

# Supplemental Technical Specification for Asphalt Mixture Quality Acceptance

SCDOT Designation: **SC-M-400 (January 1, 2020)**

APPROVED:  
Division Administrator

By: \_\_\_\_\_  
FEDERAL HIGHWAY ADMINISTRATION

## 1. SCOPE

Use this specification for the acceptance of both hot mix and warm mix asphalt. All acceptance decisions are based using the adjusted price that is established within this specification. Field acceptance of asphalt mixtures will be based on asphalt binder content, gradation, and in-place density of the compacted asphalt pavement. Apply all other acceptance criteria documented in the special provisions, supplemental specifications, and sections of the Standard Specifications, except as noted herein. If unable to meet these other acceptance criteria, cease production and take steps necessary to bring the process into compliance with the acceptance criteria.

## 2. REFERENCED DOCUMENTS

- 2.1 SCDOT Standard Specifications
  - 2.1.1 Division 300, Division 400
- 2.2 SCDOT Supplemental Technical Specifications
  - 2.2.1 SC-M-402, SC-M-404, SC-M-405, SC-M-406
- 2.3 AASHTO and ASTM Standards
  - 2.3.1 R 11, R 18, ASTM E29
- 2.4 SCDOT Test Methods
  - 2.4.1 SC-T-1, SC-T-2, SC-T-4, SC-T-62, SC-T-65, SC-T-68, SC-T-72, SC-T-75, SC-T-78, SC-T-80, SC-T-83, SC-T-84, SC-T-85, SC-T-86, SC-T-87, SC-T-88, SC-T-93, SC-T-96, SC-T-97, SC-T-101, SC-T-102, SC-T-103 and SC-T-110.
- 2.5 SCDOT Qualified Products Policies and Lists
  - 2.5.1 QPP 76, QPL 76

## 3. GENERAL

### 3.1 Job Mix Formula

Combine the mineral aggregates and asphalt binder in accordance with **SC-T-80** in such proportions that the finished HMA mixture complies with all applicable requirements specified in the Standard Specifications (including any supplemental specifications) and the special provisions. When allowed by **SC-M-402**, and used in the asphalt mixture, liquid anti-stripping additives must be introduced into the mixture and controlled in the field in accordance with **SC-M-406**. A Surface course is defined as the following; Stone Matrix Asphalt (SMA), Surface Types A, B, C, D, and E. An Intermediate course is defined as the following mix types; Intermediate Types A, B, B Special, and C, and Base mixtures are Base Types A, B, C and D. Preventive Maintenance Thin Lift Surface Course (PMTLSC), Open Graded Friction Course (OGFC) and Asphalt Shoulder Widening Course (SWC) are also referred to in the specification.

If the asphalt mixture does not meet the acceptance control limits, submit a revision to the job mix acceptance target values provided the revised job mix meets all of the requirements of the specifications. A job mix revision is only allowed between LOTS. A LOT is defined as a day's or night's production and will be closed at the end of each production shift. Email a copy of all job mix revisions to the Asphalt Mixture Verification Manager (**AMVM**), the Asphalt Materials Engineer (**AME**), and District Asphalt Manager (**DAM**) before starting the LOT on which the revised job mix will first be used. Attach all supporting data, including binder content and gradation from previous laboratory tests, to job mix revisions. The **AME** will accept all revisions as submitted unless the revisions are made outside of the acceptable tolerances and specifications.

Initial job mix formulas are valid for a maximum of 3 revisions. If additional revisions are required, a new job mix formula is required. Prepare the new job mix formula in accordance with **SC-T-80** or **SC-T-88** and comply with all applicable requirements specified in the Standard Specifications (including any supplemental specifications) and the special provisions.

Job mix formulas are associated with a specific plant, which will be accepted for an individual contract. Therefore the start of a new contract constitutes the beginning of a new set of LOT numbers. A calibration period for either a contract or a job mix formula is not permitted. LOT numbers begin immediately with the production of the mixture. If during production of a particular type of mix, a new job mix formula is needed, LOTS run continuously until the project is complete.

### 3.2 Personnel Requirements

Provide sufficient SCDOT certified personnel trained to perform the required inspections, sampling, testing, verification, and documentation at the plant and on the roadway. A certified Level 2 Asphalt Mix Technician will prepare mix designs in an SCDOT approved mix design laboratory meeting the requirements outlined in **SC-M-405**. Provide certified Level 1 Asphalt Mix Technicians at each plant site used to furnish material to the project. Conduct all sampling and testing at the plant by a certified Level 1 Asphalt Mix Technician or by a candidate for certification working in the presence and under direct observation of a certified Level 1 Asphalt Mix Technician. Provide certified Asphalt Roadway Technicians or candidates for certification working in the presence and under direct observation of a certified Roadway Technician to perform the necessary inspection, sampling, testing and documentation on the roadway, however, the certified Level 1 or Roadway Technician is responsible for all testing and reporting. Have a certified Level 3 Asphalt Mix QC Manager readily available to be on site within an hour and a half to make necessary process adjustments, make periodic visits to each active plant at a rate of no less than two times per month, review calibration and verification records as needed, be responsible for all quality control activities at each plant they oversee, and monitor mixture production, placement and testing on each project. The Contractor Level 3 QC Manager will provide insight to problems that arise during mix design and production, and therefore should be employed by the company he/she is representing. This person is the Department's primary contact should a problem develop during a project and will be held responsible for all Quality Control / Quality Acceptance testing.

Ensure that technician certifications are in accordance with the Department's Asphalt Technician Certification Program. Post a current organizational chart, including names, telephone numbers and current certification, of those responsible for the Quality Control program in the laboratory. Update this chart with appropriate changes, as they become available.

The Department will provide certified Asphalt Roadway Technicians and/or certified Level 1 Asphalt Mix Technicians or candidates for certification working in the presence and under direct observation of certified personnel to perform the necessary inspection, documentation and testing on either the roadway, in the plant laboratory or in the testing laboratories. Verification laboratories will be accredited by responsible parties using the same criteria set forth by AASHTO and lab technicians will be responsible for performing yearly AMRL proficiency samples.

### 3.3 Field Laboratory Requirements

Provide a laboratory at the plant. The laboratory will be inspected annually by a representative of the **AME** in accordance with **SC-M-404** and *SCDOT Qualified Product Policy 76*. Ensure that the laboratory is listed in the most recent edition of *SCDOT Qualified Product List 76*.

Maintain the laboratory and calibrate and verify all equipment in accordance with **AASHTO R 18**. Maintain records of calibration and verification in the laboratory. The **AME** or a District representative will inspect measuring and testing devices to confirm both calibration and condition. If the laboratory is found to be in satisfactory compliance with **SC-M-404** and *SCDOT Qualified Product Policy 76*, it will be placed on *SCDOT Qualified Product List 76*. If it is determined that the equipment is not within the limits of dimensions or calibration described in the appropriate test method, the **AME** representative may stop production until corrective action is taken by the Contractor's Asphalt Mixture QC Manager. If the necessary laboratory equipment is inoperable at the time of a required acceptance test, cease asphalt mixture production.

### 3.4 Quality Control (QC) Program

Provide to the **AME** a QC program that defines all activities, including mix design, process control inspection, sampling, testing, and necessary adjustments in the process that are related to the production and placing of an asphalt pavement. At a minimum, ensure that the QC program meets the entire specifications and requirements stipulated herein as well as all other acceptance criteria documented in the special provisions, supplemental specifications, and applicable sections of the Standard Specifications. Detail actions that will take place in the absence of a certified Level 3 QC Manager and what steps will take place to ensure all specifications are being met. Document any additional testing that is required by your company to ensure process control, such as obtaining additional check samples to determine whether or not the asphalt plant production shall be ceased before the next quality acceptance sample is obtained. The Department can require production to cease if procedures and requirements stated in the QC program are not followed, until such steps are taken to ensure that all QC program procedures are followed and all requirements are met.

### 3.5 Required Plant and Roadway QC Tests and Verifications

Perform or have performed the quality control tests specified herein.

#### 3.5.1 Required Plant QC Tests and Job Mix Validations

Use the test methods identified in Table 1 to perform QC tests and job mix validations at a frequency not less than that indicated. Take random samples at a frequency no greater than every 500 tons using **SC-T-101**. All other acceptance criteria documented in the special provisions, supplemental specifications, and sections of the Standard Specifications, except as noted herein, still apply. If unable to meet other acceptance criteria not specifically stated in this specification, cease production and take necessary steps to bring the process into compliance with the acceptance criteria.

#### 3.5.2 Volumetric Property Validation of Job Mix Formula (JMF)

Compact the specimens in accordance with **SC-T-103** to ensure field mixture meets the job mix formula at the beginning of a contract (Lot 1-1) or immediately after any job mix failure including on binder content, gradation, or failure on Air Voids and VMA. In the event that a new contract begins and a job mix was previously validated within 3 calendar days, the contractor may elect to not re-validate the volumetric properties. Determine the percent air voids and VMA by **SC-T-68**. Carry calculations for the test results for air voids, and VMA to the thousandths (0.001) and round to the nearest hundredth (0.01). Compare the bulk specific gravity of the compacted mixture with the maximum mixture specific gravity determined by **SC-T-83** to determine the air voids. Retain the samples in a dry, protected location for a minimum of 7 calendar days. Dispose of all samples that have not been selected by the Department for testing after 7 calendar days. Use the average of a minimum of 2 maximum specific gravity specimens for each test when computing air voids and in place density. The maximum allowable individual difference for bulk specific gravity and maximum specific gravity specimens are 0.020 and 0.018, respectively. Inform the **DAM** or **AME** immediately if specimens do not compare. Voids analysis will not apply for Base Courses, Shoulder Widening Courses, Surface Type E, PMTLSC, and OGFC.

**Table 1 - Required Plant QC Tests and Validations**

<b>Test Parameter</b>	<b>Required Frequency</b>	<b>Sampling Method</b>	<b>Test Method</b>
<b>Maximum Specific Gravity</b> Intermediate A-B, Intermediate B Special Surface A-B SMA  Intermediate C* Surface Type C* Surface Type D*	1 set of 2 per random sample  *1 set of 2 per LOT	SC-T-101, SC-T-62, SC-T-72 or SC-T-93	SC-T-83
<b>Volumetric Job Mix Validation: Including MSG, Air Voids, % &amp; VMA, %</b> (excluding mixes without volumetric properties)	First random sample obtained on contract* and immediately after <u>any</u> job mix criteria failure	SC-T-101, SC-T-62, and SC-T-72 or SC-T-93	SC-T-103 and SC-T-68
<b>Mixture Stability</b> Base C&D Surface Type E PMTLSC	1 set of 2 gyratory specimens per LOT	SC-T-101, SC-T-62, SC-T-72 or SC-T-93	SC-T-96
<b>Lime Rate Validation</b>	2 per LOT	SC-T-71	SC-T-71 or SC-T-78
<b>Mineral Filler Rate Validation (SMA Only)</b>	2 per LOT	-	Randomly select plant production printouts
<b>Individual Aggregate Stockpile Gradation</b>	1 per 10,000 tons (or min. of 1 per month)	SC-T-1, SC-T-2	SC-T-4

\*See note in this section in regards to re-validating on additional contracts

3.5.3 Required Roadway QC Verifications

Maintain an approved density gauge, on site, during all asphalt mixture placing and compaction operations and use the gauge to assist in the quality control of the compaction process. Require the proper number and type of rollers needed to obtain density as determined by **SC-T-65**. When density is used for acceptance, ensure that rollers meet the requirements in Section 401.3 of the Standard Specifications. Maintain roller pattern documentation (SCDOT Form 400.02) on site and perform new roller patterns when there is a change in underlying support, type of asphalt, thickness in mat or other elements (such as different rollers) that might affect the final density. Monitor the roller patterns, mixture placement, and mixture compaction during production on all projects except for driveways and full-depth patching. Verify and document the ambient air temperature and the asphalt mix temperature at the roadway, at a frequency not less than that indicated in Table 2. The Department will verify temperatures, calculate and document both the lay down rate for each 200 tons and the cumulative lay down rate (in pounds per square yard), and verify and document the tack rate and type at frequencies not less than those indicated in Table 2. SCDOT will document this information of SCDOT Form 400.04. The Department’s certified Asphalt Roadway Technician will communicate any deficiencies in a timely manner to the Contractor’s certified Asphalt Roadway Technician in order to efficiently correct problems.

**Table 2 - Required Road QC Tests and Verifications**

Test Parameter	Required Frequency	Test Method	Responsible Party
<b>Monitoring of density</b>	Continuous	SC-T-65	Contractor
<b>Temperature: Ambient air</b>	Before paving starts, then 2 per LOT	SC-T-84	Department
<b>Mat (behind paver screed)</b>	4 per LOT	SC-T-84	Department
<b>Mixture Temperature Verification (in truck)</b>	4 per LOT	SC-T-84	Department
<b>Calculated Placement Rate</b>	1 per 200 tons	SC-T-85	Department
<b>Calculated Tack Rate,</b>	1 per application	SC-T-86	Department

3.6 Acceptance Program

Perform or have performed the acceptance tests specified herein.

3.6.1 Plant Calibration

Calibrate the plant so that the mix conforms to the job mix formula and field acceptance criteria prior to production.

3.6.2 Required Plant Acceptance Tests

Use the test methods identified in Table 3 and perform random plant acceptance tests at a frequency no greater than every 500 tons produced. Carry calculations for the test results for asphalt binder content to the thousandths (0.001) and round to the nearest hundredth (0.01). Carry calculations for the test results for gradation to the hundredths (0.01) and round to the nearest tenth (0.1) except for the No. 200 sieve and dust to asphalt ratio. Carry the No. 200 sieve and the D/A ratio to the thousandths (0.001) and round to the nearest hundredth (0.01). Carry calculations for averages to the thousandths (0.001) and round to the nearest hundredth (0.01). Round the calculations in accordance with the **ASTM E29** rules of rounding.

**Table 3 - Required Plant QC Acceptance Tests**

Test Parameter	Required Frequency	Sampling Method	Test Method
<b>Asphalt Binder Content, %</b>	1 per random sample	SC-T-101, SC-T-62, SC-T-110 and SC-T-72 or SC-T-93	SC-T-75
<b>Mixture Gradation (all mixtures)</b>	1 per random sample	SC-T-101, SC-T-62, SC-T-110, and SC-T-72 or SC-T-93	SC-T-102

3.6.2.1 Asphalt Binder Content

Sample the asphalt mixture using **SC-T-62** or **SC-T-110**. Obtain samples that meet the requirements as stated in these test procedures. The samples may be reduced to testing size by using either **SC-T-72** or **SC-T-93** if necessary. The 2 samples will be identified as contractor's acceptance test sample and a Quality Acceptance (QA) sample. Bag, label and store the portions of mixture for the Department's QA sample for later testing as required in Subsection 3.8, "Quality Acceptance Sample Program." Retain the samples in a dry, protected location for a minimum of 7 calendar days. Dispose of all samples that have not been selected by the Department for testing after 7 calendar days.

Calibrate the ignition oven for each job mix prior to producing mix. Perform oven calibrations and verifications in accordance with **SC-T-75**. Keep all calibrations and verifications along with supporting data in a notebook readily available in the field laboratory. The **DAM** or **AME** may require re-calibration of the ignition oven if the acceptance split or verification samples do not compare within allowable limits.

Perform gradation **SC-T-102** for each SUBLOT for acceptance purposes for all mixtures. Evaluate each test gradation using the job mix formula and the absolute average based on Table 7 or 8 for pay purposes.

3.6.3 Required In-Place Density Acceptance Tests

3.6.3.1 Intermediate Course A and B, Intermediate B Special\*, Surface Courses Type A and B and SMA

SCDOT will compute in-place density on cores obtained from the pavement for Intermediate courses, Surface courses Type A and B, and SMA. Use **SC-T-87** as identified in Table 4 to perform the density acceptance tests at the frequency indicated. \* See Table 4 for information regarding Intermediate B Special.

3.6.3.2 Base Courses, Intermediate B Special\*, Intermediate C, and Surface Course Type C and D

Determine the in-place density for Base courses, Intermediate C, and Surface Course Type C and D, by the use of an approved density gauge and procedure. Ensure that the gauge has been approved by the **AME**. Furnish and operate the gauge to determine in-place density results at a frequency not less than that indicated in Table 4. Use **SC-T-101** and determine one gauge density value at a randomly selected location within each 500 foot test section. Express the in-place density as a percentage of the target density. Determine the target density from a control strip constructed in accordance with **SC-T-65**. Carry out calculations for density to the hundredths (0.01) and round to the nearest tenth (0.1) in accordance with **ASTM E29** rules of rounding. Allow Department personnel to witness and document the above procedure being performed.

**Table 4 - Required Roadway QC Acceptance Tests**

Test Parameter	Required Frequency		Sampling Method	Test Method
<b>In-Place Density (% of Max. Theoretical)</b>	Intermediate A – B Intermediate B Special* Surface A - B	Random 6" core 1 per 1,500 foot paved	SC-T-101 SC-T-87	SC-T-87
<b>In-Place Density (% of Target Gauge Control Strip Density)</b>	Base A-D Intermediate B Special* and C Surface C-D	Random Gauge Reading 1 per every 500 foot paved	SC-T-101	SC-T-65

\* Intermediate B Special compaction acceptance will be based on rate of placement. Cores will be required on placement rates less than or equal to 300 #/SY. Gauges will be used for rates greater than 300 #/SY once a 500 ft. test strip has been accepted by the **AME** to verify compaction effort with a minimum of five random cores.

#### 3.6.3.4 Shoulder Widening Course, Surface Course Type E, PMTLSC and OGFC

Shoulder Widening Course, Surface Course Type E, PMTLSC and OGFC will not have in place density performed. Place these mixes at the proper rate and promptly roll as indicated in the standard specifications.

#### 3.7 Failing Samples, Check Samples (Job Mix Validation) and Plant Operation

When any sample fails to meet the specification limits as outlined in Subsection 4.2.1.1 on any one of the following properties: asphalt binder content, air voids, VMA, or fails to meet the job mix formula requirements for gradation, and/or dust to asphalt ratio obtain an additional sample as a check sample (job mix validation) when feasible between random acceptance split samples. Label the sample obtained as a check sample on all paperwork and do not use it in calculating the daily pay factors.

When two consecutive acceptance samples on a job mix formula fail on any one of the following properties: asphalt binder content, air voids, VMA, gradation, and/or dust to asphalt ratio, stop production of asphalt mixture for SCDOT work. Immediately inform the **DAM** and document in a visible location in the field laboratory that a particular job mix number mix has a failing test to prevent running the same mix to another project when the mix may be on 3 and hold. Make necessary adjustments, produce 3 truckloads of mix, take a check sample from the third truck and hold plant production until the test results are obtained. If this sample meets specifications and the mix is within temperature restrictions, the mix may be placed on the project. If this sample fails, discard the mixture in the silo, clean out the plant and resume production only when the mix produced meets all job mix properties (validation). If at the end of the day the mix still fails to meet specifications, make necessary adjustments or changes before starting the next day's production, produce 3 truckloads and hold plant production until results are obtained from the third truck load. When a plant is on 3-and-hold, do not place mix on the road until a sample meets all specification and job mix limits (validation). Any mixture that is sent to the road and placed may be required to be removed in the event the 3 and hold sample fails on any criteria. This procedure may be altered when the Resident Construction Engineer (**RCE**) deems necessary but only if not altering the procedure would create an issue of public safety.

All 3-and-hold plant or mix adjustments must be documented in writing and posted in the field laboratory. This form must be filed and a copy of the form must be provided to the DAM once the mixture is back within all job mix criteria.

The 3 and hold sample test results will be for information only. Use only the samples obtained at predetermined random sample tonnage for computing daily pay factors. However, if the random sample tonnage falls within the 3-and-hold segment, obtain a sample from the first truckload produced after the 3-and-hold segment and use this sample as the replacement pay factor sample. If no more truckloads are needed on the project, use only the samples obtained in accordance with **SC-T-101**. All other samples taken between random sampling intervals are considered check samples, and are for information only. Perform at least one entire series of required plant acceptance tests on the next random sample following a failing sample as outlined in Tables 1 and 3 to ensure conformity within specification limits.

#### 3.8 Quality Acceptance Sample Program

Department personnel may witness the Contractor quality control and acceptance sampling and testing being performed. If it is observed that the sampling or the quality control or acceptance tests are not being performed in accordance with the applicable test procedures, the Department personnel witnessing the sampling and testing will immediately notify the Contractor and the **DAM** of the observed deficiencies. The **DAM** will investigate the observed deficiencies and, if the deficiencies are not immediately corrected, the **RCE**, **DAM** or the **AME** may stop production until corrective action is taken. The Department representative will document all witnessed samples and tests. The Department representative may elect to obtain samples for testing, separate from the Contractor's sampling and testing process, to augment validation of specification compliance.

The Department will conduct its own tests to validate test results. The validation tests for asphalt binder content, maximum specific gravity, and gradation will be on QA samples (see Subsection 3.6.2, "Required Plant Acceptance Tests") and on retained contractor gyratory specimens. The acceptance tests for in-place density will be on the roadway cores (see Subsection 3.6.3, "Required In-Place Density Acceptance Tests"), or based on density gauge readings.

The frequency of the Department's QA samples will in general be equal to or greater than ten percent (10%) of the tests required. The Department will provide the QA test sample results within 6 working days of the sample being obtained by the laboratories. Additionally, the Department may select any or all retained samples for further testing. All split test samples testing and data analysis will be performed by or under the supervision of a Certified Asphalt Mix 1 Technician. Inspect measuring and testing devices to confirm both calibration and condition. Calibrate and correlate all testing equipment in accordance with **AASHTO R18**.

3.8.1 Asphalt Binder Content, Maximum Specific Gravity, and Gradation

**For projects that have less than 7500 tons of any particular mix type on a contract, random split acceptance samples will be collected by the DAM.** The samples will be compared to the contractors QA test results according to Table 5. If the differences are within the allowable differences listed in Table 5, no further testing or analysis is necessary. In the event comparison of the split samples are outside the allowable differences in Table 5, the **DAM** will use the remaining material of the split sample to retest the material in a different SCDOT laboratory. If the sample results are again not within the allowable tolerances for the second round of testing, the **DAM** will utilize the test results from the second split sample to replace the non-comparing test value for the LOT, and recalculate the LPF. The non-comparison referee result will also be used in lieu of the contractor's acceptance test for that test if the project has been selected for verification under Section 3.9.

For acceptance samples that are tested by both the Contractor and the Department, compare the test results for asphalt binder content, maximum specific gravity, and gradation to each other. If a continual trend of difference between Contractor and Department QA test results is identified, the **DAM** and the **AME** will immediately investigate. The **AME** or **DAM** may suspend production while the investigation is in progress. The investigation may include testing by the Department of any remaining QA samples or a comparison of acceptance test results on the mixture currently being produced. The investigation may also include review and observation of the Contractor's technician's performance, testing procedure, and equipment.

**Table 5 - Allowable Differences between Contractor Tests and Department QA Tests**

Test Parameter		Allowable Difference
Asphalt Binder Content, %		± 0.40
Maximum Specific Gravity		± 0.024
Bulk Specific Gravity of Cores		± 0.017
Gradation (all mixtures)	1/2" and greater	± 7.0
	3/8"	± 6.0
	No. 4	± 6.0
	No. 8	± 5.0
	No. 30	± 4.0
	No. 100	± 3.0

3.8.2 Gyratory Density Specimens

For the gyratory specimens that are tested by the Contractor for quality control, the Department will perform QA testing by either directly observing the contractor running the bulk specific gravity tests or later by performing the test by re-weighing the retained gyratory specimens. If the bulk specific gravity differences are within the allowable differences listed in Table 5, no further testing or analysis will be necessary. If the bulk specific gravity differences are not within the allowable differences listed in Table 5, perform QA check sample testing and report possible reason for the non-comparison to the **DAM** or **AME**.



3.8.3 Verification of Contractor's Density - Base Courses, Intermediate B Special and C, Surface Course Type C and D

The Department will observe the establishment of the target density in accordance to **SC-T-65**. The Contractor, for verification of the established roller pattern, will retain a copy of Form 400.21 on the roadway and forward to the **RCE**. The Department will observe and document on Form 400.04 the density readings equal to or greater than 10% of the tests required for the Contractor. The Department's gauge readings should correspond to the contractor's acceptance values listed for the daily LPF.

\*Intermediate B Special – if gauges are required for acceptance.

3.8.3.1 Verification of Contractor's Roadway Density – Surface A, B, SMA, Intermediate Course A, B, and B Special\*

In the event that a Contractor has concerns with the how the cores are being handled and tested, notify the **AME** immediately. The **AME** may suspend production while the investigation is in progress. \*Intermediate B Special – if cores are required for acceptance.

3.9 Verification Program

The Department's verification tests will be conducted at an SCDOT Asphalt Mixture Verification Laboratory, or at the **OMR's** Central or District Laboratories. The Department will coordinate verification testing in an effort to minimize the impact on normal quality control and acceptance testing.

Department verification tests will be compared statistically to Contractor acceptance tests following **SC-T-97**, "Method for Verification of Contractor Asphalt Mixture Acceptance Test Results." The **AMVM** will perform this comparison in conjunction with the applicable managers of the Verification Laboratories for this project and the applicable **DAM**. Because a sufficient number of samples are needed for this statistically-based verification process, the contract unit price will be paid on the monthly estimates until the verification process is complete. Projects are not considered complete until the **AMVM** has all data, has performed all analyses required, and has provided the **DAM** the necessary information to complete all payment related functions.

3.10 Documentation

Document all observations, records of inspection, and adjustments to the mixture, test results, QC verifications, and corrective actions. Maintain all permanent records for at least three years upon completion of the project unless the Department is given the permanent records during production of the mixture. Provide Department representatives full access to all QC, acceptance, and verification documentation throughout the progress of the work. Make available at all times these documents, either in paper form or viewable on a computer monitor, to the Department representatives. Retain all written notes, including but not limited to handwritten worksheets, as part of permanent records.

Continue from contract to contract, charts, records, and testing frequencies for an asphalt mixture produced at plant site.

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**4. ACCEPTANCE OF ASPHALT MIXTURES**

Evaluate all materials used for mainline paving for acceptance by the Department's Acceptance Procedures specified herein. Utilize results from the acceptance testing when determining the acceptability of the materials. In addition, the Department will conduct limited testing and monitor and observe sampling and testing procedures to verify the data used for acceptance purposes. The Department's data will be compared with data from the acceptance testing program as described in Subsection 3.8, "Quality Acceptance Sample Program" and Subsection 3.9, "Verification Program." Conduct acceptance test sampling and testing on a random basis according to frequencies indicated in Subsection 3.6, "Acceptance Program." Determine all sampling tons and roadway locations randomly using **SC-T-101**. Notify the **DAM** and the **AMVM** at least one day prior to any production in order to make necessary arrangements for verification. Failure to do so could result in no payment for that given day's production.

Record all inspections and test results on approved forms and charts and keep up to date records that are available at all times to the Department during the performance of the work. Utilize only those tests designated in advance as acceptance tests in the computation of pay factors. Record test results on forms provided by the Department. The Department will prepare and distribute uniform forms for reproduction for use as required. *Deliver, by email all test results necessary to calculate payment factors to the **DAM** and to the **AMVM** within one hour of completion of each test, or production can be halted until results are delivered.* Provide a copy (photocopy, or control room printed) of each truck ticket printout with the corresponding plant acceptance test results. Submitted test results will be considered preliminary until the LOT pay factor worksheet, along with the needed documentation is signed and submitted for payment within 3 calendar days of completion of the LOT. If there are any issues with the results after providing them to the Department, provide a written explanation to the **DAM** and the **AMVM** within the 3-day period explaining why the results need changing. The **DAM**, in consultation with the **AME**, reserves the right to make the requested change or keep the results as submitted. The **DAM** may halt production until the request has been investigated and a decision made as to the disposition of the test results.

#### 4.1 Mixture

Evaluate the asphalt mixture at the plant, with respect to asphalt binder content and gradation on a LOT basis. Test the material for acceptance in accordance with the provisions of these special provisions. Reject any load or loads of mixture, which, in the opinion of the Department's certified roadway technician, are obviously contaminated, segregated, or otherwise unacceptable for use in the work.

##### 4.1.1 Mixture Production

Base the acceptance and pay factors for asphalt binder content and gradation on Tables 7 and 8. A LOT for asphalt binder content and gradation is defined as a day's production. If the first test is expected not to reach the random tonnage according **SC-T-101**; then perform at least one series of Plant Quality Control and Acceptance tests for payment. Provide a random sampling tonnage for such low-production days to the **DAM** prior to production. In the event that production falls short of random tonnage for the first sample, contact the **DAM** and notify them that a new sampling tonnage needs to be determined. In the event that the **DAM** cannot be contacted, obtain a sample from the last truck containing tonnage being sent to the roadway. If production continues, refer back to **SC-T-101** for sampling tonnage for the second and following tests of the mixture. Sampling loads that are below 18.0 tons will not be required due to safety (regardless of type of truck), unless the total tons for the days production exceeds 50 tons. In the event that 50 tons or more are shipped, regardless of the amount loaded in each truck, a sample must be obtained from the truck or the paver per **SC-T-62**.

##### 4.1.2 In-Place Density

For mainline paving (including shoulders and widening greater than 8 feet, mainline ramps that are used for acceleration/deceleration lanes, apply in-place density pay factors as specified herein unless otherwise directed on the plans. Gore areas that are not within the typical travel lanes should follow **SC-T-101**, but cores will not be required for acceptance. The Department's Certified Roadway Technician is responsible for determining the random core locations and providing the information to the contractor for each test location in accordance to **SC-T-101** once compaction has been completed. In the event that in place density measurements were obtained due to the road being less than 1500 feet continuous in length, or mix is placed in applications such as leveling, wedging, and driveways, use an established roller pattern, or refer to **SC-T-65**. Use pay factors using only binder content and gradation for these applications.

##### 4.1.2.1 Intermediate Courses A and B, Intermediate B Special\*, Surface Courses Type A, B, and SMA

Evaluate the in-place density for Intermediate courses A and B, Intermediate B Special\*, Surface courses Type A, B, and SMA on each LOT. Express the in-place density as a percentage of the theoretical maximum mix density. Calculate the theoretical maximum density from the maximum specific gravity as determined by **SC-T-83**. Determine the maximum specific gravity by averaging the maximum specific gravity results of the entire LOT. Carry calculations for density to the hundredths (0.01) and round to the nearest tenth (0.1) in accordance with **ASTM E29** rules of rounding. See Table 9 for specific ranges of compaction values for in place density.

\*Intermediate B Special - see Table 4 for additional guidance.

4.1.2.2 Base Courses, Intermediate B Special\*, and C, and Surface Course Type C and D

Evaluate Base Courses, Intermediate B Special and C, and Surface Course Type C and D on each LOT. Compute the in-place density by comparing density values determined by the use of an approved density gauge to the target density established on control strips constructed in accordance with **SC-T-65**. Construct a control strip at the beginning of work. Construct additional control strips when a change is made in the type or source of materials or compaction equipment, or whenever a significant change occurs in the composition of the underlying pavement structure or the composition of the material being placed from the same source. See Table 10 for specific ranges of compaction values for in place density.\*Intermediate B Special - see Table 4 for additional guidance.

4.1.2.3 Shoulder Widening Course, Surface Course Type E, PMTLSC and OGFC

Shoulder Widening Course, Surface Course Type E, PMTLSC, and OGFC will not have to have in place density performed. Place these mixtures at the proper rate or thickness and promptly roll as required by the standard or supplemental specification for these mixtures. Cease rolling as soon as the mixture is properly seated to the underlying surface.

4.2 Acceptance Plan

It is the intent of these specifications that each LOT meets specification requirements at the time of initial evaluation. No re-sampling or re-testing (other than referee testing described in Subsection 3.8, "Quality Acceptance Sample Program") is allowed.

Adjust the payment for each LOT on the basis of acceptance test results in accordance with the requirements of these specifications. Keep accurate records of the tonnage of asphalt mixture in each LOT. Determine pay factors as indicated below.

4.2.1 Determination of Pay Factor

For LOTS that contain roadways cores or gauge shots for acceptance, determine pay factors for asphalt binder content (Tables 7-8), gradation (Tables 7-8) based on the average absolute difference from job mix targets. Use In-place density (Table 9-10) for Intermediate and Surface courses based on the average of the gauge shots or the cores to determine the Pay Factor.

Base the pay factor for in-place density for Base Courses and Intermediate B Special\*, Intermediate C, Surface Course Type C and D on the percent of the established target density (Table 10). Compute the pay factor for in-place density and the unit bid price in accordance with Subsection 4.2.1.2, "Determining Pay Factor." Compute only binder content and gradation pay factors requirements for Surface Course Type E and OGFC, or any LOT where no in place density measurements were required or were not taken. \*Intermediate B Special in-place density based on rate of placement.

4.2.1.1 Specification Limits

Calculate the specification limits for mixture properties from the allowable tolerances from the job mix formula (JMF) shown in Table 6.

**Table 6 - Allowable Tolerances from the Job Mix Formula for Mixture Properties**

Characteristic	Surface	Intermediate	Base
	Tolerance	Tolerance	Tolerance
Asphalt Binder Content, %	0.36	0.43	0.50
Air Voids, %	1.15		---
VMA, %	1.15		---
Gradation	See Limits Established on Job Mix Formula		

4.2.1.2 Determining Lot Pay Factor

Determine the absolute average difference for each acceptance characteristic, asphalt binder content, gradation and in place density. For All Intermediate Courses A and B (Special ≤300 #/SY) and Surface Type A and B where in place density measurements with cores are required, base the pay factor for in-place density on Table 9. For Base Courses, Intermediate B Special (>300 #/SY) and C, and Surface Course Type C and D, base the pay factor for in-place density on percent of the target density. The payment schedule is shown in Table 10.

Determine the percent pay factor for the LOT, *LPF*, by inputting the percent pay factors for asphalt binder content, gradation (lowest PF of two required sieves), and in-place density as shown in the equation below. **If any acceptance LPF is below 1.00, then use the lowest LPF for all three acceptance criteria below.** Carry the percent pay factor for the LOT to the nearest hundredth (0.01) and round to the nearest tenth (0.1). Determine the *LPF* from the following equation:

$$LPF = \frac{(PF_{ASPHALT\ BINDER}) + (PF_{GRADATION}) + (PF_{DENSITY})}{3} \times 100$$

For Shoulder Widening Course, Surface Course Type E, Open Graded Friction Courses, PMTLSC, Full Depth Patching (FDP) Mixtures, or when in-place density measurements are not obtained, compute the pay factors by using a pay factor for asphalt binder content, and gradation (lowest PF of two required sieves). ***If any acceptance LPF is below 1.00, then use the lowest LPF for the two acceptance criteria below.*** Carry the percent pay factor for the LOT to the nearest hundredth (0.01) and round to the nearest tenth (0.1). FDP and PMTLSC are paid by the SY, and will not be eligible for bonus LPF. Determine the *LPF* from the following equation:

$$LPF = \frac{(PF_{ASPHALT\ BINDER}) + (PF_{GRADATION})}{2} \times 100$$

Pay Factors – For Acceptance		
PF <sub>ASPHALT BINDER</sub>	Percent pay factor for asphalt binder content	Table 7 or Table 8 (see mix type)
PF <sub>GRADATION</sub>	Percent pay factor for gradation (select lowest PF value for required sieves determined by mix type)	Table 7 or Table 8 (See mix type)
PF <sub>DENSITY</sub>	Percent pay factor for In-Place Density	Table 9 or Table 10 (see mix type)

**Table 7 – Surface Mixtures A-E, Intermediate B\*, OGFC, PMTLSC, and Base C-D**

Mixture Characteristics	Pay Factor	Mean of the Deviations from the Job Mix Formula			
		1 Test	2 Test	3 Test	4 Test or More
<b>PF<sub>ASPHALT BINDER</sub></b>	1.05	N/A	0.00 - 0.19	0.00 - 0.17	0.00 - 0.15
	1.00	0.00 - 0.41	0.20 - 0.38	0.18 - 0.35	0.16 - 0.32
	0.95	0.42 - 0.46	0.39 - 0.43	0.36 - 0.39	0.33 - 0.36
	0.90	0.47 - 0.51	0.44 - 0.47	0.40 - 0.43	0.37 - 0.40
	0.80	0.52 - 0.56	0.48 - 0.52	0.44 - 0.47	0.41 - 0.44
	0.70	0.57 - 0.61	0.53 - 0.56	0.48 - 0.51	0.45 - 0.47
	MR	0.62 or More	0.57 or More	0.52 or More	0.48 or More

<b>3/8 in. - (9.5mm) Sieve</b>  <b>PF<sub>GRADATION</sub></b> * includes Int. B Special	1.05	N/A	0.0 - 2.7	0.0 - 2.3	0.0 - 2.1
	1.00	0.0 - 7.3	2.8 - 5.5	2.4 - 4.7	2.2 - 4.3
	0.98	7.4 - 8.0	5.6 - 6.1	4.8 - 5.2	4.4 - 4.7
	0.95	8.1 - 9.4	6.2 - 6.8	5.3 - 5.7	4.8 - 5.2
	0.90	9.5 - 10.0	6.9 - 7.5	5.8 - 6.3	5.3 - 5.7
	0.85	10.1 - 10.6	7.6 - 8.1	6.4 - 6.9	5.8 - 6.2
	0.80	10.7 - 11.4	8.2 - 8.4	7.0 - 7.2	6.3 - 6.5
	MR	11.5 or More	8.5 or More	7.3 or More	6.6 or More

<b>No. 4 - (4.75 mm) Sieve</b>  <b>PF<sub>GRADATION</sub></b> * includes Int. B Special	1.05	N/A	0.0 - 2.7	0.0 - 2.4	0.0 - 2.2
	1.00	0.0 - 7.3	2.8 - 5.5	2.5 - 4.8	2.3 - 4.4
	0.98	7.4 - 8.0	5.6 - 6.2	4.9 - 5.2	4.5 - 4.9
	0.95	8.1 - 9.4	6.3 - 6.9	5.3 - 5.7	5.0 - 5.3
	0.90	9.5 - 10.3	7.0 - 7.5	5.8 - 6.1	5.4 - 5.7
	0.85	10.4 - 11.0	7.6 - 8.2	6.2 - 6.5	5.8 - 6.2
	0.80	11.1 - 11.4	8.3 - 8.4	6.6 - 6.7	6.3 - 6.5
	MR	11.5 or More	8.5 or More	6.8 or More	6.6 or More

<b>No. 8 - (2.36 mm) Sieve</b>  <b>PF<sub>GRADATION</sub></b> * includes Int. B Special	1.05	N/A	0.0 - 2.3	0.0 - 2.0	0.0 - 1.8
	1.00	0.0 - 5.8	2.4 - 4.7	2.1 - 4.1	1.9 - 3.7
	0.98	5.9 - 6.5	4.8 - 5.2	4.2 - 4.5	3.8 - 4.1
	0.95	6.6 - 7.3	5.3 - 5.8	4.6 - 5.0	4.2 - 4.5
	0.90	7.4 - 8.7	5.9 - 6.3	5.1 - 5.5	4.6 - 5.0
	0.85	8.8 - 9.5	6.4 - 6.9	5.6 - 5.9	5.1 - 5.3
	0.80	9.6 - 9.9	7.0 - 7.1	6.0 - 6.5	5.4 - 5.6
	MR	10.0 or More	7.2 or More	6.6 or More	5.7 or More

(MR - Mill and Replace - no additional expense to the Department)

**Table 8 – Base A & B, Intermediate A & C, and SWC**

Mixture Characteristics	Pay Factor	Mean of the Deviations from the Job Mix Formula			
		1 Test	2 Test	3 Test	4 Test or More
<b>PF<sub>ASPHALT BINDER</sub></b>	1.05	N/A	0.00 - 0.23	0.00 - 0.21	0.00 - 0.19
	1.00	0.00 - 0.52	0.24 - 0.46	0.22 - 0.43	0.20 - 0.39
	0.95	0.53 - 0.58	0.47 - 0.51	0.44 - 0.47	0.40 - 0.43
	0.90	0.59 - 0.64	0.52 - 0.56	0.48 - 0.52	0.44 - 0.47
	0.80	0.65 - 0.69	0.57 - 0.61	0.53 - 0.56	0.48 - 0.51
	0.70	0.70 - 0.72	0.62 - 0.64	0.57 - 0.59	0.52 - 0.55
	MR	0.73 or More	0.65 or More	0.60 or More	0.56 or More
<b>1/2 in. - (12.5 mm) Sieve PF<sub>GRADATION</sub></b>	1.05	N/A	0.0 - 3.2	0.0 - 2.8	0.0 - 2.5
	1.00	0.0 - 10.2	3.3 - 6.5	2.9 - 5.7	2.6 - 5.1
	0.98	10.3 - 11.0	6.6 - 7.3	5.8 - 6.3	5.2 - 5.6
	0.95	11.1 - 11.7	7.4 - 8.3	6.4 - 6.9	5.7 - 6.1
	0.90	11.8 - 12.5	8.4 - 8.8	7.0 - 7.5	6.2 - 6.6
	0.85	12.6 - 13.3	8.9 - 9.1	7.6 - 7.7	6.7 - 7.0
	0.80	13.4 - 14.0	9.2 - 9.4	7.8 - 7.9	7.1 - 7.3
	MR	14.1 or More	9.5 or More	8.0 or More	7.4 or More
<b>No. 4 - (4.75 mm) Sieve PF<sub>GRADATION</sub></b>	1.05	N/A	0.0 - 2.7	0.0 - 2.4	0.0 - 2.2
	1.00	0.0 - 7.3	2.8 - 5.5	2.5 - 4.8	2.3 - 4.4
	0.98	7.4 - 8.0	5.6 - 6.2	4.9 - 5.2	4.5 - 4.9
	0.95	8.1 - 9.4	6.3 - 6.9	5.3 - 5.7	5.0 - 5.3
	0.90	9.5 - 10.3	7.0 - 7.5	5.8 - 6.1	5.4 - 5.7
	0.85	10.4 - 11.0	7.6 - 8.2	6.2 - 6.5	5.8 - 6.2
	0.80	11.1 - 11.4	8.3 - 8.4	6.6 - 6.7	6.3 - 6.5
	MR	11.5 or More	8.5 or More	6.8 or More	6.6 or More
<b>No. 8 - (2.36 mm) Sieve PF<sub>GRADATION</sub></b>	1.05	N/A	0.0 - 2.6	0.0 - 2.3	0.0 - 2.0
	1.00	0.0 - 6.5	2.7 - 5.2	2.4 - 4.6	2.1 - 4.1
	0.98	6.6 - 7.3	5.3 - 5.7	4.7 - 5.0	4.2 - 4.5
	0.95	7.4 - 8.0	5.8 - 6.3	5.1 - 5.5	4.6 - 4.9
	0.90	8.1 - 9.4	6.4 - 6.9	5.6 - 5.9	5.0 - 5.3
	0.85	9.5 - 10.3	7.0 - 7.1	6.0 - 6.1	5.4 - 5.6
	0.75	10.4 - 11.0	7.2 - 7.3	6.2 - 6.4	5.7 - 5.9
	MR	11.1 or More	7.4 or More	6.5 or More	6.0 or More

(MR - Mill and Replace - no additional expense to the Department)

**Table 9 - In Place Density – Roadway 6” Cores  
Mix Type: Intermediate A & B\*, Surface A & B, and SMA**

Pay Factor PF <sub>DENSITY</sub>	% Compaction Using Average Daily MSG - of 6" Core Values
1.05	94.0 or more
1.00	93.0 - 93.9
0.95	92.2 - 92.9
0.90	91.2 - 92.1
0.80	89.0 - 91.1
0.50	87.7 - 88.9
MR	87.6 or Less

(MR - Mill and Replace - no additional expense to the Department)

If the road length is less than 1500 continuous feet, no cores will be required for acceptance, use roller pattern per SC-T-65.

\* Intermediate B Special when placed less than or equal to 300#/SY.

**Table 10 - In-Place Density - Gauge Readings  
Mix Type: Base A-D, Surface C-D, Intermediate B Special\* and C**

Pay Factor PF <sub>DENSITY</sub>	Average of Gauge Readings % of Target Density from Control Strip	Pay Factor PF <sub>DENSITY</sub>	% Target Density from Control Strip
0.970	102.1 – or More	0.945	96.9
1.000	98.0 - 102.0	0.940	96.8
0.995	97.9	0.935	96.7
0.990	97.8	0.930	96.6
0.985	97.7	0.925	96.5
0.980	97.6	0.920	96.4
0.975	97.5	0.915	96.3
0.970	97.4	0.910	96.2
0.965	97.3	0.905	96.1
0.960	97.2	0.900	96.0
0.955	97.1	0.800	Less than 96.0
0.950	97.0		

If the road length is less than 1500 continuous feet, no gauge readings will be required for acceptance, use roller pattern per SC-T-65.

\* Intermediate B Special when placed greater than 300 #/SY.