

WSDOT Errata to FOP for AASHTO R 90

Sampling Aggregate Products

WAQTC FOP for AASHTO R 90 has been adopted by WSDOT with the following changes:

Procedure – General

TABLE 1 Recommended Sample Sizes – *Shall conform to the following table, nominal maximum size definition and note.*

Nominal Maximum Size*in (mm)		Minimum Mass lb (kg)	
US No. 4	(4.75)	5	(2)
¼	(6.3)	10	(4)
⅜	(9.5)	10	(4)
½	(12.5)	20	(8)
⅝	(16.0)	20	(8)
¾	(19.0)	30	(12)
1	(25.0)	55	(25)
1¼	(31.5)	70	(30)
1½	(37.5)	80	(36)
2	(50)	90	(40)
2½	(63)	110	(50)
3	(75)	140	(60)
3½	(90)	180	(80)

*For Aggregate, the nominal maximum size sieve is the largest standard sieve opening listed in the applicable specification upon which more than 1-percent of the material by weight is permitted to be retained. For concrete aggregate, the nominal maximum size sieve is the smallest standard sieve opening through which the entire amount of aggregate is permitted to pass.

Note: For an aggregate specification having a generally unrestrictive gradation (i.e., wide range of permissible upper sizes), where the source consistently fully passes a screen substantially smaller than the maximum specified size, the nominal maximum size, for the purpose of defining sampling and test specimen size requirements may be adjusted to the screen, found by experience to retain no more than 5 percent of the materials.

Procedure – Specific Situations

Roadways

Method A (Berm or Windrow) – *Method not recognized by WSDOT.*

Method B (In-Place) – *Method not recognized by WSDOT.*

SAMPLING AGGREGATE PRODUCTS FOP FOR AASHTO R 90

Scope

This procedure covers sampling of coarse, fine, or a combination of coarse and fine aggregates (CA and FA) in accordance with AASHTO R 90-18. Sampling from conveyor belts, transport units, roadways, and stockpiles is covered.

Apparatus

- Shovels or scoops, or both
- Brooms, brushes, and scraping tools
- Sampling tubes of acceptable dimensions
- Mechanical sampling systems: normally a permanently attached device that allows a sample container to pass perpendicularly through the entire stream of material or diverts the entire stream of material into the container by manual, hydraulic, or pneumatic operation
- Belt template
- Sampling containers

Procedure – General

Sampling is as important as testing. The technician shall use every precaution to obtain samples that are representative of the material. Determine the time or location for sampling in a random manner.

1. Wherever samples are taken, obtain multiple increments of approximately equal size.
2. Mix the increments thoroughly to form a field sample that meets or exceeds the minimum mass recommended in Table 1.

TABLE 1
Recommended Sample Sizes

Nominal Maximum Size*	Minimum Mass
mm (in.)	g (lb)
90 (3 1/2)	175,000 (385)
75 (3)	150,000 (330)
63 (2 1/2)	125,000 (275)
50 (2)	100,000 (220)
37.5 (1 1/2)	75,000 (165)
25.0 (1)	50,000 (110)
19.0 (3/4)	25,000 (55)
12.5 (1/2)	15,000 (35)
9.5 (3/8)	10,000 (25)
4.75 (No. 4)	10,000 (25)
2.36 (No. 8)	10,000 (25)

* One sieve larger than the first sieve to retain more than 10 percent of the material using an agency specified set of sieves based on cumulative percent retained. Where large gaps in specification sieves exist, intermediate sieve(s) may be inserted to determine nominal maximum size. Maximum size is one size larger than nominal maximum size.

Note 1: Sample size is based upon the test(s) required. As a general rule, the field sample size should be such that, when split twice will provide a testing sample of proper size. For example, the sample size may be four times that shown in Table 1 of the FOP for AASHTO T 27/T 11, if that mass is more appropriate.

Procedure – Specific Situations

Conveyor Belts

Avoid sampling at the beginning or end of the aggregate run due to the potential for segregation. Be careful when sampling in the rain. Make sure to capture fines that may stick to the belt or that the rain tends to wash away.

Method A (From the Belt)

1. Stop the belt.
2. Set the sampling template in place on the belt, avoiding intrusion by adjacent material.
3. Remove the material from inside the template, including all fines.
4. Obtain at least three approximately equal increments.
5. Combine the increments and mix thoroughly to form a single sample.

Method B (From the Belt Discharge)

1. Pass a sampling device through the full stream of the material as it runs off the end of the conveyor belt. The sampling device may be manually, semi-automatic or automatically powered.
2. The sampling device shall pass through the stream at least twice, once in each direction, without overfilling while maintaining a constant speed during the sampling process.
3. When emptying the sampling device into the container, include all fines.
4. Combine the increments and mix thoroughly to form a single sample.

Transport Units

1. Visually divide the unit into four quadrants.
2. Identify one sampling location in each quadrant.
3. Dig down and remove approximately 0.3 m (1 ft.) of material to avoid surface segregation. Obtain each increment from below this level.
4. Combine the increments and mix thoroughly to form a single sample.

Roadways**Method A (Berm or Windrow)**

1. Obtain sample before spreading.
2. Take the increments from at least three random locations along the fully formed windrow or berm. Do not take the increments from the beginning or the end of the windrow or berm.
3. Obtain full cross-section samples of approximately equal size at each location. Take care to exclude the underlying material.
4. Combine the increments and mix thoroughly to form a single sample.

Note 2: Obtaining samples from berms or windrows may yield extra-large samples and may not be the preferred sampling location.

Method B (In-Place)

1. Obtain sample after spreading and before compaction.
2. Take the increments from at least three random locations.
3. Obtain full-depth increments of approximately equal size from each location. Take care to exclude the underlying material.
4. Combine the increments and mix thoroughly to form a single sample.

Stockpiles**Method A – Loader Sampling**

1. Direct the loader operator to enter the stockpile with the bucket at least 150 mm (6 in.) above ground level without contaminating the stockpile.
2. Discard the first bucketful.
3. Have the loader re-enter the stockpile and obtain a full loader bucket of the material, tilt the bucket back and up.
4. Form a small sampling pile at the base of the stockpile by gently rolling the material out of the bucket with the bucket just high enough to permit free flow of the material. (Repeat as necessary.)
5. Create a flat surface by having the loader back drag the small pile.
6. Visually divide the flat surface into four quadrants.
7. Collect an increment from each quadrant by fully inserting the shovel into the flat pile as vertically as possible, take care to exclude the underlying material, roll back the shovel and lift the material slowly out of the pile to avoid material rolling off the shovel.
8. Combine the increments and mix thoroughly to form a single sample.

Method B – Stockpile Face Sampling

1. Create horizontal surfaces with vertical faces in the top, middle, and bottom third of the stockpile with a shovel or loader.
2. Prevent continued sloughing by shoving a flat board against the vertical face. Sloughed material will be discarded to create the horizontal surface.
3. Obtain sample from the horizontal surface as close to the intersection as possible of the horizontal and vertical faces.
4. Obtain at least one increment of equal size from each of the top, middle, and bottom thirds of the pile.
5. Combine the increments to and mix thoroughly form a single sample.

Method C – Alternate Tube Method (Fine Aggregate)

1. Remove the outer layer that may have become segregated.
2. Using a sampling tube, obtain one increment of equal size from a minimum of five random locations on the pile.
3. Combine the increments to and mix thoroughly form a single sample.

Identification and Shipping

- Identify samples according to agency standards.
- Include sample report (below).
- Ship samples in containers that will prevent loss, contamination, or damage of material.

Report

- On forms approved by the agency
- Date
- Time
- Sample ID
- Sampling method
- Location
- Quantity represented
- Material type
- Supplier

AGGREGATE

WAQTC

FOP AASHTO R 90 (22)

PERFORMANCE EXAM CHECKLIST

**SAMPLING AGGREGATE PRODUCTS
FOP FOR AASHTO R 90**

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
Conveyor Belts – Method A (From the Belt)		
1. Belt stopped?	_____	_____
2. Sampling template set on belt, avoiding intrusion of adjacent material?	_____	_____
3. Sample, including all fines, scooped off?	_____	_____
4. Samples taken in at least three approximately equal increments?	_____	_____
5. Increments combined and mixed to form a single sample?	_____	_____
Conveyor Belts – Method B (From the Belt Discharge)		
6. Sampling device passed through full stream of material twice (once in each direction) as it runs off end of belt?	_____	_____
7. Increments combined and mixed to form a single sample?	_____	_____
Transport Units		
8. Unit divided into four quadrants?	_____	_____
9. Increment obtained from each quadrant, 0.3 m (1ft.) below surface?	_____	_____
10. Increments combined and mixed to form a single sample?	_____	_____
Roadways Method A (Berm or Windrow)		
11. Sample taken before spreading?	_____	_____
12. Full depth of material taken?	_____	_____
13. Underlying material excluded?	_____	_____
14. Samples taken in at least three approximately equal increments?	_____	_____
15. Increments combined and mixed to form a single sample?	_____	_____

OVER

AGGREGATE

WAQTC

FOP AASHTO R 90 (22)

Roadways Method B (In-place)

- 16. Sample taken after spreading? _____
- 17. Full depth of material taken? _____
- 18. Underlying material excluded? _____
- 19. Samples taken in at least three approximately equal increments? _____
- 20. Increments combined and mixed to form a single sample? _____

Stockpile Method A– (Loader sampling)

- 21. Loader operator directed to enter the stockpile with the bucket at least 150 mm (6 in.) above ground level without contaminating the stockpile? _____
- 22. First bucketful discarded? _____
- 23. The loader re-entered the stockpile and obtained a full loader bucket of the material with the bucket tilted back and up? _____
- 24. A small sampling pile formed at the base of the stockpile by gently rolling the material out of the bucket with the bucket just high enough to permit free-flow of the material? _____
- 25. A flat surface created by the loader back dragging the small pile? _____
- 26. Increment sampled from each quadrant by fully inserting the shovel into the flat pile as vertically as possible, care taken to exclude the underlying material? _____
- 27. Increments combined and mixed to form a single sample? _____

Stockpile Method B (Stockpile Face)

- 28. Created horizontal surfaces with vertical faces? _____
- 29. At least one increment taken from each of the top, middle, and bottom thirds of the stockpile. _____
- 30. Increments combined and mixed to form a single sample? _____

Stockpile Method C – Alternate Tube Method (Fine Aggregate)

- 31. Outer layer removed? _____
- 32. Increments taken from at least five locations with a sampling tube? _____
- 33. Increments combined and mixed to form a single sample? _____

Comments: First attempt: Pass ___ Fail ___ Second attempt: Pass ___ Fail ___

Examiner Signature _____ WAQTC #: _____

PERFORMANCE EXAM CHECKLIST (ORAL)

**SAMPLING AGGREGATE PRODUCTS
FOP FOR AASHTO R 90**

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. How is a sample obtained from a conveyor belt using Method A?		
a. Stop the belt.	_____	_____
b. Set the sampling template on belt, avoiding intrusion of adjacent material.	_____	_____
c. All the material is removed from belt including all fines.	_____	_____
d. Take at least three approximately equal increments.	_____	_____
e. Combine and mix to form a single sample.	_____	_____
2. How is a sample obtained from a conveyor belt using Method B?		
a. Pass the sampling device through a full stream of material as it runs off the end of the belt.	_____	_____
b. The device must be passed through at least twice (once in each direction).	_____	_____
c. Increments combined and mixed to form a single sample?	_____	_____
d. Combine and mix to form a single sample.	_____	_____
3. How is a sample obtained from a Transport Unit?		
a. Divide the unit into four quadrants.	_____	_____
b. Dig 0.3 m (1 ft.) below surface.	_____	_____
c. Obtain an increment from each quadrant.	_____	_____
d. Combine and mix to form a single sample.	_____	_____
4. Describe the procedure for sampling from roadways Method A (Berm or Windrow).		
a. Sample before spreading	_____	_____
b. Sample the material full depth without obtaining underlying material.	_____	_____
c. Take at least three approximately equal increments.	_____	_____
d. Combine and mix to form a single sample.	_____	_____

OVER

Procedure Element

Trial 1 Trial 2

5. Describe the procedure for sampling from roadway Method B (In-place).

- a. Sample after spreading, before compaction. _____
- b. Sample the material full depth without obtaining underlying material. _____
- c. Take at least three approximately equal increments. _____
- d. Combine and mix to form a single sample. _____

6. Describe the procedure for sampling a stockpile Method A (Loader Sampling).

- a. Loader enters the stockpile at least 150 mm (6in.) above ground level. _____
- b. Loader discard first bucket full. _____
- c. Loader obtains a full bucket of material and forms a small sampling pile. _____
- d. Loader back drags pile to create a flat surface. _____
- e. Divide the flat surface into four quadrants. _____
- f. Take an approximately equal increment from each quadrant, excluding the underlying material. _____
- g. Combine and mix to form a single sample. _____

7. Describe the procedure for sampling a stockpile Method B (Stockpile Face Sampling).

- a. Create horizontal surfaces with vertical faces with a shovel. _____
- b. At least one increment taken from each of the top, middle, and bottom thirds of the stockpile. _____
- c. Combine and mix to form a single sample. _____

8. Describe the procedure for sampling a stockpile Method C – Alternate Tube Method (Fine Aggregate).

- a. Remove the outer layer of segregated material. _____
- b. Obtain increments using sampling tube from at least five locations. _____
- c. Combine and mix to form a single sample. _____

Comments: First attempt: Pass _____ Fail _____ Second attempt: Pass _____ Fail _____

Examiner Signature _____ WAQTC #: _____