-46	>-16	>-22	>-28	>-34	>-40	>-10	>-16	>-22	>-28	>-34	>-40	>-10	>-16	>-22	>-28	>-34	>-40	>-10	>-16	>-22	>-28	>-34	>-10	>-16	>-22	>-28	>-34
Original Binder																																					
Flash Point Temp, T 48: Minimum °C	230																																				
Viscosity, ASTM D 4402: [b] Maximum, 3 Pa-s (3000 cP), Test Temp, °C	135																																				
Dynamic Shear, TP 5: [c] G*/sin δ, Minimum, 1.00 kPa Test Temperature @ 10 rad/s, °C	46			52							58					64						70						76					82				
Rolling Thin Film Oven (T 240) or Thin Film Oven (T 179) Residue																																					
Mass Loss, Maximum, %	1.00																																				
Dynamic Shear, TP 5: G*/sin δ, Minimum, 2.20 kPa Test Temperature @ 10 rad/s, °C	46			52							58					64						70						76					82				
Pressure Aging Vessel Residue (PP 1)																																					
PAV Aging Temperature, °C [d]	90			90							100					100						100 (110)						100 (110)					100 (110)				
Dynamic Shear, TP 5: G*/sin δ, Maximum, 5000 kPa Test Temperature @ 10 rad/s, °C	10	7	4	25	22	19	16	13	10	7	25	22	19	16	13	31	28	25	22	19	16	34	31	28	25	22	19	37	34	31	28	25	40	37	34	31	28
Physical Hardening [e]	Report																																				
Creep Stiffness, TP1: [f] S, Maximum, 300 MPa m-value, Minimum, 0.300 Test Temperature @ 60 sec, °C	-24	-30	-36	0	-6	-12	-18	-24	-30	-36	-6	-12	-18	-24	-30	0	-6	-12	-18	-24	-30	0	-6	-12	-18	-24	-30	0	-6	-12	-18	-24	0	-6	-12	-18	-24
Direct Tension, TP 3 [f] Failure Strain, Minimum, 1.0% Test Temp @ 1.0 mm/min, °C	-24	-30	-36	-0	-6	-12	-18	-24	-30	-36	-6	-12	-18	-24	-30	0	-6	-12	-18	-24	-30	0	-6	-12	-18	-24	-30	0	-6	-12	-18	-24	0	-6	-12	-18	-24

Notes:

a. Pavement temperatures can be estimated from air temperatures using an algorithm contained in the Superpave™ software program or may be provided by the specifying agency, or by following the procedures as outlined in MP 2 and PP 28.

b. This requirement may be waived at the discretion of the specifying agency if the supplier warrants that the asphalt binder can be adequately pumped and mixed at temperatures that meet all applicable safety standards.

c. For quality control of unmodified asphalt cement production, measurement of the viscosity of the original asphalt cement may be substituted for dynamic shear measurements of G*/sin δ at test temperatures where the asphalt is a Newtonian fluid. Any suitable standard means of viscosity measurement may be used, including capillary or rotational viscometer (AASHTO T 201 or T 202).

d. The PAV aging temperature is based on simulated climatic conditions and is one of three temperatures 90°C, 100°C or 110°C. The PAV aging temperature is 100°C for PG 64- and above, except in desert climates, where it is 110°C.

e. Physical Hardening - TP 1 is performed on a set of asphalt beams according to Section 13.1 of TP 1, except the conditioning time is extended to 24 hrs ± 10 minutes at 10°C above the minimum performance temperature. The 24-hour stiffness and m-value are reported for information purposes only.

f. If the creep stiffness is below 300 MPa, the direct tension test is not required. If the creep stiffness is between 300 and 600 MPa, the direct tension failure strain requirement can be used in lieu of the creep stiffness requirement. The m-value requirement must be satisfied in both cases.

APPENDIX E

SUPERPAVE PERFORMANCE GRADED ASPHALT BINDER SPECIFICATIONS

INDEX

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(As of July 1998)

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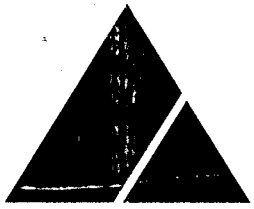
Errata

- Table 6-1, page 6-18: The units for the values shown are **psi.**

- Page 6-24, step 3: The last number in the column "Number Equal to or Greater Than" should be changed **from 6 to 7.**

- Page 10-5, second paragraph, last sentence: The Asphalt Institute conservatively suggests a range of 0.16 (unstablized base) to 0.30 (stabilized base), which equates to conversion factors **c = 0.4 and c = 0.7** respectively.

- Page 13-2, second paragraph, third sentence: The word diameter should be changed to **distance**.



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