WSDOT Errata to FOP for AASHTO R 47

Reducing Samples of Hot Mix Asphalt (HMA) to Testing Size

WAQTC FOP for AASHTO R 47 has been adopted by WSDOT with the following changes:

Procedure

Quartering Method

Note: If this method is being used for Initial Reduction of Field Sample, step 4 “turning the entire sample over a minimum of 4 times” for safety reasons is not required.

Procedure

Include items below:

Sample Identification

1. Each sample submitted for testing shall be accompanied by a transmittal letter completed in detail. Include the contract number, acceptance and mix design verification numbers, mix ID.
2. Samples shall be submitted in standard sample boxes, secured to prevent contamination and spillage.
3. Sample boxes shall have the following information inscribed with indelible-type marker: Contract number, acceptance and mix design verification numbers, mix ID.
4. The exact disposition of each quarter of the original field sample shall be determined by the agency.

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REDUCING SAMPLES OF HOT MIX ASPHALT (HMA) TO TESTING SIZE FOP FOR AASHTO R 47

Scope

This procedure covers sample reduction of Hot Mix Asphalt (HMA) to testing size in accordance with AASHTO R 47-14. The reduced portion is to be representative of the original sample.

Apparatus

- Thermostatically controlled oven capable of maintaining a temperature of at least 110°C (230°F) or high enough to heat the material to a pliable condition for splitting.
- Non-contact temperature measuring device.
- Metal spatulas, trowels, metal straightedges, or drywall taping knives, or a combination thereof; for removing HMA samples from the quartering device, cleaning surfaces used for splitting, etc.
- Square-tipped, flat-bottom scoop, shovel or trowel for mixing HMA before quartering.
- Miscellaneous equipment including hot plate, non-asbestos heat-resistant gloves or mittens, pans, buckets, and cans.
- Sheeting: Non-stick heavy paper, heat-resistant plastic, or other material as approved by the agency.
- Agency-approved release agent, free of solvent or petroleum-based material that could affect asphalt binder.
- Mechanical Splitter Type A (Quartermaster): having four equal-width chutes discharging into four appropriately sized sample receptacles. Splitter is to be equipped with a receiving hopper that will hold the sample until the release lever is activated with four sample receptacles of sufficient capacity to accommodate the reduced portion of the HMA sample from the mechanical splitter. Refer to AASHTO R 47, Figures 1 through 3, for configuration and required dimensions of the mechanical splitter.
- Mechanical Splitter Type B (Riffle): having a minimum of eight equal-width chutes discharging alternately to each side with a minimum chute width of at least 50 percent larger than the largest particle size. A hopper or straight-edged pan with a width equal to or slightly smaller than the assembly of chutes in the riffle splitter to permit uniform discharge of the HMA through the chutes without segregation or loss of material. Sample receptacles of sufficient width and capacity to receive the reduced portions of HMA from the riffle splitter without loss of material.

- Quartering Template: formed in the shape of a cross with equal length sides at right angles to each other. Template shall be manufactured of metal that will withstand heat and use without deforming. The sides of the quartering template should be sized so that the length exceeds the diameter of the flattened cone of HMA by an amount allowing complete separation of the quartered sample. Height of the sides must exceed the thickness of the flattened cone of HMA.

- Non-stick mixing surface that is hard, heat-resistant, clean, level, and large enough to permit HMA samples to be mixed without contamination or loss of material.

Sampling

Obtain samples according to the FOP for AASHTO T 168.

Sample Preparation

The sample must be warm enough to separate. If not, warm in an oven until it is sufficiently soft to mix and separate easily. Do not exceed either the temperature or time limits specified in the test method(s) to be performed.

Selection of Procedure (Method)

Refer to agency requirements when determining the appropriate method(s) of sample reduction. In general, the selection of a particular method to reduce a sample depends on the initial size of the sample vs. the size of the sample needed for the specific test to be performed. It is recommended that, for large amounts of material, the initial reduction be performed using a mechanical splitter. This decreases the time needed for reduction and minimizes temperature loss. Further reduction of the remaining HMA may be performed by a combination of the following methods, as approved by the agency. The methods for reduction are:

- Mechanical Splitter Method
  - Type A (Quartermaster)
  - Type B (Riffle Splitter)
- Quartering Method
  - Full Quartering
  - By Apex
- Incremental Method

Procedure

Mechanical Splitter Type A (Quartermaster)

1. Clean the splitter and apply a light coating of approved release agent to the surfaces that will contact HMA.

2. Close and secure hopper gates.

3. Place the four sample receptacles in the splitter so that there is no loss of material.

4. Remove the sample from the agency-approved container(s) and place in the mechanical splitter hopper. Avoid segregation, loss of HMA or the accidental addition of foreign material.

5. Release the handle, allowing the HMA to drop through the divider chutes and discharge into the four receptacles.

6. Any HMA that is retained on the surface of the splitter shall be removed and placed into the appropriate receptacle.

7. Close and secure the hopper gates.

8. Reduce the remaining HMA as needed by this method or a combination of the following methods as approved by the agency.

9. Combine the material contained in the receptacles from opposite corners and repeat the splitting process until an appropriate sample size is obtained.

10. Retain and properly identify the remaining unused portion of the HMA sample for further testing if required by the agency.

Mechanical Splitter Type B (Riffle)

1. When heating of the testing equipment is desired, it shall be heated to a temperature not to exceed 110ºC (230ºF).

2. Clean the splitter and apply a light coating of approved release agent to the surfaces that will come in contact with HMA (hopper or straight-edged pan, chutes, receptacles).

3. Place two empty receptacles under the splitter.

4. Carefully empty the HMA from the agency-approved container(s) into the hopper or straight-edged pan without loss of material. Uniformly distribute from side to side of the hopper or pan.

5. Discharge the HMA at a uniform rate, allowing it to flow freely through the chutes.

6. Any HMA that is retained on the surface of the splitter shall be removed and placed into the appropriate receptacle.

7. Reduce the remaining HMA as needed by this method or a combination of the following methods as approved by the agency.

8. Using one of the two receptacles containing HMA, repeat the reduction process until the HMA contained in one of the two receptacles is the appropriate size for the required test.

9. After each split, remember to clean the splitter hopper and chute surfaces if needed.

10. Retain and properly identify the remaining unused HMA sample for further testing if required by the agency.

Quartering Method

1. When heating of the testing equipment is desired, it shall be heated to a temperature not to exceed the maximum mixing temperature from the job mix formula (JMF).

2. If needed, apply a light coating of release agent to quartering template.

3. Dump the sample from the agency approved container(s) into a conical pile on a hard, "non-stick," clean, level surface where there will be neither a loss of material nor the accidental addition of foreign material. The surface can be made non-stick by the application of an approved asphalt release agent, or sheeting.

4. Mix the material thoroughly by turning the entire sample over a minimum of four times with a flat-bottom scoop; or by alternately lifting each corner of the sheeting and pulling it over the sample diagonally toward the opposite corner, causing the material to be rolled. Create a conical pile by either depositing each scoop or shovelful of the last turning on top of the preceding one or lifting both opposite corners.

5. Flatten the conical pile to a uniform diameter and thickness where the diameter is four to eight times the thickness. Make a visual observation to ensure that the material is homogeneous.

6. Divide the flattened cone into four equal quarters using the quartering template or straightedges assuring complete separation.

7. Reduce to appropriate sample mass by full quartering or by apex.

Full Quartering

1. Remove two diagonally opposite quarters, including all of the fine material.
2. Remove the quartering template, if used.
3. Combine the remaining quarters.
4. Remix and form a conical pile.
5. Flatten the conical pile to a uniform diameter and thickness where the diameter is four to eight times the thickness. Make a visual observation to ensure that the material is homogeneous.
6. Divide the flattened cone into four equal quarters using the quartering template or straightedges assuring complete separation.
7. Remove two diagonally opposite quarters, including all of the fine material. Repeat until appropriate sample mass is obtained. The final sample must consist of the two remaining diagonally opposite quarters.

Retain and properly identify the remaining unused portion of the HMA sample for further testing if required by the agency.

By Apex

1. Using a straightedge, slice through a quarter of the HMA from the center point to the outer edge of the quarter.
2. Pull or drag the material from the quarter with two straight edges or hold one edge of the straightedge in contact with quartering device.
3. Remove an equal portion from the diagonally opposite quarter and combine these increments to create the appropriate sample mass.
4. Continue using the apex method with the unused portion of the HMA until samples have been obtained for all required tests.
5. Retain and properly identify the remaining unused portion of the HMA sample for further testing if required by the agency.

Incremental Method

1. Cover a hard, clean, level surface with sheeting. This surface shall be large enough that there will be neither a loss of material nor the accidental addition of foreign material.

2. Place the sample from the agency approved container(s) into a conical pile on that surface.

3. Mix the material thoroughly by turning the entire sample over a minimum of four times:

   a. Use a flat-bottom scoop; or

   b. Alternately lift each corner of the sheeting and pull it over the sample diagonally toward the opposite corner, causing the material to be rolled.

4. Create a conical pile by either depositing each scoop or shovelful of the last turning on top of the preceding one or lifting both opposite corners.

5. Grasp the sheeting and roll the conical pile into a cylinder (loaf), then flatten the top. Make a visual observation to determine that the material is homogenous.

6. Remove one quarter of the length of the loaf and place in a container to be saved; by either:

   a. Pull sheeting over edge of counter and drop material into container.

   b. Use a straightedge to slice off material and place into container.

   7. Obtain an appropriate sample mass for the test to be performed.

   a. Pull sheeting over edge of counter and drop cross sections of the material into container until proper sample mass has been obtained.

   b. Use a straightedge to slice off cross sections of the material until proper sample mass has been obtained and place into container.

   Note1: When reducing the sample to test size it is advisable to take several small increments, determining the mass each time until the proper minimum size is achieved. Unless the sample size is grossly in excess of the minimum or exceeds the maximum test size, use the sample as reduced for the test.

8. Repeat Step 7 until all the samples for testing have been obtained or until final quarter is reached.

9. Retain and properly identify the remaining unused portion of the HMA sample for further testing if required by the agency.

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PERFORMANCE EXAM CHECKLIST

REDUCING SAMPLES OF HOT MIX ASPHALT (HMA) TO TESTING SIZE FOP FOR AASHTO R 47

Participant Name _____ Exam Date _____

Record the symbols "P" for passing or "F" for failing on each step of the checklist.

Procedure Element	**Trial 1**	**Trial 2**
1. Sample made soft enough to separate easily without exceeding temperature limits?	_____	_____
Mechanical Splitter Method Type A (Quartermaster)		
1. Splitter cleaned and surfaces coated with release agent?	_____	_____
2. Hopper closed and receptacles in place?	_____	_____
3. Sample placed into hopper without segregation or loss of material?	_____	_____
4. Hopper handle released allowing the HMA to uniformly flow into receptacles?	_____	_____
5. Splitter surfaces cleaned of all retained HMA, allowing it to fall into appropriate receptacles?	_____	_____
6. Further reduction with the quartermaster:		
a. Material in receptacles from opposite corners combined?	_____	_____
b. Splitting process repeated until appropriate sample mass is obtained?	_____	_____
7. Remaining HMA stored in suitable container and properly labeled?	_____	_____
Mechanical Splitter Method Type B (Riffle)		
1. Splitting apparatus and tools, if preheated, not exceeding 110ºC (230ºF)?	_____	_____
2. Splitter cleaned, and surfaces coated with release agent?	_____	_____
3. Two empty receptacles placed under splitter?	_____	_____
4. Sample placed in hopper or straight edged pan without loss of material and uniformly distributed from side to side?	_____	_____
5. Material discharged across chute assembly at controlled rate allowing free flow of HMA through chutes?	_____	_____
6. Splitter surfaces cleaned of all retained HMA allowing it to fall into appropriate receptacles?	_____	_____

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Procedure Element	Trial 1	Trial 2
7. Further reduction with the riffle splitter:		
a. Material from one receptacle discharged across chute assembly at controlled rate, allowing free flow of HMA through chutes?	_____	_____
b. Splitting process continued until appropriate sample mass obtained, with splitter surfaces cleaned of all retained HMA after every split?	_____	_____
8. Remaining unused HMA stored in suitable container, properly labeled?	_____	_____
Quartering Method		
1. Testing equipment preheated to a temperature not to exceed mix temperature?	_____	_____
2. Sample placed in a conical pile on a hard, non-stick, heat-resistant splitting surface such as metal or sheeting?	_____	_____
3. Sample mixed by turning the entire sample over a minimum of 4 times?	_____	_____
4. Conical pile formed and then flattened uniformly to diameter equal to about 4 to 8 times thickness?	_____	_____
5. Sample divided into 4 equal portions either with a metal quartering template or straightedges such as drywall taping knives?	_____	_____
6. Reduction by Full Quartering:		
a. Two diagonally opposite quarters removed and returned to sample container?	_____	_____
b. Two other diagonally opposite quarters combined and process continued until appropriate sample mass has been achieved?	_____	_____
7. Reduction by Apex:		
a. Using two straightedges or a quartering device and one straightedge, was one of the quarters split from apex to outer edge of material?	_____	_____
b. Similar amount of material taken from the diagonally opposite quarter?	_____	_____
c. Increments combined to produce appropriate sample mass?	_____	_____
8. Remaining unused HMA stored in suitable container, properly labeled?	_____	_____
Incremental Method		
1. Sample placed on hard, non-stick, heat-resistant splitting surface covered with sheeting?	_____	_____
2. Sample mixed by turning the entire sample over a minimum of 4 times?	_____	_____

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Procedure Element	**Trial 1**	**Trial 2**
3. Conical pile formed?	_____	_____
4. HMA rolled into loaf and then flattened?	_____	_____
5. The first quarter of the loaf removed by slicing off or dropping off edge of counter and set aside?	_____	_____
6. Proper sample mass sliced off or dropped off edge of counter into sample container?	_____	_____
7. Process continued until all samples are obtained or final quarter is remaining?	_____	_____
8. All remaining unused HMA stored in suitable container, properly labeled?	_____	_____

Comments: First attempt: Pass____Fail_____ Second attempt: Pass_____Fail_____

Examiner Signature _____ WAQTC #:_____

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