T 2

SAMPLING OF AGGREGATES

FOP FOR AASHTO T 2

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Sampling aggregate

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Significance

Tests cannot be performed on all the material included in an entire project, so samples are taken from the whole. Proper material sampling is critical to all subsequent testing. If the representative portion obtained through sampling does not truly represent the material, any analysis of that portion is inappropriate for the project at hand. Since only a portion of the whole is used, that portion must be a reliable reflection of the whole. The size of the sample will depend upon the tests to be run and on the nominal maximum size of the aggregate.

Scope

This procedure covers sampling of fine, coarse, and mixtures of fine and coarse aggregates (FA, CA, FA/CA) in accordance with AASHTO T 2. Sampling from conveyor belts, aggregate feeders, transport units, roadways, and stockpiles is covered.

The specifications for some materials may require the contractor to provide a mechanical sampling system at crushers, screening operations, and mixing plants. This system is 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. The sample container is normally larger at the bottom than the top (trapezoidal shaped), with the opening in the top based on the size of aggregate being sampled.

04 Operation may be hydraulic, pneumatic, or manual, and shall allow the sample container to pass through the stream at least twice, once in each direction, without overfilling. With manually operated systems, a consistent operating speed is difficult to maintain and may result in variably sized, non-representative samples. For this reason, some agency specifications require that the sampling device be automatic or semi-automatic.

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Apparatus

06 **Apparatus**

- Shovels, scoops, sampling tubes of acceptable dimensions.
- Custom built sampling devices or templates suitable for varied sampling scenarios, and sampling containers.

07 **Procedure - General**

Sampling is as important as testing, and the technician shall use every precaution to obtain samples that will show the true nature and condition of the materials the sample represents.

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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.

09 Size of sample depends on the test to be run and the nominal maximum aggregate size.

10 ***Note 1:*** Based upon the tests required, the sample size may be four times that shown in Table 2 of the FOP for AASHTO T 27/T 11, if that mass is more appropriate. As a general rule the field sample size should be such that, when split twice, will provide a testing sample of proper size.

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TABLE 1
Sample Sizes

Nominal Maximum Size* (in.)	Minimum Mass grams	(lb)
No. 8	10,000	(25)
No. 4	10,000	(25)
3/8	10,000	(25)
1/2	15,000	(35)
3/4	25,000	(55)
1	50,000	(110)
1½	75,000	(165)
2	100,000	(220)
2½	125,000	(275)
3	150,000	(330)
3½	175,000	(385)

* 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 sieve larger than nominal maximum size.

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Nominal maximum size and maximum size are <u>not</u> the same.

Sieve Size	Percent Retained Individual	Percent Retained Cumulative
3”	**0**	**0**
2½”	**0**	**0**
2”	**0**	**0**
1½”	**7**	**7**
1”	**9**	**16**
3/4”	**11**	**27**
1/2”	**20**	**47**
3/8”	**11**	**58**
No.4	**14**	**72**

First sieve to cumulatively retain >10 percent: **1”**

Nominal maximum size: **1½”**

Maximum size: **2”**

Procedure – Specific Situations

In all situations, determine the time or location for sampling in a random manner.

- **Conveyor Belts & Feeders**

  Avoid sampling at the beginning or the end of an aggregate run due to the potential for segregation.

Belt Sampler

Sampling from the belt

Method A (From the Belt):

14 1. Stop the belt.

15 2. Set the sampling template in place on the belt, avoiding intrusion by adjacent material.

3. Scoop off the sample, including all fines.

4. Obtain a minimum of three increments.

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Method B (From the Belt Discharge or Aggregate Feeder):

17 1. Pass a sampling device through the full
18 stream of the material as it runs off the end
19 of the conveyor belt or flows from the feeder. The sampling device may be manually, semi-automatic or automatically powered.

2. The sample container shall pass through the stream at least twice, once in each direction, without overfilling while maintaining a constant speed during the sampling process.

20 3. Avoid sampling at the beginning or end of
21 an aggregate run.

22 4. Be careful when sampling in the rain. Fines may be lost (stuck to the belt or washed away).

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- **Transport Units**
  1. Visually divide the unit into four quadrants.
  2. Identify one sampling location in each quadrant.
  3. Dig down and remove approximately 1 ft of material to avoid surface segregation. Obtain each increment from below this level.
  4. Combine the increments to form a single sample.
- **Roadways**

  Method A (Berm or Windrow):

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  1. Sample after the last mixing pass and prior to spreading. Take one increment from a minimum of three random locations along the fully-formed windrow or berm.
  2. Do not take the increments from the beginning or the end of the windrow or berm.

Sampling from windrow

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  3. Obtain full cross-section samples of approximately equal size at each location. Take care to exclude the underlying material.
  4. Combine and mix thoroughly as a single field sample.

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

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  Method B (In-Place):

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  1. Sample after spreading and prior to compacting.
  2. Take one increment from each of the three random locations of the roadway.
  3. Obtain full-depth samples of approximately equal size from each location. Take care to exclude the underlying material.
  4. Combine and mix thoroughly as a single field sample.

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Top, middle, bottom

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Tips!

- Remember, the sample must be representative of the whole.
- The sample must be selected at random to avoid bias.
- Automatic mechanical sampling is preferred.

- **Stockpiles**

  Method A – Coarse Aggregates, and Mixtures of Coarse and Fine Aggregates: Create, with a loader if one is available, horizontal surfaces with vertical faces in the top, middle, and bottom third of the stockpile. When no equipment is available, a shovel may be used to create horizontal surfaces with vertical faces. Prevent sloughing by shoving a flat board in against the vertical face. Sloughed material will be discarded to create the horizontal surface. Sample from the horizontal surface at the intersection of the horizontal and vertical faces. Take at least one increment from each of the top, middle, and bottom thirds of the pile and combine.

  Method B – Fine Aggregate (Sand): Remove the outer layer that may have become segregated. Using a sampling tube, obtain material from a minimum of five random locations on the pile and mix thoroughly to form one sample.

Note 3: Sampling at stockpiles should be avoided whenever possible due to problems involved in obtaining a representative gradation of material.

REVIEW QUESTIONS

1. How can power equipment, such as loaders and backhoes, be used to collect aggregate samples?

2. Describe the process for sampling from a conveyor belt using method “A”.

3. Which sampling location should be avoided whenever possible due to problems involved in obtaining a representative gradation of material?

4. Describe sampling from roadways.

PERFORMANCE EXAM CHECKLIST

SAMPLING OF AGGREGATES
FOP FOR AASHTO T 2

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 increments?	_____	_____
Conveyor Belts – Method B (From the Belt Discharge)		
5. Sampling device passed through full stream of material twice (once in each direction) as it runs off end of belt?	_____	_____
Transport Units		
6. Unit divided into four quadrants?	_____	_____
7. Increment obtained from each quadrant, 1ft. below surface?	_____	_____
8. Increments combined to make up the sample?	_____	_____
Roadways		
9. Full depth of material taken?	_____	_____
10. Underlying material excluded?	_____	_____
11. Samples taken in at least three increments?	_____	_____
Stockpiles		
12. Created horizontal surfaces with vertical faces?	_____	_____
13. At least one increment taken from each of the top, middle, and bottom thirds of the stockpile.	_____	_____
14. When sampling sand, outer layer removed and increments taken from at least five locations with a sampling tube?	_____	_____
General		
15. Increments mixed thoroughly to form sample?	_____	_____

Comments: First attempt: Pass ☐ Fail ☐ Second attempt: Pass ☐ Fail ☐

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Examiner Signature _____WAQTC #:_____

PERFORMANCE EXAM CHECKLIST (ORAL)

SAMPLING OF AGGREGATES
FOP FOR AASHTO T 2

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.	_____	_____
a) Take at least three equal increments.	_____	_____
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).	_____	_____
3. How is a sample obtained from a transport unit?		
a) Divide the unit into four quadrants.	_____	_____
b) Dig 1 ft. below surface.	_____	_____
c) Obtain an increment from each quadrant.	_____	_____
4. Describe the procedure for sampling roadways?		
a) Sample the material full depth without obtaining underlying material.	_____	_____
b) Take at least three equal increments.	_____	_____
5. Describe the procedure for sampling a stockpile.		
a) Create horizontal surfaces with vertical faces and at least one increment taken from each of the top, middle, and bottom thirds of the stockpile.	_____	_____
6. Describe the procedure for sampling a sand stockpile.		
a) Remove the outer layer and increments taken from at least five locations with a sampling tube.	_____	_____
7. After obtaining the increments what should you do prior to performing T248?		
a) Increments mixed thoroughly to form sample.	_____	_____

Comments: First attempt: Pass ☐ Fail ☐ Second attempt: Pass ☐ Fail ☐

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Examiner Signature _____WAQTC #:_____