

SECTION 400 FLEXIBLE PAVEMENTS

SECTION 401—CONVENTIONAL MIXTURE DESIGN, STANDARD AND RPS CONSTRUCTION OF PLANT-MIXED HMA COURSES

401.1 DESCRIPTION—This work is standard and RPS construction of plant-mixed HMA courses on a prepared surface using a conventional mixture design (Modified Marshall Procedure).

401.2 MATERIAL—

(a) Bituminous Material.

1. Virgin Mix or Mix Containing 5% to 15% RAP. Furnish the type and class of bituminous material required by the applicable pavement section and as specified in [Section 702](#), at the point of delivery and at the bituminous concrete plant. Furnish material conforming to the requirements of Standard Specifications for Performance-Graded Asphalt Binder, AASHTO M 320, except as revised in Bulletin 25. Obtain material from a source listed in [Bulletin 15](#) for the specified grade. Provide QC testing and certification as specified in [Sections 106.03\(b\)](#) and [702.1\(b\)1](#). Provide the Representative with a copy of a signed Certificate of Compliance ([CS-4171](#)), a Bill of Lading, and a Certificate of Analysis for bituminous material on the first day of paving and when the batch number changes.

2. Mix Containing more than 15% RAP. The MTD will evaluate the asphalt content in the RAP source material. The MTD will determine the class (grade) of asphalt cement and recycling agent the Contractor is required to use in the mixture.

Furnish the type and class of bituminous material required by the applicable pavement section and as specified in [Section 702](#), at the point of delivery and at the bituminous concrete plant. Furnish material conforming to the requirements of Standard Specifications for Performance-Graded Asphalt Binder, AASHTO M 320, except as revised in Bulletin 25. Obtain material from a source listed in [Bulletin 15](#) for the specified grade. Provide QC testing and certification as specified in [Sections 106.03\(b\)](#) and [702.1\(b\)1](#). Provide the Representative with a copy of a signed Certificate of Compliance ([CS-4171](#)), a Bill of Lading, and a Certificate of Analysis for bituminous material on the first day of paving and when the batch number changes.

(b) Aggregates and RAM. Provide aggregate from sources listed in [Bulletin 14](#) and conforming to the gradation of Table A. If using RAM, conform to the applicable quality requirements of [Section 703.1](#), [Table A](#), or [Section 703.2](#), [Table B](#). For wearing courses, provide aggregate with at least the SRL designation specified. To achieve the specified SRL, the Contractor may provide a blend of two aggregates if the blend has an SRL designation equal to or better than that specified. Blends are 50% by mass (weight) of each aggregate. Blend the aggregates using an approved method.

(c) RAP. If RAP material is proposed for use in the mixture, use at least 5% RAP consisting of cold-milled or crushed hot-mix bituminous mixtures. Include a plan to control RAP and the procedures to handle RAP of significantly different composition in the producer's QC Plan. Maintain all processed material free of foreign materials and minimize segregation. Process the RAP so that the final mixture conforms to [Section 401.2\(e\)](#).

(d) Filler. If required, as specified in [Section 703.1\(c\)1](#).

(e) Mixture Composition for Standard and RPS Construction.

1. Virgin Material Mixtures. Test materials, proportions, and the mixture at the producer's laboratory. Design the mixture according to the requirements of Bulletin 27. The JMF shall include a list of sources used to provide materials and identify the mixture producer. The JMF shall conform to the following:

- 3.0% to 5.0% voids for ID-2 and ID-3 wearing courses and for ID-2 binder courses.
- The production limits of this Section for apparent moisture content, stability, flow, and Voids in Mineral Aggregate (VMA).
- The aggregate and asphalt content requirements of Table A.

If the Department has not used the JMF on previous projects, provide test results from previous mixture production that show the mixture conformed to all JMF production tolerances. Submit a copy of each completed JMF, signed by a certified HMA Level 2 plant technician, to the District Materials Manager/District Materials Engineer (DMM/DME) at least 3 weeks before the planned start of mixture production. Do not start mixture production until after the DMM/DME reviews the JMF.

Submit a new JMF with a change in material sources or if a new JMF is necessary to produce a mixture conforming to this specification.

1.a Producer QC Plan. Each producer must prepare a QC Plan as specified in [Section 106](#) and conforming to the additional QC requirements of this specification. Submit the QC Plan to the DMM/DME annually, but at least 3 weeks before the planned start of mixture production and do not start mixture production until the DMM/DME reviews the QC Plan.

1.a.1 QC Organization Chart.

- Names of personnel responsible for QC.
- Area of responsibility of each individual.
- List outside agencies, e.g., testing laboratories and a description of services provided.

1.a.2 Testing Plan with Action Points.

- List of all tests to be performed.
- Frequency of testing.
- List action points to initiate corrective procedures.
- Recording method to document corrective procedures.
- Procedures for conducting JMF verification testing.

1.a.3 Materials Storage and Handling.

- Aggregate/RAP/RAM stockpiles.
- Cold-feed systems for aggregates/RAP/RAM.
- Additives or modifiers for mixture.

- Modified asphalt/liquid additive storage tanks.
- Surge/storage silos for mixture.
- All measuring and conveying devices, including calibration procedures.
- Haul vehicle loading procedures.

1.b Mixture Production. During mixture production, provide a certified HMA Level 1 plant technician at the plant and an on-call certified HMA Level 2 plant technician, both meeting the requirements outlined in Publication 351. Instruct and train the certified technician to perform all tests and to control plant operation. The Department may use its own certified HMA plant technicians to verify tests and to work in close cooperation with producer's technician. All technicians must carry a valid certification card during mixture production.

1.b.1 JMF Verification. During initial production of each JMF for a project, verify, according to the QC Plan, that the mixture conforms to this specification. Within 2 days of production, if the mixture does not conform to the production limits for stability, flow, and volumetrics and to the single and multiple gradation and asphalt content tolerances of Table B, suspend shipping the mixture to the project. Do not ship the mixture to the project until after the Representative reviews and verifies that results conform to the above requirements. During JMF verification, mixture acceptance is according to the approved acceptance level of Table C.

TABLE A (Metric)
Composition—Bituminous Surface Courses

Surface Course	Total Percent by Mass (Passing Square Openings, Lab Sieve Tests)													Bitumen % By Mass	
	50.0 mm	37.5 mm	25.0 mm	19.0 mm	12.5 mm	9.5 mm	4.75 mm	2.36 mm	1.18 mm	600 μm	300 μm	150 μm	75 μm	Stone or Gravel	Slag
ID-2 W.C./H.D. ID-2 W.C.	—	—	—	—	100	80-100	*** 45-80	30-60	20-45	10-35	5-25	4-14	3-6	** 4.5-8.0	** 7.0-10.5
ID-2 B.C./H.D.	100	95-100	85-95	—	*** 40-65	—	20-47	15-37	10-30	5-24	4-17	3-10	2-5	** 3.5-7.0	** 5.0-9.0
ID-2 B.C.	—	100	90-100	—	*** 40-75	—	20-47	15-37	10-30	5-24	4-17	3-10	2-5	** 4.0-7.0	** 5.5-9.0
FJ-1 W.C.	—	—	—	—	—	100	90-100	60-100	40-80	20-60	10-40	7-25	3-15	6.0-12.0	
FJ-1C W.C.	—	—	—	—	—	100	80-100	60-80	40-60	20-40	10-35	7-25	3-15	6.0-12.0	
FJ-4 W.C.	—	—	—	—	—	100	90-100	60-100	40-80	20-60	10-40	7-25	3-15	6.0-12.0	
ID-3 W.C./H.D. ID-3 W.C.	—	—	100	90-100	—	60-80	*** 40-65	25-50	20-40	12-28	5-25	4-14	3-6	** 4.2-7.5	** 6.2-9.7
FB-2 W.C.	—	—	—	—	100	85-100	20-40	4-20	—	—	—	—	—	4.2*	5.7*
FB-2 B.C.	—	100	90-100	—	40-65	—	5-20	4-16	—	—	—	—	—	3.0*	3.5*
FB-1 W.C.	—	—	—	—	100	85-100	20-30	0-10	—	—	—	—	—	4.0*	5.7*
FB-1 B.C.	—	100	95-100	—	40-60	—	0-10	0-5	—	—	—	—	—	3.0*	3.5*

* Minimum Residue

** As Per Design (Bulletin 27)

*** Supplemental Control Sieve

TABLE A (English)
Composition—Bituminous Surface Courses

Surface Course	Total Percent by Weight(Passing Square Openings, Lab Sieve Tests)													Bitumen % By Weight	
	2"	1 1/2"	1"	3/4"	1/2"	3/8"	No. 4	No. 8	No. 16	No. 30	No. 50	No. 100	No. 200	Stone or Gravel	Slag
ID-2 W.C./H.D. ID-2 W.C.	—	—	—	—	100	80-100	*** 45-80	30-60	20-45	10-35	5-25	4-14	3-6	** 4.5-8.0	** 7.0-10.5
ID-2 B.C./H.D.	100	95-100	85-95	—	*** 40-65	—	20-47	15-37	10-30	5-24	4-17	3-10	2-5	** 3.5-7.0	** 5.0-9.0
ID-2 B.C.	—	100	90-100	—	*** 40-75	—	20-47	15-37	10-30	5-24	4-17	3-10	2-5	** 4.0-7.0	** 5.5-9.0
FJ-1 W.C.	—	—	—	—	—	100	90-100	60-100	40-80	20-60	10-40	7-25	3-15	6.0-12.0	
FJ-1C W.C.	—	—	—	—	—	100	80-100	60-80	40-60	20-40	10-35	7-25	3-15	6.0-12.0	
FJ-4 W.C.	—	—	—	—	—	100	90-100	60-100	40-80	20-60	10-40	7-25	3-15	6.0-12.0	
ID-3 W.C./H.D. ID-3 W.C.	—	—	100	90-100	—	60-80	*** 40-65	25-50	20-40	12-28	5-25	4-14	3-6	** 4.2-7.5	** 6.2-9.7
FB-2 W.C.	—	—	—	—	100	85-100	20-40	4-20	—	—	—	—	—	4.2*	5.7*
FB-2 B.C.	—	100	90-100	—	40-65	—	5-20	4-16	—	—	—	—	—	3.0*	3.5*
FB-1 W.C.	—	—	—	—	100	85-100	20-30	0-10	—	—	—	—	—	4.0*	5.7*
FB-1 B.C.	—	100	95-100	—	40-60	—	0-10	0-5	—	—	—	—	—	3.0*	3.5*

* Minimum Residue

** As Per Design (Bulletin 27)

*** Supplemental Control Sieve

1.b.2 Production. After JMF verification, sample and test the mixture according to the QC Plan. For daily production of each JMF greater than 45 tonnes (50 tons), obtain at least one sample each day large enough to determine asphalt content, gradation, and theoretical maximum specific gravity, and to perform volumetric analysis and stability and flow of compacted specimens from the same sample. Perform additional sampling and testing as directed. Produce a mixture within the following production limits:

1.b.2.a Apparent Moisture Content. If the water absorption of a coarse aggregate, as determined by AASHTO T 85, exceeds 2.0%, sample the mixture according to [PTM No. 1](#) and at the frequency in the producer's QC Plan. Determine the apparent moisture content in the mixture according to [PTM No. 749](#). Produce a mixture with the apparent moisture content not to exceed 0.5%.

1.b.2.b Asphalt Content. Use automated and recordated plants. Use printed tickets for controlling asphalt content of the mixture. If the producer is not currently approved to use printed tickets, request Department approval according to Bulletin 27. Include in the producer's QC Plan a frequency of obtaining mixture samples according to [PTM No. 1](#) and performing asphalt content tests to verify the automated plant is recording the actual asphalt content and to verify the mixture conforms to the tolerances of Table B.

After obtaining a minimum of three test results, determine compliance with the multiple sample tolerances in Table B. After obtaining five or more test results, determine compliance with the multiple sample tolerances in Table B using the running average of the last five consecutive test results. During mixture production, maintain 90% of the printed ticket results for each day of production within 0.2 percentage points of the JMF.

1.b.2.c Gradation. Sample the completed mixture, or sample the combined aggregate from the hot bins of a batch plant or the combined aggregate belt of a drum plant, according to [PTM No. 1](#) and at the frequency in the producer's QC Plan.

- Test the completed mixture according to [PTM No. 757](#) or according to [PTM No. 702](#) and [PTM No. 739](#).
- Test combined aggregate samples according to [PTM No. 743](#).

Produce a mixture within the tolerances of Table B. Determine compliance with the multiple-sample tolerance after obtaining a minimum of three test results for the mixture. After obtaining five or more test results for the mixture, determine compliance with the multiple-sample tolerance using the running average of the last five consecutive test results. Determine the running average of the last five gradation tests and produce a mixture with the average of the last five tests within the multiple-sample tolerances of Table B.

TABLE B
Job-Mix Tolerance Requirements of Completed Mix

		Single Sample (n = 1)	Multiple Samples (n ≥ 3)
Gradation			
Passing 12.5 mm (1/2 inch) and Larger Sieves		±8%	±6%
Passing 9.5 mm (3/8 inch) to 150 µm (No. 100) Sieves (Inclusive)		±6%	±4%
Passing 75 µm (No. 200) Sieve		±3.0%	±2.0%
Asphalt Content			
Wearing Courses		±0.7%	±0.4%
Binder Courses		±0.8%	±0.5%
Temperature of Mixture (°C (F))			
Class of Material	Types of Material	Minimum	Maximum
PG 58-28	Asphalt Cement	125 (260)	155 (310)
PG 64-22	Asphalt Cement	130 (265)	160 (320)
PG 76-22	Asphalt Cement	140(285)	165(330)
All other P.G. Binders	Asphalt Cement	As specified in Bulletin 25 (Specifications for Bituminous Materials)	

1.b.2.d Theoretical Maximum Specific Gravity. Sample the mixture according to [PTM No. 1](#) at the frequency required in Bulletin 27. Test the samples according to AASHTO T 209.

Calculate the percentage of unfilled air voids and the theoretical maximum density of the mixture using the most recently determined theoretical maximum specific gravity value or average value as specified in Bulletin 27.

1.b.2.e Stability, Flow, Voids, and VMA Produce a mixture that, when tested according to [PTM No. 705](#), conforms to the following Marshall values:

- Stability at least 5300 N (1,200 pounds) at 60 °C (140F) for binder course and wearing courses except if the applicable paving section specifies another stability value.
- Flow from 6 to 16.
- Voids within 2.0 percentage points of the JMF and within the master range of 2.0% to 6.0%.
- VMA at least 15% for ID-2 wearing courses and at least 12% for ID-2 binder courses. Determine VMA from the Marshall specimen testing described above.

1.b.3 Corrective Actions. Immediately take corrective actions if one or more of the following occurs:

- QC test results on a single sample (n=1) for percent passing the 2.36 mm (No.8) sieve, the 75 µm (No. 200) sieve, or asphalt content are not within the tolerances of Table B.
- The average of multiple samples (n≥3) for percent passing any sieve or asphalt content are not within the tolerances of Table B.
- QC test results on a single sample (n=1) for stability, flow, voids, VMA, are not within the production tolerances.

- Independent assurance (IA) or QA sample test results at the producer's plant are not within the tolerances of Table B, or not within the production tolerances for stability, flow, voids, or VMA.

After taking corrective actions, sample the completed mixture within 140 tonnes (150 tons) of production. After sampling, test the mixture and provide test results to the Representative before shipping additional mixture to the project. If the mixture does not conform to Table B or the production tolerances for stability, flow, voids, or VMA, suspend production and determine the cause of the problem. Provide a written explanation of the problem and a proposed solution to the Department. After the Representative reviews the proposed solution and authorizes production to continue, resume production and perform JMF verification according to the QC Plan. During corrective actions and JMF verification, mixture acceptance is according to the approved acceptance level of Table C.

2. Mixtures with RAM or RAP. [Section 401.2\(e\)1.](#) and as follows:

2.a RAM and RAP SRL. For HMA wearing courses, limit the total combination of RAM and RAP to a maximum of 15% of the mixture by mass (weight) unless documentation of the SRL designation of the coarse aggregate in the RAM and RAP materials is provided to the DMM/DME and the RAM and RAP conform to the specified SRL or can be blended for SRL as specified in [Section 401.2\(b\)](#).

2.b RAP Asphalt Content and Gradation. Determine the average asphalt content and gradation of the RAP stockpile according to Bulletin 27. Determine the proportions of RAM, RAP, and virgin materials necessary to conform to the JMF requirements. Maintain and provide the Representative access to records of all sampling, testing, and calculations.

(f) Mixture Acceptance.

1. General. For standard construction, the Department will accept the mixture according to the appropriate level of Table C. At least 3 weeks before placing mixtures, submit a mixture-acceptance plan to the Department for approval. The mixture-acceptance plan shall propose an appropriate acceptance level based on the requirements of this specification and project-specific conditions. Identify the contract item number and description, plan locations, quantity, JMF, and the proposed acceptance level in the mixture-acceptance plan. Do not place mixtures until the Department approves the mixture-acceptance plan.

For RPS Construction, the Department will accept mixtures by lot acceptance as specified in [Section 401.2\(f\)3](#).

TABLE C
Mixture Acceptance

Acceptance Level	Acceptance Method
Certification	Producer Certification of Mixture
Lot Acceptance– MTD or Local Verification Testing	Producer QC Test Results, Verification Testing at the MTD or Local Laboratory

2. Certification. Acceptance by certification is appropriate for the following mixtures, conditions, or applications:

- Scratch or leveling less than a minimum 50 mm (2 inch) depth, driveway adjustments, and other non-uniform depth courses less than a maximum 50 mm (2 inch) depth
- Mixtures used by Department maintenance forces
- Mixtures purchased by local or municipal governments

- Mixtures placed in quantities too small for consistent plant operation, but not to exceed 360 tonnes (400 tons) in a continuous placement operation

2.a General. Obtain certification from the mixture producer. Certify mixtures using [Form CS-4171](#) or another acceptable form. Include the QC test results on the form. Provide the form to the Inspector-in-Charge within 1 working day after completing the QC tests. Certify mixtures as specified in [Section 106.03\(b\)3](#) and the requirements below.

2.b Certification. Certify each mixture daily if QC test results conform to the production limits of [401.2\(e\)1.b.2](#) and at least 90% of the printed tickets for asphalt content are within 0.2 percentage points of the JMF. If the mixture does not conform to the above requirements, do not certify the mixture. Instead, provide all QC test results to the Inspector-in-Charge. Payment will be determined according to Table G based on the QC test results.

2.c Maintaining Approval to Certify Mixtures. The Department may suspend certification if QC is not performed according to the producer's QC Plan, mixtures are not produced according to Bulletin 27, less than 90% of the daily printed ticket results for asphalt content are within 0.2 percentage points of the JMF, or as described below.

The Department may take IA samples of the completed mixture at the plant. In the presence of the Department, test the IA samples for asphalt content and gradation according to the test methods indicated in the producer's QC Plan. Take immediate corrective actions if the mixture does not conform to Table B.

The Department may take QA samples of the completed mixture at the plant or from directly behind the paver. The Department will test QA samples according to [PTM No. 757](#) for conformance to Table B. If the results of the QA samples do not comply with Table B, review the producer's QC Plan and the QC test results that followed the QA samples for conformance to Table B.

After completing corrective actions or the sample review, the Department will perform an on-site evaluation of the producer's plant operation and QC and then take a sample of the completed mixture at the plant. In the presence of the Representative, test the sample. If the sample does not comply with Table B, the Department will suspend certification. Immediately suspend shipping mixtures accepted by certification to the project.

After testing verifies that the produced mixture conforms to Table B, with the Department present, conduct JMF verification according to the QC Plan. After successfully completing JMF verification, resume both certification and shipping mixtures accepted by certification to the project.

3. Lot Acceptance. Lot acceptance is appropriate for standard construction mixtures placed in quantities that allow consistent operation of the plant and appropriate for RPS construction.

3.a Lots and Sublots. The normal lot size is the daily placement of each mixture up to a maximum of 1080 tonnes (1,200 tons). If daily placement exceeds 1080 tonnes (1,200 tons), the normal lot size is 1080 tonnes (1,200 tons), unless operational conditions or project size dictate otherwise. Each lot has three equal sublots (n=3), unless operational conditions or project size dictate otherwise. The normal subplot size is one-third the daily placement of each mixture up to a maximum of 360 tonnes (400 tons), unless operational conditions or project size dictate otherwise.

Terminate lots and sublots at the end of each day's placement or, for allowable night projects, at the end of a continuous placement operation that extends into the next calendar day. If a subplot is terminated before it is completed, combine the material with the previous subplot and the subplot may exceed 360 tonnes (400 tons). A completed subplot has all verification samples, and pavement cores if required, collected according to [PTM No. 1](#). If the final lot is terminated before completing three sublots, the Inspector will combine the completed sublots with the previous lot for a lot that includes four or five sublots and the lot may exceed 1080 tonnes (1,200 tons).

3.b Mixture Acceptance Samples. Perform mixture acceptance sampling at the plant. The Department will verify the results of acceptance testing by testing verification samples obtained for each lot from directly behind the paver. Use printed tickets for asphalt content. Take three mixture or three combined aggregate samples per day according to [PTM No. 1](#) for percent passing the 75 µm (No. 200) sieve. Mixture acceptance samples may be used to meet QC testing requirements. The Department will accept the mixture, as specified in [Section 401.4\(a\)](#).

3.c Mixture Verification Samples. The Inspector will select different sample locations in each subplot according to [PTM No. 1](#) and [PTM No. 746](#). For each subplot and in the presence of the Inspector, take one loose sample from directly behind the paver.

Identify the samples by lot number, location, date of placement, mixture type, and as acceptance samples type code LV (Local Verification Testing) or FV (MTD Verification Testing). Immediately package individual samples in cardboard boxes dimensioned approximately 95 mm x 120 mm x 240 mm (3 3/4 inches by 4 3/4 inches by 9 1/2 inches). Place the individually packaged samples in one container or tie the individually packaged samples for one lot together and submit the samples to the Inspector.

3.d Verification Sample Testing. One of the following testing options will be indicated in the proposal. These procedures apply to standard and RPS construction.

3.d.1 MTD Testing. The Department will test the samples according to [PTM No. 757](#) or [PTM No. 702](#), Modified Method D if previously identified problematic aggregates are used in the mixture, to determine asphalt content and the percent passing the 75 μm (No. 200) sieve. The Department will use the calibration factors (C_f and $200 C_f$) provided with the JMF for [PTM No. 757](#). The Department will analyze the test results for extreme values according to [PTM No. 4](#) at the 5% significance level.

If the asphalt content is not within the tolerances in Table B for two consecutive lots or a total of three lots or if the percent passing the 75 μm (No. 200) sieve is not within the tolerances in Table B for two consecutive lots or a total of three lots, stop all mixture production. Determine the cause of the problem and provide a written evaluation of the problem and the proposed solution to the Department. Do not resume production until the Representative reviews the proposed solution and authorizes paving to continue.

3.d.2 Local Testing. Prepare a separate QC Plan for local verification testing. Submit the QC Plan for approval at least 3 weeks before the scheduled start of mixture production. Detail in the QC Plan the method and procedures for sampling, packaging, securing, transporting, and handling verification samples. Identify in the QC Plan the location and address of the laboratory where the Representative's certified HMA plant technician will test the samples using the laboratory's equipment. The Contractor may use the producer's laboratory or designate another laboratory for testing verification samples. If using a laboratory other than the producer's laboratory, include the laboratory name, address, phone number, and contact person on the QC plan. The Department may perform an inspection of laboratories used to test verification samples.

Obtain and identify samples as specified in [Section 401.2\(f\)3.d](#). Package samples according to the QC Plan for local verification testing and secure the packaged samples with individually numbered security ties. Transport samples to the local testing location according to the QC Plan. Do not remove the security tie. At the test location, the Representative's certified HMA plant technician will remove the security tie. If the Representative's certified HMA plant technician determines the samples were damaged or not secured, obtain additional samples for verification testing as directed. Immediately stop production if the Representative determines sample security was intentionally compromised. Determine the cause of the compromised security and provide a written explanation of the cause and a proposed solution. Do not resume production until the Representative reviews the written explanation and solution and authorizes production to continue.

With the producer's certified HMA plant technician present, the Representative's certified HMA plant technician will randomly select one subplot from each lot and test the sample according to [PTM No. 757](#) or [PTM No. 702](#), Modified Method D if previously identified problematic aggregates are used in the mixture, to determine the asphalt content and percent passing the 75 μm (No. 200) sieve. If the asphalt content is not within $\pm 0.2\%$ of the JMF or the percent passing the 75 μm (No. 200) sieve is not within $\pm 1.0\%$ of the JMF, the Representative's certified HMA plant technician will test the remaining subplot verification samples from the lot. The Representative will evaluate the test results for extreme values according to [PTM No. 4](#) at the 5% significance level. The Department will accept the lot as specified in [Section 401.4](#).

If the asphalt content is not within the tolerances in Table B for two consecutive lots or a total of three lots or if the percent passing the 75 μm (No. 200) sieve is not within the tolerances in Table B for two consecutive lots or a total of three lots, stop all mixture production. Determine the cause of the problem and provide a written evaluation of the problem and the proposed solution to the Department. Do not resume production until the Representative reviews the proposed solution and authorizes production to continue.

401.3 CONSTRUCTION—

(a) Paving Operation QC Plan. Prepare a paving operation QC Plan, as outlined on Form CS-401, for field control and evaluation of bituminous concrete paving operations for the Representative's review. Submit the QC Plan before or at the pre-construction conference. The QC Plan shall describe the construction equipment and methods necessary to construct and test the bituminous concrete courses as specified in [Section 401.2](#). Do not start paving until after the Representative reviews the QC Plan.

(b) Weather Limitations. Do not place bituminous paving mixtures from November 1 to March 31, unless allowed in writing by the District Executive. Do not place bituminous paving mixtures when surfaces are wet or when the air or surface temperature is 4 °C (40F) or lower. If work is halted because of weather conditions, the Representative may allow the Contractor to place limited quantities of mixture that are en route to the project.

(c) Bituminous Mixing Plant. Obtain bituminous mixtures from a plant fully automated and recodedated and currently listed in [Bulletin 41](#). The necessary facilities for inspection include a plant office as specified in [Section 714.5\(a\)](#), except the minimum floor space is 11.1 m² (120 square feet). For recycled mixtures, add the following requirements:

1. Batch Plant. Modify the batch plant to measure the mass (weight) of the RAP before adding it into the pug mill. Design the cold-feed bin, conveyor system, charging chute(s), and all special bins to prevent RAP from segregating and sticking. Dry the virgin aggregate and RAM and then heat the virgin aggregate and RAM to a temperature that, after adding RAP, produces a completed mixture temperature from 127 °C to 154 °C (260F to 310F). Ensure that virgin aggregate is free of unburned fuel oil when delivered to the pug mill.

2. Drum Mixer Plant. Modify the drum mixer plant to prevent RAP from directly contacting the burner flame and prevent RAP from overheating. Produce a completed mixture with a temperature from 127 °C to 154 °C (260F to 310F).

(d) Hauling Equipment. Haul the mixtures in tightly sealed vehicles that do not contain petroleum oils, solvents, or other materials that adversely affect bituminous concrete. Provide covers of sufficient size and quality to protect the entire load, under all conditions. Maintain the proper and uniform placement temperature specified in [Section 401.3\(h\)1](#). Provide insulation on all sides of the truck body, a double-walled truck body, or a heated truck body when the air temperature is below 10 °C (50F) between October 1 and May 1.

(e) Bituminous Pavers. Provide self-contained, power-propelled units with activated screeds or activated strike-off assemblies and with automatic screed controls, capable of producing a finished surface of specified evenness and texture. Provide heated units capable of spreading and finishing the mixture to the widths and depths indicated. Provide units capable of being operated at forward speeds consistent with satisfactory laying of the mixture, equipped with receiving hoppers having sufficient capacity for uniform spreading, and equipped with distribution systems that place the mixture uniformly in front of the screeds.

Use hydraulic or other extension types against abutting lanes or longitudinal joints only if the unit feeds and activates the extension by the same method as the main screed. At the outside edge of pavement widths that cannot be uniformly placed, the Contractor may use a non-activated extension when approved by the Inspector-in-Charge.

Do not use equipment that tears, shoves, or gouges the mixture or that causes tracks, indented areas, flushing, or other permanent blemishes. Do not use blade graders or drags.

(f) Rollers. Use steel-wheel, pneumatic-tire, or vibratory rollers as specified in [Section 108.05\(c\)3](#). Operate rollers according to manufacturer's recommendations. Use vibratory rollers with separate controls for vibration and propulsion.

(g) Preparation of Existing Surface.

1. Conditioning of Existing Surface. Before delivering bituminous mixtures, remove and dispose of loose and foreign material and excess joint sealer and crack filler from the surface of existing pavement or previously placed pavement courses. If necessary, use a broom.

Before placing a wearing course, correct irregularities in the binder course. If practical, do not allow traffic on the binder course to prevent contamination. Remove and replace binder course that cannot be cleaned to the Representative's satisfaction.

Paint existing vertical surfaces of curbs, structures, gutters, and pavements that will be in contact with bituminous mixtures with a uniform coating of bituminous material, Class E-6 (AASHTO SS-1 or CSS-1), E-8 (AASHTO SS-1h or CSS-1h), Class AET applied in two or more applications, or of the class and type designated for the bituminous course.

Before overlaying existing surfaces, apply a tack coat as specified in [Section 460.3](#) unless otherwise indicated. Apply a tack coat to previously placed courses if the Representative determines a tack coat is necessary to ensure bonding between the two courses.

2. Scratch and Leveling Courses. Where indicated, place a separate scratch or leveling course ahead of resurfacing operations. Use the scratch course to fill wheel ruts and other local small depressions even with the surrounding pavement. Use the leveling course to provide a relatively uniform working platform for placing binder or wearing courses.

(h) Spreading and Finishing. Provide a certified HMA field technician with qualifications outlined in Publication 351 and dedicated to controlling the placement of bituminous mixtures. Instruct and train the certified HMA field technician to control the paving operation so that the completed paving work complies with the specified requirements. All certified HMA field technicians must carry a valid certification card during placement of all bituminous mixtures.

1. General Requirements.

1.a Placing. Unless otherwise allowed, deliver, place, and compact bituminous paving mixtures during daylight hours. Ensure the mixture does not contain lumps of cold material.

Deliver and place virgin-material mixtures at the laying temperatures specified in Table B for the type and class of material used.

1.b Spreading and Finishing. Spread and strike off the mixture over the entire lane width or as much lane width as practical. Adjust screed assemblies to provide the required cross section and depth. After spreading, do not add mixture to the pavement mat that is segregated or below the minimum temperature, contains either a deficiency or an excess of asphalt content, or is otherwise unsuitable to add to the pavement mat.

If the course is more than 150 mm (6 inches) in compacted depth, construct it in two or more layers of approximately equal depth, with no layer less than 80 mm (3 inches) or more than 150 mm (6 inches) in compacted depth. For binder or leveling courses that have isolated areas exceeding 150 mm (6-inch) compacted depth, use a scratch or leveling course to eliminate the isolated areas before full-depth paving.

Immediately after placing the bituminous mixture, work the exposed outer edges to avoid a sharp, ragged, and open edges; to eliminate an unfinished appearance; and to reduce edge breakdown. Immediately repair edge breakdowns.

In areas where mechanical spreaders cannot be used, place and screed the mixture with suitable hand tools. Do not use rakes.

Adjacent to flush curbs, gutters, and other abutting structures, place the wearing course mixture uniformly higher so that after compaction the finished surface is slightly above the edge of the abutting structure. Remove harmful material, clean, and seal the surface of wearing courses adjacent to curbs to form a bituminous gutter. Seal the mixture surface with bituminous material of the class and type designated for the wearing course. Evenly apply the bituminous material a minimum width of 300 mm (12 inches) from the curb. The Contractor may use Class AET, Class E-6 (AASHTO SS-1 or CSS-1), or E-8 (AASHTO SS-1h or CSS-1h) emulsified asphalt instead of hot bituminous material. Control the application rate so residual asphalt completely fills surface voids and provides a watertight joint along the curb. If necessary, apply emulsified asphalt in two or more applications. After sealing, remove excess sealant material.

2. Pattern Segregation. Pattern segregation is continuous or repeated areas of non-uniform distribution of coarse and fine aggregate particles in the finished mat. The Department will address pattern segregation as follows:

2.a Evaluation of Pattern Segregation. If the Representative observes pattern segregation that may result in defective pavement, then:

- The Inspector will immediately notify the Contractor of the observed pattern segregation.
- The Contractor may continue work at its own risk and immediately and continually adjust the operation and eliminate the pattern segregation from future work.
- As a minimum and in the presence of the Representative, determine the average depth of pavement surface macrotexture of areas with the pattern segregation and areas with non-segregated pavement according to [PTM No. 751](#). The pattern segregation is unacceptable if the difference in pavement texture depth between the non-segregated and segregated areas exceeds 0.610 mm (0.024 inch). The Representative will determine the extent of defective pavement as specified in 401.3(h)2.c.

2.b Test Section. If the macrotexture tests identify unacceptable pattern segregation, then:

- Immediately suspend placement of the bituminous course. Evaluate the cause of pattern segregation according to the Paving Operation QC Plan and as directed. Provide proposed corrective actions to the Representative. Do not resume placing the bituminous course until after the Representative has reviewed the proposed corrective actions.
- After the Representative allows paving to resume, place a test section not to exceed 180 tonnes (200 tons). If the corrective actions do not eliminate unacceptable pattern segregation, the Department will suspend paving before the Contractor places the entire test section. Determine if the pattern segregation resulted in defective pavement as specified in [Section 401.3\(h\)2.c](#), propose additional corrective actions, and construct another test section. Resume normal paving operations after constructing an entire test section without the Representative observing pattern segregation.

2.c Defective Pavement. At locations selected by the Inspector and with the Inspector present, drill a minimum of three 152 mm (6-inch) diameter cores from both the area of pattern segregation and the pavement representing non-segregated areas. Do not compress, bend, or distort samples during cutting and handling and immediately provide the cores to the Inspector. The Inspector will transport cores to the plant. With the Inspector present, test the cores at the plant for density, extraction, and gradation analysis. The Department may request additional tests as part of its evaluation of pattern segregation. Determine the maximum theoretical density according to AASHTO T 209 and core density according to [PTM No. 715](#).

An area of pattern segregation contains defective pavement if two or more sieves vary 10% or more from the JMF, the summation of deviations from any two sieves is 20% or more from the JMF, the core density is defective, the mixture is defective in asphalt content, or the mixture is defective for percent passing the 75 µm (No. 200) sieve. Remove and replace the full width of the affected lane and a minimum of 1.5 m (5 feet) beyond each end of the area with unacceptable pattern segregation. For replacement, use the appropriate surface tolerances as specified in [Section 305.3\(l\)](#) or [Section 401.3\(l\)](#).

(i) Compaction. Compact the mixture to achieve the density acceptance requirements and to eliminate all roller marks. Compact the mixture while it is in proper condition and adjust roller speed, amplitude, frequency, pattern, and roller size to eliminate displacement, shoving, cracking, and aggregate breakage. Satisfactorily correct displacement resulting from reversing roller directions and other causes.

Without using excess water, maintain wheels of steel-wheel rollers moist and clean to prevent the mixture from adhering to the wheels. Use suitable methods to clean pneumatic-tire roller wheels.

For areas inaccessible to rollers, compact with mechanical vibrating hand tampers.

Remove areas that are loose, broken, mixed with dirt, or show an excess or deficiency of bituminous material. Replace removed mixture with fresh hot mixture and compact the mixture even with the surrounding pavement surface.

(j) Mat Density Acceptance (Standard and RPS Construction).

1. General. The Department will accept the mat density of standard construction according to one of the levels in Table D. With the proposed mixture-acceptance plan, submit a proposed density-acceptance plan to the Department for approval. Include in the density-acceptance plan the contract item number and description, plan locations, quantity, JMF, and the proposed density acceptance level for the mixture. Do not place mixtures until the Inspector-in-Charge has approved the density-acceptance plan.

For courses with mixture acceptance by certification, the density acceptance level will be either non-movement or optimum-rolling pattern.

The Department will accept the mat density of RPS construction by lots and pavement cores as specified in [Section 401.3\(j\)4](#).

TABLE D
Density Acceptance

Density Acceptance Level	Acceptance Criteria
Non-Movement	Table F
Optimum-Rolling Pattern	Table F
Pavement Cores*	Table G
* Use only when mixture acceptance is by lots	

2. Non-Movement. The Inspector-in-Charge will approve non-movement density acceptance for the following materials, conditions, or applications:

- Scratch or leveling courses less than 30 mm (1-inch) in depth or equal to or less than 60 kg/m² (110 pounds per square yard).
- Areas of paving or patching less than 1.2 m (4 feet) in width or too narrow to prevent bridging of the area by approved compaction equipment.

The Inspector-in-Charge will accept density by non-movement for the following materials, conditions, or applications that are also determined by the Representative to be non-critical for density:

- Materials placed in quantities too small for consistent operation of the plant, but not to exceed 360 tonnes (400 tons) in a continuous placement operation.
- Mixtures placed on unstable or non-uniform bases.
- Mixtures used for patching, road widening, shoulders, driveway adjustments, and other miscellaneous applications determined by the Representative.

The Department will accept the density of courses when the mixture does not move under the compaction equipment.

3. Optimum-Rolling Pattern. The Representative may accept density using an optimum-rolling pattern for the following materials, conditions, or applications:

- Materials placed in quantities too small for consistent operation of the plant.
- Mixtures placed on unstable or non-uniform bases.
- Leveling courses or other courses that are a minimum 30 mm (1-inch) in depth or equal to or less than 60 kg/m² (110 pounds per square yard).
- Mixtures used for patching, road widening, shoulders, driveway adjustments, and other miscellaneous applications determined by the Representative.

- □ □ Mixtures placed at less than the minimum compacted depths on Table E.

With the Inspector and the Contractor's certified HMA field technician present, determine density according to [ASTM D 2950](#) with a licensed nuclear gauge operator, or determine density according to PTM No. 403, and follow the control strip technique specified in [PTM No. 402](#), to construct at least one control strip to establish the optimum-rolling pattern for each course. Compact the course according to the optimum-rolling pattern. During paving, the Representative may require the Contractor to construct a new control strip to verify the optimum-rolling pattern.

Use one of the following gauges or approved equal:

- Troxler Electronic Laboratories, Model 4640-B
- Campbell Pacific Nuclear, Model MC-2
- Seaman Nuclear, Model MC-2
- TransTech Systems, Inc., PQI™, Model 300 or 301
- Troxler Electronic Laboratories, PaveTracker™

If requested by the Inspector, submit a copy of the certificate of nuclear gage annual calibration according to [ASTM D 2950](#) and documentation of training of the nuclear gage operator. Recalibrate nuclear gauges that are damaged or repaired.

4. Pavement Cores.

4.a General. Pavement cores are required for accepting the density of RPS construction. Pavement cores are appropriate for accepting the density if the following materials, conditions, or applications exist:

- Mixture acceptance is by lots.
- Materials placed in quantities that allow consistent operation of the plant.
- Materials placed at uniform depths according to Table E.
- Materials placed on stable and uniform bases.

TABLE E
Mixture Minimum Compacted Depths

Mixture	Minimum Depth
ID-2 and ID-2 H.D. Wearing Course	40 mm (1 1/2 in.)
ID-3 and ID-3 H.D. Wearing Course	50 mm (2 in.)
ID-2 and ID-2 H.D. Binder Course	50 mm (2 in.)

4.b Lot/Sublot Size. [Section 401.2\(f\)3](#)

4.c Density Acceptance Samples. The Inspector will select different sample locations in each sublot according to [PTM No. 1](#), [PTM No. 729](#), and [PTM No. 746](#). With the Inspector present, drill 152 mm (6-inch) diameter cores as soon as possible but no later than the day following placement. Do not compress, bend, or distort samples during cutting, handling, transporting, and storing. If samples are damaged, immediately obtain replacement samples, as directed by the Inspector, from within 300 mm (1 foot) of the original sample location. Within 24 hours after coring, backfill the hole with mixture of the same JMF or with mixture used for subsequent courses and compact and seal the mixture.

Identify the samples by lot number, location, date of placement, mixture type, and as acceptance samples (Type Code LA (Local Acceptance Testing) or AS (MTD Acceptance Testing)). Immediately package and deliver the samples to the Inspector according to the QC Plan. Use sample containers of sufficient strength to prevent samples from being damaged during transport. Submit samples for one lot in one container.

One of the following testing methods will be indicated in the proposal. These procedures apply to standard and RPS construction.

4.c.1 MTD Acceptance Testing. The MTD will test the samples according to [PTM No. 715](#), and if necessary [PTM No. 716](#), to determine the percent compaction. The Department will determine acceptance, with respect to density, as specified in [Section 401.4](#).

If cores are not taken within 1 day after placing the mixture, or if the density for two consecutive lots or a total of three lots does not meet the density payment factor percentage of 100, stop paving operations as directed. Review and evaluate the operation and determine the cause of the problem. Provide a written explanation along with the proposed solution to the Department. Do not resume paving until after the Representative reviews the proposed solution and authorizes paving to continue.

4.c.2 Local Acceptance Testing. Prepare a separate QC Plan for local acceptance testing. The Contractor may submit one QC Plan for local acceptance testing of both mixture composition and density. Submit the QC Plan at least 3 weeks before the planned start of mixture production. Detail in the QC Plan the methods and procedures for taking, packaging, securing, tying, transporting, handling, and testing the acceptance samples for density. Identify in the QC Plan the location and address of the laboratory where the Representative's certified HMA plant technician will test the samples using the laboratory's equipment. The Contractor may use the producer's laboratory or designate another laboratory for testing acceptance samples. If using a laboratory other than the producer's laboratory, the QC Plan shall include the laboratory name, address, phone number, and contact person. The Department may perform an inspection of laboratories used for acceptance testing.

Obtain and identify samples as specified in [Section 401.3\(j\)4.c](#). Package samples according to the QC Plan for local acceptance testing and secure the packaged samples with individually numbered security ties. Do not remove the security tie. Transport the samples to the local testing location according to the QC Plan. At the test location, the Inspector will remove the security tie. If the Inspector determines the samples were damaged or not secure, obtain replacement acceptance samples within 300 mm (1-foot) of the original sample location, as directed by the Inspector. Immediately stop paving if the Representative determines that sample security was intentionally compromised. Determine the cause of the compromised sample security and provide a written explanation of the cause and a proposed solution. Do not resume production until the Representative reviews the written explanation and solution and authorizes paving to continue.

With the producer's certified HMA plant technician present, the Representative's certified HMA plant technician will test the pavement core acceptance samples according to [PTM No. 715](#), and if necessary [PTM No. 716](#), to determine the percent compaction. The Department will determine acceptance, with respect to field density, as specified in [Section 401.4](#).

If cores are not taken within 1 day after placing the mixture, or if the density for two consecutive lots or for a total of three lots does not meet the density payment factor percentage of 100, stop all paving operations as directed. Review and evaluate the operation and determine the cause of the problem. Provide a written explanation along with the proposed solution to the Department. Do not resume paving, until after the Representative reviews the proposed solution and authorizes paving to continue.

(k) Joints.

1. Longitudinal Joints.

1.a General. Offset joints in a layer from the joint in the layer immediately below by approximately 150 mm (6 inches). Plan joint locations to ensure the joint in the top layer is at the approximate pavement centerline for two-lane roadways and within 300 mm (12 inches) of the lane lines for roadways with more than two lanes.

Before placing abutting lanes, paint the entire area of the joint with a thin coating of bituminous material, Class AET, Class E-6 (AASHTO SS-1 or CSS-1), E-8 (AASHTO SS-1h or CSS-1h), or PG 64-22. Use two applications of AET emulsified asphalt.

Place and compact the mixture at the joint according to the Paving Operation QC Plan. Ensure the surface across the joint is smooth and the surface along the joint is within the surface tolerances specified in [Section 401.3\(l\)](#).

If traffic or other causes distort the lane edge, restore the lane edge to its original shape using acceptable procedures.

1.b Vertical Joints.

- The Contractor may use vertical joints for base, binder, and wearing courses.
- If traffic or other cause distorts the lane edge, carefully saw a vertical lane edge before painting.
- Place the abutting lane on the same day, and if necessary, leave only short lane sections, normally less than 8 m (25 feet) in length, where the abutting lane is not placed the same day.

1.c Notched Wedge Joints.

- The Contractor can use notched wedge joints for wearing and binder courses.
- Remove and dispose of all loose and foreign material before opening the lane to traffic.
- Construct the joint according to Standard Drawing RC-28.
- If the joint is next to opposing traffic, place the abutting lane within 1 working day after placing the mixture. If the joint is next to traffic in the same direction, place the abutting lane within 10 working days after placing the mixture.
- If both lanes that make the joint are not placed on the same day, amend the Maintenance and Protection of Traffic Plan and install additional signing for uneven pavements at no additional cost to the Department. Install “Uneven Pavement” signs according to Publication 212 and 1 km (1/2-mile) before the notched wedge joint area and every 1 km (1/2-mile) within the uneven pavement area.

2. Transverse Joints. Construct joints perpendicular to the pavement surface. The Contractor may saw transverse joints. If used, install bulkheads straight and perpendicular to the surface. If bulkheads are not used and the roller moves over the rounded edge of new mixture, locate the joint a sufficient distance from the rounded edge to provide a true surface and cross section. Paint the joint face with a thin coating of bituminous material, Class AET, Class E-6 (AASHTO SS-1 or CSS-1), E-8 (AASHTO SS-1h or CSS-1h), or PG 64-22, before placing fresh mixture against the joint face. If necessary, use two applications of AET emulsified asphalt.

3. Other Joints. Where placing a wearing course abutting to existing pavement at locations such as paving notches, lane additions, or utility openings, seal the joint with hot bituminous material of the class and type designated for the wearing course. Evenly apply the sealant a minimum of 150 mm (6 inches) on both sides of the joint. The Contractor may use a Class AET, Class E-6 (AASHTO SS-1 or CSS-1) or E-8 (AASHTO SS-1h or CSS-1h) emulsified asphalt instead of hot bituminous material. Before sealing, clean and remove harmful material from the area to be sealed. Control the application rate so residual asphalt completely fills surface voids and provides a watertight joint. If necessary, use two or more applications of emulsified asphalt. Remove excess bituminous material and immediately cover the sealed area with a light application of acceptable dry sand.

(l) Surface Tolerance. Test the finished surface with a 3 m (10-foot) straightedge at areas the Representative determines may be deficient or irregular, and at transverse joints and paving notches, and at longitudinal joints. Hold the straightedge in contact with the surface and in successive positions parallel to the road centerline to check the entire width of the pavement. Advance along the pavement in stages of not more than one-half the length of the straightedge until the entire area is tested. The pavement is defective if irregularities are more than 5 mm (3/16 inch). View Animation.

(m) Tests for Depth: Binder and Wearing Courses. Construct the pavement to the depth indicated and within the specified tolerances.

For courses with density acceptance by lots, the Inspector will measure the depth of each subplot according to [PTM No. 737](#) using the density acceptance samples. The Department will accept the course depth as specified in [Section 401.4](#).

For courses with a designed course depth and density acceptance by non-movement or rolling pattern, the Inspector will calculate the mass per square meter (weight per square yard) for verification of yield. If yield results indicate insufficient course depth, drill one 152 mm (6 inch) diameter core for each 180 tonnes (200 tons) to determine the extent of pavement with deficient depth. Pavement deficient in depth by more than 6 mm (1/4 inch) and that cannot be satisfactorily corrected is defective. Pavement deficient by more than 3 mm in three adjacent core locations and that cannot be satisfactorily corrected is defective. After the Inspector completes depth measurements, backfill, compact, and seal core holes with the mixture used to construct the course. Immediately start correction of courses deficient in depth at the core location and proceed longitudinally and transversely until the depth is within 6 mm (1/4 inch) of the design depth.

(n) Protection of Courses. Do not allow vehicular traffic or loads on newly compacted courses for 24 hours or until the mixture uniformly cools to a temperature of 60 °C (140F) or less. Provide alternate routes as indicated or as directed. If both lanes that form a longitudinal joint are placed on the same day and public safety is not restricted, do not allow vehicular traffic or loads on the lanes until adequate stability and adhesion are obtained and the material has uniformly cooled to 60 °C (140F) or less. Maintain the course, as specified in [Sections 105.13](#), [107.15](#), and [901](#).

(o) Defective Work. As specified in [Section 105.12](#) and as follows:

Department acceptance and QA testing shall not relieve the Contractor of responsibility for material or workmanship that the Representative determines is defective before the Department issues the acceptance certificate. Remove and replace, or repair defective work as directed. The BOCM will review Representative determinations of defective materials or workmanship.

Unless otherwise directed in writing by the District Executive remove and replace defective pavement for surface tolerance as specified in [Section 401.3\(l\)](#) or [Section 305.3\(l\)](#), depth as specified in [Section 401.3\(m\)](#) or [Section 305.3\(m\)](#), and pattern segregation as specified in [Section 401.3\(m\)](#). Remove and replace defective pavement as specified in Tables F and G.

401.4 MEASUREMENT AND PAYMENT—

(a) Plant-Mixed Bituminous Concrete Courses. Measurement as specified in applicable sections.

1. Mixture Acceptance by Certification and Density Acceptance by Non-Movement and Optimum-Rolling Pattern. The Representative will pay at the contract price, adjusted according to Table F. The total payment factor percentage is the sum of adjustments or each test criterion subtracted from 100%. The adjustment for an individual test criterion is the payment factor percentage subtracted from 100%.

TABLE F
Contract Price Adjustments

Mixture Acceptance by Certification			
Course	Test Criteria	Test Value	Payment Factor Percentage
Asphalt Content			
All Wearing, Binder, and Bituminous Concrete Base Courses (BCBC)	Printed Tickets	At least 90% of Daily Tickets Within 0.2% of JMF	100
		Less than 90% of Daily Tickets Within 0.2% of JMF	75
Gradation			
All Wearing, Binder	% Passing 75 μ m (No. 200) Sieve (n=1)	$\pm 3.0\%$	100
		$\pm 3.1\%$ to $\pm 4.0\%$	75
		$> \pm 4.0\%$	*
Mat Density			
All Wearing, Binder, and BCBC	Non-Movement	Section 409.3(j)2	100
	Optimum-Rolling Pattern	Section 409.3(j)3	100
* Defective pavement. Remove and replace or, when permitted by the District Executive in writing, leave in place and the Department will pay 50% of the contract unit price.			

2. Mixture Acceptance by Lot and Density Acceptance by Non-Movement, Optimum-Rolling Pattern, or Pavement Cores. The Department will pay on a lot-by-lot basis at the contract price, adjusted for Payment Factor Percentages as specified in Table G. For the payment factor percentages based on percent within tolerance, the Department will determine the percent within tolerance according to [Section 106.03\(a\)3](#), using the upper and lower specification limits in Table H.

TABLE G
Contract Price Adjustments

Mixture Acceptance by Lots			
Course	Test Criteria	Test Value	Payment Factor Percentage
Asphalt Content			
All Wearing and Binder	Printed Tickets	At least 90% of daily tickets within 0.2% of the JMF, and verification sample test results are within the n=1 and $n \geq 3$ tolerances in Table B*	100
		Less than 90% of daily tickets within 0.2% of the JMF, and verification sample test results are within the n=1 or $n \geq 3$ tolerances of Table B*.	95
		Percent Within Tolerance if the verification sample test results are not within the n=1 or $n \geq 3$ tolerances of Table B	Table I

Gradation			
All Wearing and Binder	% Passing 75 μ m (No. 200) Sieve	Producer QC test results are within the $n=1$ and $n \geq 3$ tolerances of Table B and verification sample test results are within the $n=1$ and $n \geq 3$ tolerances of Table B*	100
		Percent Within Tolerance, if verification sample test results are not within the $n=1$ or $n \geq 3$ tolerances of Table B	Table I
Mat Density			
All Wearing, Binder and BCBC	Non-Movement	Section 409.3(j)2	100
	Optimum-Rolling Pattern	Section 409.3(j)3	100
All RPS Wearing and Binder	Pavement Cores	All individual subplot test results for the lot are $\geq 92\%$ and $<97\%$ of daily maximum theoretical density	100
		Percent Within Tolerance if any individual subplot test result for the lot is not $\geq 92\%$ and $<97\%$ of daily maximum theoretical density	Table I
All Standard Wearing and Binder	Pavement Cores	All individual subplot test results are $\geq 90\%$ and $<97\%$ and the lot average is $\geq 92\%$ and $<97\%$ of the daily maximum theoretical density	100
		Percent Within Tolerance if any individual subplot test result is not $\geq 90\%$ and $<97\%$ or if the lot average is not $\geq 92\%$ and $<97\%$ of the daily maximum theoretical density	Table I
All BCBC	Pavement Cores	All individual subplot test results are $\geq 88\%$ and $<97\%$ and the lot average is $\geq 90\%$ and $<97\%$ of the daily maximum theoretical density	100
		Percent Within Tolerance if any individual subplot test result is not $\geq 88\%$ and $<97\%$ or if the lot average is not $\geq 90\%$ and $<97\%$ of the daily maximum theoretical density	Table I
<p>* The Department may elect to randomly select and test only one subplot verification sample from each lot to verify conformance to the specifications. If only one subplot verification sample is tested, tighter tolerances than those in Table B will be used to verify conformance to the specifications for the entire lot. If the one subplot is within $\pm 0.2\%$ of the JMF for asphalt content and within $\pm 1.0\%$ of the JMF for percent passing the 75 μm (no. 200) sieve, the lot will be considered to conform with the specifications and the lots payment factor percentage will be determined according to this table. If the one subplot fails to meet the tighter tolerances, all verification samples from the lot will be tested to determine the payment factor percentage according to this table.</p>			

TABLE H
Upper and Lower Specification Limits for Calculating Percent Within Tolerance

Course	Testing Criteria	
	Lower Specification Limit (L)	Upper Specification Limit (U)
	Asphalt Content from JMF Value, %	
Wearing Courses	-0.4	+0.4
Binder and BCBC	-0.5	+0.5
	Percent Passing the 75 μm (No. 200) sieve from JMF Value, %	
All Wearing and Binder	-2.0	+2.0
	Mat Density*	
Wearing and Binder	0.91T	0.98T
BCBC	0.88T	0.98T
* Where T = Current Maximum Theoretical Density, kg/m^3 (lbs./cu.ft.)		

TABLE I
Payment Factor Based on Percent Within Tolerance
 To be used in Adjusted Payment Formula specified in Section 402.4(a) and (b)

Percent Within Tolerance	Payment Factor Percentage
99	97
98	97
97	97
96	96
95	96
94	96
93	95
92	95
91	95
90	95
89	93
88	91
87	90
86	88
85	86
84	84
83	83
82	81
81	79
80	78
79	76
78	74
77	72
76	71
75	69
74	67
73	66
72	64
71	62
70	60
69	59
68	57
67	55
66	54
65	52
64	50
Less than 64	Defective Lot**

** Remove and replace the lot. If only one lot characteristic has a percent within tolerance less than 64, the District Executive, with the concurrence of the Chief Engineer, may allow the Contractor to leave the defective lot in place. The Department will pay for the defective lot at 50% of the contract unit price.

2.a Payment. The Representative will compute the percent of the contract price paid as follows:

$$\text{Lot Payment} = C_p(2P_D + P_B + P_A)/400$$

C_p = Contract unit price per lot (unit price times lot quantity)

P_D = Payment Factor Percentage for density

P_B = Payment Factor Percentage for asphalt content.

P_A = Payment Factor Percentage for percent passing 75 μm (No. 200) sieve

2.b Retesting. For mixture or density acceptance testing performed by the MTD, the Contractor may request that the Department retest a lot. The Department may allow retesting if the Contractor has a reasonable basis to conclude the test results do not represent the lot. With the Contractor present, the MTD will perform the retest. The MTD will not retest cores coated with paraffin wax as a result of [PTM No. 716](#). The MTD will perform analysis of the original test values and the retest values according to [PTM No. 5](#).

The MTD will evaluate a re-tested lot with:

- The original test values if repetition is established.
- The retest values if lack of repetition is established.

If the retest values indicate repetition of the original test values, the Department will deduct from the payment an amount equal to ten times the contract unit price per tonne (ton) or, for a contract with a unit price per square meter (square yard), ten times the calculated price per tonne (ton).

(b) HMA RPS Construction.

1. Mixture Acceptance by Lot and Density Acceptance by Pavement Cores. Section 401.4(a)2, except for RPS, the Department will determine mat density by pavement cores only.