

# WSDOT FOP for AASHTO T 2<sup>1</sup>

## *Standard Practice for Sampling Aggregates*

### 1. Scope

- 1.1 This practice covers sampling of coarse and fine aggregates for the following purposes:
  - 1.1.1 Preliminary investigation of the potential source of supply,
  - 1.1.2 Control of the product at the source of supply,
  - 1.1.3 Control of the operations at the site of use, and
  - 1.1.4 Acceptance or rejection of the materials.
- 1.2 The values stated in English units are to be regarded as the standard.
- 1.3 This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

### 2. Referenced Documents

#### 2.1 AASHTO Standards:

T 248 Reducing Samples of Aggregate to Testing Size

#### 2.2 ASTM Standards:

C 702 Practice for Reducing Field Samples of Aggregate to Testing Size

D 2234 Test Method for Collection of a Gross Sample of Coal

D 3665 Practice for Random Sampling of Construction Materials

E 105 Practice for Probability Sampling of Materials

E 122 Practice for Choice of Sample Size to Estimate the Average Quality of a Lot or Process

E 141 Practice for Acceptance of Evidence Based on the Results of Probability Sampling

### 3. Significance and Use

- 3.1 Sampling is equally as important as the testing, and the sampler shall use every precaution to obtain samples that will show the nature and condition of the materials which they represent.
- 3.2 When sampling of aggregate sources for preliminary testing, the sampling must be witnessed or taken by a designated representative of the Regional Materials Engineer. The Acceptance samples will be taken by a qualified tester employed by the contracting agency or their designated qualified representative.

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<sup>1</sup> This Procedure is based on AASHTO T 2-91 (2000) and has been modified per WSDOT standards. To view the redline modifications, contact WSDOT Quality Systems Manager at (360) 709-5412.

**Note 2:** The preliminary investigation and sampling of potential aggregate sources and types occupies a very important place in determining the availability and suitability of the largest single constituent entering into the construction. It influences the type of construction from the standpoint of economics and governs the necessary material control to ensure durability of the resulting structure, from the aggregate standpoint. This investigation should be done only by agency guidelines. For more comprehensive guidance, see the Appendix.

#### 4. Securing Samples

- 4.1 General — Where practicable, samples to be tested for quality shall be obtained from the finished product. Samples from the finished product to be tested for abrasion loss shall not be subject to further crushing or manual reduction in particle size in preparation for the abrasion test unless the size of the finished product is such that it requires further reduction for testing purposes.

Native soils within the contract limits to be used for embankment construction and/or backfill material do not require the sampling by a qualified tester. For material that requires gradation testing such as but not limited to manufactured aggregates and Gravel Borrow, a qualified tester shall be required for sampling.

- 4.2 Inspection — The material shall be inspected to determine discernible variations. The seller shall provide suitable equipment needed for proper inspection and sampling.

#### 4.3 Procedure

- 4.3.1 Sampling from a Flowing Aggregate Stream (Bins or Belt Discharge) — Select units to be sampled by a random method, from the production. Obtain a field sample whose mass equals or exceeds the minimum recommended in 4.4.2. Take the sample from the entire cross section of the material as it is being discharged. The Standard Specifications require an mechanical, automatic or semi-automatic sampling device be used for processed materials.

**Note 3:** Sampling the initial discharge or the final few tons from a bin or conveyor belt increases the chances of obtaining segregated material and should be avoided.

- 4.3.2 Sampling from the Conveyor Belt (Stopped)— Select units to be sampled by a random method, from the production. Obtain a field sample selected at random, from the unit being sampled and combine to form a field sample whose mass equals or exceeds the minimum recommended in 4.4.2. Stop the conveyor belt while the sample increments are being obtained. Insert two templates, the shape of which conforms to the shape of the belt in the aggregate stream on the belt, and space them such that the material contained between them will yield an increment of the required weight. Carefully scoop all material between the templates into a suitable container and collect the fines on the belt with a brush and dust pan and add to the container.

- 4.3.3 Sampling from Stockpiles or Transportation Units — Avoid sampling coarse aggregate or mixed coarse and fine aggregate from stockpiles or transportation units whenever possible, particularly when the sampling is done for the purpose of determining aggregate properties that may be dependent upon the grading of the sample. If circumstances make it necessary to obtain samples from a stockpile of coarse aggregate or a stockpile of combined coarse and fine aggregate, design a sampling plan for the specific case under consideration. The sampling plan shall define the number of samples necessary to represent lots and sublots of specific sizes. General principles for sampling from stockpiles are applicable to sampling from trucks, rail cars, barges or other transportation units. For general guidance in sampling from stockpiles, see the Appendix.
- 4.3.4 Sampling from Roadway (Bases and Subbases) — WSDOT has deleted this section.
- 4.4 Number and Masses of Field Samples
- 4.4.1 The number of field samples (obtained by one of the methods described in 4.3) required depends on the criticality of, and variation in, the properties to be measured. Designate each unit from which a field sample is to be obtained prior to sampling. The number of field samples from the production should be sufficient to give the desired confidence in test results.
- Note 4:** Guidance for determining the number of samples required to obtain the desired level of confidence in test results may be found in Test Method D 2234, Practice E 105, Practice E 122, and Practice E 141.
- 4.4.2 The field sample masses cited are tentative. The masses must be predicated on the type and number of tests to which the material is to be subjected and sufficient material obtained to provide for the proper execution of these tests. Standard acceptance and control tests are covered by ASTM standards and specify the portion of the field sample required for each specific test. Generally speaking, the amounts specified in Table 1 will provide adequate material for routine grading and quality analysis. Extract test portions from the field sample according to T 248 or as required by other applicable test methods.

## 5. Shipping Samples

- 5.1 Transport aggregates in bags or other containers so constructed as to preclude loss or contamination of any part of the sample, or damage to the contents from mishandling during shipment. The weight limit for each bag of aggregate is 30 pounds maximum.
- 5.2 Shipping containers for aggregate samples shall have suitable individual identification attached and enclosed so that field reporting, laboratory logging, and test reporting may be facilitated.

All samples submitted for testing to the Region or State Materials Laboratories shall be accompanied by a completed sample information report from the Materials Testing System (MATS).

Nominal Maximum Size <sup>A*</sup> in (mm)		Minimum Mass <sup>B</sup> 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)

<sup>A\*</sup> For aggregate, the nominal maximum size, (NMS) is the largest standard sieve opening listed in the applicable specification, upon which any material is permitted to be retained. For concrete aggregate, NMS is the smallest standard sieve opening through which the entire amount of aggregate is permitted to pass.

### Size of Samples

**Table 1**

**Note:** Agencies that do not have access to MATS may submit a completed WSDOT Form 350-056.

**Note 5:** 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% of the materials.

## Appendices

### XI. Sampling Aggregate From Stockpiles or Transportation Units

#### X1.1 Scope

X1.1.1 In some situations it is mandatory to sample aggregates that have been stored in stockpiles or loaded into rail cars, barges, or trucks. In such cases the procedure should ensure that segregation does not introduce a serious bias in the results.

#### X1.2 Sampling From Stockpiles

X1.2.1 In sampling material from stockpiles it is very difficult to ensure unbiased samples, due to the segregation which often occurs when material is stockpiled, with coarser particles rolling to the outside base of the pile. For coarse or mixed coarse and fine aggregate, every effort should be made to enlist the services of power equipment, such as a front end loader, to develop a separate, small sampling pile composed of materials drawn from various levels and locations in the main pile after which several increments may be combined to compose the field sample. If necessary to indicate the degree of variability existing within the main pile, separate samples should be drawn from separate areas of the pile.

X1.2.2 Where power equipment is not available, the contractor may be required to sample the stockpile witnessed by WSDOT personnel. Samples from stockpiles should be made up of at least three increments taken from the top third, at the mid-point, and at the bottom third of the volume of the pile. A board shoved vertically into the pile just above the sampling point aids in preventing further segregation. In sampling stockpiles of fine aggregate the outer layer, which may have become segregated, should be removed and the sample taken from the material beneath. Sampling tubes approximately 1½ in (30 mm) min by 6 ft (2 m) min in length may be inserted into the pile at random locations to extract a minimum of five increments of material to form the sample.

#### X1.3 Sampling From Transportation Units

X1.3.1 In sampling coarse aggregates from railroad cars or barges, effort should be made to enlist the services of power equipment capable of exposing the material at various levels and random locations. Where power equipment is not available, a common procedure requires excavation of three or more trenches across the unit at points that will, from visual appearance, give a reasonable estimate of the characteristics of the load. The trench bottom should be approximately level, at least 1 ft. (0.3 m) in width and in depth below the surface. A minimum of three increments from approximately equally spaced points along each trench should be taken by pushing a shovel downward into the material. Coarse aggregate in trucks should be sampled in essentially the same manner as for rail car or barges, except for adjusting the number of increments according to the size of the truck. For

fine aggregate in transportation units, sampling tubes as described in X1.2 may be used to extract an appropriate number of increments to form the sample.

## X2. Exploration of Potential Aggregate Sources

### X2.1 Scope

X2.1.1 Sampling for evaluation of potential aggregate sources should be performed by a responsible trained and experienced person. Because of the wide variety of conditions under which sampling may have to be done it is not possible to describe detailed procedures applicable to all circumstances. This appendix is intended to provide general guidance and list more comprehensive references.

### X2.2 Sampling Stone from Quarries of Ledges

X2.2.1 Inspection — The ledge or quarry face should be inspected to determine discernible variations or strata. Differences in color and structure should be recorded.

X2.2.2 Sampling and Size of Sample — Separate samples having a mass of at least 55 lbs (25 kg) should be obtained from each discernible stratum. The sample should not include material weathered to such an extent that it is no longer suitable for the purpose intended. One or more pieces in each sample should be at least 6 × 6 × 4 inch (150 by 150 by 100 mm) in size with the bedding plane plainly marked, and this piece should be free of seams or fractures.

X2.2.3 Record — In addition to the general information accompanying all samples the following information should accompany samples taken from ledges or quarry faces:

X2.2.3.1 Approximate quantity available. (If quantities is very large this may be recorded as practically unlimited.)

X2.2.3.2 Quantity and character of overburden.

X2.2.3.3 A detailed record showing boundaries and location of material represented by each sample.

**Note X2.1:** A sketch, plan, and elevation, showing the thickness and location of the different layers is recommended for this purpose.

### X2.3 Sampling Roadside or Bank Run Sand and Gravel Deposits

X2.3.1 Inspection — Potential sources of bank run sand and gravel may include previously worked pits from which there is an exposed face or potential deposits discovered through air-photo interpretation, geophysical exploration, or other types of terrain investigation.

- X2.3.2 Sampling — Samples should be so chosen from each different stratum in the deposit discernible to the sampler. An estimate of the quantity of the different materials should be made. If the deposit is worked as an open-face bank or pit, samples should be taken by channeling the face vertically, bottom to top, so as to represent the materials proposed for use. Overburdened or disturbed material should not be included in the sample. Test holes should be excavated or drilled at numerous locations in the deposit to determine the quality of the material and the extent of the deposit beyond the exposed face, if any. The number and depth of test holes will depend upon the quantity of the material needed, topography of the area, nature of the deposit, character of the material, and potential value of the material in the deposit. If visual inspection indicates that there is considerable variation in the material, individual samples should be selected from the material in each well defined stratum. Each sample should be thoroughly mixed and quartered if necessary so that the field sample thus obtained will be at least 25 lb (12 kg) for sand and 75 lb (35 kg) if the deposit contains an appreciable amount of coarse aggregate.
- X2.3.3 Record — In addition to the general information accompanying all samples the following information should accompany samples of bank run sand and gravel:
  - X2.3.3.1 Location of supply.
  - X2.3.3.2 Estimate of approximate quantity available.
  - X2.3.3.3 Quantity and character of overburden.
  - X2.3.3.4 Length of haul to proposed site of work.
  - X2.3.3.5 Character of haul (kind of road, maximum grades, etc.)
  - X2.3.3.6 Details as to extent and location of material represented by each sample. Performance Exam Checklist



## Performance Exam Checklist

### *Sampling of Aggregates FOP for AASHTO T 2*

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

#### **Procedure Element**

##### ***Preparation***

**Yes No**

1. The tester has a copy of the current procedure on hand?

##### ***Conveyor Belts –Stopped***

2. Belt stopped?

3. Sampling device set on belt, avoiding intrusion of adjacent material?

4. Sample, including all fines, scooped off?

##### ***Flowing Aggregate Sampler***

5. Container passed through full stream of material as it runs off end of belt?  
(Mechanical, Automatic or Semi Automatic Sampler Only)

##### ***Transport Units***

6. Three or more trenches cut across the unit?

7. Trench bottom level and approximate 1 foot wide and 1 foot below surface of  
material in unit?

8. Three samples taken at equal spacing along each trench?

##### ***Stockpiles***

9. Create vertical face, if one does not exist, or use mechanical equipment to build a  
small sampling pile?

10. At least three increments taken, at various locations?

##### ***Procedure Element***

11. When sampling sand, outer layer removed and increments taken from a least five  
locations?

12. Correct sample size?

First attempt: Pass  Fail

Second attempt: Pass  Fail

Signature of Examiner \_\_\_\_\_

Comments: