GEORGIA DEPARTMENT OF TRANSPORTATION

STATE OF GEORGIA

SPECIAL PROVISION

Section 400—Hot Mix Asphalctic Concrete Construction

Delete Section 400 and substitute the following:

400.1 General Description

This work includes constructing one or more courses of bituminous plant mixture on the prepared foundation or existing roadway surface. The mixture shall conform with lines, grades, thicknesses, and typical cross sections shown on the Plans or established by the Engineer.

This section includes the requirements for all bituminous plant mixtures regardless of the gradation of the aggregates, type and amount of bituminous material, or pavement use.

Work will be accepted on a lot-to-lot basis according to the requirements of this Section and Section 106.

400.1.01 Definitions

Segregated Mixture: Mixture lacking homogeneity in HMA constituents of such a magnitude that there is a reasonable expectation of accelerated pavement distress or performance problems. May be quantified by measurable changes in temperature, gradation, asphalt content, air voids, or surface texture.

New Construction: A roadway section more than 0.5 mile (800 m) long that is not longitudinally adjacent to the existing roadway. If one or more lanes are added longitudinally adjacent to the existing lane, the lane(s) shall be tested under the criteria for a resurfacing project. If work is performed on the existing roadway including leveling, grade changes, widening and/or resurfacing then that lane shall be tested under the criteria for a resurfacing project.

Trench Widening: Widening no more than 4 ft. (1.2 m) in width.

Comparison sample: Opposite quarter of material sampled by the Contractor.

Independent Sample (Quality Assurance Sample): A sample taken by the Department to verify an acceptance decision without regard to any other sample that may also have been taken to represent the material in question.

Referee sample: A sample of the material retained during the quartering process which is used for evaluation if a comparison of Contractor and Departmental test results is outside allowable tolerances.

400.1.02 Related References

A. Standard Specifications
   Section 106—Control of Materials
   Section 109—Measurement and Payment
   Section 152—Field Laboratory Building
   Section 413—Bituminous Tack Coat
   Section 424—Bituminous Surface Treatment
   Section 802—Coarse Aggregate for Asphalctic Concrete
B. Referenced Documents

AASHTO T 315
AASHTO T 209
AASHTO T 202
AASHTO T 49

Georgia Department of Transportation Standard Operating Procedure (SOP) 27
Georgia Department of Transportation Standard Operating Procedure (SOP) 15
Georgia Department of Transportation Standard Operation Procedure (SOP) 40

GDT 38
GDT 73
GDT 78
GDT 83
GDT 93
GDT 119
GDT 125
GDT 134
GSP 15
GSP 21
QPL 1
QPL 2
QPL 7
QPL 26
QPL 30
QPL 39
QPL 41
QPL 45
QPL 65
QPL 67
QPL 70
QPL 77

400.1.03 Submittals

A. Invoices

Furnish formal written invoices from a supplier for all materials used in production of HMA when requested by the Department. Show the following on the Bill of Lading:

- Date shipped
- Quantity in tons (megagrams)
- Included with or without additives (for asphalt cement)
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Purchaser asphaltic cement directly from a supplier listed on Qualified Products List 7 and provide copies of Bill of Lading at the Department’s request.

B. Paving Plan

Before starting asphaltic concrete construction, submit a written paving plan to the Engineer for approval. Include the following on the paving plan:

- Proposed starting date
- Location of plant(s)
- Rate of production
- Average haul distance(s)
- Number of haul trucks
- Paver speed feet (meter)/minute for each placement operation
- Mat width for each placement operation
- Number and type of rollers for each placement operation
- Sketch of the typical section showing the paving sequence for each placement operation
- Electronic controls used for each placement operation
- Temporary pavement marking plan

If staged construction is designated in the Plans or contract, provide a paving plan for each construction stage.

If segregation is detected, submit a written plan of measures and actions to prevent segregation. Work will not continue until the plan is submitted to and approved by the Department.

C. Job Mix Formula

After the Contract has been awarded, submit to the Engineer a written job mix formula proposed for each mixture type to be used based on an approved mix design. Furnish the following information for each mix:

- Specific project for which the mixture will be used
- Source and description of the materials to be used
- Mixture I.D. Number
- Proportions of the raw materials to be combined in the paving mixture
- Single percentage of the combined mineral aggregates passing each specified sieve
- Single percentage of asphalt by weight of the total mix to be incorporated in the completed mixture
- Single temperature at which to discharge the mixture from the plant
- Theoretical specific gravity of the mixture at the designated asphalt content
- Name of the person or agency responsible for quality control of the mixture during production

Do the following to have the formulas approved in accordance with SOP 40 “Approval of Contractor Job Mix Formulas” and to ensure their quality:

1. Submit proposed job mix formulas for review at least two weeks before beginning the mixing operations.
2. Do not start hot mix asphaltic concrete work until the Engineer has approved a job mix formula for the mixture to be used. No mixture will be accepted until the Engineer has given approval.
3. Provide mix designs for all Superpave and 4.75 mm mixes to be used. The Department will provide mix design results for other mixes to be used.
4. After a job mix formula has been approved, assume responsibility for the quality control of the mixtures supplied to the Department according to Subsection 106.01, “Source of Supply and Quantity of Materials.”

D. Quality Control Program

Submit a Quality Control Plan to the Office of Materials and Research for approval. The Quality Control Program will be included as part of the certification in the annual plant inspection report.
400.2 Materials

Ensure that materials comply with the specifications listed in Table 1.

<table>
<thead>
<tr>
<th>Material</th>
<th>Subsection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asphalt Cement, Grade Specified</td>
<td>820.2</td>
</tr>
<tr>
<td>Coarse Aggregates for Asphaltic Concrete</td>
<td>802.2.02</td>
</tr>
<tr>
<td>Fine Aggregates for Asphaltic Concrete</td>
<td>802.2.01</td>
</tr>
<tr>
<td>Mineral Filler</td>
<td>883.1</td>
</tr>
<tr>
<td>Heat Stable Anti-Stripping Additive</td>
<td>831.2.04</td>
</tr>
<tr>
<td>Hydrated Lime</td>
<td>882.2.03</td>
</tr>
<tr>
<td>Silicone Fluid (When approved by the Office of Materials and Research)</td>
<td>831.2.05</td>
</tr>
<tr>
<td>Bituminous Tack Coat: PG 58-22, PG 64-22, PG 67-22</td>
<td>820.2</td>
</tr>
<tr>
<td>Hot Mix Asphaltic Concrete Mixtures</td>
<td>828</td>
</tr>
</tbody>
</table>

400.2.01 Delivery, Storage, and Handling

Storage of material is allowed in a properly sealed and insulated system for up to 24 hours except that Stone Matrix Asphalt (SMA), Open-Graded Friction Course (OGFC), or Porous European Mix (PEM) mixtures shall not be stored more than 12 hours. Mixtures other than SMA, OGFC, or PEM may be stored up to 72 hours in a sealed and insulated system, equipped with an auxiliary inert gas system, with the Engineer’s approval. Segregation, lumpiness, drain-down, or stiffness of stored mixture is cause for rejection of the mixture. The Engineer will not approve using a storage or surge bin if the mixture segregates, loses excessive heat, or oxidizes during storage.

The Engineer may obtain mixture samples or recover asphalt cement according to GDT 119, AASHTO T 315, AASHTO T 202 and T 49 will be used to perform viscosity and penetration tests to determine how much asphalt hardening has occurred.

A. Vehicles for Transporting and Delivering Mixtures

Ensure trucks used for hauling bituminous mixtures have tight, clean, smooth beds.

Follow these guidelines when preparing vehicles to transport bituminous mixtures:

1. Use an approved releasing agent from QPL 39 in the transporting vehicle beds, if necessary, to prevent the mixture from sticking to the bed. Ensure that the releasing agent is not detrimental to the mixture. When applying the agent, drain the excess agent from the bed before loading. Remove from the project any transporting vehicles determined to contain unapproved releasing agents.

2. Protect the mixture with a waterproof cover large enough to extend over the sides and ends of the bed. Securely fasten the waterproof cover before the vehicle begins moving.

3. Insulate the front end and sides of each bed with an insulating material with the following specifications:
   - Consists of builders insulating board or equivalent
   - Has a minimum “R” value of 4.0
   - Can withstand approximately 400 °F (200 °C) temperatures

   Install the insulating material so it is protected from loss and contamination. A “Heat Dump Body” may be used in lieu of insulation of the bed. “Heat Dump Body” refers to any approved transport vehicle that is capable of diverting engine exhaust and transmitting heat evenly throughout the dump body to keep asphalt at required temperature. Mark the “Heat Dump Body” clearly with “OPEN” and “CLOSE” position at the exhaust diverter. Install a padlock and lock it in the “OPEN” position when the “Heat Dump Body” is used to transport bituminous mixtures.

4. Mark each transporting vehicle with a clearly visible identification number.

5. Create a hole in each side of the bed so that the temperature of the loaded mixture can be checked. The placement of these holes shall be located to assure that the thermometer is being placed in the hot mix asphaltic concrete.
Ensure the mixture is delivered to the roadway at a temperature within ± 20 °F (± 11 °C) of the temperature on the job mix formula.

If the Engineer determines that a truck may be hazardous to the Project or adversely affect the quality of the work, remove the truck from the project.

B. Containers for Transporting, Conveying, and Storing Bituminous Material

To transport, convey, and store bituminous material, use containers free of foreign material and equipped with sample valves. Bituminous material will not be accepted from conveying vehicles if material has leaked or spilled from the containers.

400.3 Construction Requirements

400.3. 01 Personnel

General Provisions 101 through 150.

400.3.02 Equipment

Hot mix asphaltic concrete plants that produce mix for Department use are governed by Quality Assurance for Hot Mix Asphaltic Concrete Plants in Georgia, Laboratory Standard Operating Procedure No. 27.

The Engineer will approve the equipment used to transport and construct hot mix asphaltic concrete. Ensure that the equipment is in satisfactory mechanical condition and can function properly during production and placement operations.

Place the following equipment at the plant or project site:

A. Field Laboratory

Provide a field laboratory according to Section 152.

B. Plant Equipment

1. Scales

Provide scales as follows:

   a. Furnish (at the Contractor’s expense) scales to weigh bituminous plant mixtures, regardless of the measurement method for payment.

   b. Ensure that the weight measuring devices that provide documentation comply with Subsection 109.01, “Measurement and Quantities.”

   c. When not using platform scales, provide weight devices that record the mixture net weights delivered to the truck. A net weight system will include, but is not limited to:

      ● Hopper or batcher-type weight systems that deliver asphaltic mixture directly to the truck

      ● Fully automatic batching equipment with a digital recording device

   d. Use a net weight printing system only with automatic batching and mixing systems approved by the Engineer.

   e. Ensure that the net weight scale mechanism or device manufacturer, installation, performance, and operation meets the requirements in Subsection 109.01, “Measurement and Quantities”

   f. Provide information on the Project tickets according to Department of Transportation SOP-15.

2. Time-Locking Devices

Furnish batch type asphalt plants with automatic time-locking devices that control the mixing time automatically. Construct these devices so that the operator cannot shorten or eliminate any portion of the mixing cycle.

3. Surge- and Storage-Systems

Provide surge and storage bins as follows:

   a. Ensure bins for mixture storage are insulated and have a working seal, top and bottom, to prevent outside air infiltration and to maintain an inert atmosphere during storage. Bins not intended as storage bins may be used as surge bins to hold hot mixtures for part of the working day. However, empty these surge bins completely at the end of the working day.

   b. Ensure surge and storage bins can retain a predetermined minimum level of mixture in the bin when the trucks are loaded.

   c. Ensure surge and storage systems do not contribute to mix segregation, lumpiness, drain-down, or stiffness.
d. Ensure the scale mechanism or device manufacture, installation, performance, and operation meets the requirements in Subsection 109.01 "Measurement and Quantities".

4. Controls for Dust Collector Fines

Control dust collection as follows:

a. When collecting airborne aggregate particles and returning them to the mixture, have the return system meter all or part of the collected dust uniformly into the aggregate mixture and waste the excess. The collected dust percentage returned to the mixture is subject to the Engineer’s approval.

b. When the collected dust is returned directly to the hot aggregate flow, interlock the dust feeder with the hot aggregate flow and meter the flow to maintain a flow that is constant, proportioned, and uniform.

5. Hydrated Lime Treatment System

When hydrated lime is required as a mixture ingredient:

a. Use a separate bin and feed system to store and proportion the required quantity into the mixture.

b. Ensure that the aggregate is uniformly coated with hydrated lime aggregate before adding the bituminous material to the mixture. Add the hydrated lime so that it will not become entrained in the exhaust system of the drier or plant.

c. Control the feeder system with a proportioning device that meets these specifications:
   - Is accurate to within ± 10 percent of the amount required
   - Has a convenient and accurate means of calibration
   - Interlocks with the aggregate feed or weigh system to maintain the correct proportions for all rates of production and batch sizes and to ensure that mixture produced is properly treated with lime

Provide flow indicators or sensing devices for the hydrated lime system and interlock them with the plant controls to interrupt mixture production if hydrated lime introduction fails to meet the required target value after no longer than 60 seconds.

6. Net Weight Weighing Mechanisms

Certify the accuracy of the net weight weighing mechanisms by an approved registered scale serviceperson at least once every 6 months. Check the accuracy of net weight weighing mechanisms at the beginning of Project production and thereafter as directed by the Engineer. Check mechanism accuracy as follows:

a. Weigh a load on a set of certified commercial truck scales. Ensure that the difference between the printed total net weight and that obtained from the commercial scales is no greater than 4 lbs/1,000 lbs (4 kg/Mg) of load.

Check the accuracy of the bitumen scales as follows:
   - Use standard test weights.
   - If the checks indicate printed weights are out of tolerance, have a registered scale serviceperson check the batch scales and certify the accuracy of the printer.
   - While the printer system is out of tolerance and before its adjustment, continue production only if using a set of certified truck scales to determine the truck weights.

b. Ensure plants using batch scales maintain ten 50 lb (25 kg) standard test weights at the plant site to check batching scale accuracy.

c. Ensure plant scales that are used only to proportion mixture ingredients, and not to determine pay quantities, are within two percent throughout the range.

C. Equipment at Project Site

1. Cleaning Equipment

Provide sufficient hand tools and power equipment to clean the roadway surface before placing the bituminous tack coat. Use power equipment that complies with Subsection 424.3.02.F, “Power Broom and Power Blower.”

2. Pressure Distributor

To apply the bituminous tack coat, use a pressure distributor complying with Subsection 424.3.02.B, “Pressure Distributor.”

3. Bituminous Pavers
To place hot mix asphaltic concrete, use bituminous pavers that can spread and finish courses that are:

- As wide and deep as indicated on the Plans
- True to line, grade, and cross section
- Smooth
- Uniform in density and texture

a. Continuous Line and Grade Reference Control. Furnish, place, and maintain the supports, wires, devices, and materials required to provide continuous line and grade reference control to the automatic paver control system.

b. Automatic Screed Control System. Equip the bituminous pavers with an automatic screed control system actuated from sensor-directed mechanisms or devices that will maintain the paver screed at a pre-determined transverse slope and elevation to obtain the required surface.

c. Transverse Slope Controller. Use a transverse slope controller capable of maintaining the screed at the desired slope within ± 0.1 percent. Do not use continuous paving set-ups resulting in unbalanced screed widths or off-center breaks in the main screed cross section unless approved by the Engineer.

d. Screed Control. Equip the paver to permit the following four modes of screed control. The method used shall be approved by the Engineer.

- Automatic grade sensing and slope control
- Automatic dual grade sensing
- Combination automatic and manual control
- Total manual control

Ensure the controls are referenced with a taut string or wire set to grade, or with a ski-type device or mobile reference at least 30 ft (9 m) long when using a conventional ski. Approved non-contacting laser or sonar-type skis listed on QPL 91 “Georgia’s List of Approved Non-contacting Laser and Sonar-type Electronic Grade and Slope Controls” may be used in lieu of conventional 30 ft (9m) skis. Under limited conditions, a short ski or shoe may be substituted for a long ski on the second paver operating in tandem, or when the reference plane is a newly placed adjacent lane.

Automatic screed control is required on all Projects; however, when the Engineer determines that Project conditions prohibit the use of such controls, the Engineer may waive the grade control, or slope control requirements, or both.

e. Paver Screed Extension. When the laydown width requires a paver screed extension, use bolt-on screed extensions to extend the screeds, or use an approved mechanical screed extension device. When the screed is extended, add auger extensions to assure a length of no more than 18 inches (0.5 m) from the auger to the end gate of the paver. Auger extensions may be omitted when paving variable widths. Ensure the paver is equipped with tunnel extensions when the screed and augers are extended.

NOTE: Do not use extendible strike-off devices instead of approved screed extensions. Only use a strike-off device in areas that would normally be luted in by hand labor.

4. Compaction Equipment

Ensure that the compaction equipment is in good mechanical condition and can compact the mixture to the required density. The compaction equipment number, type, size, operation, and condition is subject to the Engineer’s approval.

400.3.03 Preparation

A. Prepare Existing Surface

Prepare the existing surface as follows:

1. Clean the Existing Surface. Before applying hot mix asphaltic concrete pavement, clean the existing surface to the Engineer’s satisfaction.
2. Patch and Repair Minor Defects
   Before placing leveling course:
Section 400—Hot Mix Asphaltic Concrete Construction

a. Correct potholes and broken areas requiring patching in the existing surface and base as directed by the Engineer.

b. Cut out, trim to vertical sides, and remove loose material from the areas to be patched.

c. Prime or tack coat the area after being cleaned. Compact patches to the Engineer’s satisfaction. Material for patches does not require a job mix formula, but shall meet the gradation range shown in Section 828. The Engineer must approve the asphalt content to be used.

3. Apply Bituminous Tack Coat

Apply the tack coat according to Section 413. The Engineer will determine the application rate, which must be within the limitations Table 2.

Table 2—Application Rates for Bituminous Tack, gal/yd² (L/m²)

<table>
<thead>
<tr>
<th></th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Mixes *</td>
<td>0.04 (0.180)</td>
<td>0.06 (0.270)</td>
</tr>
</tbody>
</table>

*On thin leveling courses and freshly placed asphaltic concrete mixes, reduce the application rate to 0.04 gal/yd² (0.09 to 0.18 L/m²).

B. Place Patching and Leveling Course

1. When the existing surface is irregular, bring the surface area to the proper cross section and grade with a leveling course of hot mix asphaltic concrete materials.

2. Place leveling at the locations and in the amounts directed by the Engineer.

3. Use leveling course mixtures meeting the requirements of the job mix formulas defined in:
   - Subsection 400.3.05.A, “Observe Composition of Mixtures”
   - Section 828
   - Leveling acceptance schedules in Subsection 400.3.06.A, “Acceptance Plans for Gradation and Asphalt Cement Content”

4. If the leveling and patching mix type is undesignated, determine the mix type by the thickness or spread rate according to Table 3, but do not use 4.75 mm mix on interstate projects.

Table 3—Leveling and Patching Mix Types

<table>
<thead>
<tr>
<th>Thickness</th>
<th>Rate of Spread</th>
<th>Type of Mix</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 0.75 in (19 mm)</td>
<td>Up to 85 lbs/yd² (45 kg/m²)</td>
<td>4.75 mm Mix or 9.5 mm Superpave Type 1</td>
</tr>
<tr>
<td>0.75 to 1.5 in (19 to 38 mm)</td>
<td>85 to 165 lbs/yd² (45 to 90 kg/m²)</td>
<td>9.5 mm Superpave Type 2</td>
</tr>
<tr>
<td>1.5 to 2 in (38 to 50 mm)</td>
<td>165 to 220 lbs/yd² (90 to 120 kg/m²)</td>
<td>12.5 mm Superpave *</td>
</tr>
<tr>
<td>2 to 2.5 in (50 to 64 mm)</td>
<td>220 to 275 lbs/yd² (120 to 150 kg/m²)</td>
<td>19 mm Superpave *</td>
</tr>
<tr>
<td>Over 2.5 in (64 mm)</td>
<td>Over 275 lbs/yd² (150 kg/m²)</td>
<td>25 mm Superpave</td>
</tr>
</tbody>
</table>

* These mixtures may be used for isolated patches no more than 6 in. (150 mm) deep and no more than 4 ft. (1.2 m) in diameter or length.

400.3.04 Fabrication

General Provisions 101 through 150.

400.3.05 Construction

Provide the Engineer at least one day’s notice prior to beginning construction, or prior to resuming production if operations have been temporarily suspended.
A. Observe Composition of Mixtures

1. Calibration of plant equipment

   If the material changes, or if a component affecting the ingredient proportions has been repaired, replaced, or adjusted, check and recalibrate the proportions.

   Calibrate as follows:

   a. Before producing mixture for the Project, calibrate by scale weight the electronic sensors or settings for proportioning mixture ingredients.

   b. Calibrate ingredient proportioning for all rates of production.

2. Mixture control

   Compose hot mix asphaltic concrete from a uniform mixture of aggregates, bituminous material, and if required, hydrated lime, mineral filler, or other approved additive.

   Ensure the constituents are proportional to produce mixtures that meet the requirements in Section 828. The general composition limits prescribed are extreme ranges within which the job mix formula must be established. Base mixtures on a design analysis that meets the requirements of Section 828.

   Ensure that the field performance of the in-place mixtures meet the requirements of Subsection 828.2.B for Permeability, Moisture Susceptibility, Rutting Susceptibility and Fatigue. In-place mix may be evaluated for compliance with requirements of Subsection 828.2.B at the discretion of the State Bituminous Construction Engineer under the following conditions:

   - Deviates greater than 10 percent on gradation for mixture control sieves from the approved Job Mix Formula based on Acceptance or Independent Samples.
   - Deviates greater than 0.7 percent in asphalt cement content from the approved Job Mix Formula based on Acceptance or Independent Samples.
   - The calculated mean pavement air voids result in an adjusted pay factor less than 0.80 or any single sub lot result in mean pavement air voids exceeding 10.5 percent.
   - Mix produced not using an approved mix design and/or job mix formula.

   Remove and replace (at the Contractor’s expense) any areas determined to not meet the requirements of Subsection 828.2.B

   If control test results show that the characteristic tested does not conform to the job mix formula control tolerances given in Section 828, take immediate action to ensure that the quality control methods are effective.

   Control the materials to ensure that extreme variations do not occur. Maintain the gradation within the composition limits in Section 828.

B. Prepare Bituminous Material

Uniformly heat the bituminous material to the temperature specified in the job mix formula with a tolerance of ± 20 °F (± 11 °C).

C. Prepare the Aggregate

Prepare the aggregate as follows:

1. Heat the aggregate for the mixture, and ensure a mix temperature within the limits of the job mix formula.
2. Do not contaminate the aggregate with fuel during heating.
3. Reduce the absorbed moisture in the aggregate until the asphalt does not separate from the aggregate in the prepared mixture. If this problem occurs, the Engineer will establish a maximum limit for moisture content in the aggregates. When this limit is established, maintain the moisture content below this limit.

D. Prepare the Mixture

Proportion the mixture ingredients as necessary to meet the required job mix formula. Mix until a homogenous mixture is produced.

1. Add Hydrated Lime
When hydrated lime is included in the mixture, add it at a rate specified in Section 828 and the job mix formula. Use methods and equipment for adding hydrated lime according to Subsection 400.3.02.B.6, “Hydrated Lime Treatment System.”

Add hydrated lime to the aggregate by using Method A or B as follows:

Method A—Dry Form—Add hydrated lime in its dry form to the mixture as follows, according to the type of plant:

a. Batch Type Asphalt Plant: Add hydrated lime to the mixture in the weigh hopper or as approved and directed by the Engineer.

b. Continuous Plant Using Pugmill Mixer: Feed hydrated lime into the hot aggregate before it is introduced into the mixer so that dry mixing is complete before the bituminous material is added.

c. Continuous Plant Using Drier-Drum Mixer: Add hydrated lime so that the lime will not become entrained into the air stream of the drier and so that thorough dry mixing will be complete before the bituminous material is added.

Method B—Lime/Water Slurry—Add the required quantity of hydrated lime (based on dry weight) in lime/water slurry form to the aggregate. This solution consists of lime and water in concentrations as directed by the Engineer. Equip the plant to blend and maintain the hydrated lime in suspension and to mix it with the aggregates uniformly in the proportions specified.

2. Add Gilsonite Modifier

When approved by the Office of Materials and Research and required by the Contract, add the Gilsonite modifier to the mixture at a rate to ensure eight percent by weight of the asphalt cement is replaced by Gilsonite. Use either PG 64-22 or PG 67-22 asphalt cement as specified in Subsection 820.2.01. Provide suitable means to calibrate and check the rate of Gilsonite being added. Introduce Gilsonite modifier by either of the following methods.

a. For batch type plants, incorporate Gilsonite into the pugmill at the beginning of the dry mixing cycle. Increase the dry mix cycle by a minimum of 10 seconds after the Gilsonite is added and prior to introduction of the asphalt cement. For this method, supply Gilsonite in plastic bags to protect the material during shipment and handling and store the modifier in a waterproof environment. The bags shall be capable of being completely melted and uniformly blended into the combined mixture. Gilsonite may also be added through a mineral filler supply system as described in Subsection 400.3.02.B.5, “Mineral Filler Supply System.” The system shall be capable of injecting the modifier into the weigh hopper near the center of the aggregate batching cycle so the material can be accurately weighed.

b. For drum drier plants, add Gilsonite through the recycle ring or through an acceptable means which will introduce the Gilsonite prior to the asphalt cement injection point. The modifier shall be proportionately fed into the drum mixer at the required rate by a proportioning device which shall be accurate within ± 10 percent of the amount required. The entry point shall be away from flames and ensure the Gilsonite will not be caught up in the air stream and exhaust system.

3. Materials from Different Sources

Do not use mixtures prepared from aggregates from different sources intermittently. This will cause the color of the finished pavement to vary.

E. Observe Weather Limitations

Do not mix and place asphaltic concrete if the existing surface is wet or frozen. Follow the temperature guidelines in the following table:

<table>
<thead>
<tr>
<th>Lift Thickness</th>
<th>Minimum Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 in (25 mm) or less</td>
<td>55 °F (13 °C)</td>
</tr>
<tr>
<td>1.1 to 2 in (26 mm to 50 mm)</td>
<td>45 °F (8 °C)</td>
</tr>
<tr>
<td>2.1 to 3 in (51 mm to 75 mm)</td>
<td>40 °F (4 °C)</td>
</tr>
<tr>
<td>3.1 to 4 in (76 mm to 100 mm)</td>
<td>35 °F (2 °C)</td>
</tr>
<tr>
<td>4.1 to 8 in (101 mm to 200 mm)</td>
<td>32 °F (0 °C) and rising. Base Material must not be frozen</td>
</tr>
</tbody>
</table>
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F. Perform Spreading and Finishing

Spread and finish the course as follows:

1. Determine the course’s maximum compacted layer thickness by the type mix being used according to Table 5.

<table>
<thead>
<tr>
<th>Mix Type</th>
<th>Minimum Layer Thickness</th>
<th>Maximum Layer Thickness</th>
<th>Maximum Total Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 mm Superpave</td>
<td>2 1/2 in (64 mm)</td>
<td>4 in (100 mm) *</td>
<td>—</td>
</tr>
<tr>
<td>19 mm Superpave</td>
<td>1 3/4 in (44 mm)</td>
<td>3 in (75 mm) *</td>
<td>—</td>
</tr>
<tr>
<td>12.5 mm Superpave</td>
<td>1 3/8 in (35 mm)</td>
<td>2 1/2 in (64 mm)**</td>
<td>8 in (200 mm)</td>
</tr>
<tr>
<td>9.5 mm Superpave Type II</td>
<td>1 1/8 in.(28 mm)</td>
<td>1 1/2 in (38 mm)**</td>
<td>4 in (100 mm)</td>
</tr>
<tr>
<td>9.5 mm Superpave Type I</td>
<td>7/8 in (22 mm)</td>
<td>1 1/4 in (32 mm)</td>
<td>4 in (100 mm)</td>
</tr>
<tr>
<td>4.75 mm Mix</td>
<td>3/4 in (19 mm)</td>
<td>1 1/8 in (28 mm)</td>
<td>2 in (50 mm)</td>
</tr>
</tbody>
</table>

* Allow up to 6 in (150 mm) per lift on trench widening. **Place 9.5 mm Superpave and 12.5 mm Superpave up to 4 in (100 mm) thick for driveway and side road transition.

2. Unload the mixture into the paver hopper or into a device designed to receive the mixture from delivery vehicles.
3. Except for leveling courses, spread the mixture to the loose depth for the compacted thickness or the spread rate. Use a mechanical spreader true to the line, grade, and cross section specified.
4. For leveling courses, use a motor grader equipped with a spreader box and smooth tires to spread the material or use a mechanical spreader meeting the requirements in Subsection 400.3.02.C, “Equipment at Project Site.”
5. Obtain the Engineer’s approval for the sequence of paving operations, including paving the adjoining lanes. Minimize tracking tack onto surrounding surfaces.
6. Ensure the outside edges of the pavement being laid are aligned and parallel to the roadway center line.
7. For New Construction or Resurfacing Contracts containing multiple lifts or courses, arrange the width of the individual lifts so the longitudinal joints of each successive lift are offset from the previous lift at least 1 ft (300 mm). This requirement does not apply to the lift immediately over thin lift leveling courses. Ensure the longitudinal joint(s) in the surface course and the mix immediately underneath asphaltic concrete OGFC or PEM are at the lane line(s).

NOTE: Perform night work with artificial light provided by the Contractor and approved by the Engineer.

8. Where mechanical equipment cannot be used, spread and rake the mixture by hand. Obtain the Engineer’s approval of the operation sequence, including compactive methods, in these areas.
9. Keep small hand raking tools clean and free from asphalt build up. Do not use fuel oil or other harmful solvents to clean tools during the work.
10. Do not use mixture with any of these characteristics:

    - Segregated
    - Nonconforming temperature
    - Deficient or excessive asphalt cement content
    - Otherwise unsuitable to place on the roadway in the work

11. Remove and replace mixture placed on the roadway that the Engineer determines has unacceptable blemish levels from segregation, raveling, streaking, pulling and tearing, or other deficient characteristics. Replace with acceptable mixture at the Contractor’s expense. Do not continually place mixtures with deficiencies. Do not place subsequent course lifts over another lift or courses placed on the same day while the temperature of the previously placed mix is 140 °F (60 °C) or greater.
12. Obtain the Engineer’s approval of the material compaction equipment. Perform the rolling as follows:
   a. Begin the rolling as close behind the spreader as possible without causing excessive distortion of the asphaltic concrete surface.
   b. Continue rolling until roller marks are no longer visible.
   c. Use pneumatic-tired rollers with breakdown rollers on all courses except asphaltic concrete OGFC, PEM and SMA or other mixes designated by the Engineer.

13. If applicable, taper or “feather” asphaltic concrete from full depth to a depth no greater than 0.5 in (13 mm) along curbs, gutters, raised pavement edges, and areas where drainage characteristics of the road must be retained. The Engineer will determine the location and extent of tapering.

G. Maintain Continuity of Operations

Coordinate plant production, transportation, and paving operations to maintain a continuous operation. If the spreading operations are interrupted, construct a transverse joint if the mixture immediately behind the paver screed cools to less than 250 ºF (120 ºC).

H. Construct the Joints

1. Construct Transverse Joints
   a. Construct transverse joints to facilitate full depth exposure of the course before resuming placement of the affected course.
   b. Properly clean and tack the vertical face of the transverse joint before placing additional material.

   NOTE: Never burn or heat the joint by applying fuel oil or other volatile materials.

   c. Straightedge transverse joints immediately after forming the joint.
   d. Immediately correct any irregularity that exceeds 3/16 in. in 10 ft (5 mm in 3 m).

2. Construct Longitudinal Joints

Clean and tack the vertical face of the longitudinal joint before placing adjoining material. Construct longitudinal joints so that the joint is smooth, well sealed, and bonded.

I. Protect the Pavement

Protect sections of the newly finished pavement from traffic until the traffic will not mar the surface or alter the surface texture. If directed by the Engineer, use artificial methods to cool the newly finished pavement to open the pavement to traffic more quickly.

J. Modify the Job Mix Formula

If the Engineer determines that undesirable mixture or mat characteristics are being obtained, the job mix formula may require immediate adjustment.

400.3.06 Quality Acceptance

A. Acceptance Plans for Gradation and Asphalt Cement Content

The Contractor will randomly sample and test mixtures on a lot basis. The Department will monitor the Contractor testing program and perform comparison and quality assurance testing. The Contractor’s Quality Control Technicians shall participate in the Department’s Independent Assurance Systems Basis Program.

1. Determine Lot Amount

   A lot consists of the tons (megagrams) of asphaltic concrete produced and placed each production day. If this production is less than 500 tons (500 Mg), or its square yard (meter) equivalent, production may be incorporated into the next working day. The Engineer may terminate a lot when a pay adjustment is imminent if a plant or materials adjustment resulting in a probable correction has been made. Terminate all open lots at the end of the month, except for materials produced and placed during the adjustment period. If the final day’s production does not constitute a lot, the production may be included in the lot for the previous day’s run; or, the Engineer may treat the production as a separate lot with a corresponding lower number of tests.

2. Determine Lot Acceptance

   If the Engineer determines that the material is not acceptable to leave in place, the materials shall be removed and replaced at the Contractor’s expense.
3. Provide Quality Control Program

Provide a Quality Control Program as established in SOP 27 which includes:

- Assignment of quality control responsibilities to specifically named individuals who have been certified by the Office of Materials and Research
- Provisions for prompt implementation of control and corrective measures
- Provisions for communication with Project Manager, Bituminous Technical Services Engineer, and Testing Management Operations Supervisor at all times
- Provisions for reporting all test results daily through the Office of Materials and Research computerized Field Data Collection System; other checks, calibrations and records will be reported on a form developed by the Contractor and will be included as part of the project records
- Notification in writing of any change in quality control personnel

a. Certification Requirements:

- Use laboratory and testing equipment certified by the Department. (Laboratories which participate in and maintain AASHTO accreditation for testing asphaltic concrete mixtures will be acceptable in lieu of Departmental certification.)
- Provide certified quality control personnel to perform the sampling and testing. A Quality Control Technician (QCT) may be certified at three levels:
  1) Temporary Certification – must be a technician trainee who shall be given direct oversight by a certified Level 1 or Level 2 QCT while performing acceptance testing duties during the first 5 days of training. The trainee must complete qualification requirements within 30 GDOT production days after being granted temporary certification. A trainee who does not become qualified within 30 GDOT production days will not be re-eligible for temporary certification. A certified Level 1 or Level 2 QCT shall be at the plant at all times during production and shipment of mixture to monitor work of the temporarily certified technician.
  2) Level 1 – must demonstrate they are competent in performing the process control and acceptance tests and procedures related to hot mix asphalt production and successfully pass a written exam.
  3) Level 2 – must meet Level 1 requirements and must be capable of and responsible for making process control adjustments, and successfully pass a written exam.

- Technician certification is valid for 3 years from the date on the technician’s certificate unless revoked or suspended. Eligible technicians may become certified through special training and testing approved by the Office of Materials and Research. Technicians who lose their certification due to falsification of test data will not be eligible for recertification in the future unless approved by the State Materials and Research Engineer.

b. Quality Control Management

1) Designate at least one Level 2 QCT as manager of the quality control operation. The Quality Control Manager shall meet the following requirements:
   - Be accountable for actions of other QCT personnel
   - Ensure that all applicable sampling requirements and frequencies, test procedures, and Standard Operating Procedures are adhered to
   - Ensure that all reports, charts, and other documentation is completed as required

2) Provide QCT personnel at the plant as follows:
   - If daily production for all mix types is to be greater than 250 tons (megagrams), have a QCT person at the plant at all times during production and shipment of mixture until all required acceptance tests have been completed
   - If daily production for all mix types will not be greater than 250 tons (megagrams) a QCT may be responsible for conducting tests at up to two plants, subject to random number sample selection
   - Have available at the plant or within immediate contact by phone or radio a Level 2 QCT responsible for making prompt process control adjustments as necessary to correct the mix

3) Sampling, Testing, and Inspection Requirements.
Provide all sample containers, extractants, forms, diaries, and other supplies subject to approval of the Engineer.

Perform daily sampling, testing, and inspection of mixture production that meets the following requirements:

(a) Randomly sample mixtures according to GSP 15, and GDT 73 (Method C) and test on a lot basis. In the event less than the specified number of samples are taken, obtain representative 6 in (150 mm) cores from the roadway at a location where the load not sampled was placed. Take enough cores to ensure minimum sample size requirements are met for each sample needed.

(b) Maintain a printed copy of the computer generated random sampling data as a part of the project records.

(c) Perform sampling, testing, and inspection duties of GSP 21.

(d) Perform extraction or ignition test (GDT 83 or GDT 125) and extraction analysis (GDT 38). If the ignition oven is used, a printout of sample data including weights shall become a part of the project records. For asphalt cement content only, digital printouts of liquid asphalt cement weights may be substituted in lieu of an extraction test for plants with digital recorders. Calculate the asphalt content from the ticket representing the mixture tested for gradation.

(e) Save extracted aggregate, opposite quarters, and remaining material (for possible referee testing) of each sample as follows:
   - Store in properly labeled, suitable containers
   - Secure in a protected environment
   - Store for three working days. If not obtained by the Department, within three days they may be discarded in accordance with GSP 21.

(f) Add the following information on load tickets from which a sample or temperature check is taken:
   - Mixture temperature
   - Signature of the QCT person performing the testing

(g) Calibrate the lime system when hydrated lime is included in the mixture:
   - Perform a minimum of twice weekly during production
   - Post results at the plant for review
   - Provide records of materials invoices upon request (including asphalt cement, aggregate, hydrated lime, etc.)

(h) Take action if acceptance test results are outside Mixture Control Tolerances of Section 828.
   - One sample out of tolerance
     1. Contact Level 2 - QCT to determine if a plant adjustment is needed
     2. Immediately run a process control sample. Make immediate plant adjustments if this sample is also out of tolerance
     3. Test additional process control samples as needed to ensure corrective action taken appropriately controls the mixture
   - Two consecutive acceptance samples of the same mix type out of tolerance regardless of Lot or mix design level, or three consecutive acceptance samples out of tolerance regardless of mix type
     1. Stop plant production immediately
     2. Reject any mixture already in storage that:
        - Deviates more than 10 percent in gradation from the job mix formula based on the acceptance sample
        - Deviates more than 0.7 percent in asphalt content from the job mix formula based on the acceptance sample
     3. Make a plant correction to any mix type out of tolerance prior to resuming production
Do not send any mixture to the project before test results of a process control sample meets Mixture Control Tolerances.

Reject any mixture produced at initial restarting that does not meet Mixture Control Tolerances.

4) Comparison Testing and Quality Assurance Program

Periodic comparison testing by the Department will be required of each QCT to monitor consistency of equipment and test procedures. The Department will take independent samples to monitor the Contractor's quality control program.

a) Comparison Sampling and Testing

Retain samples for comparison testing and referee testing if needed as described in Subsection 400.3.06.A.3.b.3. Discard these samples only if the Contractor's acceptance test results meet a 1.00 pay factor and the Department does not procure the samples within three working days.

The Department will test comparison samples on a random basis. Results will be compared to the respective contractor acceptance tests and the maximum difference shall be as follows:

Table 6—Allowable Percent Difference Between Department and Contractor Acceptance Tests

<table>
<thead>
<tr>
<th>SIEVE SIZE</th>
<th>SURFACE</th>
<th>SUB-SURFACE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2 in. (12.5 mm)</td>
<td>3.5%</td>
<td>4.0%</td>
</tr>
<tr>
<td>3/8 in. (9.5 mm)</td>
<td>3.5%</td>
<td>4.0%</td>
</tr>
<tr>
<td>No. 4 (4.75 mm)</td>
<td>3.5%</td>
<td>3.5%</td>
</tr>
<tr>
<td>No. 8 (2.36 mm)</td>
<td>2.5%</td>
<td>3.0%</td>
</tr>
<tr>
<td>No. 200 (75 μm)</td>
<td>2.0%</td>
<td>2.0%</td>
</tr>
<tr>
<td>A.C.</td>
<td>0.4%</td>
<td>0.5%</td>
</tr>
</tbody>
</table>

(1) If test comparisons are within these tolerances:
- Continue production
- Use the Contractor's tests for acceptance of the lot

(2) If test comparisons are not within these tolerances:
- Another Departmental technician will test the corresponding referee sample
- Results of the referee sample will be compared to the respective contractor and Departmental tests using the tolerance for comparison samples given above.
  (a) If referee test results are within the above tolerances when compared to the Contractor acceptance test, use the Contractor's test for acceptance of the effected lot.
  (b) If referee test results are not within the above tolerances when compared to the Contractor acceptance test, the Department will review the Contractor's quality control methods and determine if a thorough investigation is needed.

b) Independent Verification Sampling and Testing

(1) Randomly take a minimum of two independent samples from the lesser of five days or five lots of production regardless of mix type or number of projects.

(2) Compare test deviation from job mix formula to Mixture Control Tolerances in Section 828. If results are outside these tolerances, another sample from the respective mix may be taken.

NOTE: For leveling courses less than 110 lb/yd² (60 kg/m²) having quality assurance test results outside the Mixture Control Tolerances of Section 828, use the Department's test results only.
If test results of the additional sample are not within Mixture Control Tolerances, the Department will take the following action:

- Take random samples from throughout the subject lot(s) as established in Subsection 400.3.06.A.3.b.3 and use these test results for acceptance and in calculations for the monthly plant rating. Determine if the Contractor's quality control program is satisfactory and require prompt corrective action by the Contractor if specification requirements are not being met.

- Determine if the QCT has not followed Departmental procedures or has provided erroneous information.

- Take samples of any in-place mixture represented by unacceptable QCT tests and use the additional sample results for acceptance and in calculations for the monthly plant rating. The Contractor QCT tests will not be included in the monthly plant rating.

B. Compaction

Determine the mixture compaction using either GDT 39, GDT 59 or AASHTO T-331. The method of GDT-39 for “Uncoated Specimens, Dense Graded Mixtures Only” shall not apply when the water absorption of a sample exceeds 2.0 percent, as measured according to AASHTO T-166. In this case, either AASHTO T-331 or the paraffin method of GDT-39 shall apply. The compaction is accepted in lots defined in Subsection 400.3.06. A “Acceptance Plans for Gradation and Asphalt Cement Content” and is within the same lot boundaries as the mixture acceptance.

1. Calculate Pavement Mean Air Voids

   The Department will calculate the pavement air voids placed within each lot as follows:

   a. One test per sub-lot.
      
      - Lots ≥ 500 tons of mix should be divided into 5 sub-lots of equal distance.
      - Lots < 500 tons of mix should be comprised of a sub-lot or sub-lots consisting of up to 100 tons of mix each. There may be less than 5 sub-lots.

   b. Average the results of all tests run on randomly selected sites in that lot.

   c. Select the random sites using GDT 73.

   Density tests are not required for asphaltic concrete placed at 125 lbs/yd² (68 kg/m²) or less, 4.75 mm mix and mixes placed as variable depth or width leveling. Compact these courses to the Engineer’s satisfaction. Density tests will not be performed on turn-outs and driveways.

   The targeted maximum Pavement Mean Air Void content for all Superpave mixtures is 5.0 percent. Ensure that the maximum Pavement Mean Air Voids for all Superpave mixtures does not exceed 7.8 percent. The maximum Pavement Mean Air Voids for 2 foot shoulder widening is 9.0 percent. The adjustment period for density shall be three lots or three production days, whichever is less, in order for the contractor to ensure maximum compactive effort has been achieved which will yield no more than the specified maximum allowed Mean Air Voids. If the contractor needs to adjust the mixture to improve density results, a change in the job mix formula may be requested for approval during the adjustment period so long as the following values are not exceeded:

   - Coarse pay sieve ± 4%
   - No. 8 (2.36 mm) sieve ± 2%
   - No. 200 (75 μm) sieve ± 1%
   - Asphalt Content ± 0.2%

   All value changes must still be within specification limits

If the Office of Materials and Research is satisfied that the contractor has exerted the maximum compactive effort and is not able to maintain Pavement Mean Air Voids at no more than 7.8%, the Engineer may establish a maximum target for Pavement Mean Air Voids.

If the Pavement Mean Air Voids within a Lot exceeds 7.8 (or 100% of the maximum target air voids, if established is not maintained); the Engineer may stop the paving operation until appropriate steps are taken by the Contractor to correct the deficiency. Upon approval of the Engineer, the paving operation may be restarted but will be limited to a
1000 ft (300 m) test section to verify that the corrective action taken will result in satisfactory density. Continued operation may not be permitted if the Pavement Mean Air Voids fail to meet the specified density requirements.

2. Parking Facilities Pavement Mean Air Voids
   - 7.8 percent or less for state funded Park and Ride Parking Lots
   - 8.3 percent or less for all other parking facilities on Contracts with ≥ 1000 tons combined of all asphaltic concrete mix types.
   - 9.0 percent or less for all other parking facilities on Contracts with < 1000 tons combined of all asphaltic concrete mix types.
   - If the Office of Materials and Research is satisfied that the contractor has exerted the maximum compactive effort and is not able to maintain the specified Pavement Mean Air Voids, the Engineer may establish a maximum allowable percent Pavement Mean Air Voids. To determine a maximum allowable percent Pavement Mean Air Voids, a Control Strip (100 feet minimum) shall be placed to the same width and thickness to be utilized during construction of that mix type. The materials used in the construction of the Control Strip shall conform to the requirements of the approved Job Mix Formula as defined in Sub-Section 400.1.03. The materials shall be furnished from the same source and shall be of the same type used in the remainder of the pavement course and mix type represented by the Control Strip. The in-place air voids of the Control Strip, if accepted, shall be the maximum allowable percent Pavement Mean Air Voids for the remainder of the pavement course which it represents. The in-place air voids of the Control Strip will be determined by averaging the results of five density tests taken at randomly selected sites within the Control Strip. The density tests shall be tested in accordance with GDT 73, Procedure 2.a (Cores) or Procedure 2.b (Nuclear Gauge). Compaction of the Control Strip shall be continued until no appreciable increase in density can be obtained by additional roller coverages.

3. Obtain Uniform Compaction
   For a lot to be accepted for compaction, the air void range cannot exceed 4 percent for new construction or 5 percent for resurfacing projects. The range is the difference between the highest and lowest acceptance test results within the affected lot.

C. Surface Tolerance
   In this Specification, pavement courses to be overlaid with an Open-Graded Friction Course or PEM are considered surface courses. Asphalt paving is subject to straightedge and visual inspection and irregularity correction as shown below:

   1. Visual and Straightedge Inspection
      Paving is subject to visual and straightedge inspection during and after construction operations until Final Acceptance. Locate surface irregularities as follows:
      a. Keep a 10 ft (3 m) straightedge near the paving operation to measure surface irregularities on courses. Provide the straightedge and the labor for its use.
      b. Inspect the base, intermediate, and surface course surfaces with the straightedge to detect irregularities.
      c. Correct irregularities that exceed 3/16 in. in 10 ft (5 mm in 3 m) for base and intermediate courses, and 1/8 in. in 10 ft (3 mm in 3 m) for surface courses.

      Mixture or operating techniques will be stopped if irregularities such as rippling, tearing, or pulling occur and the Engineer suspects a continuing equipment problem. Stop the paving operation and correct the problem.

D. Reevaluation of Lots
   Reevaluation of Lots and acceptance will be based on Department evaluations. The Department will be reimbursed by the Contractor for all costs of these evaluations. Request for reevaluation shall be made within 5 working days of notification of the lot results.

E. Segregated Mixture
   Prevent mixture placement yielding a segregated mat by following production, storage, loading, placing, and handling procedures. Ensure needed plant modifications and provide necessary auxiliary equipment. (See Subsection 400.1.01, “Definitions.”)

   If the mixture is segregated in the finished mat, the Department will take actions based on the degree of segregation. The actions are described below.
4. Unquestionably Unacceptable Segregation

When the Engineer determines the segregation in the finished mat is unquestionably unacceptable, follow these measures:

d. Suspend Work and require the Contractor to take positive corrective action. The Department will evaluate the segregated areas to determine the extent of the corrective work to the in-place mat as follows:
   - Perform extraction and gradation analysis by taking 6 in (150 mm) cores from typical, visually unacceptable segregated areas.
   - Determine the corrective work according to Subsection 400.3.06.E.3.

e. Require the Contractor to submit a written plan of measures and actions to prevent further segregation. Work will not continue until the plan is submitted to and approved by the Department.

f. When work resumes, place a test section not to exceed 500 tons (500 Mg) of the affected mixture for the Department to evaluate. If a few loads show that corrective actions were not adequate, follow the measures above beginning with step 1.a. above. If the problem is solved, Work may continue.

2. Unacceptable Segregation Suspected

When the Engineer observes segregation in the finished mat and and the work may be unacceptable, follow these measures:

g. Allow work to continue at Contractor’s risk.

h. Require Contractor to immediately and continually adjust operation until the visually apparent segregated areas are eliminated from the finished mat. The Department will immediately investigate to determine the severity of the apparent segregation as follows:
   - Take 6 in (150 mm) cores from typical areas of suspect segregation.
   - Test the cores for compliance with the mixture control tolerances in Section 828.

When these tolerances are exceeded, suspend work for corrective action as outlined in Subsection 400.3.06.E.3.

3. Corrective Work

a. Remove and replace (at the Contractor’s expense) any segregated area where the gradation on the control sieves is found to vary 10 percent or more from the approved job mix formula, the asphalt cement varies 1.0% or more from the approved job mix formula, or if in-place air voids exceed 13.5% based on GDT 39. The control sieves for each mix type are shown in Subsection 400.5.01.B “Determine Lot Acceptance.”

b. Subsurface mixes. For subsurface mixes, limit removal and replacement to the full lane width and no less than 10 ft. (3 m) long and as approved by the Engineer.

i. Surface Mixes. For surface mixes, ensure that removal and replacement is not less than the full width of the affected lane and no less than the length of the affected areas as determined by the Engineer.

Surface tolerance requirements apply to the corrected areas for both subsurface and surface mixes.

400.3.07 Contractor Warranty and Maintenance

A. Contractor’s Record

Maintain a dated, written record of the most recent plant calibration. Keep this record available for the Engineer’s inspection at all times. Maintain records in the form of:

- Graphs
- Tables
- Charts
- Mechanically prepared data

400.4 Measurement

Thickness and spread rate tolerances for the various mixtures are specified in Subsection 400.4.A.2.b, Table 11, Thickness and Spread Rate Tolerance at Any Given Location. These tolerances are applied as outlined below:

A. Hot Mix Asphaltic Concrete Paid for by Weight

1. Plans Designate a Spread Rate
Section 400—Hot Mix Asphaltic Concrete Construction

a. Thickness Determinations. Thickness determinations are not required when the Plans designate a spread rate per square yard (meter).
   If the spread rate exceeds the upper limits outlined in the Subsection 400.4.A.2.b, Table 11, “Thickness and Spread Rate Tolerance at Any Given Location”, the mix in excess will not be paid for.
   If the rate of spread is less than the lower limit, correct the deficient course by overlaying the entire lot.
   The mixture used for correcting deficient areas is paid for at the Contract Unit Price of the course being corrected and is subject to the Mixture Acceptance Schedule—Table 9 or 10.

b. Recalculate the Total Spread Rate. After the deficient hot mix course has been corrected, the total spread rate for that lot is recalculated, and mix in excess of the upper tolerance limit as outlined in the Subsection 400.4.A.2.b, Table 11, “Thickness and Spread Rate Tolerance at Any Given Location” is not paid for.
   The quantity of material placed on irregular areas such as driveways, turnouts, intersections, feather edge section, etc., is deducted from the final spread determination for each lot.

2. Plans Designate Thickness
   If the average thickness exceeds the tolerances specified in the Subsection 400.4.A.2.b, Table 11, “Thickness and Spread Rate Tolerance at Any Given Location”, the Engineer shall take cores to determine the area of excess thickness. Excess quantity will not be paid for.
   If the average thickness is deficient by more than the tolerances specified in the Thickness and Spread Rate Tolerance at Any Given Location table below, the Engineer shall take additional cores to determine the area of deficient thickness. Correct areas with thickness deficiencies as follows:
   a. Overlay the deficient area with the same mixture type being corrected or with an approved surface mixture. The overlay shall extend for a minimum of 300 ft (90 m) for the full width of the course.
   b. Ensure that the corrected surface course complies with Subsection 400.3.06.C.1, “Visual and Straightedge Inspection.” The mixture required to correct a deficient area is paid for at the Contract Unit Price of the course being corrected.
   The quantity of the additional mixture shall not exceed the required calculated quantity used to increase the average thickness of the overlaid section to the maximum tolerance allowed under the following table.

<table>
<thead>
<tr>
<th>Course</th>
<th>Thickness Specified</th>
<th>Spread Rate Specified</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asphaltic concrete base course</td>
<td>± 0.5 in (±13 mm)</td>
<td>+40 lbs, -50 lbs (+20 kg, -30 kg)</td>
</tr>
<tr>
<td>Intermediate and/or wearing course</td>
<td>± 0.25 in (± 6 mm)</td>
<td>+20 lbs, -25 lbs (+10 kg, -15 kg)</td>
</tr>
<tr>
<td>Overall of any combination of 1 and 2</td>
<td>± 0.5 in (±13 mm)</td>
<td>+40 lbs, -50 lbs (+20 kg, -30 kg)</td>
</tr>
</tbody>
</table>

**Note:** Thickness and spread rate tolerances are provided to allow normal variations within a given lot. Do not continuously operate at a thickness of spread rate not specified.

When the Plans specify a thickness, the Engineer may take as many cores as necessary to determine the average thickness of the intermediate or surface course. The Engineer shall take a minimum of one core per 1,000 ft (300 m) per two lanes of roadway. Thickness will be determined by average measurements of each core according to GDT 42.

If the average exceeds the tolerances specified in the Subsection 400.4.A.2.b, Table 11, “Thickness and Spread Rate Tolerance at Any Given Location”, additional cores will be taken to determine the area of excess thickness and excess tonnage will not be paid for.

B. Hot Mix Asphaltic Concrete Paid for by Square Yard (Meter)
   1. The thickness of the base course or the intermediate or surface course will be determined by the Department by cutting cores and the thickness will be determined by averaging the measurements of each core.
2. If any measurement is deficient in thickness more than the tolerances given in the table above, additional cores will be taken by the Department to determine the area of thickness deficiency. Correct thickness deficiency areas as follows:
   a. Overlay the deficient area with the same type mixtures being corrected or with surface mixture. Extend the overlay at least 300 ft (90 m) for the full width of the course.
   b. Ensure that the corrected surface course complies with Subsection 400.3.06.C.1, Visual and Straightedge Inspection.
   c. The mixture is subject to the Mixture Acceptance Schedule—Table 9 or 10.
3. No extra payment is made for mixtures used for correction.
4. No extra payment is made for thickness in excess of that specified.

C. Asphaltic Concrete

Hot mix asphaltic concrete, complete in place and accepted, is measured in tons (megagrams) or square yards (meters) as indicated in the Proposal. If payment is by the ton (megagram), the actual weight is determined by weighing each loaded vehicle on the required motor truck scale as the material is hauled to the roadway, or by using recorded weights if a digital recording device is used.

The weight measured includes all materials. No deductions are made for the weight of the individual ingredients. The actual weight is the pay weight except when the aggregates used have a combined bulk specific gravity greater than 2.75. In this case the pay weight is determined according to the following formula:

\[
T_1 = T \times \left( \frac{\% \text{ AC} \times \% \text{ Aggregate} \times 2.75 + \% \text{ Y}}{\text{combined bulk Specific Gravity}} \right) + \frac{\% \text{ Y}}{100}
\]

Where:

<table>
<thead>
<tr>
<th>Description</th>
<th>Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pay weight, tonnage (Mg)</td>
<td>(T_1)</td>
</tr>
<tr>
<td>Actual weight</td>
<td>(T)</td>
</tr>
<tr>
<td>Percent asphalt cement by weight of total mixture</td>
<td>(% \text{ AC})</td>
</tr>
<tr>
<td>Percent aggregate by weight of total mixture</td>
<td>(% \text{ Aggregate})</td>
</tr>
<tr>
<td>Calculated combined bulk specific gravity of various mineral aggregates used in the mixture</td>
<td>(\text{Combined Bulk Sp. Gr.})</td>
</tr>
<tr>
<td>Percent hydrated lime by weight of mineral aggregate</td>
<td>(% \text{ Y})</td>
</tr>
</tbody>
</table>

D. Bituminous Material

Bituminous material is not measured for separate payment.

E. Hydrated Lime

When hydrated lime is used as an anti-stripping additive, it is not measured for separate payment.

F. Field Laboratory

The field laboratory required in this Specification is not measured for separate payment.

G. Asphaltic Concrete Leveling

Payment of hot mix asphaltic concrete leveling, regardless of the type mix, is full compensation for furnishing materials, bituminous materials, and hydrated lime (when required) for patching and repair of minor defects, surface preparation, cleaning, hauling, mixing, spreading, and rolling.
Section 400—Hot Mix Asphaltic Concrete Construction

Mixture for leveling courses is subject to the acceptance schedule as stated in Subsection 400.3.06.A and Subsection 400.3.06.B.

H. Asphaltic Concrete Patching

Hot mix asphaltic concrete patching, regardless of the type mix, is paid for at the Contract Unit Price per ton (Megagram), complete in place and accepted. Payment is full compensation for:

- Furnishing materials such as bituminous material and hydrated lime (when required)
- Preparing surface to be patched
- Cutting areas to be patched, trimmed, and cleaned
- Hauling, mixing, placing, and compacting the materials

400.4.01 Limits

When the asphaltic concrete is paid for by the square yard (meter) and multiple lifts are used, the number and thickness of the lifts are subject to the Engineer’s approval and are used to prorate the pay factor for the affected roadway section.

400.5 Payment

Hot mix asphaltic concrete of the various types are paid for at the Contract Unit Price per ton (megagram) or per square yard (meter). Payment is full compensation for furnishing and placing materials including asphalt cement, hydrated lime when required, approved additives, and for cleaning and repairing, preparing surfaces, hauling, mixing, spreading, rolling, and performing other operations to complete the Contract Item.

Payment will be made under:

<table>
<thead>
<tr>
<th>Item No. 400</th>
<th>Asphaltic concrete type Superpave, group-blend, Including polymer-modified bituminous materials and hydrated lime</th>
<th>Per ton (megagram)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item No. 400</td>
<td>Asphaltic concrete type, Superpave, group-blend, including bituminous materials and hydrated lime</td>
<td>Per ton (megagram)</td>
</tr>
<tr>
<td>Item No. 400</td>
<td>Asphaltic concrete type Superpave, group-blend, Including bituminous materials, Gilsonite modifier, and hydrated lime</td>
<td>Per ton (megagram)</td>
</tr>
<tr>
<td>Item No. 400</td>
<td>— inches asphaltic concrete, type Superpave, group-blend including bituminous materials, Gilsonite modifier and hydrated lime</td>
<td>Per square yard (meter)</td>
</tr>
<tr>
<td>Item No. 400</td>
<td>Asphaltic concrete type Stone Matrix Asphalt, group-blend, including polymer-modified bituminous materials and hydrated lime</td>
<td>Per ton (megagram)</td>
</tr>
<tr>
<td>Item No. 400</td>
<td>Asphaltic concrete type OGFC, group 2 only, including bituminous materials and hydrated lime</td>
<td>Per ton (megagram)</td>
</tr>
<tr>
<td>Item No. 400</td>
<td>Asphaltic concrete type OGFC, group 2 only, including polymer-modified bituminous materials and hydrated lime</td>
<td>Per ton (megagram)</td>
</tr>
<tr>
<td>Item No. 400</td>
<td>Asphaltic concrete type Porous European Mix, group 2 only, including polymer-modified bituminous materials and hydrated lime</td>
<td>Per ton (megagram)</td>
</tr>
</tbody>
</table>

400.5.01 Adjustments

A. Determine Lot Acceptance

The control sieves used in the mixture acceptance schedule for the various types of mix are indicated below:

<table>
<thead>
<tr>
<th>Control Sieves Used in the Mixture Acceptance Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asphaltic concrete 25 mm Superpave</td>
</tr>
<tr>
<td>Asphaltic concrete 19 mm Superpave</td>
</tr>
<tr>
<td>Asphaltic concrete 12.5 mm Superpave</td>
</tr>
</tbody>
</table>
Control Sieves Used in the Mixture Acceptance Schedule

<table>
<thead>
<tr>
<th>Control Sieves</th>
<th>Acceptance Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asphaltic concrete 9.5 mm</td>
<td>No. 4, No. 8 (4.75 mm, 2.36 mm) sieves and asphalt cement</td>
</tr>
<tr>
<td>Superpave</td>
<td></td>
</tr>
<tr>
<td>Asphaltic concrete 4.75 mm</td>
<td>No. 8 (2.36 mm) sieve and asphalt cement</td>
</tr>
<tr>
<td>Mix</td>
<td></td>
</tr>
</tbody>
</table>

The Department will perform the following tasks:

1. Determine the mean of the deviations from the job mix formula per test results per lot.
2. Determine this mean by averaging the actual numeric value of the individual deviations from the job mix formula; disregard whether the deviations are positive or negative amounts.

C. Calculate Pavement Mean Air Voids

The Department will determine the percent of maximum air voids for each lot by dividing the pavement mean air voids by the maximum pavement mean air voids acceptable.

D. Asphaltic Concrete For Temporary Detours

Hot mix asphaltic concrete placed on temporary detours not to remain in place as part of the permanent pavement does not require hydrated lime. Hot mix used for this purpose is paid for at an adjusted Contract Price. The payment for this item shall cover all cost of construction, maintenance and removal of all temporary mix. Hot mix asphaltic concrete placed as temporary mix shall meet requirements established in Subsection 400.3.05.F.

Where the Contract Price of the asphaltic concrete for permanent pavement is let by the ton (megagram), the Contract Price for the asphaltic concrete placed on temporary detours is adjusted by subtracting $0.75/ton ($0.85/mg) of mix used.

Where the Contract price of the mix in the permanent pavement is based on the square yard (meter), obtain the adjusted price for the same mix used on the temporary detour by subtracting $0.04/yd² ($0.05/ m²) per 1-in (25-mm) plan depth.

Further price adjustments required in Subsection 400.3.06, “Quality Acceptance,” are based on the appropriate adjusted Contract Price for mix used in the temporary detour work.

E. Determine Lot Payment

If the Engineer determines that the material is not acceptable to leave in place, remove and replace the materials at the Contractor’s expense.

Office of Materials and Research