1. SCOPE

Base field acceptance of asphalt mixtures on asphalt binder content, air voids, voids in mineral aggregate (VMA), and in-place mat density of the pavement. Acceptance of hot mix and warm mix asphalt use this specification for mixture acceptance. Base decisions regarding acceptance, rejection, or acceptance at an adjusted price upon the percentage of the lot that is within the specification limits. 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.

This specification is comprised of three sections:

- Section 3 – GENERAL - Describes what is required to meet the Asphalt Mixture Quality Acceptance (QA) Specification. This section describes requirements, frequency, sampling and testing methods, acceptance and verification, and the party responsible for each item.

- Section 4 – ACCEPTANCE OF MAINLINE PAVING - Describes what mainline production consists of (including shoulders, ramps, and acceleration/deceleration lanes), and the requirements and pay factor calculations for mainline paving on a LOT basis as described in Subsection 4.1.1 and Subsection 4.1.2.1.

- Section 5 – ACCEPTANCE OF LOW TONNAGE PAVING - Describes what low tonnage is, and the requirements and pay factor calculations associated with low tonnage paving. Low tonnage is defined as 2500 tons or less of a specific asphalt mixture on a project or when the specific asphalt mixture is to be used for non-mainline work, such as patching, leveling, widening less than 8-feet, wedging and driveway paving. The pay factor calculations for non-mainline paving will be calculated on a LOT-to-LOT basis as described in Subsection 5.1.1 and Subsection 5.1.2.1.

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


2.5 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; Surface Types A, B, C, D, and E. An Intermediate course is defined as the following mix types; Intermediate Types A, B 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 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. 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 volumetric properties and gradation from previous laboratory tests, to job mix revisions. The Department 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 approved for an individual contract. Submit Lab Form No. 310 with previously approved job mix formulas to the AME prior to starting production. The AME will review the forms and accept the job mix formulas based on a contract’s specifications. 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 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, conform the QC program to meet 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 Validations
Use the test methods identified in Table 1 to perform QC tests and validations at a frequency not less than that indicated. 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.

Table 1. Required Plant QC Tests and Validations

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Required Frequency</th>
<th>Sampling Method</th>
<th>Test Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Specific Gravity (excluding Base Courses, Shoulder, Surface Type E, PMTLS and OGFC)</td>
<td>1 per SUBLOT</td>
<td>SC-T-101, SC-T-62, SC-T-72 or SC-T-93</td>
<td>SC-T-83</td>
</tr>
<tr>
<td>Mixture Gradation</td>
<td>1 per Odd numbered SUBLOT</td>
<td>SC-T-101, SC-T-62, SC-T-72 or SC-T-93</td>
<td>SC-T-102</td>
</tr>
<tr>
<td>Mixture Stability (Base C&amp;D, Surface Type E, PMTLS)</td>
<td>1 per LOT</td>
<td>SC-T-101, SC-T-62, SC-T-72 or SC-T-93</td>
<td>SC-T-96</td>
</tr>
<tr>
<td>Lime Rate Validation</td>
<td>2 per LOT</td>
<td>SC-T-71</td>
<td>SC-T-71 or SC-T-78</td>
</tr>
<tr>
<td>Individual Aggregate Stockpile Gradation</td>
<td>1 per 10,000 tons (or min. of 1 per month)</td>
<td>SC-T-1, SC-T-2</td>
<td>SC-T-4</td>
</tr>
</tbody>
</table>

3.5.2 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 400.21) 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 ART in order to efficiently correct problems.
### Table 2. Required Road QC Tests and Verifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Required Frequency</th>
<th>Test Method</th>
<th>Responsible Party</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monitoring of density</td>
<td>Continuous</td>
<td>SC-T-65</td>
<td>Contractor</td>
</tr>
<tr>
<td>Temperature:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ambient air Mat</td>
<td>Before paving starts, then 2 per LOT</td>
<td>SC-T-84</td>
<td>Department</td>
</tr>
<tr>
<td>Mixture Temperature Verification</td>
<td>4 per LOT</td>
<td>SC-T-84</td>
<td>Department</td>
</tr>
<tr>
<td>Calculated Lay Down Rate</td>
<td>1 per 200 tons</td>
<td>SC-T-85</td>
<td>Department</td>
</tr>
<tr>
<td>Tack Rate, Type</td>
<td>1 per application</td>
<td>SC-T-86</td>
<td>Department</td>
</tr>
</tbody>
</table>

### 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 the plant acceptance tests at a frequency not less than that indicated. Carry calculations for the test results for asphalt binder content, air voids, and VMA 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 Acceptance Tests

<table>
<thead>
<tr>
<th>Test Parameter</th>
<th>Required Frequency</th>
<th>Sampling Method</th>
<th>Test Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asphalt Binder Content, %</td>
<td>1 per SUBLOT</td>
<td>SC-T-101, SC-T-62, SC-T-110 and SC-T-72 or SC-T-93</td>
<td>SC-T-75</td>
</tr>
<tr>
<td>Voids Analysis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Air Voids, %</td>
<td>1 per SUBLOT</td>
<td>SC-T-101, SC-T-62, and SC-T-72 or SC-T-93</td>
<td>SC-T-103 and SC-T-68</td>
</tr>
<tr>
<td>VMA, %</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(excluding Base Courses, Shoulder, Surface Type E, PMTLSC and OGFC)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mixture Gradation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Base Courses, Shoulder, Surface Type E, PMTLSC, and OGFC only)</td>
<td>1 per SUBLOT</td>
<td>SC-T-101, SC-T-62, SC-T-110, and SC-T-72 or SC-T-93</td>
<td>SC-T-102</td>
</tr>
</tbody>
</table>
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.

3.6.2.2 Voids analysis

Compact the specimens in accordance with SC-T-103. Determine the percent air voids and VMA by SC-T-68. 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 SUBLOT when computing air voids. 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 Course Type E, PMTLSC, and OGFC.

3.6.2.3 Gradation (For Base Courses, Shoulder Widening Course, Surface Type E, PMTLSC, and OGFC Only)

Perform gradation SC-T-102 for each SUBLOT for acceptance purposes for Base Courses, SWC, PMTLSC, Surface Course Type E, and OGFC. Evaluate each SUBLOT’s gradation on an individual basis for pay purposes.

3.6.3 Required In-Place Density Acceptance Tests

3.6.3.1 Intermediate Courses and Surface Courses Type A and B

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

3.6.3.2 Base Courses, and Surface Course Type C and D

Determine the in-place density for Base courses, 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. Divide each LOT into equal SUBLOTS corresponding to the number of density values to be obtained. Use SC-T-101 and determine one gauge density value at a randomly selected location within each SUBLOT. Express the in-place density as a percentage of the target density. The target density shall be determined 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 Acceptance Tests

<table>
<thead>
<tr>
<th>Test Parameter</th>
<th>Required Frequency</th>
<th>Sampling Method</th>
<th>Test Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>In-Place Density (%) of Max. Theoretical</td>
<td>Surface</td>
<td>1 per 2,000 foot</td>
<td>SC-T-101</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SUBLOT</td>
<td>SC-T-87</td>
</tr>
<tr>
<td></td>
<td>Intermediate</td>
<td>1 per 1,500 foot</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>SUBLOT</td>
<td></td>
</tr>
<tr>
<td>In-Place Density (%) of Target Gauge Control Strip Density</td>
<td>10 per LOT</td>
<td>SC-T-101</td>
<td>SC-T-65</td>
</tr>
</tbody>
</table>

Note: Requirements apply to Intermediate Courses and to Surface Courses Type A and B

Note: Requirements apply for Base Courses and Surface Courses Type C & D

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 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 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. 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. 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 JMF 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 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 the differences are within the allowable differences listed in Table 5, no further testing or analysis is necessary.

In the event comparison of the required test results is outside the allowable differences in Table 5, Department acceptance QA samples fail the specification limits, or 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. The AMVM, when applicable, will be notified by the AME that a trend of non-comparing QA samples has occurred, and the verification labs may elect to increase their frequency of obtaining samples.
Table 5. Allowable Differences Between Contractor Tests and Department QA Tests

<table>
<thead>
<tr>
<th>Test Parameter</th>
<th>Allowable Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asphalt Binder Content, %</td>
<td>± 0.40</td>
</tr>
<tr>
<td>Maximum Specific Gravity</td>
<td>± 0.024</td>
</tr>
<tr>
<td>Bulk Specific Gravity of Cores</td>
<td>± 0.017</td>
</tr>
<tr>
<td>Gradation (Base, Shoulder Widening, Surface Type E, PMTLSC, and OGFC only)</td>
<td></td>
</tr>
<tr>
<td>½” and greater</td>
<td>± 7.0</td>
</tr>
<tr>
<td>3/8”</td>
<td>± 6.0</td>
</tr>
<tr>
<td>No. 4</td>
<td>± 6.0</td>
</tr>
<tr>
<td>No. 8</td>
<td>± 5.0</td>
</tr>
<tr>
<td>No. 30</td>
<td>± 4.0</td>
</tr>
<tr>
<td>No. 100</td>
<td>± 3.0</td>
</tr>
</tbody>
</table>

3.8.2 Gyratory Density Specimens

For the gyratory specimens that are tested by the Contractor for material acceptance, 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 and the Contractor’s values will be used in the computations for LOT pay factor. 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, 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.

3.8.3.1 Verification of Contractor’s Roadway Density – Surface A, B, and Intermediate Courses

In the event that a Contractor has comparison issues as compared to SCDOT Independent Assurance Samples, the AME will immediately investigate. The AME may suspend production while the investigation is in progress.

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, 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.

4. ACCEPTANCE OF MAINLINE PAVING

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, “Split Test 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, either by email or fax 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 (Xerox, 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 to the air voids and VMA of laboratory-compacted samples, on a LOT-to-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 Mainline production

Base the acceptance and pay factors for asphalt binder content and the volumetric properties of air voids and VMA on the percentage of the LOT that is within the specification limits based on
the Quality Index calculated using the test results from the LOT. A LOT for asphalt binder content and volumetric properties is defined as a day's production with at least 3 SUBLOTS, where a SUBLOT consists of 500 tons of a particular mixture.

Therefore, in accordance to Table 3, if 4 tests are obtained from a given LOT, calculate the Quality Index on the results of four tests (n=4). However, when operational conditions are such that fewer than 4 tests are obtained from the production on a given day, follow the procedure in the next paragraph.

If the number of tests obtained from the day's production is three (n=3), compute the Quality Index from the results of the 3 tests and use the corresponding table for n=3. If insufficient tests (n=1 or n=2) are obtained from the day's production, combined these results with the next day's production SUBLOTS until at least 3 tests are obtained. If the next day's production is not within 30 days of the open SUBLOT, combine the open SUBLOT with enough tests from the previous completed LOT to yield 3 tests and calculate the Quality Index and close out the open LOT. If the last LOT on the project has only 1 or 2 tests, combine with enough tests from the previous LOT to yield 3 tests and calculate the Quality Index.

If the first SUBLOT 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 SUBLOTS of the mixture.

4.1.2 In-Place Density

For mainline paving (including shoulders, ramps, and acceleration/deceleration lanes), apply in-place density pay factors as specified herein unless otherwise noted on the plans. The Department’s Certified Roadway Technician is responsible for determining the random core locations and providing the information to the contractor for each SUBLOT in accordance to SC-T-101 once compaction has been completed.

4.1.2.1 Intermediate Courses and Surface Courses Type A and B

Evaluate the in-place density for Intermediate courses and Surface courses Type A and B on a LOT-to-LOT basis, where a LOT is defined as a day’s production with at least 3 plant acceptance SUBLOTS. Therefore, if less than 3 plant SUBLOTS are performed for a given day, combine the roadway cores taken from the first day with the following day(s) until at least 3 plant acceptance SUBLOTS are completed.

In the event that less than 3 roadway cores are obtained, but 3 plant acceptance SUBLOTS are complete, use the entire length of the represented LOT to establish the remaining core(s) to close the 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.

4.1.2.2 Base Courses and Surface Course Type C and D

Evaluate Base Courses and Surface Course Type C and D on a LOT-to-LOT basis. 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.

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, “Split Test Sample Program”) will be 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 Mainline Paving

For mainline LOTS, determine pay factors for asphalt binder content, air voids, VMA, and in-
place density for Intermediate and Surface courses based on the estimated PWL determined
from the Quality Index and Tables 12 through 20. The Quality Index uses both the average and
standard deviation within each LOT to estimate the percentage of the LOT within the
specification limits. Remove and replace all material in the LOT that has a TPWL of 20 or less
for any one acceptance characteristic, or has a TPWL of 40 or less for any 2 acceptance
characteristics, or has a TPWL of 60 or less for any 3 or more acceptance characteristics. For
material with a TPWL greater than 60, compute the unit bid price in accordance with Subsection
4.2.1.3, “Pay Factors.”

Base the pay factor for in-place density for Base Courses and Surface Course Type C and D on
the percent of the established target density. Compute the pay factor for in-place density and
the unit bid price in accordance with Subsection 4.2.1.3, “Pay Factors.” Compute only binder
content and gradation pay factors for Surface Course Type E and OGFC.

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>
<thead>
<tr>
<th>Characteristic</th>
<th>Surface Tolerance</th>
<th>Intermediate Tolerance</th>
<th>Base Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asphalt Binder Content, %</td>
<td>0.36</td>
<td>0.43</td>
<td>0.50</td>
</tr>
<tr>
<td>Air Voids, %</td>
<td></td>
<td>1.15</td>
<td>---</td>
</tr>
<tr>
<td>VMA, %</td>
<td></td>
<td>1.15</td>
<td>---</td>
</tr>
</tbody>
</table>

Compute the specification limits for mixture properties using the tolerances from Table 6 and
the following equations:
USL = JMF + Tolerance

LSL = JMF – Tolerance

Where:

USL = Upper Specification Limit
LSL = Lower Specification Limit
JMF = Job Mix Formula Target Value
Tolerance = Allowable Tolerance from Table 6.

The in-place mat density specification limits are shown in Table 7.

### Table 7. Specification Limits for In-Place Density

<table>
<thead>
<tr>
<th>% of Theoretical Maximum Density</th>
<th>Intermediate Courses and Surface Type A and B</th>
<th>Base Courses and Surface Type C and D</th>
</tr>
</thead>
<tbody>
<tr>
<td>LSL</td>
<td>USL</td>
<td>LSL</td>
</tr>
<tr>
<td>Interstate and US Primary Routes</td>
<td>92.2</td>
<td>94.0</td>
</tr>
<tr>
<td>All Other Paving</td>
<td>91.2</td>
<td>94.0</td>
</tr>
</tbody>
</table>

Use Table 4 of this specification to determine number of cores during daily mainline operations.

In the event that a LOT contains mixtures that are placed on various roads that require different LSL listed above, cut a minimum of three cores for each specification limit exceeding 1500 feet. If the total length is less than 1500 feet, no cores will be required, use roller pattern per SC-T-65. Two LPFs will be necessary to represent the two specification limits for compaction with the tonnage separated as appropriate.

#### 4.2.1.2 Determining Percent Within Limits

Determine the estimated PWL value for each acceptance characteristic, asphalt binder content, air voids, VMA, and in-place density as follows:

**Step 1.** Calculate the LOT average, $X_a$, and sample standard deviation, $s$, using the equations below:

$$X_a = \frac{1}{n} \sum X_i$$

$$s = \sqrt{\frac{1}{n-1} \sum (X_i - X_a)^2}$$

Where:

- $n$ is the number of test results for the LOT.
- $X_i$ represents the individual contractor acceptance test results

**Step 2.** Calculate the lower specification limit Quality Index, $Q_L$, using the equation below:

$$Q_L = \frac{X_a - LSL}{s}$$

**Step 3.** Calculate the upper specification limit Quality Index, $Q_U$, using the equation below:

$$Q_U = \frac{USL - X_a}{s}$$
Step 4. Depending upon the value of $n$, use $Q_i$ to enter the appropriate table (from Tables 12 through 20), to determine the percentage of the LOT that is above the lower specification limit. This will be called the Lower Percent Within Limits (LPWL). If there is no lower specification limit for a material characteristic, then $\text{LPWL} = 100.0\%$.

Step 5. Depending upon the value of $n$, use $Q_j$ to enter the appropriate table (from Tables 12 through 20) to determine the percentage of the LOT that is below the upper specification limit. This will be called the Upper Percent Within Limits (UPWL). If there is no upper specification limit for a material characteristic, then $\text{UPWL} = 100.0\%$.

Step 6. Calculate the total percentage of the LOT that is within the specification limits. This will be called the Total Percent Within Limits (TPWL) and is calculated using the equation below:

$$ \text{TPWL} = (\text{LPWL} + \text{UPWL}) - 100 $$

4.2.1.3 Pay Factors

If the TPWL is 20 or less for any one acceptance characteristic, or 40 or less for any 2 acceptance characteristics, or 60 or less for any 3 or more acceptance characteristics remove and replace the mixture representing that LOT.

Determine, by using the equation below, an individual percent pay factor, $PF$, for each of the individual material characteristics if the TPWL for each of the individual material characteristics (asphalt content, air voids, VMA, and in-place density) is appropriate to leave in place, and if no one TPWL is less than 80. **If any one individual material characteristic has a TPWL less than 80, the maximum pay factor for the remaining characteristics cannot be more than 100 percent.** LOTS with TPWL greater than 90 will receive pay factors greater than 100 percent. The maximum pay factor is 105 percent.

$$ PF = 55 + 0.5(\text{TPWL}) $$

For Base Courses 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 8.

Table 8. Pay Factors for In-Place Density for Base Courses and Surface Type C & D

<table>
<thead>
<tr>
<th>Average Percent of Target Control Strip Density</th>
<th>Pay Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greater than 102.0</td>
<td>97</td>
</tr>
<tr>
<td>98.0–102.0</td>
<td>100</td>
</tr>
<tr>
<td>96.0 – 97.9</td>
<td>$5 \times (\text{Percent Density} – 78.0)$</td>
</tr>
<tr>
<td>Less than 96.0</td>
<td>80.0</td>
</tr>
</tbody>
</table>

Determine the percent pay factor for the LOT, $LPF$, by multiplying the percent pay factors for asphalt binder content, air voids, VMA, and in-place density by weighted coefficients as shown in the equation 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:

$$ LPF = 0.30(\text{PF}_{\text{AC}}) + 0.25(\text{PF}_{\text{AV}}) + 0.10(\text{PF}_{\text{VMA}}) + 0.35(\text{PF}_{\text{Den}}) $$

Where:

- $LPF$ = Percent pay factor for the LOT
- $\text{PF}_{\text{AC}}$ = Percent pay factor for asphalt binder content
- $\text{PF}_{\text{AV}}$ = Percent pay factor for air voids
- $\text{PF}_{\text{VMA}}$ = Percent pay factor for VMA.
- $\text{PF}_{\text{Den}}$ = Percent pay factor for in-place density.
When Base Courses are produced, determine the pay factors by computing a pay factor for asphalt binder content, gradation, and density. Determine the pay for asphalt binder content in accordance to Subsection 4.2.1.2 and the pay factor for gradation by using Table 9.

### Table 9. Pay Factor for Gradations
(Base Courses, Shoulder Widening Course, Surface Type E, and OGFC only)

<table>
<thead>
<tr>
<th>Number of out of tolerance gradations per LOT</th>
<th>Pay Factor (PF&lt;sub&gt;GRAD&lt;/sub&gt;)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>1</td>
<td>90</td>
</tr>
<tr>
<td>2</td>
<td>75</td>
</tr>
<tr>
<td>3 or more</td>
<td>50</td>
</tr>
</tbody>
</table>

\[
\text{LPF} = 0.30(PF_{AC}) + 0.35(PF_{GRAD}) + 0.35(PF_{Den})
\]

Where:

\[
PF_{GRAD} = \text{Percent pay factor for Gradation (see Table 9)}
\]

When Shoulder Widening Course, Surface Course Type E, and Open Graded Friction Courses are produced, compute the pay factors by using a pay factor for asphalt binder content, and gradation. Determine the pay for asphalt binder content by Subsection 4.2.1.2 and the pay factor for gradation by using Table 9.

\[
\text{LPF} = 0.50(PF_{AC}) + 0.50(PF_{GRAD})
\]

Base any reductions or increases in payment that are necessary on the original contract unit bid price per ton of asphalt concrete mixture. The total amount of any reduction or increase in payment will be in the form of a lump sum deducted from or added to the monies due.

---

5. **Acceptance of Low Tonnage Paving**

Use this acceptance procedure when there are 2500 tons or less of a specific asphalt mixture on a project or when the specific asphalt mixture is to be used for non-mainline work, such as patching, leveling, widening less than 8-foot, wedging and driveway paving. Evaluate all materials used for low tonnage paving for acceptance by the Department's Acceptance Procedures specified herein. The Department will utilize results from the Contractor's acceptance testing when determining the acceptability of the materials. In addition, the Department will conduct limited testing and monitor and observe the Contractor's sampling and testing procedures to verify the data used for acceptance purposes. The Department's data will be compared with data from the Contractor's acceptance testing program as described in Subsection 3.8, "Split Test 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."

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, either by email or fax 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 (Xerox 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.

Base the acceptance and pay factors for low tonnage for asphalt binder content and the volumetric properties of air voids and VMA on the difference from the target value for each acceptance characteristic. Perform at least one series of required plant acceptance tests in accordance to Table 3 per LOT where a LOT is defined as a day's production. Notify the Department 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, either in person, email or fax all test results necessary to calculate payment factors to the DAM no later than 3 working days after the completion of the LOT, or production may be halted by the DAM until results are delivered. Provide a copy of each truck ticket printout with the corresponding plant acceptance test results.

5.1 Mixture

Evaluate the asphalt mixture at the plant, with respect to asphalt binder content and to the air voids, VMA and/or in-place density, on a LOT-to-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.

5.1.1 Low-tonnage production

Base the acceptance and pay factors for asphalt binder content and the volumetric properties of air voids and VMA on the percentage of the LOT that is within the specification limits based on the Quality Index calculated using the test results from the LOT when more than 3 SUBLOTS are produced in a day. If less than 3 SUBLOTS are produced in a day, base the acceptance and pay factors for asphalt binder content and the volumetric properties of air voids and VMA on the absolute average difference (AAD) from the target value for each acceptance characteristic.

Therefore, in accordance to Table 3, if 3 or more (n=3 or more) tests are obtained from a given LOT, calculate the Quality Index on the results of the tests in accordance with Subsection 4.2.1.2, "Determining Percent Within Limits" and use Subsection 4.2.1.3 “Pay Factors” to calculate payment. Payments computed with 3 or more tests are calculated using PWL, and will be eligible for incentive payment. However, when operational conditions are such that fewer than 3 tests are obtained from the production on a given day, follow the procedure in the next paragraph.

If the number of tests obtained from the day's production is less than 3 (n=1 or n=2), determine pay factors for asphalt binder content, air voids, and VMA based on the average absolute difference (AAD) between the acceptance test results from the LOT and the acceptance target values in accordance to Subsection 5.2.1 “Determining Average Absolute Difference,” and compute the pay factor in accordance with Subsection 5.2.2, “Pay Factors.”

Perform at least one series of required plant acceptance tests per LOT no matter how many tons of a particular mixture is produced in a day and follow the requirements according to the sampling and test methods in Table 3.
5.1.2 In-Place Density

5.1.2.1 Intermediate Courses and Surface Courses Type A and B

Evaluate the in-place density for Intermediate courses and for Surface courses Type A and B on a LOT-to-LOT basis. If the number of linear feet in the LOT is less than 1,500, no cores are required. Compute the LOT payment in accordance with Subsection 5.2.2.2. If the number of linear feet is greater than 1,500, subdivide the LOT into 3 separate SUBLOTS and obtain cores in accordance to SC-T-101. Compute the payment in accordance with Subsection 5.2.2.1.

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. The maximum specific gravity used shall be the average of the maximum specific gravity results of the LOT using Contractor data. 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.

5.1.2.2 Base Courses and Surface Courses Type C and D

Evaluate Base Courses and Surface Courses Type C and D on a LOT-to-LOT basis. The in-place density shall be based on density values determined by the use of an approved density gauge, and on a target density established on control strips constructed in accordance with SC-T-65. One control strip shall be constructed at the beginning of work on each roadway or shoulder course, and on each lift of each course. An additional control strip shall be constructed 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.

5.1.2.3 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.

5.1.2.4 Full Depth Patching

Full depth patching (4, 6, 8, 10, 12") is paid by the square yard under the LPF of this specification using section 5.2.2.2 for the corresponding mix type used in constructing patches. Use binder content and gradation for LPF (no volumetric properties will be required for LPF). Adhere to section 3.7 of this specification in order to halt production and make necessary adjustments to get the mix properties back within job mix criteria.

5.2 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 3.6, “Verification Program”) will be 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.

5.2.1 Determining Average Absolute Difference

Determine the AAD from the target value for each acceptance characteristic, asphalt binder content, air voids, and VMA, as follows:
Step 1. For each acceptance property, calculate the absolute difference, $D_i$, between each Contractor acceptance test result, $X_i$, and the target value, $T$, from the equation below that gives a positive value for $D_i$:

$$D_i = X_i - T \quad \text{or} \quad D_i = T - X_i$$

Step 2. For each acceptance property, calculate the average absolute difference, $AAD_j$, using the absolute differences, $D_i$, calculated in Step 1, from the following equation:

$$AAD_j = \frac{\sum_{i=1}^{n} D_i}{n}$$

Where: $n$ is the number of test results for the LOT.

5.2.2 Pay Factors

Determine an individual pay factor, $PF$, for each acceptance property, asphalt binder content, air voids, and VMA in accordance to Subsection 5.1 “Mixture.” Remove and replace any mixture having a laboratory mix property pay factor below 80 percent in table 10. In place density results will follow section 4.2.1, TWPL for density of 20.0 or less will result in remove and replace the mixture representing that LOT.

<table>
<thead>
<tr>
<th>Property</th>
<th>PF</th>
<th>Average Absolute Difference from Target</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Number of Tests</td>
</tr>
<tr>
<td><strong>Binder Content</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surface</td>
<td>100</td>
<td>0.00-0.36</td>
</tr>
<tr>
<td></td>
<td>95</td>
<td>0.37-0.44</td>
</tr>
<tr>
<td></td>
<td>90</td>
<td>0.45-0.55</td>
</tr>
<tr>
<td></td>
<td>80</td>
<td>0.56-0.66</td>
</tr>
<tr>
<td>Intermediate</td>
<td>100</td>
<td>0.00-0.43</td>
</tr>
<tr>
<td></td>
<td>95</td>
<td>0.44-0.52</td>
</tr>
<tr>
<td></td>
<td>90</td>
<td>0.53-0.65</td>
</tr>
<tr>
<td></td>
<td>80</td>
<td>0.66-0.78</td>
</tr>
<tr>
<td>Base</td>
<td>100</td>
<td>0.00-0.50</td>
</tr>
<tr>
<td></td>
<td>95</td>
<td>0.51-0.65</td>
</tr>
<tr>
<td></td>
<td>90</td>
<td>0.66-0.75</td>
</tr>
<tr>
<td></td>
<td>80</td>
<td>0.76-0.90</td>
</tr>
<tr>
<td><strong>Air Voids &amp; VMA</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surface and Intermediate</td>
<td>100</td>
<td>0.00-1.15</td>
</tr>
<tr>
<td></td>
<td>95</td>
<td>1.16-1.40</td>
</tr>
<tr>
<td></td>
<td>90</td>
<td>1.41-1.75</td>
</tr>
<tr>
<td></td>
<td>80</td>
<td>1.76-2.10</td>
</tr>
</tbody>
</table>

5.2.2.1 Density LOTS

Determine the percent pay factor for the LOT, $LPF$, by multiplying the percent pay factors for asphalt binder content, air voids, VMA, and in-place density by weighted coefficients as shown in the equation below. Carry the percent pay factor for the LOT to the nearest hundredth (0.01) and round to the nearest tenth (0.1). Use the following equation to determine the $LPF$: 

$$LPF = \sum_{i=1}^{n} PF_i$$
\[
\text{LPF} = 0.30(\text{PF}_{\text{AC}}) + 0.25(\text{PF}_{\text{AV}}) + 0.10(\text{PF}_{\text{VMA}}) + 0.35(\text{PF}_{\text{Den}})
\]

Where:
- \(\text{LPF}\) = Percent pay factor for the LOT
- \(\text{PF}_{\text{AC}}\) = Percent pay factor for asphalt binder content
- \(\text{PF}_{\text{AV}}\) = Percent pay factor for air voids
- \(\text{PF}_{\text{VMA}}\) = Percent pay factor for VMA.
- \(\text{PF}_{\text{Den}}\) = Percent pay factor for Density.

When Base courses are produced, determine pay factors by computing a pay factor for asphalt binder content, gradation and density. Use Subsection 5.1 “Mixture” to determine the pay for asphalt binder content and Table 9 to determine the pay factor for gradation.

\[
\text{LPF} = 0.35(\text{PF}_{\text{AC}}) + 0.30(\text{PF}_{\text{GRAD}}) + 0.35(\text{PF}_{\text{Den}})
\]

Where:
- \(\text{PF}_{\text{GRAD}}\) = Percent pay factor for Gradation (see Table 9)

Base any reductions or increases in payment that are necessary on the original contract unit bid price per ton of asphalt concrete mixture. The total amount of any reduction or increase in payment will be in the form of a lump sum deducted from or added to the monies due.

5.2.2.2 Non-Density LOTS

Determine the percent pay factor for the LOT, \(LPF\), by multiplying the percent pay factors for asphalt binder content, air voids, and VMA by weighted coefficients as shown in the equation below. Carry the percent pay factor for the LOT to the nearest hundredth (0.01) and round to the nearest tenth (0.1). Use the following equation to determine the \(LPF\):

\[
\text{LPF} = 0.45(\text{PF}_{\text{AC}}) + 0.45(\text{PF}_{\text{AV}}) + 0.10(\text{PF}_{\text{VMA}})
\]

When Base Courses, Surface Course Type E, and/or Open Graded Friction Courses are produced, determine the LPF by computing a pay factor for asphalt binder content and gradation. Use Subsection 5.1 “Mixture” to determine the pay for asphalt binder content and Table 9 to determine the pay factor for gradation.

\[
\text{LPF} = 0.50(\text{PF}_{\text{AC}}) + 0.50(\text{PF}_{\text{GRAD}})
\]

Base any reductions or increases in payment that are necessary on the original contract unit bid price per ton of asphalt concrete mixture. The total amount of any reduction or increase in payment will be in the form of a lump sum deducted from or added to the monies due.
Table 12. Estimate of LPWL or UPWL Using Q_L or Q_U for n = 3.

<table>
<thead>
<tr>
<th>Q_L or Q_U</th>
<th>LPWL or UPWL</th>
<th>Q_L or Q_U</th>
<th>LPWL or UPWL</th>
</tr>
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<td>1.152 or More</td>
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<td>-0.039 to 0.000</td>
<td>50</td>
</tr>
<tr>
<td>1.149 to 1.151</td>
<td>99</td>
<td>-0.069 to -0.040</td>
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<tr>
<td>1.145 to 1.148</td>
<td>98</td>
<td>-0.109 to -0.070</td>
<td>48</td>
</tr>
<tr>
<td>1.141 to 1.144</td>
<td>97</td>
<td>-0.139 to -0.110</td>
<td>47</td>
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<td>1.138 to 1.140</td>
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<td>-0.179 to -0.140</td>
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<td>1.134 to 1.137</td>
<td>95</td>
<td>-0.219 to -0.180</td>
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<td>1.127 to 1.133</td>
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<td>-0.249 to -0.220</td>
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</tr>
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<td>1.118 to 1.126</td>
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<td>-0.289 to -0.250</td>
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<tr>
<td>1.111 to 1.117</td>
<td>92</td>
<td>-0.319 to -0.290</td>
<td>42</td>
</tr>
<tr>
<td>1.101 to 1.110</td>
<td>91</td>
<td>-0.359 to -0.320</td>
<td>41</td>
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<td>1.031 to 1.040</td>
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<td>1.011 to 1.030</td>
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<td>-0.559 to -0.520</td>
<td>35</td>
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<tr>
<td>1.001 to 1.010</td>
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</tr>
<tr>
<td>0.961 to 0.970</td>
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<td>-0.649 to -0.620</td>
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<td>0.931 to 0.960</td>
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<td>0.891 to 0.910</td>
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<td>0.871 to 0.890</td>
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<td>0.651 to 0.680</td>
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<td>-0.959 to -0.930</td>
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### Table 13. Estimate of LPWL or UPWL Using $Q_L$ or $Q_U$ for $n = 4$.

<table>
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<th>$Q_L$ or $Q_U$</th>
<th>LPWL or UPWL</th>
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<td>1.351 to 1.380</td>
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<td>-0.179 to 0.150</td>
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<td>-0.239 to 0.210</td>
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<td>-0.539 to 0.510</td>
<td>33</td>
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<td>0.931 to 0.960</td>
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<td>-0.569 to 0.540</td>
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<td>0.871 to 0.900</td>
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<td>-0.629 to 0.600</td>
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<td>0.841 to 0.870</td>
<td>79</td>
<td>-0.659 to 0.630</td>
<td>29</td>
</tr>
<tr>
<td>0.811 to 0.840</td>
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<td>-0.689 to 0.660</td>
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<td>0.781 to 0.810</td>
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<td>-0.929 to 0.900</td>
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<td>0.211 to 0.240</td>
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<td>0.181 to 0.210</td>
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Table 14. Estimate of LPWL or UPWL Using $Q_L$ or $Q_U$ for $n = 5$.

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<th>$Q_L$ or $Q_U$</th>
<th>LPWL or UPWL</th>
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<td>-0.079 to -0.060</td>
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<td>-0.109 to -0.080</td>
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<td>-0.199 to -0.160</td>
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Table 15. Estimate of LPWL or UPWL Using $Q_L$ or $Q_U$ for $n = 6$.

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Table 16. Estimate of LPWL or UPWL Using $Q_L$ or $Q_U$ for $n = 7$.

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Table 17. Estimate of LPWL or UPWL Using $Q_L$ or $Q_U$ for $n = 8$.

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