CERTIFIED
HOT MIX ASPHALT
PRODUCER PROGRAM
PARTIAL AUDIT CHECKLIST

Date _____ Page ___ of ___

Date of Full Audit _____

Plant No. _____

Producer _____

Plant Location _____

INDOT Audit Team Members

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

Producer Members

	Name	Position
1.	_____	Management Representative
2.	_____	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
  - Asphalt Technician Certification is current
    - If more than one Technician is listed, check all Technicians
  - Documents referenced in QCP, including test methods with revision dates
- Review previous audits, especially the most recent one
- Coordinate with Independent Assurance Technician for comparison testing schedule

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
ASC	Approved Supplier Certification
JMF	Job Mix Formula
DMF	Design Mix Formula
RAP	Reclaimed Asphalt Pavement
SMA	Stone Matrix Asphalt
WMA	Warm Mix 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
[O] Observation

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

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

2. DOCUMENTS Reference 2.0

Audit Team Member: _____

Determine whether the following documents are on file at the Producer's Lab or Plant:

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 Standard Specifications
2.3 [ ] Type A Certifications for PG 58-28 and PG 64-22 binder

3. DIARY Reference 8.0

Audit Team Member: _____

Select at random one production week for review of the diary. The diary shall 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
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 or JMF number
3.6 [ ] Contract or purchase order number the mixture was sent to
3.7 [ ] Time samples 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 Certified Technician or Management Representative
3.10 [ ]* Other person's signature counter-signed by Certified Technician or Management Representative

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

3.11 [ ] Nonconforming test(s) are noted in diary
- Control limits are exceeded for Binder Content, Air Voids, VMA, or aggregate gradation
- Moisture content exceeds 0.30% at the plant or 0.10% behind paver

3.12 [ ] Corrective action was taken

4. SAMPLING AND TESTING Reference 9.0

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_____ JMF_____ Mixture _____ Quantity _____

	QCP Frequency	**Tests Required**	**Tests Completed**
Blended Aggregates	_____	_____	_____

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

Recycled Materials

Note: For assistance, see calculation example page in appendix

Percent by mass from JMF _____ Total RAP used _____

	QCP Frequency	**Tests Required**	**Tests Completed**
Actual Binder Content	_____	_____	_____
Moisture	_____	_____	_____
Gradation	_____	_____	_____
CAA	_____	_____	_____

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

SAMPLING AND TESTING (continued)

Mixture

Plant	**QCP Frequency**	**Tests Required**	**Tests Completed**
Actual Binder Content	_____	_____	_____
Temperature	_____	_____	_____
Gradation (SMA Only)	_____	_____	_____
Draindown (OG & SMA)	_____	_____	_____
Moisture	_____	_____	_____

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

Pavement	**QCP Frequency**	**Tests Required**	**Tests Completed**
Air Voids	_____	_____	_____
VMA	_____	_____	_____
Actual Binder Content	_____	_____	_____
Gradation (SMA only)	_____	_____	_____
Moisture (surface only)	_____	_____	_____

4.4 [ ] Sampling and testing of Mixture from the pavement for air voids, VMA, actual binder content, gradation (SMA mixtures only), and moisture content (surface HMA only), is in accordance with QCP

Aggregate Stockpiles

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

PG Binder

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

SAMPLING AND TESTING (continued) Reference 9.0

Obtain the diary for one **HMA** mixture produced during 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 or 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 or JMF for base and intermediate mixtures.

2. The first 250 t and each subsequent 600 t of each DMF or JMF for surface mixtures.

Mixture_____ QCP Frequency _____ Quantity_____

Tests Required _____ Tests Completed _____

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 -- ± 1.5% from DMF/JMF
Binder Content -- ± 0.7% from DMF/JMF

4.9 [ ] Type D certifications are on file

4.10 [ ] Test results shown on Type D certifications match test reports

SAMPLING AND TESTING (continued) Reference 9.0

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.

Blended Aggregate

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

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

Hot Mix Asphalt -- Location of Sample _____

4.20 [ ] Determination of Air Voids and VMA calculated correctly
4.21 [ ] Binder content calculated correctly (Fines correction, if required, is used in calculation)
4.22 [ ]* Gradation from Mixture sample calculated correctly
4.23 [ ]* Moisture content calculated correctly
4.24 [ ] Bulk Specific Gravity calculated correctly
4.25 [ ] Maximum Specific Gravity calculated correctly
4.26 [ ]* If Ignition Oven is utilized, correct calibration factors are used

5. HMA PLANT Reference 13.2

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.

Material Stockpiles

5.1	[ ]*	Stockpile map is current and located as indicated in QCP
5.2	[ ]*	All stockpiles have signs as indicated in QCP
5.3	[ ]*	Stockpiling procedure is in accordance with QCP
5.4	[ ]	Stockpiles are adequately spaced and not contaminated
5.5	[ ]*	Cold bin loading procedure is in accordance with QCP

Binder Tanks

5.6	[ ]	Binder tanks are labeled

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 clearly _____
5.9	[ ]*	Anti-adhesive agent is product on Approved List

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 shall be observed to verify that they comply with the Sampling, Sample Reduction, and Testing Procedures checklist.

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 blended aggregate, the mixture, or the RAP, if applicable. A separate blended aggregate sample is only required if specified by QCP. The sample obtained shall be split by the Producer's Technician and the Department's portion given to the INDOT Technician. The sample 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 the test report from both the INDOT audit team member and the Producers 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	Max % Difference	Binder Content	Max % Difference
*1 in.	5	*RAP	0.5
*3/4 in.	5	Mixture	0.5
*1/2 in.	5		
No. 8	3		
No. 30	3		
No. 200	3		

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 District Testing Engineer.

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:_____

_____

_____

_____

_____

_____

Deadline Date Is: _____

<u>Follow-up</u> **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)

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

VOIDS in the MINERAL AGGREGATE (AASHTO R 35)

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

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

*Not required for ignition oven

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

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

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

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	Weighing in Water	Supplemental Procedure
$G_{mm} = \frac{A}{A + D - E}$	$G_{mm} = \frac{A}{A - (C - B)}$	$G_{mm} = \frac{A}{A_1 + D - E}$

AGGREGATE MOISTURE CONTENT (AASHTO T 255)

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

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

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)

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

CALCULATIONS (continued)

Example Calculation for Recycled Materials Sampling and Testing

Contract__R-38721_ JMF_120460J__ Mixture _19.0 mm Int._ Quantity __17,500 tons_

Recycled Materials

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

	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		

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

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

Percent by mass from JMF ___19.0____ Total used (in tons) _3,325_tons_

	QCP Frequency	Tests Required	Tests Completed
Actual Binder Content	_1/1000 t RAP_	_____3_____	_____5_____
Moisture	_1/1000 t RAP_	_____3_____	_____5_____
Gradation	_1/1000 t RAP_	_____3_____	_____5_____
CAA	_1/1000 t RAP_	_____3_____	_____5_____

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