

## **WSDOT Errata to FOP for AASHTO R 76**

### ***Reducing Samples of Aggregate to Testing Size***

WAQTC FOP for AASHTO R 76 has been adopted by WSDOT with the following changes:

**Procedure**

**Method A – Mechanical Splitter**

**Mechanical Splitter Check - *Step not required by WSDOT***



## REDUCING SAMPLES OF AGGREGATE TO TESTING SIZE FOP FOR AASHTO R 76

### Scope

This procedure covers the reduction of samples to the appropriate size for testing in accordance with AASHTO R 76-23. Techniques are used that minimize variations in characteristics between test samples and field samples. Method A (Mechanical Splitter) and Method B (Quartering) are covered.

This FOP applies to fine aggregate (FA), coarse aggregate (CA), and combinations of the two (FA / CA) and may also be used on soils.

### Terminology

Saturated Surface-Dry (SSD) – condition of an aggregate particle when the permeable voids are filled with water, but no water is present on exposed surfaces.

*Note 1:* As a quick approximation, if the fine aggregate will retain its shape when molded in the hand, it may be considered wetter than saturated surface-dry.

### Apparatus

#### Method A – Mechanical Splitter

Splitter chutes:

- Even number of equal width chutes
- Discharge alternately to each side
- Minimum of 8 chutes total for CA and FA / CA, 12 chutes total for FA
- Width:
  - Minimum 50 percent larger than largest particle
  - Maximum chute width of 19 mm (3/4 in.) for fine aggregate passing the 9.5 mm (3/8 in.) sieve
- Feed Control:
  - Hopper or straightedge pan with a width equal to or slightly less than the overall width of the assembly of chutes
  - Capable of feeding the splitter at a controlled rate
- Splitter receptacles / pans:
  - Capable of holding two halves of the sample following splitting

The splitter and accessory equipment shall be so designed that the sample will flow smoothly without restriction or loss of material.

**Method B – Quartering and Sectoring**

- Straightedge scoop, shovel, or trowel
- Broom or brush
- Stick or pipe
- Tarp: A tear resistant rectangular tarp,, appropriate for the amount and size of the material being reduced.
- Quartering Template: Formed in the shape of a 90-degree cross with equal length sides that exceed the diameter of the flattened cone of material sufficient to allow complete separation of the quartered sample. The height of the sides must be sufficient to extend above the thickness of the flattened cone of the sample to be quartered.

**Method Selection**

Selecting the method of sample reduction depends on

- The type of material: fine aggregate (FA), coarse aggregate (CA), and combinations of the two (FA / CA)
- The moisture content: drier than saturated surface-dry (SSD), SSD, or wetter than SSD.

*Note 2:* To use Method A on samples of FA and CA/FA that are at SSD or wetter, the entire sample may be dried – using temperatures that do not exceed those specified for any of the tests contemplated – and then reduced.

Select from the following methods based on the material type and moisture condition.

**Method A Mechanical**

- CA
- FA/CA drier than SSD
- FA drier than SSD

**Method B Quartering**

- CA
- FA/CA
- FA at SSD or wetter

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**Method B Sectoring**

- FA at SSD or wetter

**Table 1**

	<b>Drier than SSD</b>	<b>SSD or Wetter</b>
Fine Aggregate (FA)	Method A Mechanical	Method B Quartering Method B Sectoring
Mixture of FA/CA	Method A Mechanical Method B Quartering	Method B Quartering
Coarse Aggregate (CA)	Method A Mechanical Method B Quartering	Method A Mechanical Method B Quartering

**Procedure****Method A – Mechanical Splitter**

1. Place two clean empty receptacles under the splitter.
2. Empty the sample into the hopper or pan without loss of material.
3. Uniformly distribute the material in the hopper or pan from edge to edge so that approximately equal amounts flow through each chute.
4. Discharge the material at a uniform rate, allowing it to flow freely through the chutes.
5. Remove any material retained on the surface of the splitter and place into the appropriate receptacle.
6. Using one of the two receptacles containing material, repeat Steps 1 through 6 until the material in one of the two receptacles is the appropriate sample size for the required test.
7. Retain and properly identify the remaining unused sample for further testing if required.

**Mechanical Splitter Check**

- Determine the mass of each reduced portion. If the percent difference of the two masses is greater than 5 percent, corrective action must be taken.

**Calculation**

$$\frac{\text{Smaller Mass}}{\text{Larger Mass}} = \text{Ratio} \quad (1 - \text{ratio}) \times 100 = \% \text{ Difference}$$

Splitter check: 5127 g total sample mass

Splitter pan #1: 2583 g

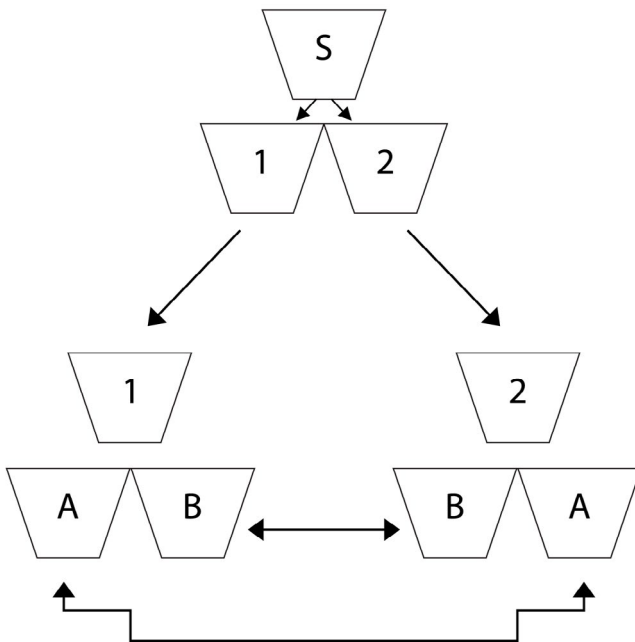
Splitter pan #2: 2544 g

$$\frac{2544 \text{ g}}{2583 \text{ g}} = 0.985 \quad (1 - 0.985) \times 100 = 1.5\%$$

**Alternative to Mechanical Splitter Check**

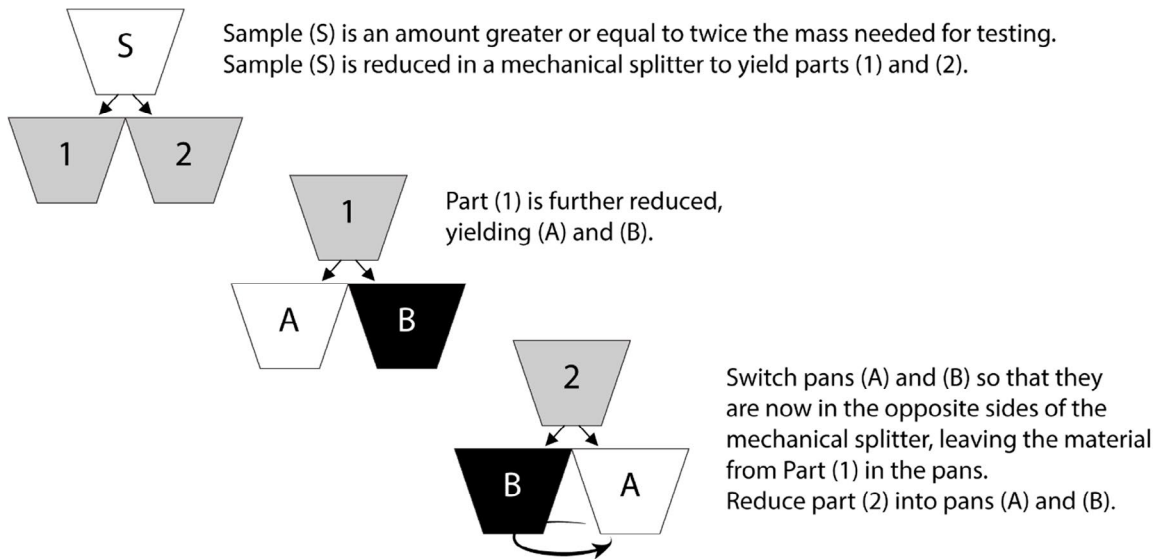
- In lieu of determining the mass of each reduced portion, use the method illustrated in Figure 1 or 2 during reduction.

**Figure 1**



- Sample (S) is an amount greater than or equal to twice the mass needed for testing. Sample (S) is reduced in a mechanical splitter to yield parts (1) and (2).
- Part (1) is further reduced yielding (A) and (B) while part (2) is reduced to yield (B) and (A).
- Final testing sample is produced by combining alternate pans, i.e. A/A or B/B only.

Figure 2



## Method B

### Method B Quartering

Use either of the following two procedures or a combination of both.

#### Surface

1. Place the sample on a hard, clean, level surface where there will be neither loss of material nor the accidental addition of foreign material.
2. Mix the material thoroughly by turning the entire sample over a minimum of four times. With the last turning, shovel the entire sample into a conical pile by depositing each shovelful on top of the preceding one.
3. Flatten the conical pile to a uniform thickness and diameter by pressing down with a shovel. The diameter should be four to eight times the thickness.
4. Divide the flattened pile into four approximately equal quarters with a shovel or trowel.
5. Remove two diagonally opposite quarters, including all fine material, and brush the cleared spaces clean.
6. Successively mix and quarter the remaining material until the sample is reduced to the desired size.
7. The final test sample consists of two diagonally opposite quarters.

**Tarp**

1. Place the sample on the tarp.
2. Mix the material thoroughly a minimum of four times by pulling each corner of the tarp horizontally over the sample toward the opposite corner. After the last turn, form a conical pile.
3. Flatten the conical pile to a uniform thickness and diameter by pressing down with a shovel. The diameter should be four to eight times the thickness.
4. Divide the flattened pile into four approximately equal quarters with a shovel or trowel or insert a stick or pipe beneath the tarp and under the center of the pile, then lift both ends of the stick, dividing the sample into two roughly equal parts. Remove the stick leaving a fold of the tarp between the divided portions. Insert the stick under the center of the pile at right angles to the first division and again lift both ends of the stick, dividing the sample into four roughly equal quarters.
5. Remove two diagonally opposite quarters, being careful to clean the fines from the tarp.
6. Successively mix and quarter the remaining material until the sample size is reduced to the desired size.
7. The final test sample consists of two diagonally opposite quarters.

**Method B Sectoring**

1. Place the sample on a hard, clean, level surface where there will be neither loss of material nor the accidental addition of foreign material.
2. Mix the material thoroughly by turning the entire sample over a minimum of four times. With the last turning, shovel the entire sample into a conical pile by depositing each shovelful on top of the preceding one.
3. Flatten the conical pile to a uniform thickness and diameter by pressing down with a shovel. The diameter should be four to eight times the thickness.
4. Divide the flattened cone into four approximately equal quarters using a quartering template, straightedge, shovel, or trowel, assuring complete separation.
5. Using a straightedge, obtain a sector by slicing through a quarter of the material from the center point to the outer edge of the quarter.
6. Pull or drag the sector from the quarter with two straight edges or hold one edge of the straightedge in contact with quartering device.



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7. Remove an equal sector from the diagonally opposite quarter and combine to create the appropriate sample mass.
8. Continue obtaining sectors from diagonally opposite quarters until the required sample size has been obtained for all required tests.

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Aggregate 10-8

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## PERFORMANCE EXAM CHECKLIST

### REDUCING SAMPLES OF AGGREGATE TO TESTING SIZE FOP FOR AASHTO R 76

Participant Name \_\_\_\_\_ Exam Date \_\_\_\_\_

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

	Trial 1	Trial 2
<b>Method A - Splitting</b>		
1. Chutes appropriate size and number?	_____	_____
2. Material spread uniformly on feeder?	_____	_____
3. Rate of feed slow enough so that sample flows freely through chutes?	_____	_____
4. Material in one pan re-split until desired mass is obtained?	_____	_____
5. Mechanical splitter checked or alternative used?	_____	_____
<b>Method B - Quartering</b>		
1. Sample placed on a tarp or clean, hard, and level surface?	_____	_____
2. Mixed by turning over 4 times with shovel or by pulling the tarp horizontally over pile?	_____	_____
3. Conical pile formed without loss of material?	_____	_____
4. Pile flattened to uniform thickness and diameter?	_____	_____
5. Diameter equal to about 4 to 8 times thickness?	_____	_____
6. Divided into 4 equal portions without loss of material?		
a. Using a shovel or trowel?	_____	_____
b. Placing stick or pipe under the tarp?	_____	_____
c. Using quartering template?	_____	_____
7. Quartering		
a. Two diagonally opposite quarters, including all fine material, removed?	_____	_____
b. Process continued until desired sample size is obtained when two opposite quarters combined?	_____	_____
8. Sectoring		
a. Using two straightedges or a quartering device and one straightedge, sector obtained from one of the quarters from the center point to the outer edge of the quarter?	_____	_____
b. Equal sector obtained taken from the diagonally opposite quarter?	_____	_____

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9. Increments combined to produce appropriate sample mass? \_\_\_\_\_

Comments: First attempt: Pass \_\_\_\_\_ Fail \_\_\_\_\_ Second attempt: Pass \_\_\_\_\_ Fail \_\_\_\_\_

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\_\_\_\_\_  
\_\_\_\_\_

Examiner Signature \_\_\_\_\_ WAQTC #: \_\_\_\_\_