

**CERTIFIED
HOT MIX ASPHALT PRODUCER PROGRAM
PARTIAL AUDIT CHECKLIST (EXTRA/INTERIM)**

Date _____

Page 1 of ____

Plant No. _____

Producer _____

Plant Location _____

INDOT Audit Team Members

	<u>Name</u>	<u>Position</u>
1.	_____	District Testing Engineer
2.	_____	Area Supervisor
3.	_____	Technician
4.	_____	_____
5.	_____	_____
6.	_____	_____

Producer Members

	<u>Name</u>	<u>Position</u>
1.	_____	Management Representative
2.	_____	Level 1 or Certified Asphalt Technician
3.	_____	_____
4.	_____	_____

1. GENERAL INSTRUCTIONS**Audit Team Members**

A Partial Audit should be conducted only when a Full Audit has already been conducted or will be conducted in the same calendar year.

Tasks to be **completed before arriving** at the Producer's site:

- Review the QCP
- Review previous audits, especially the most recent one and note all corrective actions
- Coordinate with Independent Assurance Technician for comparison testing schedule
- Bring copies of the following:
 - Approved DMF and Contract Record worksheets for the current calendar year. These can be found at <https://itap.indot.in.gov/>
 - Qualified Products Lists and Qualified Source Lists
 - Performance-Graded Asphalt Binder Suppliers
 - Anti-Adhesive materials
 - Indiana Certified Asphalt Technicians (ICAT) List
 - Current copy of ITM 583

Terminology:

QC/QA HMA	Std. Spec. Section 401 (QC/QA Hot Mix Asphalt)
HMA	Std. Spec. Section 402 (Hot Mix Asphalt)
QCP	Quality Control Plan
PGABS	Performance-Graded Asphalt Binder Suppliers
DMF	Design Mix Formula
RAP	Reclaimed Asphalt Pavement
RAS	Reclaimed Asphalt Shingles
SMA	Stone Matrix Asphalt

Brackets must be filled in as follows:

- [✓] Satisfactory
 [X] Unsatisfactory or deficient; a **Corrective Action** Sheet must be prepared
 [NA] Not applicable to the audit or Producer

* Item is only applicable in some cases; fill in 'NA' if not applicable

All unsatisfactory or deficient items resolved during the audit shall be noted on corrective action sheets with indication that item has been corrected.

2. DOCUMENTS

ITM 583 Reference

2.0

Audit Team Member: _____

Determine whether the following current documents are maintained at the Producer's lab or Plant, either by hard copies or electronically.

- 2.1 [] Bill of ladings for most current days production indicating material from an ASC producer
- 2.2 [] Weigh tickets adhere to requirements of section 109.01(b) of INDOT specs
- 2.2 [] Type A Certifications for all binders

3. DIARY

ITM 583 Reference

8.0, 11.0

Audit Team Member: _____

Select at random one production week for review of the diary. The diary should be in accordance with the following requirements and information.

Week/Month/Year _____

- 3.1 [] Diary on file for 3 years
- 3.2 [] Open book format or readily accessible electronic format
- 3.3 [] One or more pages for each day of production
- 3.4 [] Type of Mixture (QC/QA HMA, HMA, SMA) produced and quantity
- 3.5 [] DMF number
- 3.6 [] Contract or purchase order number the mixture was sent to
- 5.7 [] Time sample obtained and tests completed (samples are required to be tested within two working days of the time the sample was taken. If all samples are tested the same day, a statement indicating that this occurred is acceptable)
- 3.8 []* Significant events or problems
- 3.9 [] Signature of Level 1 or Certified Technician or Management Representative

DIARY (continued)

Review the month test data for nonconforming tests. If some are found, review the diary on the date of each test for notations regarding action taken.

- 3.10 [] Nonconforming test(s) are noted in diary
- Control limits are exceeded for Binder Content, Vbe, VMA, Air Voids, aggregate gradation.
 - Control limits are exceeded for 2.36mm sieve (9.5mm surface only)
 - 2.36 mm sieve %passing greater than 47% for 9.5 mm surface mix
 - Aggregate degradation value for SMA mix is greater than 3.0%
 - Dust/Vbe ratio is less than 0.6 or greater than 1.4 (or 1.0 to 2.0 for 4.75 mm mixtures)
 - Vbe is determined to be less than design minimum or more than design maximum
 - Moisture content of surface mixture exceeds 0.30% at the plant or 0.10% behind paver
- 3.11 [] Corrective action was taken or documented.

4. SAMPLING AND TESTING

ITM 583 Reference

9.1, 9.2

Audit Team Member: _____

For the week being reviewed, perform calculations as needed for a **QC/QA HMA or SMA** mixture and compare the quantities produced from the diary against the number of tests, thereby determining the frequency of testing. The previous or subsequent week in the diary may need to be obtained to verify the frequency of tests.

Contract _____ DMF _____ Mixture _____ Quantity _____

Recycled Materials

4.1 []* Sampling and testing of Recycled Materials for actual binder content, moisture content, gradation, coarse aggregate angularity, and bulk specific gravity is in accordance with QCP

Note: For assistance, see example calculation page in appendix

Percent by mass from DMF _____ Total RAP and/or RAS used _____

--or--

Total RAP and/or RAS processed _____

	QCP Frequency	Tests Required	Tests Completed
Actual Binder Content	_____	_____	_____
Moisture	_____	_____	_____
Gradation	_____	_____	_____
CAA	_____	_____	_____
Bulk Spec. Gravity of Agg	_____	_____	_____

Aggregates

4.2 [] Sampling and testing of Blended Aggregate is in accordance with QCP

QCP Frequency Tests Required Tests Completed

4.3 [] Sampling and testing of Aggregate Stockpiles is in accordance with QCP

PG Binder

4.4 [] Sampling of PG Binder is in accordance with QCP

Plant # _____

Page 6 of

Mixture

Plant/Truck Samples	QCP Frequency	Tests Required	Tests Completed
Actual Binder Content	_____	_____	_____
Gradation	_____	_____	_____
Moisture	_____	_____	_____
Temperature	_____	<u>N/A</u>	(Y or N)
Draindown (OG & SMA)	_____	_____	_____
Agg. Degredation (SMA, 1 per lot)	_____	_____	_____

4.5 [] Sampling and testing of Mixture at the Plant for actual binder content, gradation, draindown (open graded and SMA mixtures only), moisture content, and temperature is in accordance with QCP

Pavement/Plate Samples	QCP Frequency	Tests Required	Tests Completed
Air Voids	_____	_____	_____
VMA	_____	_____	_____
Actual Binder Content	_____	_____	_____
Gradation	_____	_____	_____
Dust/Pbe ratio	_____	_____	_____
Volume Eff. Binder (Vbe)	_____	_____	_____
Moisture (surface only)	_____	_____	_____

4.6 [] Sampling and testing of Mixture from the pavement for properties listed above is in accordance with QCP

SAMPLING AND TESTING (continued)

ITM 583 Reference

9.1, 9.2

Obtain the diary for one **HMA** (402) mixture produced during one a one week period. Perform calculations as needed and compare the quantities produced from the diary against the number of tests, thereby determining the frequency of testing. The previous of subsequent week in the diary may need to be obtained to verify the frequency of tests. The frequency of sampling and testing shall be in accordance with the QCP, but not less than:

1. The first 250 t and each subsequent 1000 t of each DMF for base and intermediate mixtures. If a DMF does not reach 250 t, a minimum of one sample is required for certification.
2. The first 250 t and each subsequent 600 t of each DMF for surface mixtures. If a DMF does not reach 250 t, a minimum of one sample is required for certification.

Mixture _____ QCP Frequency _____ Quantity _____

Tests Required _____ Tests Completed _____

Certifications Required _____ Certifications sent to Jobsite _____

- 4.7 [] Sampling and Testing of Mixture for binder content, coarse aggregate angularity, gradation, and air voids is in accordance with QCP.
- 4.8 [] Test results are within requirements as follows:
Air Voids -- $\pm 2\%$ from DMF
Binder Content -- $\pm 0.7\%$ from DMF
- 4.9 [] Type D certifications were sent to jobsite as required and are on file
- 4.10 [] Test results shown on Type D certifications match test reports

SAMPLING AND TESTING (continued)ITM 583 Reference

9.1, 9.2

Select at random one test report for any one **QC/QA HMA or SMA** mixture and check the calculations performed for the Blended Aggregate, RAP, and Mixture. If only **HMA** mixture is produced, check the calculations for that mixture only.

[]* Producer reports results to a third party application? If yes skip to section 7.

Blended Aggregate

Mixture _____

Date _____

- 4.11 []* Gradation of aggregate from mixture sample is calculated correctly
 4.12 []* Gradation of aggregate from cold feed belt or belt discharge is calculated correctly (Drum Plants)
 4.13 []* Gradation of aggregate from each hot bin is calculated correctly and blend calculations are correct (Batch Plants)
 4.14 []* Moisture content of aggregate is calculated correctly

* Recycled Materials

RAP size/Name _____

Date _____

- 4.15 [] Actual binder content calculated correctly (fines correction, if required, is used in calculation)
 4.16 [] Gradation of aggregate calculated correctly
 4.17 []* Moisture content calculated correctly
 4.18 []* Coarse Aggregate Angularity for RAP calculated correctly
 4.19 [] Gsb of recycled aggregate calculated correctly

Hot Mix Asphalt

Mixture _____

Date _____

- 4.20 [] Determination of Air Voids and VMA calculated correctly
 4.21 [] Actual binder content calculated correctly (fines correction, if required, is used in calculation)
 4.22 [] Gradation from mixture sample calculated correctly
 4.23 [] Dust/calculated effective binder ratio calculated correctly
 4.24 []* Moisture content calculated correctly
 4.25 [] Bulk Specific Gravity calculated correctly
 4.26 []* Aggregate degradation value (SMA only)
 4.27 [] Maximum Specific Gravity calculated correctly
 4.28 [] Volume of Effective Binder calculated correctly
 4.29 []* If ignition oven is utilized, correct calibration factors are used

Plant # _____

Page 9 of _____

5. HMA PLANT

ITM 583 Reference

2.5, 12.2

Audit Team Member: _____

Inspect the site and observe the operation of the Plant to verify that the production process is in accordance with the QCP and the Plant site layout diagram is correct.

Aggregates (material stockpiles)

- 5.1 []* Stockpiling procedure is in accordance with QCP
- 5.2 [] Stockpiles are adequately spaced and not contaminated
- 5.3 []* Cold bin loading procedure is in accordance with QCP

Binder Tanks

- 5.4 [] Binder tanks are labeled
- 5.5 [] Two binder samples per grade obtained this calendar year? If yes skip to 5.7
- 5.6 [] Binder samples obtained during audit

Anti-Adhesive Agent

- 5.7 []* Procedure for application of anti-adhesive agent is in accordance with QCP
- 5.8 [] Anti-adhesive agent supply is labeled with original manufactures label
Name: _____
- 5.9 [] Anti-adhesive is on approved list. Approval # : _____

Truck Loading

- 5.10 []* Procedure for loading trucks is in accordance with QCP

Other Process Control Techniques

- 5.11 []* Procedures are in accordance with QCP

6. COMPARISON TESTING

Audit Team Member: _____

Testing procedures required by the QCP will be observed to verify that they comply with the Sampling, Sample Reduction, and Testing Procedures checklist. IA comparison testing that occurs every 2 years will be adequate.

- 6.1 [] Independent Assurance Technician has completed
Date Comparison Testing Completed: _____
- 6.2 [] Independent Assurance Technician will complete
Estimated Comparison Testing Date: _____
- 6.3 [] Will be completed as part of this audit (Provide results to IA)

If comparison testing will be performed as part of this audit, the Producer’s Certified Technician shall obtain a sample of the mixture, the blended aggregate, and the RAP (if applicable). A separate blended aggregate sample is only required if specified by QCP. The samples obtained shall be split by the Producer’s Certified Technician and the Department’s portion given to the INDOT audit team member. Samples shall be tested by both the Producer and INDOT.

- 6.4 [] Sampling procedures are correct
- 6.5 [] Sample Reduction procedures are correct

The following test results will be determined. A copy of all test reports from both the INDOT audit team member and the Producer’s Certified Technician will be attached to the audit checklist. The variation of test results will be shown in the remarks section of the INDOT audit team member’s report for each material sampled and tested. The allowable variation will be as follows:

Sieves	Deviation (± %)
*1 in.	5
*3/4 in	5
*1/2 in.	5
No. 8	3
No. 30	3
No. 200	3

Binder Content	Deviation (± %)
*RAP	0.5
Mixture	0.5

- 6.6 [] Gradation is within limits
- 6.7 []* Binder content of RAP is within limits
- 6.8 [] Binder content of Mixture is within limits

7. AUDIT CLOSE-OUT

DTE or Area Supervisor

A meeting with the Producer will be conducted at the completion of the audit. The results of the audit will be discussed, and all outstanding matters will be completely resolved or solutions with deadlines will be established. An Audit Close-Out meeting with the Producer will be scheduled for two weeks after the Audit, or if circumstances require, at a time deemed appropriate by the DTE.

When all items indicated on Corrective Action Sheets have been addressed, and all testing results (if applicable) have been reviewed, the DTE and/or Area Supervisor will verify the audit package is prepared properly and completely. Upon completion of the Audit Close-Out meeting, all documents will be sent to the Asphalt Engineer, Office of Materials Management.

Corrective Action Sheets requiring longer than two weeks must be addressed by the DTE.

DTE/Area Supervisor

Date

CORRECTIVE ACTION SHEET

PLANT # _____

DATE _____

ITEM _____

Problem Explanation: _____

Corrective Action To Be Taken Is:

- Not Applicable; Observation.** This item occurred in the past and cannot be corrected.
- Not Applicable; Corrected.** This item was resolved at the audit.

Deadline Date Is: _____

Follow-up **Date** _____

Finding: _____

Corrective Action Sheets requiring longer than two weeks must be addressed by the DTE

CALCULATIONS

BINDER CONTENT (ITM 571)

$$\% \text{ Binder} = \frac{\text{Wt. of Sample} - (\text{Wt. of Extracted Aggregate} + \text{Wt. of Fines})}{\text{Wt. of Sample}} \times 100$$

HMA or RAP MOISTURE CONTENT (ITM 572)

$$\% \text{ Moisture} = \frac{\text{Wt. of Original Sample} - \text{Wt. of Dried Sample}}{\text{Wt. of Dried Sample}} \times 100$$

VOIDS in the MINERAL AGGREGATE (AASHTO R 35)

G_{sb} = Bulk Specific Gravity of Aggregate (obtained from DMF)

P_s = Aggregate, percent by total weight of HMA

$$\% \text{ VMA} = 100 - \frac{G_{mb} \times P_s}{G_{sb}}$$

AGGREGATE GRADATION (AASHTO T 27)

$$\% \text{ Passing} = \frac{\text{Wt. Passing Each Sieve}}{\text{Original Dry Sample Wt.}} \times 100$$

HMA or RAP EXTRACTED AGGREGATE GRADATION (AASHTO T 30)

$$\% \text{ Passing} = \frac{\text{Wt. Passing Each Sieve}}{\text{Original Dry Wt. of Aggregate} + \text{Wt. of Fines}^*} \times 100$$

*Not required for ignition oven

BULK SPECIFIC GRAVITY (Dense Graded and SMA) -- G_{mb} (AASHTO T 166)

$$G_{mb} = \frac{\text{Wt. of Specimen in Air}}{(\text{Wt. of Surface-Dry Specimen in Air}) - (\text{Wt. of Specimen in Water})}$$

$$\% \text{ Absorption} = \frac{(\text{Wt. of Surface-Dry Specimen in Air}) - (\text{Wt. of Specimen in Air})}{(\text{Wt. of Surface-Dry Specimen in Air}) - (\text{Wt. of Specimen in Water})}$$

CALCULATIONS (continued)

MAXIMUM SPECIFIC GRAVITY -- G_{mm} (AASHTO T 209)

A = weight of oven dry sample in air

A_1 = weight of surface dry sample

B = weight of container in water, g

C = weight of container and sample in water, g

D = weight of container filled with water at 77°F

E = weight of container filled with sample and water at 77°F

Weighing in Air

$$G_{mm} = \frac{A}{A + D - E}$$

Weighing in Water

$$G_{mm} = \frac{A}{A - (C - B)}$$

Supplemental Procedure

$$G_{mm} = \frac{A}{A_1 + D - E}$$

AGGREGATE MOISTURE CONTENT (AASHTO T 255)

$$\% \text{ Moisture} = \frac{\text{Wt. of Original Sample} - \text{Wt. of Dried Sample}}{\text{Wt. of Dried Sample}} \times 100$$

AIR VOIDS (AASHTO T 269)

$$\% \text{ Air Voids} = \frac{G_{mm} - G_{mb}}{G_{mm}} \times 100$$

DRAINDOWN (Open Graded and SMA) -- (AASHTO T 305)

$$\% \text{ Draindown} = \frac{A - B}{C} \times 100$$

A = final weight of plate or container, g

B = initial weight of plate or container, g

C = initial total sample weight, g

AGGREGATE DEGRADATION LOSS VALUE (SMA only) – (ITM 220)

Aggregate Degradation Loss, % = A - B

A = average % passing the No. 8 sieve from the gyratory specimens

B = % passing the No. 8 sieve from the uncompacted mixture sample

CALCULATIONS (continued)

BULK SPECIFIC GRAVITY (Open Graded) -- G_{mb} (AASHTO T331)

A = weight of dry specimen in air, g

B = weight of dry, sealed specimen, g

E = weight of sealed specimen in water, g

F_t = apparent specific gravity of plastic sealing material at 77°F

$$G_{mb} = \frac{A}{B - E - \frac{B - A}{F_t}}$$

COARSE AGGREGATE ANGULARITY (ASTM D 5821)

$$\% \text{CAA} = \frac{\text{Wt. of Crushed Particles}}{\text{Wt. of Crushed Particles} + \text{Wt. of Uncrushed Particles}} \times 100$$

VOLUME OF EFFECTIVE BINDER

$$V_{be} = \text{VMA} - \text{AV}$$

VMA = VMA of the mixture

AV = Air voids of the mixture

DUST TO CALCULATED EFFECTIVE BINDER RATIO

$$\text{Dust/Pbe} = \left(\frac{P_{200}}{P_{be}} \right)$$

P200 = aggregate passing the No. 200 sieve

Pbe = Percent of effective binder

$$P_{be} = \left(\frac{V_{be}}{G_{mb}/1.03} \right)$$

CALCULATIONS (continued)

Example Calculation for Recycled Materials Sampling and Testing

Contract R-38721 DMF 120460J Mixture 19.0 mm Int. Quantity 17,500 tons

Recycled Materials

$$\text{Total RAP used} = \text{Total mix quantity} \times \frac{\text{Percent RAP by Mass}}{100}$$

	Binder % RAS	Binder Replacement %	Virgin Binder %
	0.0%	24.7%	2.9%
			%

10.0% + 9.0%
= 19.0% RAP
by mass

Fine RAP/ Coarse RAP/ RAS in mixture, %	10.0%	9.0%	
Fine RAP/ Coarse RAP/ RAS binder, extracted, %	5.7%	4.1%	
Ignition oven test temp (°F)	1000		

$$\text{Total RAP used} = 17,500 \text{ tons mix} \times \frac{19.0\%}{100}$$

$$\text{Total RAP used} = 3,325 \text{ tons RAP}$$

Percent by mass from DMF 19.0 Total used (in tons) 3,325 tons

-- or --

Total Processed 3,325 tons

	QCP Frequency	Tests Required	Tests Completed
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Actual Binder Content	<u>1/1000 t RAP</u>	<u>3</u>	<u>5</u>
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Moisture	<u>1/1000 t RAP</u>	<u>3</u>	<u>5</u>
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Gradation	<u>1/1000 t RAP</u>	<u>3</u>	<u>5</u>
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CAA	<u>1/1000 t RAP</u>	<u>3</u>	<u>5</u>
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6.4 [✓]* Sampling and testing of Recycled Materials for actual binder content, moisture content, gradation and coarse aggregate angularity is in accordance with QCP