SECTION 450 GENERAL REQUIREMENTS FOR ASPHALTIC PAVEMENTS

450.1 Description

(1) This section describes requirements common to plant mixed asphaltic bases and pavements. Exceptions and additional requirements are specified in section 455 through section 490.

450.2 Materials

450.2.1 Acronyms and Definitions

Revise 450.2.1 to add an acronym and definition for warm mix asphalt. This change was implemented in ASP 6 effective with the Nov 2011 letting.

(1) Interpret materials related acronyms used in sections 450 through 499 as follows:

FRAP	Fractioned reclaimed asphaltic pavement
HMA	Hot mix asphalt
JMF	Job mix formula
PG	Performance graded
RAP	Reclaimed asphaltic pavement
RAS	Recycled asphalt shingles
SMA	Stone matrix asphalt
VMA	Voids in mineral aggregate
WMA	Warm mix asphalt

(2) Interpret materials related definitions used in sections 450 through 499 as follows:

Asphaltic binder	The principal asphaltic binding agent in HMA. including asphalt cement and material added to modify the original asphalt cement properties.
Filler	A finely divided mineral aggregate added to asphaltic mixtures to improve mixture properties.
Fractioned reclaimed asphaltic pavement	Material resulting from cold milling or crushing existing asphaltic pavement processed to control gradation properties.
Leveling layer	Initial layer placed thinner than the minimum required under 460.3.2.
Lower layer	Any asphaltic pavement layer that will not be exposed to traffic when the pavement structure is complete. A pavement structure may have multiple lower layers.
Reclaimed asphaltic pavement	Material resulting from cold milling or crushing existing asphaltic pavement.
Recycled asphalt shingles	Waste material from a shingle manufacturing facility, either new or used material salvaged from residential roofing operations, or any combination of these materials ground to ensure that 100 percent will pass a 1/2 sieve and processed to remove deleterious material.
Upper layer	The asphaltic pavement layer exposed to traffic when the pavement structure is complete. A pavement structure has only one upper layer.
Warm mix asphalt	Any asphaltic mixture that contains a warm mix additive, or utilizes a warm mix process, as part of its mixture design that has the ability to reduce the mixing and compaction temperature requirements below the typical temperatures used for that application.

450.2.2 Aggregate Sampling and Testing

(1) The department and the contractor will sample and test according to the following methods, except as revised with the engineer's approval:

Sampling aggregates ..... AASHTO T2
Material finer than No. 200 sieve ..... AASHTO T11
Sieve analysis of aggregates ..... AASHTO T27
Mechanical analysis of extracted aggregate ..... AASHTO T30
Sieve analysis of mineral filler ..... AASHTO T37
Liquid limit of soils ..... AASHTO T89

Plastic limit of soils.....AASHTO T90
Plasticity index of soils.....AASHTO T90
Los Angeles abrasion of coarse aggregate .....AASHTO T96
Freeze-thaw soundness of coarse aggregate.....AASHTO T103
Sodium sulfate soundness of aggregates.....AASHTO T104
Extraction of bitumen .....AASHTO T164

450.3 Construction

450.3.1 Equipment

450.3.1.1 Batch Plants

450.3.1.1.1 Plant Scales

(1) Provide beam, springless, dial, or digital scales on weigh boxes and silos. Use scales of a standard make and design accurate to within 0.5 percent of the maximum required load. For each plant, provide at least ten standard 50 pound weights accurate to within 0.1 percent. For each scale, provide a suitable cradle or platform for applying test loads.

(2) If using beam scales for aggregate, provide a separate beam for each size of aggregate. Also provide a device that warns when the applied load is within 200 pounds of the required load.

(3) If using beam scales for asphaltic materials, provide a tare beam and a full capacity beam with a minimum graduation no greater than 2 pounds. Also provide a device that warns when the applied load is within 20 pounds of the required load.

(4) If using dial scales, provide a standard make springless scale designed, constructed, and installed to be vibration free. Ensure that all dials are plainly visible to the operator at all times. Equip with adjustable pointers for marking the weight of each material batched.

(5) If using digital scales, conform to National Bureau of Standards Handbook 44.

450.3.1.1.2 Automatic Batching

(1) On contracts with 10,000 tons or more, provide automated batch plants. Ensure that the plants' control system can coordinate mixture proportioning, timing, and discharge by the operation of a single control. Also provide an automatic batch weighing, cycling, and monitoring system.

(2) On contracts with less than 10,000 tons, if the contractor elects to use batch plant automatic systems, conform to the requirements here under 450.3.1.1.2. The contractor need not use automatic recordation. If the contractor elects to use automatic recordation, conform to 450.3.1.1.4 for truck loads, or 450.3.1.1.3 for batch weights.

(3) Ensure that the system accurately proportions mixture components by weight or volume in the proper order and controls the mixing cycle sequence and timing. Provide interlocks that ensure that the scale is at zero before a batch can start and that the batch is mixed completely before discharge. Do not start subsequent batches before completely discharging the previous batch. Also provide interlocks that ensure that all batch materials are in the mixer before the batch can discharge. Ensure that unauthorized personnel cannot alter mix designs and that equipment emits an audible signal if discharging a batch with out-of-tolerance component weights. Ensure that this signal is loud enough to hear throughout the plant area under normal operating conditions.

(4) Provide adjustable timing devices to control individual component batching and mixing operations. Provide auxiliary interlock cutoff circuits necessary to stop automatic cycling whenever an weighing error exceeding a specified tolerance occurs or when another part of the control system malfunctions.

(5) Ensure that the batching system automatic control can stop the cycle in the underweight check position and the overweight check position for each material to check tolerance limits.

(6) Ensure that the scale system is equipped with a device that applies pressure to a scale lever to simulate batching operations for tolerance checks.

(7) Consistently deliver materials within the full range of batch sizes within the following tolerances:

MATERIAL	PERCENT OF TOTAL MATERIAL BATCH WEIGHT
Coarse aggregate	+ 1.0
Fine aggregate	+ 1.0
Aggregate for use with salvaged or reclaimed pavement materials	+ 1.5
Mineral filler	+ 0.5

Salvaged or reclaimed asphaltic pavement material ..... + 1.5
Asphaltic material ..... + 0.1
Zero return for aggregate..... + 0.5
Zero return for salvaged or reclaimed material ..... + 0.5
Zero return for asphaltic material ..... + 0.1

(8) Unless providing separate tolerance controls for batching mineral filler, reduce aggregate tolerances to +/- 0.5 percent for aggregates delivered before the filler.

(9) Ensure that the total weight of the batch does not vary by more than +/- 2.0 percent of the designated batch weight.

(10) Ensure that the electrical circuits for the above delivery tolerances of each cutoff interlock are capable of providing the total span for the full allowable tolerance for maximum batch size. Provide tolerance controls automatically or manually adjustable to provide spans suitable for less than full-size batches. Ensure that the automatic controls and interlock cutoff circuits are consistently coordinated with the batching scale or meter within an accuracy of 0.2 percent of the scale or meter nominal capacity[1] throughout the full range of the batch sizes.

[1] Nominal capacity of a scale is defined as the maximum quantity which the scale or meter can measure.

(11) If the automatic control or monitoring systems break down, the contractor may operate the plant manually for up to 2 working days.

450.3.1.1.3 Recording Batch Weights

(1) On contracts involving 10,000 tons or more of asphaltic mixtures, unless the contractor elects to record truck loads as provided in 450.3.1.1.4, produce an automatic digital record for each batch indicating the proportions of each aggregate component, mineral filler, and asphaltic material.

(2) Provide a digital recorder that can print multiple copies of mixture reports that give the total weight of asphaltic mixture and asphaltic material both per load and per batch. Include weights of the individual aggregates and fillers. Reports need not provide tare weight and may use accumulative weights. Ensure that reported weights are accurate within +/- 1 kg/500 kg. Allow sufficient time for the scale to come to rest before printing each weight.

(3) The contractor may use mixture storage silos with digital recorder equipped batch plants if the department determines the storage silo output is coordinated with the recorded batch weights.

(4) If the recording system breaks down, the contractor may operate the plant without automatic recording for up to 2 working days.

450.3.1.1.4 Recording Truck Loads

(1) If not using automatic batch recording, install a digital recorder as part of the platform truck or storage silo scales. Ensure that the recorder can produce a printed digital record of at least the gross or net weights of delivery trucks. Provide gross, tare, and net weights as well as date, time, ticket number, project, and mix type; but not all of this data need be on by the printout system. Ensure that scales cannot be manually manipulated during the printing process. Provide an interlock to prevent printing until the scales come to rest. Size the scales and recorder to accurately weigh the heaviest loaded trucks or tractor-trailers hauling asphaltic mixture. Ensure that recorded weights are accurate to within 0.1 percent of the nominal capacity of the scale.

(2) If the digital recorder breaks down, the contractor may manually record weights for up to 2 working days.

450.3.1.2 Asphaltic Mixture Hauling Vehicles

(1) Provide trucks for hauling asphaltic mixtures with tight, clean, and smooth boxes. The contractor may thinly coat boxes with a release agent chosen from the department's approved products list. Drain excess release agent after coating. Equip each box with a cover big enough to protect the mixture. Do not use trucks that show oil leaks of any magnitude.

450.3.1.3 Transfer Devices

(1) Ensure that transfer devices have surge bin capacity adequate to pave continuously at a uniform speed. If maintaining uniform and continuous paving, the engineer may allow the contractor to omit the surge bin. Do not use devices that cause vibrations or other motion that adversely affect the finished ride.

450.3.1.4 Pavers

(1) Ensure that the screed or strike-off assembly produces a finished surface of the required evenness and texture without tearing, shoving, or gouging the mixture. Use a screed adjustable for the required crown and cross section of the finished pavement.

(2) Ensure that pavers are equipped with an activated screed or strike-off assembly and use activation at all times during paving unless the engineer allows otherwise. Do not extend the screed with one or more static extensions totaling more than 12 inches at either screed end, except at the shoulder end for paving shoulders.

(3) Provide pavers with department-approved automatics that control the elevation and slope of the screed. The department will not require automatic controls when paving entrances, approaches, side road connections, small irregular areas, or if the engineer determines using automatic controls is not practical. Use both grade and slope controls whenever automatics are required, except the engineer may waive the longitudinal or grade control requirement for the final surface. Ensure that the operator can adjust or vary the slope throughout super elevated curves and transitions. Also ensure that the system allows the sensor to operate on either side of the paver.

(4) If automatics break down, the contractor may pave under manual control only until the end of that working day.

450.3.1.5 Compaction Equipment

(1) Ensure all rollers are in good mechanical condition, capable of operating both forwards and backwards, and the operating mechanism allows for starting, stopping, or reversing direction in a smooth manner, without loosening or distorting the surface being rolled.

(2) Equip all rollers with a drum or tire lubricator. Do not lubricate with petroleum or tar products.

450.3.2 Constructing Asphaltic Mixtures

450.3.2.1 General

(1) Notify the engineer at least one business day before paving. Unless the contract provides otherwise, keep the road open to all traffic during construction. Prepare the existing foundation for treatment as specified in section 211, unless the contract specifies otherwise.

(2) Do not place asphaltic mixture when the air temperature approximately 3 feet above grade, in shade, and away from artificial heat sources is less than 36 F. The contractor may place lower layer and base course mixtures at a lower temperature with the engineer's written approval.

(3) Do not place asphaltic mixture between October 15 and May 1, regardless of temperature, without the engineer's written approval or direction. Do not construe the engineer's non-approval as grounds for extending contract time. The department will conduct the final inspection and determine acceptance when the contractor completes placement.

(4) If the engineer directs or allows placing asphaltic mixtures between October 15 and May 1, either at the contractor's request or to complete the work to the stage the contract requires, perform the work at the contractor's risk. The department may subsequently revoke acceptance based on the results of a post-acceptance inspection in May. Restore all pavement damage or defects the engineer attributes to temperature or other weather conditions occurring between October 15 and May 1 by repairing or replacing pavement as the engineer directs.

(5) If the engineer directs placing asphaltic mixtures between October 15 and May 1 for department convenience, the department is responsible for damage or defects the engineer attributes to temperature or other weather conditions occurring between October 15 and May 1.

(6) Place asphaltic mixture only on a prepared, firm, and compacted base, foundation layer, or existing pavement substantially surface-dry and free of loose and foreign material. Do not place over frozen subgrade or base, or where the roadbed underlying the foundation or base is temporarily unstable from the effects of frost heaving. Unless the contract provides otherwise, incorporate loose roadbed aggregate as a part of preparing the foundation, in shoulder construction, or dispose of as the engineer approves.

450.3.2.2 Preparing and Storing Mixtures

(1) Heat and combine aggregate and asphaltic material to produce a mixture within the temperature range the mixture design specifies when discharged from the mixer. Mix until achieving a homogeneous mixture with uniformly coated aggregate. The contractor may store the mixture in silos.

450.3.2.3 Transporting and Delivering Mixtures

(1) Deliver the mixture to the paver receiving hopper at a temperature within 20 F of the temperature the asphaltic material supplier recommends. Cover all loads during inclement weather or when the ambient air temperature falls below 65 F.

(2) If depositing asphaltic mixture on the roadway, provide equipment to pick up substantially all of the asphaltic mixture from the roadway and load it directly into the paver receiving hopper. Use either a device integral to the paver or intermediate transfer equipment.

450.3.2.4 Correcting Base

(1) Before placing asphaltic base or surface courses, correct the existing pavement by filling potholes, sags, and depressions; altering the existing crown; or other corrections the engineer requires. Place asphaltic lower layer mixtures where and as the engineer directs. The contractor may hand place or use blade graders or mechanical spreaders to place mixture used for wedging, leveling layers, or filling holes. Feather the mixture out to become co-planar with adjoining areas and, unless the engineer directs otherwise, compact uniformly as specified in 450.3.2.6.2.

450.3.2.5 Spreading and Finishing Mixture

(1) Place asphaltic mixtures in layers to the typical sections the plans show with self-propelled pavers. Pave at a constant speed, appropriate for the paver and mixture, that ensures uniform spreading and strike-off with a smooth, dense texture and no tearing or segregation. Do not pave faster than the average delivery rate of asphaltic mixture to ensure, as nearly as possible, continuous paving.

(2) If placing the initial lane of a given layer, sense off a tight string line, a mobile string line, or a traveling straightedge whichever the engineer approves for the specific field conditions. On subsequent lanes of the layer, the contractor may sense off the adjacent lane surface.

(3) Avoid raking over machine spread and finished material on surface courses to the extent possible to prevent segregation.

(4) The contractor may spread material by hand in areas not accessible to pavers. Dump material outside the placement area, spread into place with shovels, and shape to the required grade and contour with rakes and lutes. Do not rake material from a pile of dumped material.

(5) Do not haul over any portion of a placed layer until after the final rolling is complete on that portion.

(6) If a longitudinal joint other than the notched wedge joint is constructed, place multi-lane pavement so that each day's placement in all lanes ends at the same station, unless the engineer directs or allows otherwise.

450.3.2.6 Compaction

450.3.2.6.1 General

(1) Unless the contract specifies otherwise for the particular type of work, compact using the ordinary compaction procedure. After spreading and strike-off and while still hot, compact each layer thoroughly and uniformly by rolling. Roll during daylight hours unless providing artificial light the engineer finds satisfactory. Use the appropriate number of rollers to achieve the specified compaction, surface finish, and smoothness requirements. Ensure that the compacted surface is smooth and true to the established crown and grade.

(2) Roll the entire surface until achieving the specified compaction and, to the extent that it is practical, eliminating all roller marks. If turning or reversing the roller, or other operations, causes any scuffing or displacement, immediately correct the damage and revise the rolling procedure to prevent further damage. Keep roller wheels moistened to keep mixture from sticking to them. Do not use excess water. Do not disturb the line and grade elevation of edges of the asphaltic pavement or surfacing.

(3) Along forms, curbs, headers, walls, and at other places not accessible to the roller, compact the mixture thoroughly with hot hand tampers or mechanical tampers giving equivalent compression. On depressed areas, use a trench roller or other engineer-approved equipment.

(4) Remove and replace, with fresh hot mixture, any material that is loose and broken, mixed with dirt, or is in any way unacceptable. Also remove and replace areas with excess asphaltic material. Compact replaced mixture immediately to conform with the adjacent placement.

450.3.2.6.2 Ordinary Compaction

(1) Unless the contract specifies otherwise, compact all patching, leveling, and wedging layers of asphaltic pavement or surfacing; all layers of plant mixed asphaltic base and base widening; driveways; and other

non-traffic areas until no further appreciable consolidation is visible under the action of the compaction equipment. Use 2 or more rollers per paver if placing more than approximately 165 tons of mixture per hour.

(2) The engineer will assess the compacted density using the methods specified for the particular type of work.

450.3.2.7 Applying Tack Coat

(1) Apply tack coat as specified in 455.3.2 to each layer of a plant-mixed asphaltic base or pavement that will be overlaid with asphaltic mixture under the same contract.

450.3.2.8 Jointing

(1) Place all layers as continuously as possible without joints. Do not roll over an unprotected end of freshly laid mixture unless interrupting placement long enough for the mixture to cool. If interrupting placement, ensure proper bond with the new surface. Form joints by cutting back on the previous run to expose the full depth of the layer. After resuming placement, place the fresh mixture against the joint to form intimate contact and be co-planar with the previously completed work after consolidation.

(2) If an asphaltic mat adjoins an older high-type asphaltic mat, cut back the old mat on a straight line to form a butt joint for over full depth of the new mat.

(3) Construct notched wedge longitudinal joints for all mainline paving if the pavement thickness conforms to the minimums specified in 460.3.2, unless the engineer directs or allows an alternate joint. Taper each layer at a slope no greater than 12:1. Extend the taper beyond the normal lane width, or as the engineer directs. Ensure that tapers for all layers directly overlap and slope in the same direction.

(4) Place a 1/2 to one inch vertical notch after compaction at the top of tapers on all layers. Place the finished longitudinal joint line of the upper layer at the pavement centerline for 2-lane roadways, or at the lane lines if the roadway has more than 2 lanes.

(5) Construct the tapered portion of each layer using an approved strike-off device that will provide a uniform slope and will not restrict the main screed. Apply a weighted steel side roller wheel, as wide as the taper, to the tapered section. Compact the initial taper section to as near the final density as possible. Apply a tack coat to the taper surface before placing the adjacent lane.

(6) Clean longitudinal and transverse joints coated with dust and, if necessary, paint with hot asphaltic material, a cutback, or emulsified asphalt to ensure a tightly bonded, sealed joint.

450.3.2.9 Surface Requirements

(1) Test the surface at engineer-selected locations with a 10-foot straightedge or other engineer-specified device. Ensure that upper layers show no variation greater than 1/8 inch between any 2 surface contacts. Ensure that lower layers, shoulder surfacing, and surfacing on temporary connections and bypasses show no variation greater than 1/4 inch between any 2 surface contacts.

(2) Remove and replace or otherwise correct, using engineer-approved methods, all humps or depressions exceeding the specified tolerance.

450.3.2.10 Paving Shoulders

(1) Conform to the other requirements under 450.3.2 except, if constructing shoulders separately and the placement width is too narrow to accommodate the required pavers and rollers, the contractor may use engineer-approved alternate spreading and compaction equipment. Alternate equipment must be capable of satisfactorily laying mixture to the required width, thickness, texture, and smoothness.

450.3.3 Maintaining the Work

(1) Except as provided under 104.6, maintain the work during all construction stages until final or partial acceptance. Protect and repair the prepared foundation, tack coat, base, paved traffic lanes, shoulders, and seal coat. Correct all rich or bleeding areas, breaks, raveled spots, or other nonconforming areas in the paved surface.

450.4 Measurement

(1) The department will measure asphaltic mixtures by the ton of mixed aggregate and asphaltic material incorporated in the work unless the measurement subsection for a particular application specifies otherwise. Provide the engineer with weigh tickets showing the net weight of each load of material delivered. The department or department-authorized testing firms or agencies will test the contractor's truck, storage silo, or plant scales.

(2) For minor quantities of mixtures and if the engineer approves, the contractor may report batch weights from plant scales as described in 450.3.1.1.1, instead of truck or storage silo scale weights.

450.5 Payment

(1) All costs of furnishing, maintaining, and operating the truck scale or other weighing equipment and furnishing the weigh tickets is incidental to the contract.

(2) Nonconforming material allowed to remain in place is subject to price adjustment under 105.3.2.

(3) If the engineer directs or allows placing asphaltic mixtures between October 15 and May 1, either at the contractor's request or to complete the work to the stage the contract requires, the contractor shall bear the cost of restoring damage or defects the engineer attributes to temperature or other weather conditions occurring between October 15 and May 1.

(4) If the engineer directs placing asphaltic mixtures between October 15 and May 1 for department convenience, the department will not assess disincentives for density or ride on pavement the department orders the contractor to place when the temperature, as defined in 450.3.2.1(2), is less than 36 F.