OKLAHOMA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISIONS FOR
PLANT MIX BITUMINOUS BASES AND SURFACES

These Special Provisions revise, amend and where in conflict, supersede applicable sections of the 1999 Standard Specifications for Highway Construction, English and Metric, as applicable. Units of measurement are provided in the subsections in both English and Metric equivalents. The units applicable for this project will be those specified in the project plans.

SECTION 418
STONE MATRIX ASPHALT

418.01. DESCRIPTION.
This work shall consist of mixing, in a central plant, aggregate and bituminous materials, and then spreading and compacting the mixed material on a prepared roadbed, all in substantial compliance with the Specifications and dimensions shown on the Plans.

418.02. MATERIALS.
Materials shall meet the requirements of Section 718. Have ample material in the stockpiles at the plant site at the beginning of each day's operation to supply and be used for that day's operation as well as provide to the Department's representative results of quality control tests on a daily basis.

418.03. EQUIPMENT.
1. **Mixing Plants.** At all times, have available at the plant site 1) a legible copy of the manufacturer's specifications for the mixing plant and 2) any modifications made to the plant including the manufacturer's tolerances for points of wear affecting the production of bituminous mixtures. Mixing plants shall be inspected and shall be within the manufacturer's tolerances and in good working order; in addition, they shall be so coordinated and of sufficient capacity to adequately produce the required bituminous mixture. All plants used for preparation of bituminous concrete mixtures shall conform to the requirements of AASHTO M 156 for plants and meet the Department's certification requirements. Batch plants shall be equipped with a mechanical batch counter.

   Develop and maintain calibration charts for each cold feed for the job aggregates or maintain other suitable evidence of compliance with the paving mixture Specifications.

   A closed system for storing and feeding mineral filler shall be provided which maintains a constant supply of material with minimal loss through any part of the mix production system. The mineral filler measuring device shall be an integral part of the automatic plant controls and provide a consistent percentage of filler. The system shall include flow indicators or sensing devices which will automatically interrupt mix production if mineral filler introduction fails. All mineral filler feeder systems shall be approved by the engineer.

   A separate system for feeding cellulose fibers shall be used to proportion the correct amount of fibers into the mixture so that a uniform distribution is obtained. The fiber supply system shall include low level and no-flow indicators and a printout or data file tracking the status of the feed rate. The fiber supply line shall include a section of transparent pipe for observing consistency of flow or feed. All mineral filler feeder systems shall be approved by the engineer.
2. **Scales.** The bituminous mixture shall be weighed on approved scales furnished by the Contractor or

on public scales at the Contractor's expense. When an approved automatic printer system is used in conjunction with an automatic batching and mixing control system, the printed batch weights may be used in lieu of truck scales. Such weights shall be evidenced by a weigh ticket for each load. Scales shall be inspected and certified as often as the Engineer deems necessary to assure their accuracy but not less than once every six months.

3. **Bituminous Pavers.** Bituminous pavers shall be self-contained, power-propelled units, in good working order and provided with an activated heated screed; they shall also be equipped with an approved automatic control device for laying the mixture to the specified slope and grade, and be capable of spreading and finishing courses of bituminous plant mix material in lane widths applicable to the specified typical section and thicknesses shown on the Plans. Pavers used for shoulders and similar construction shall be capable of spreading and finishing courses of bituminous plant mix material in widths shown on the Plans.

   The paver shall be equipped with a receiving hopper having sufficient capacity for a uniform spreading operation and also with a distribution system to place the mixture uniformly in front of the screed.

   The screed shall effectively produce a finished surface of the required evenness and texture without tearing, shoving, or gouging the mixture.

   When laying mixtures, the paver shall be capable of being operated at forward speeds consistent with satisfactory laying of the mixture.

   The Contractor may use an approved strike-off assembly, heated if necessary, provided the finished surface produces the required evenness and uniform texture without tearing, shoving, or gouging the mixture.

   The paver shall be equipped with hoppers and distributing screws of the reversing type adequate to place the mixture evenly ahead of the screed for the full width being laid.

4. **Trucks and Transports** Trucks used for hauling bituminous mixtures shall comply with legal load limits and have tight, clean, smooth metal beds which have been thinly coated with a minimum amount of soap solution, lime solution, or other approved material to prevent the mixture from adhering to the beds. Antiadhesive solutions shall not be allowed to pond in the truck beds.
   NOTE: The use of solutions which contain diesel fuel or other contaminating solvents will not be allowed between daily truck deliveries.

   Each truck shall have a cover of canvas or other suitable material of such size as to protect the mixture from the weather. When necessary, so that the mixture will be delivered on the road at the specified temperature, truck beds shall be insulated and covers shall be securely fastened.

   Transports used for hauling liquid asphalt materials shall comply with Subsection 708.03(b). Keep a log or diary containing the delivery date, asphalt grade, source, quantity, invoice number, and the material hauled in the previous load. This information shall be furnished to the Engineer upon request.

5. **Sampling Device.** Provide an aggregate sampling device that can be safely operated by the Inspector and is capable of obtaining a representative sample of the combined aggregate from a flowing aggregate stream (belt or bin discharge)— in accordance with the requirements of AASHTO T-2— prior to entering the dryer drum or drum mixer and without stopping plant production. The sampling device shall be approved by the Engineer.

418.04. CONSTRUCTION METHODS.

(a) Stockpiling Materials. Aggregate stockpiles shall meet the requirements of Subsection 106.09.

(b) **Preparation of Materials.**

1. **Bituminous material and aggregate.** The discharge temperature of the SMA shall not exceed 350˚F. Heat bituminous material and aggregate in a manner that will avoid local overheating and

provide a continuous supply of the bituminous material to the mixer at a uniform temperature at all times.

2. **Dried and heated aggregate**. Properly adjust flames used for drying and heating the aggregate to avoid damage to the aggregate and avoid soot on the aggregate. Dust collected from this operation may be either wasted or returned to the mixture as deemed necessary.

(c) **Plant Startup Requirements for New Construction and All Overlays.** Prior to placing any SMA, produce a trial batch to properly calibrate the plant and procedures using the mix design approved for mainline construction. The SMA thus produced will be tested by the Engineer for the following:

Air voids (lab-molded); VMA; Asphalt binder content; and Gradation.

No SMA from the startup operation shall be placed on the roadway or the control strip. Instead, adjustments shall continue to be made until all of the requirements are met.

Costs of plant startup operations, including both labor and materials, will be included in the price bid for the in-place mixture.

(d) **Control Strip Requirements.** After fulfilling the plant startup requirements, one or more control strips shall be constructed on the detour (if available), shoulder (if detour is not available), or mainline (if neither detour nor shoulder is available) for the purpose of verifying the required production mix characteristics and establishing rolling patterns to obtain target requirements. The initial placement of asphalt shall be limited to approximately 500 tons plus or minus 100 tons. This material shall then be sampled and tested by the Engineer for roadway density, air voids (lab-molded), VMA, asphalt binder content and gradation. No additional asphalt shall be placed until all the results are evaluated and necessary adjustments in production and placement procedures are made. No pay adjustments will be made for deviations from target values on the initial control strip. However, no mix in this or any subsequent control strips which is determined to be unacceptable shall be allowed to remain in the mainline or shoulder. Such unacceptable mix shall be removed and replaced by the contractor at no additional expense to the Department.

After necessary adjustments are made, the above process shall be repeated for the next approximately 500 tons of asphalt placed. Pay adjustments for deviations from target values on this second control strip will be made at the rate of one half of those specified. If required, additional control strips shall be made until a product meeting specification requirements is produced. Pay adjustments for deviations from target values on all asphalt after the second control strip will be made at the full rate specified. Control strips will be paid for at the contract unit price (as adjusted) for SMA.

(e) **Mixing.** Combine aggregates in the mixer in the amount of each fraction of aggregates required to meet the approved job-mix formula. Measure or gauge the bituminous material and introduce it into the mixer in the amount specified by the job-mix formula. The moisture content of the bituminous mixture at the point of discharge shall not exceed 0.75 percent. Uncoated or nonuniform mixtures will not be accepted.

During daily start-up or shutdown of plant operations, waste sufficient material to assure that all deliveries to the storage silo or roadway are in compliance with the Specification requirements for the type mixture specified. Do not change from one type of mixture to another until the plant has been emptied and the cold feed bins charged with the proper aggregates.

(f) **Mat Irregularities.** The mat shall be free from segregation, nonuniform texture, bleeding, or fat spots, and cracking.

(g) **Tack Coat.** Apply a tack coat in accordance with Section 407.

(h) **Weather and Seasonal Limitations.** Construction of SMA will be permitted only under the following conditions:

When the surface is dry; when the mat surface on which it is to be placed is 60˚F or above when measured away from artificial heat; when the weather is not foggy, rainy or stormy; and when the wind or other conditions permit proper leveling and consolidation. Any material already in transit when rain

begins may be placed at the Contractor's risk, subject to all density and other requirements.

Aggregate stockpiles must be reasonably dry so that drum mixing will drive out all remaining moisture.

(i) **Spreading and Finishing.** Prior to placing SMA, clean all foreign matter from the surface of the existing roadbed. The temperature of the mixture for placement on the road shall be 300 ± 25˚F.

Establish the alignment of one edge of the SMA with string, wire, laser, or other method acceptable to the Engineer in advance of the placing of the asphalt mixture.

The SMA shall not be windrowed prior to spreading and finishing. A Materials Transfer Device or Materials Transfer Vehicle (MTD/MTV) shall be used for placement of the SMA. At the Engineer's discretion, isolated portions of a project may be exempted from use of the MTD/MTV.

The material shall be continuously remixed or reblended either internally in the transfer device, in a paver hopper insert, or in the paver's hopper. Remixing/reblending shall be accomplished by using remixing augers or paddles capable of continuously blending the SMA.

The MTD/MTV, haul units, and the paver shall work together to provide a continuous, uniform, segregation-free flow of material. The number of haul units, speed of the paver, plant production rate, and speed of the MTD/MTV shall be coordinated to avoid stop and go operations. The wings of the paver/receiving hopper shall not be raised (dumped) at any time during the paving operation.

If a MTD/MTV unit malfunctions during laydown operations, the Contractor may continue until any SMA in transit or stored in a silo has been laid and until such time as there is sufficient SMA placed to maintain traffic in a safe manner. Laydown operations shall cease afterward, until the equipment is operational.

Any MTD/MTV unit which exceeds 20,000 pounds per axle will be allowed to cross bridges in good condition, provided the unit's hopper is substantially empty, the vehicle travels at crawl speed, and the wheels on the vehicle travel as close as possible to the underlying beam lines. For bridges in poor condition or posted for load limits, the Engineer will consult Bridge Division to determine if any additional limitations are necessary, such as transporting the unit on a vehicle with more axles to distribute the load.

(j) **Joints.** Stagger longitudinal and transverse joints on succeeding lifts approximately 6 inches (150 mm), and make them carefully.

Construct all longitudinal joints within 1 foot (300 mm) of the lane lines. The longitudinal joints in the top layer or in the layer upon which an permeable friction course is to be placed shall be at lane lines.

Well bonded and sealed joints are required. When making joints between old and new pavements or between successive days' work, take care to make them in such a manner as to ensure a thorough and continuous bond between the old and new surfaces. Cut back the transverse edge of the previously laid course to its full depth so as to expose a fresh surface; then paint the edge with a tack coat, and place the hot mixture in contact with it, raking it to a proper depth and grade.

(k) **Compaction.**

1. **(1) General.** To compact and smooth, use self-propelled steel wheel and pneumatic tired compactors. Steel wheeled compactors shall weigh at least 10 tons (nine metric tons). Pneumatic tired compactors shall have at least seven pneumatic tires of equal size and diameter. They shall be constructed so that their total weights shall be varied to produce an operating weight of at least 3500 pounds (1588 kg) per tire. The tires shall be capable of being inflated to at least 110 psi (758 kPa) and be spaced so that the gaps between adjacent tires shall be covered by the following tires. Operating tire pressure (after one hour of operation) shall be maintained at 90 to 110 psi (620 to 758 kPa) with the range in pressure between tires not to exceed 10 psi (68 kPa).

Compactors shall be of adequate number, size, and weight and designed and properly maintained so that they are capable of accomplishing the required compaction. Operate them in accordance with the

manufacturer's recommendations.

Use self-propelled pneumatic tired rollers on all lifts following the initial rolling with a steel wheel roller and before finishing with a steel wheel roller. A minimum of two coverages with the pneumatic tired roller is required on each lift.

During compaction, if there is any displacement as a result of the reversing of direction of compactor, or other causes, correct the surface at once by the use of rakes and addition of fresh mixture when required. Be careful in compacting not to displace the line and grade of the edges of the bituminous mixture. Take care that there is no damage caused by adhesion of the mixture to the compactors.

Use hot hand tampers, smoothing irons, or mechanical tampers to thoroughly compact the mixture along forms, curbs, headers, walls, and other places not accessible to the compaction equipment. To transmit compression to a depressed area, a trench compactor may be used when approved by the Engineer.

Remove any mixture that becomes loose and broken, mixed with dirt, or is in any way defective, and replace it with fresh, hot mixture, compacting it to conform with the surrounding area.

NOTE: Any area showing segregation or an excess or deficiency of bituminous material shall be removed and replaced at the expense of the Contractor as unacceptable work.

Asphaltic concrete immediately behind the laydown machine shall be a minimum of 250˚F (121˚C). The target density of thicker lifts and optimum densities of thinner lifts shall be obtained before the mat temperature of the lifts under compaction drops below 180˚F (82˚C).

2. **Acceptance.** All lifts 1 1/2 inch (40 mm) or greater in nominal (Plan) thickness including both new construction and overlays will be accepted on the basis of density as specified in Subsection 2.1.

   All lifts less than 1 1/2 inch (40 mm) in nominal thickness will be accepted on the basis of compactive effort as specified in Subsection 2.2.

   Both new construction and overlays (all thicknesses) will be accepted on a lot-by-lot basis. Normally, a lot shall be considered to be 1000 tons (1000 metric tons); however, the Engineer may terminate a lot at any point and designate a new one when a materials or workmanship adjustment has been made which results in the desired correction.

   2.1 *All lifts 1 ½ inch (40 mm) or greater in nominal (Plan) thickness.* The target density of each lot shall be 94 percent of the Maximum Theoretical Specific Gravity at the Job Mix Formula (JMF) asphalt content determined by the most recent specific gravity of the bituminous paving mixture in accordance with AASHTO T 209.

   The roadway density for each lot will be the average of tests of three separate specimens taken randomly within the limits of the area represented by the lot. Cut test specimens for each lot from the pavement by sawing or coring a specimen a minimum size of 6 inches (150 mm) on the cut side or diameter, at locations and times established by the Engineer. The cost of cutting specimens and satisfactorily placing and finishing new materials in areas where specimens have been taken will be included in the price bid for mixture in place. The tests may be on the specimens or through use of nuclear or non-nuclear density gauges which have been correlated with roadway cores using the procedure described in OHD L-14.

   Acceptance and pay adjustments will be based on tests by the Department and in accordance with the following schedule:

AVERAGE LOT DENSITY PAY ADJUSTMENT FACTOR

% OF MAXIMUM THEORETICAL DENSITY

(ALD)	(PAF)
Above 97	Unacceptable *
92 - 97	1.00
91 - 92	1.00-(0.07) (92-ALD)
88.1- 91	0.93-(0.15) (91-ALD)
Below 88.1	Unacceptable *
Adjustment Payment = PAF x Contract Unit Price	

* Unless otherwise directed by the Engineer, products testing in this range are unacceptable and shall be removed and replaced at no additional cost to the Department.

(l) **Tolerances.**

1. **Surface**. The surface tolerance shall be in conformity with Section 401.
2. **Width and Thickness.** The width shall be in reasonably close conformity with the dimensions shown on the Plans or established by the Engineer. The thickness of individual courses and the total thickness of the asphalt concrete pavement shall be in reasonably close conformity with the thicknesses shown on the Plans or established by the Engineer.

(m) **Opening to Traffic.** Do not permit traffic on the asphalt concrete pavement until it has received its final rolling and has cooled to a temperature such that traffic will not mar the surface or alter the surface texture. Water or other artificial means may be used to assist in cooling.

418.05. METHOD OF MEASUREMENT.

Stone Matrix Asphalt, including aggregate, liquid asphalt, cellulose fiber, and other ingredients as specified in the job-mix formula - will be measured by the ton of combined mixture.
Tack Coat will be measured and paid for in accordance with Section 407.

418.06. BASIS OF PAYMENT.

Accepted quantities of Stone Matrix Asphalt measured, as provided above, will be paid for at the contract unit price as follows:.

SMA (½ INCH NMS).....TON

Such payment shall be full compensation for furnishing all materials, equipment, labor and incidentals to complete the work as specified.