

SECTION 305—BITUMINOUS CONCRETE BASE COURSE

305.1 DESCRIPTION—This work is standard construction of plant-mixed bituminous concrete base courses using a conventional mixture design (Modified Marshall Procedure). If placed on subgrade, this work includes the preparation of subgrade as specified in [Section 210](#).

305.2 MATERIAL—

(a) **Bituminous Material.** One of the following:

1. Virgin or Recycled Mix Containing 5% to 15% RAP. Asphalt cement, Class PG 64-22, [Section 702](#). The Contractor may use asphalt cement, Class PG 58-28, [Section 702](#) instead of PG 64-22 in Districts 1-0, 2-0, 3-0, 4-0, 9-0, 10-0, 11-0, 12-0 and the Monroe, Carbon, and Schuylkill Counties of District 5-0. 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 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 cement in the RAP source material. The MTD will determine the class (grade) of asphalt cement and recycling agent the Contractor shall use in the mixture. 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 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 aggregates from sources listed in [Bulletin 14](#).

1. Fine Aggregate. [Section 703.1](#), except [Table A](#) gradation does not apply.

2. Coarse Aggregate. [Section 703.2](#), Type A or Type B, except [Table C](#) does not apply.

3. RAM. RAM shall conform to the applicable quality requirements of [Section 703.1](#), [Table A](#) or [Section 703.2, Table B](#).

(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. The processed RAP shall conform to Table A and have at least 95% pass the 50.0 mm (2 inch) sieve.

(d) **Mixture Composition.**

1. Virgin Material Mixtures. Use Bulletin 27 to design and control production of bituminous mixtures. Establish a JMF that conforms to Bulletin 27 and the requirements of this specification. Submit a copy of the JMF to the District Materials Engineer/District Materials Manager (DME/DMM) at least 3 weeks before the planned start of mixture production for the project. Do not produce the mixture until after the DME/DMM reviews the JMF. The JMF shall conform to Table A, unfilled voids from 4.0% to 7.0%, and the following Marshall values determined according to [PTM No. 705](#):

- Stability at 60 °C (140F)
 - at least 5 300 N (1,200 pounds), when the maximum aggregate size is not over 37.5 mm (1 1/2 inches), with a 102 mm (4-inch) test specimen, or
 - at least 13 300 N (3,000 pounds), when the maximum aggregate size is over 37.5 mm (1 1/2 inches), with a 152 mm (6-inch) test specimen.
- Flow
 - from 6 to 16 with a 102 mm (4-inch) test specimen; or
 - from 9 to 24 with a 152 mm (6-inch) test specimen.

TABLE A
Composition of Mixture
(Mass (Weight) Percent Passing Square Openings, Based on Laboratory Sieve Tests)

Sieve Size	Required Percent Passing
50 mm (2 inches)	100
37.5 mm (1 1/2 inches)	95 - 100
19 mm (3/4-inch)	52 - 100
9.5 mm (3/8-inch)	36 - 70
2.36 mm (No. 8)	16 - 38
600 µm (No. 30)	8 - 24
300 µm (No. 50)	6 - 18
150 µm (No. 100)	4 - 10
Asphalt Content % by Mass (Weight)	
Stone or Gravel	3.5 - 6.0
Slag	4.5 - 8.5

2. 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. Until project completion, annually resubmit the QC Plan for this work to the DMM/DME.

3. Mixture Production

3.a JMF Verification. During initial production of each JMF for a project, verify, according to the QC Plan, that the mixture conforms to this specification. If the mixture does not conform to the production limits for asphalt content, gradation, stability, flow, and voids within 2 days of production, 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 as specified in [Section 305.2\(f\)](#).

3.b Mixture Production. After JMF verification, test materials, proportions, and the mixture according to the QC Plan, Bulletin 27, and the requirements below. For daily production of each JMF greater than 45 tonnes (50 tons), test for asphalt content, gradation, stability, flow, and voids to ensure the mixture conforms to the following production limits:

3.b.1 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. Perform asphalt content tests to verify the automated plant is recording the actual asphalt content and to verify the mixture asphalt content is within 0.8

percentage points of the JMF for individual samples (n=1) and within 0.5 percentage points for multiple samples (n ≥ 3).

After obtaining a minimum of three test results, determine compliance with the multiple sample tolerances. After obtaining five or more test results, determine compliance with the multiple sample tolerances 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.

3.b.2 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 aggregate composition of Table A.

3.b.3 Stability and Flow. Sample the completed mixture according to [PTM No. 1](#) and at the frequency in the producer's QC Plan. Test the mixture according to [PTM No. 705](#) and produce a mixture meeting the minimum stability and flow ranges specified in Section 305.2(d).

3.b.4 Unfilled Air Voids. Sample the completed mixture according to [PTM No. 1](#) and at the frequency in the producer's QC Plan. Test the mixture according to [PTM No. 705](#) and produce a mixture with air voids from 3.5% to 7.5%.

3.b.5 Maximum Theoretical Specific Gravity. Sample the completed mixture according to [PTM No. 1](#) at the frequency required in Bulletin 27. Test the mixture according to AASHTO T 209. Maintain the running average of the last five consecutive test values. Inform the Representative of the running average within 24 hours after completing each test. Calculate the percentage of unfilled air voids and the theoretical maximum density of the mixture using the running average.

3.c Corrective Actions. Immediately take corrective actions if less than 90% of the daily printed tickets are within 0.2 percentage points of the JMF, QC tests for asphalt content are not within the production limits, or if the percent passing the 2.36 mm (No. 8) sieve does not conform to the production limits. 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 the production limits for asphalt content and percent passing the 2.36 mm (No. 8) sieve, 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.

(e) Mixtures with RAP or RAM. As specified in [Section 305.2\(d\)](#) and as follows:

For recycled courses, determine the average asphalt content and gradation of the RAP stockpile and determine the average gradation of stockpiles of virgin aggregate and RAM. Obtain a minimum of ten samples from different locations in each stockpile. Determine the proportions of RAP, RAM, 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. The Department will accept the mixture by certification. Obtain certification from the mixture producer. Certify mixtures using [Form CS-4171](#) or another acceptable form. Provide the form to the Inspector-in-Charge within 1 working day after mixture production. Certify mixtures as specified in [Section 106.03\(b\)3](#) and the requirements below.

1. Certification. Certify each mixture daily if QC test results conform to the production limits of [Section 305.2\(d\) 3.b](#) 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 requirement, do not certify the mixture. Instead, provide all QC tests results to the Inspector-in-Charge. Payment will be determined according to [Section 401.4\(a\)](#), [Table G](#), based on the QC test results.

2. Maintaining Approval to Certify Mixtures. The Department may suspend certification if the Contractor is not performing QC according to the producer's QC Plan or not producing mixtures according to Bulletin 27, and as described below.

The Department may take independent assurance (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 corrective actions if the mixture does not conform to Table A.

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](#) conformance to Table A. If the results of the QA samples do not comply with Table A, review the producer's QC Plan and the QC test results that followed the QA samples for conformance to Table A.

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 A, the Department will suspend certification. Immediately suspend shipping mixtures accepted by certification to the project.

After testing verifies that the produced mixture conforms to Tables A and B and 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.

305.3 CONSTRUCTION—[Section 401.3](#) with additions and modifications as follows:

(b) Weather Limitations. Replace with the following:

Do not place the base course on surfaces that are wet or when the air or the surface temperature is 2 °C (35F) or lower. If work is stopped for adverse weather, the Representative may allow the Contractor to place limited quantities of base course that are en route to the project

(h) Spreading and Finishing. Add the following:

If the base course is more than 130 mm (5 inches) in compacted depth, construct it in two or more layers of approximately equal compacted depth, with no layer less than 65 mm (2 1/2 inches) or more than 130 mm (5 inches). If the air temperature is below 5 °C (40F), only construct base courses that are greater than 200 mm (8 inches) in compacted depth and using layers at least 100 mm (4 inches) in depth.

(j) Mat Density Acceptance. As specified in [Section 401.3\(j\)](#), revised as follows:

4.b Lot/Sublot Size. A lot is the area of base course completed each day. The Inspector will divide the lot into three sublots of approximately the same area. The Inspector will select one random test location in each sublot according to [PTM No. 1](#). The Inspector will select another random test location if the test location is:

- within 600 mm (2 feet) of an unsupported edge.
- within 300 mm (1 foot) of a longitudinal paving joint.
- within an area of pattern segregation evaluated according to [Section 401.3\(h\)](#).
- within 300 mm (1 foot) of the edge of obstructions such as manhole covers and inlets.

(l) Surface Tolerances. Replace the requirement for defective pavement with the following:
The pavement is defective if irregularities are more than 6 mm (1/4-inch).

(m) Tests for Depth. Replace with the following:

Control the loose depth of each layer to construct the base course to the compacted depth indicated and within the specified tolerance.

On the top lift and in the presence of the Inspector, drill full-depth cores at one random location selected by the Inspector according to [PTM No. 1](#) in each 2500 m² (3,000 square yards) of completed base course and at other locations the Inspector suspects are deficient

The Representative will measure the depth of the full-depth cores according to [PTM No. 737](#). Pavement deficient in depth by 13 mm (1/2 inch) or more 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 correcting courses or pavement that are deficient in depth at the core location and proceed longitudinally and transversely until the depth is within 13 mm (1/2 inch) of the design depth.

305.4 MEASUREMENT AND PAYMENT—Square Meter (Square Yard) or Tonne (Ton)

(a) Mixture Composition. As specified in [Section 401.4\(a\)](#), [Table G](#), for asphalt content only.

(b) Density. As specified in [Section 401.4\(a\) 2.b](#), except that the pay factor percentages for asphalt content and percent passing the 75 µm (No. 200) sieve are both 100.