Alaska Department of Transportation and Public Facilities

Alaska Sampling Module Manual

Revised October 28, 2022

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PREFACE

This module is one of a set developed for the Western Alliance for Quality Transportation Construction (WAQTC). WAQTC is an alliance supported by the western state Transportation Departments, along with the Federal Highway Administration (FHWA) and the Western Federal Lands Highway Division (WFLHD) of FHWA. WAQTC's charter includes the following mission.

MISSION

Provide continuously improving quality in transportation construction.

Through our partnership, we will:

- Promote an atmosphere of trust, cooperation, and communication between government agencies and with the private sector.
- Assure personnel are qualified.
- Respond to the requirements of identified needs and new technologies that impact the products that we provide.

BACKGROUND

There are two significant driving forces behind the development of the WAQTC qualification program. One, there is a trend to the use of quality control/quality assurance (QC/QA) specifications. QC/QA specifications include qualification requirements for a contractor's QC personnel and will be requiring WAQTC qualified technicians. Two, Federal regulation on materials sampling and testing (23 CFR 637, *Quality Assurance Procedures for Construction*, published in June 1995) mandates that by June 29, 2000 all testing technicians whose results are used as part of the acceptance decision shall be qualified. In addition, the regulation allows the use of contractor test results to be used as part of the acceptance decision.

OBJECTIVES

WAQTC's objectives for its Transportation Technician Qualification Program include the following:

- To provide highly skilled, knowledgeable materials sampling and testing technicians.
- To promote uniformity and consistency in testing.
- To provide reciprocity for qualified testing technicians between states.
- To create a harmonious working atmosphere between public and private employees based upon trust, open communication, and equality of qualifications.

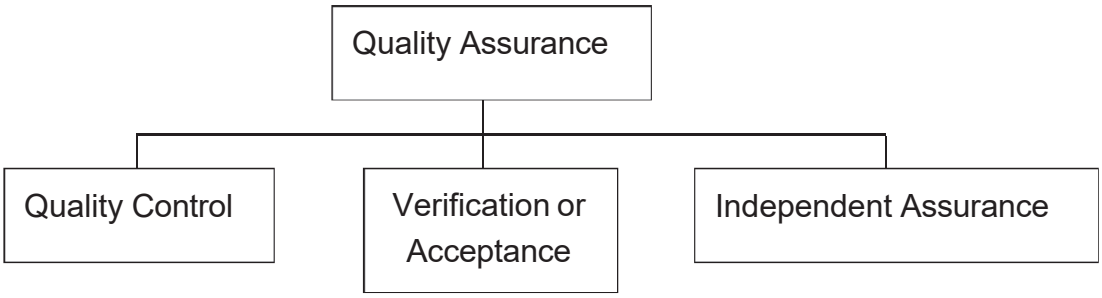
Training and qualification of transportation technicians is required for several reasons. It will increase the knowledge of laboratory, production, and field technicians – both industry and agency personnel – and increase the number of available, qualified testers. It will reduce problems associated with test result differences. Regional qualification eliminates the issue of reciprocity between states and allows qualified QC technicians to cross state lines without having the concern or need to be requalified by a different program.

The WAQTC Executive Board

QUALITY ASSURANCE CONCEPTS

The Federal Highway Administration (FHWA) has established requirements that each State Transportation Department must develop a Quality Assurance (QA) Program that is approved by the FHWA for projects on the National Highway System (NHS). In addition to complying with this requirement, implementing QA specifications in a construction program includes the benefit of improvement of overall quality of highway and bridge construction. 01 02

A QA Program may include three separate and distinct parts as illustrated below.



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Quality Assurance (QA) are those planned and systematic actions necessary to provide confidence that a product or service will satisfy given requirements for quality. 04

Quality Control (QC) are those operational, process control techniques or activities that are performed or conducted to fulfill contract requirements for material and equipment quality. In some states, the constructor is responsible for providing QC sampling and testing, while in other states the STD handles QC. Where the constructor is responsible for QC tests, the results may be used for acceptance only if verified or accepted by additional tests performed by an independent group. 05

Verification/Acceptance consists of the sampling and testing performed to validate QC sampling and testing and, thus, the quality of the product. Verification/Acceptance samples are obtained and tests are performed independently from those involved with QC. Samples taken for QC tests may not be used for Verification/Acceptance testing. 06

Independent Assurance (IA) are those activities that are an unbiased and independent evaluation of all the sampling and testing procedures used in QC and Verification/Acceptance. IA may use a combination of laboratory certification, technician qualification or certification, proficiency samples, or split samples to assure that QC and Verification/Acceptance activities are valid. Agencies may qualify or certify laboratories and technicians, depending on the state in which the work is done. 07

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ALASKA SAMPLING QUALIFICATION PROCESS
FOR MATERIALS TESTING TECHNICIANS

The Alaska Sampling Qualification is not part of the Western Alliance for Quality Transportation Construction (WAQTC) Technician Qualification program, however, all the material and procedures are WAQTC. A WAQTC qualification number will be issued for successful completion of this module.

Sampling Qualification is designed for those individuals responsible for field sampling of:

- aggregates for bases, Asphalt mixtures, soils, and soil aggregate mixture,
- asphalt cement and emulsified asphalt (asphalt materials), and
- asphalt mixtures.

Participants may include contractor and supplier quality control personnel, consulting engineering and materials testing firm personnel, quality assurance technicians, and public agency personnel.

The Process for Qualifying in Sampling:

Meet the prerequisites. (see below)
Pass the written and performance examinations.

Course Length: approximately 2 days
Course Size: 12-15 recommended

Prerequisites for being Qualified in Sampling: None

Recommendation: The participant should exhibit basic mathematics and reading comprehension skills.

The methods that are presented herein are excerpted from the following manuals: WAQTC Aggregate; WAQTC Embankment & Base & In-Place Density; and WAQTC Asphalt.

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TEST METHODS FOR Sampling QUALIFICATION

AASHTO/ WAQTC	PROCEDURE	TRAINING Classroom (C) Laboratory (L)	EXAM Written (W) Performance (P)
	Random Sampling Of Construction Materials	C	W
R 90	Sampling of Aggregates	C	W, P*
R 47	Reducing Samples of Aggregate to Testing Size	C, L**	W, P
R 66	Sampling Bituminous Materials	C	W, P*
R 97	Sampling Asphalt Mixtures	C	W, P*
R 47	Reducing Samples of Asphalt Mixtures to Testing Size	C, L**	W, P

* The Examinee will be asked to explain the sampling or reducing process during this portion of the performance examination.

** The Instructor **will** demonstrate the procedure to the participants in the lab, and participants **will not** be required to practice the procedure in the lab.

TESTING AND RETESTING

Performance test:
Technician receives 2 attempts at the performance of each test method. Technician must complete each step on the performance checklist accurately and in its entirety. Technician may stop a test, by stating they wish to begin again, without it being a failure. If the first attempt is failed, Performance evaluator has discretion to retest on same day, if the number of failed tests is less than 50% of the total. Failure of a retest of any test method constitutes failure of the module. Technician should retrain and practice and retake, either in Alaska or in A WAQTC reciprocal State.

Written test:
After Successful completion of the performance test, technician should schedule a written test, either with the Statewide WAQTC Coordinator in Anchorage, or using the Kryterion testing center, once operational.
Technicians must pass 70% of the written questions, and have 3/5 correct answers in each test method to pass. Failure of either condition is a failure of the exam. Technicians will retake the entire exam if either condition is met. Failure of a second attempt requires the technician to receive training and then retake both the performance and written exams.

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RANDOM SAMPLING OF CONSTRUCTION MATERIALS

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Significance

Sampling and testing are two of the most important functions in quality control (QC). Data from the tests are the tools with which the quality of product is controlled. For this reason, great care must be used in following standardized sampling and testing procedures.

In controlling operations, it is necessary to obtain numerous samples at various points along the production line. Unless precautions are taken, sampling can occur in patterns that can create a bias to the data gathered. Sampling at the same time, say noon, each day may jeopardize the effectiveness of any quality program. This might

02

occur, for example, because a material producer does certain operations, such as cleaning screens at an aggregate plant, late in the morning each day. To obtain a representative sample, a reliable system of random sampling must be employed.

Scope

The procedure presented here eliminates bias in sampling materials. Randomly selecting a set of numbers from a table or calculator will eliminate the possibility for bias. Random numbers are used to identify sampling times, locations, or points within a lot or sublot. This method does not cover how to sample, but rather how to determine sampling times, locations, or points.

Sampling Concepts

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A lot is the quantity of material evaluated by QC procedures. A lot is a preselected quantity that may represent hours of production, a quantity or number of loads of material, or an interval of time. A lot may be comprised of several portions that are called sublots or units. The number of sublots comprising a lot will be determined by the agency's specifications.

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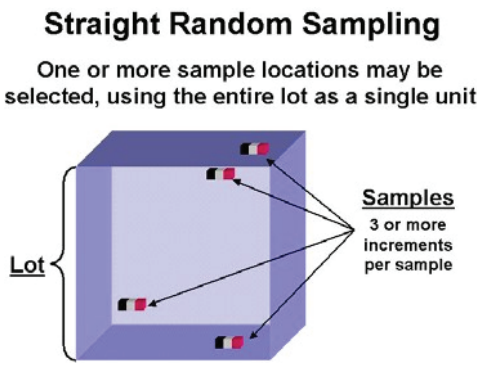

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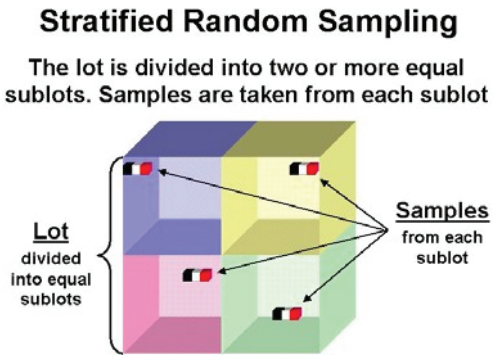

Straight Random Sampling vs. Stratified Random Sampling: Straight random sampling considers an entire lot as a single unit and determines each sample location based on the entire lot size. Stratified random sampling divides the lot into a specified number of sublots or units and then determines each sample location within a distinct sublot. Both methods result in random distribution of samples to be tested for compliance with the agency's specification.

Agencies stipulate when to use straight random sampling or stratified random sampling. AASHTO R 90, Sampling Aggregate Products, for example, specifies a straight random sampling procedure.

Picking Random Numbers from a Table

07

Table 1 contains pairs of numbers. The first number is the "pick" number and the second is the Random Number, "RN". The table was generated with a spreadsheet and the cells (boxes at the intersection of rows and columns) containing the RNs actually contain the "random number function." Every time the spreadsheet is opened or changed, all the RNs change.

1. Select a Pick number in a random method. The first two or last two digits in the next automobile license plate you see would be one way to select. Another would be to start a digital stop watch and stop it several seconds later, using the decimal part of the seconds as your Pick number.
2. Find the RN matching the Pick number.

Picking Random Numbers with a Calculator

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Many calculators have a built-in random number function. To obtain a random number, key in the code or push the button(s) the calculator's instructions call for. The display will show a number between 0.000 and 1.000 and this will be your random number.

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TABLE 1
Random Numbers

Pick	RN	Pick	RN	Pick	RN	Pick	RN	Pick	RN
01	0.998	21	0.758	41	0.398	61	0.895	81	0.222
02	0.656	22	0.552	42	0.603	62	0.442	82	0.390
03	0.539	23	0.702	43	0.150	63	0.821	83	0.468
04	0.458	24	0.217	44	0.001	64	0.187	84	0.335
05	0.407	25	0.000	45	0.521	65	0.260	85	0.727
06	0.062	26	0.781	46	0.462	66	0.815	86	0.708
07	0.370	27	0.317	47	0.553	67	0.154	87	0.161
08	0.410	28	0.896	48	0.591	68	0.007	88	0.893
09	0.923	29	0.848	49	0.797	69	0.759	89	0.255
10	0.499	30	0.045	50	0.638	70	0.925	90	0.604
11	0.392	31	0.692	51	0.006	71	0.131	91	0.880
12	0.271	32	0.530	52	0.526	72	0.702	92	0.656
13	0.816	33	0.796	53	0.147	73	0.146	93	0.711
14	0.969	34	0.100	54	0.042	74	0.355	94	0.377
15	0.188	35	0.902	55	0.609	75	0.292	95	0.287
16	0.185	36	0.674	56	0.579	76	0.854	96	0.461
17	0.809	37	0.509	57	0.887	77	0.240	97	0.703
18	0.105	38	0.013	58	0.495	78	0.851	98	0.866
19	0.715	39	0.497	59	0.039	79	0.678	99	0.616
20	0.380	40	0.587	60	0.812	80	0.122	00	0.759

Examples of Straight Random Sampling Procedures Using Random Numbers

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Sampling from a Belt or Flowing Stream: Agencies specify the frequency of sampling in terms of time, volumes, or masses. The specification might call for one sample from every 1,000,000 kg(1000 t) or 1100 Tons(T) of aggregate. If the random number was 0.317, the sample would be taken at (0.317)(1,000,000 kg) = 317,000 kg (317 t). Or (.317) (1100 T) = 349 T.

One sample per day might also be specified. If the day were 9 hours long and the random number 0.199, the sample would be taken at (0.199) (9 hrs) = 1.79 hr = 1 hr, 48 minutes into the day. AASHTO R 90 permits this time to be rounded to the nearest 5 minutes.

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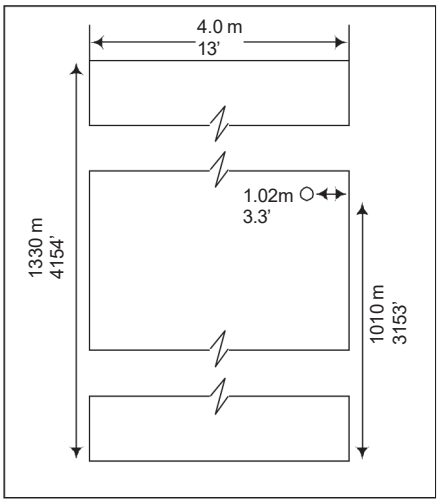
Sampling from Haul Units: Based on the agency's specifications – in terms of time, volume, or mass – determine the number of haul units that comprise a lot. Multiply the selected random

number(s) by the number of units to determine which unit(s) will be sampled.

For example, if 20 haul units comprise a lot and one sample is needed, pick one RN. If the RN were 0.773, then the sample would be taken from the (0.773) (20) = 15.46, or 16th haul unit.



Sampling from a roadway

Sampling from a Roadway with Previously Placed Material: The agency's specified frequency of sampling – in time, volume, or mass – can be translated into a location on a job. For example, if a sample is to be taken every 800 m^3 (1000yd^3) and material is being placed 0.15 m (0.50 ft) thick and 4.0 m (13 ft) wide, then the lot is 1330 m (4154 ft) long. You would select two RNs in this case. To convert yd^3 to ft^3 multiply by 27.

The first RN would be multiplied by the length to determine where the sample would be taken along the project. The second would be multiplied by the width to determine where, widthwise, the sample would be taken. For example, a first RN of 0.759 would specify that the sample would be taken at (0.759)(1330 m) or (4154 ft) = 1010 m or 3153 ft from the beginning. A second RN of 0.255 would specify that the sample would be taken at (0.255)(4.0 m) or (13 ft) = 1.02 m or 3.3 ft from the right edge of the material. To avoid problems associated with taking samples too close to the edge, no sample is taken closer than 0.3 m (1 ft) to the edge. If the RN specifies a location closer than 0.3 m (1 ft), then 0.3 m (1 ft) is added to or subtracted from the distance calculated.

Sampling from a Stockpile: AASHTO R 90 recommends against sampling from stockpiles. However, some agencies use random procedures in determining sampling locations from a stockpile. Bear in mind that stockpiles are prone to segregation and that a sample obtained from a stockpile may not be representative. Refer to AASHTO R 90 for guidance on how to sample from a stockpile.

In-Place Density Testing: Agency specifications will indicate the frequency of tests. For example, one test per 500 m^3 (650 yd^3) might be required. If the material is being placed 0.15 m (0.50 ft) thick and 10.0 m (33 ft) wide, then the lot is 333 m (1090 ft) long. You would select two RNs in this case.

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The first RN would be multiplied by the length to determine where the sample would be taken along the project. The second would be multiplied by the width to determine where, widthwise, the sample would be taken. For example, a first RN of 0.387 would specify that the sample would be taken at (0.387)(333 m) or (1090 ft) = 129 m or (422 ft) from the beginning. A second RN of 0.558 would specify that the sample would be taken at (0.588)(10.0 m) or (33 ft) = 5.88 m or (19 ft) from the right edge of the material. To avoid problems associated with taking samples too close to the edge, no sample is taken closer than 0.3 m (1 ft) to the edge. If the RN specifies a location closer than 0.3 m (1 ft), then 0.3 m (1 ft) is added to or subtracted from the distance calculated.

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SAMPLING AGGREGATE PRODUCTS
FOP FOR AASHTO R 90

01

Sampling aggregate

02

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.

03

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

04

Apparatus

1. Shovels or scoops, or both
2. Brooms, brushes, and scraping tools
3. Sampling tubes of acceptable dimensions
4. 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
5. Belt template
6. Sampling containers

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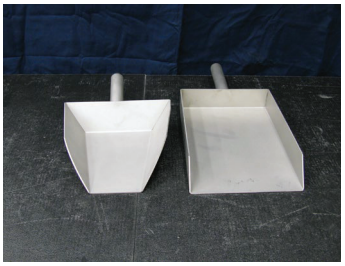

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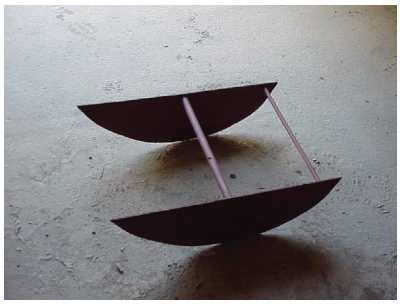
Scoops



Procedure - General

Sampling is as important as testing. The technician shall use every precaution to obtain samples that are representative of the material the sample represents. 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* mm (in.)		Minimum Mass 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.

Nominal maximum size and maximum size are not the same.

Example: 13

Sieve Size, mm (in)		Cumulative Percent Retained
75	(3)	0
63	(2 1/2)	0
50	(2)	0
37.5	(1 1/2)	7
25.0	(1)	32
19.0	(3/4)	38
12.5	(1/2)	47
9.5	(3/8)	58
4.75	(No. 4)	72

First sieve to cumulatively retain >10 percent: 25.0 mm (1 in.)
Nominal maximum size: 37.5 mm (1 ½ in.)
Maximum size: 50 mm (2 in.)

Sampling from the belt

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20

14
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Procedure – Specific Situations

Conveyor Belts

Avoid sampling at the beginning or the end of an 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)

16 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.

Automatic Sampling Device in Stream

17 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.

18 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

21 1. Visually divide the unit into four quadrants.

2. Identify one sampling location in each quadrant.

Sampling from a Transport

3. Dig down and remove approximately 0.3 m (1 ft) of material to avoid surface segregation. 22 Obtain each increment from below this level.

4. Combine the increments and mix thoroughly to form a single sample.

Roadways

23 **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.

24 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.

25

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)

26 1. Obtain sample after spreading and before compaction.

27 2. Take the increments from at least three random locations.

3. Obtain full-depth increments of approximately equal size from each

28 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

29 1. Direct the loader operator to enter the stockpile with the bucket at least150 mm (6 in.) above ground level without contaminating the stockpile.

2. Discard the first bucketful.

3. Have the loader re-enter the stockpile and

30 obtain a full loader bucket of the material, tilt the bucket back and up.

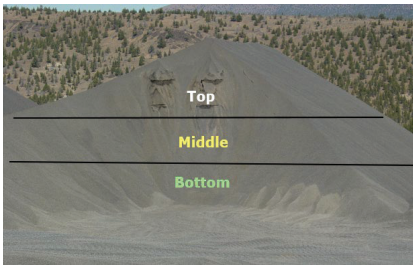
4. Form a small sampling pile at the base of the stockpile by gently rolling the material out of the bucket with the bucket just high enough to permit free flow of the material. (Repeat as necessary.)

5. Create a flat surface by having the loader back drag the small pile.

31 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.



Top, middle, bottom

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 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 and mix thoroughly to 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 and mix thoroughly to 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.

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Report

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

Tips!

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

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REVIEW QUESTIONS

1. How can loaders be used to collect aggregate samples?

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

3. Describe sampling from roadways.

4. What are the differences in Methods A, B, and C when sampling from a stockpile?

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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

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?	_____	_____
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_____

_____

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Examiner Signature _____WAQTC #:_____

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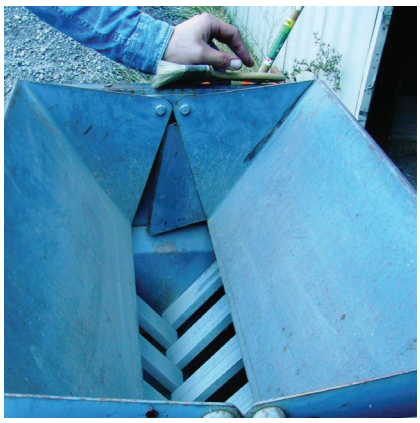
REDUCING SAMPLES OF AGGREGATE TO TESTING SIZE FOP FOR AASHTO R 76

Adjustable Mechanical Splitter

Quartered sample



Mechanical splitter

Significance

Aggregates and other materials sampled in the field in accordance with AASHTO R 90 are large composites and need to be reduced to the appropriate size for testing. It is extremely important that the procedure used to reduce the field sample not modify the material.

Scope

This procedure covers the reduction of samples to the appropriate size for testing in accordance with AASHTO R 76-16. 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 mixes of the two (FA/CA) and may also be used on soils.

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 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

Mechanical (riffle) splitter

- 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

- Straightedge scoop, shovel, or trowel
- Broom or brush
- Tarp: A square canvas or plastic sheet, appropriate for the amount and size of the material being reduced

Method B Apparatus

Method Selection

Samples of CA may be reduced by either Method A or Method B.

Samples of FA which are drier than the saturated surface dry (SSD) condition, as described in AASHTO T 84, shall be reduced by a mechanical splitter according to Method A. As a quick approximation, if the fine aggregate will retain its shape when molded with the hand, it is wetter than SSD.

Tarp

Samples of FA / CA which are drier than SSD may be reduced by Method A or Method B.

Samples of FA that are at SSD or wetter than SSD shall be reduced by Method B, or the entire sample may be dried – using temperatures that do not exceed those specified for any of the tests contemplated – and then reduced to test sample size using Method A.

Table 1 18

	Drier than SSD	Wetter than SSD
Fine Aggregate (FA)	Method A (Mechanical)	Method B (Quartering)
Mixture of FA/CA	Either Method	Method B (Quartering)
Coarse Aggregate (CA)	Either Method	Either Method

Procedure

Method A – Mechanical Splitter

20

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.

21

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.

22

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

23

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

Splitter check: 5127 g total sample mass

Splitter pan #1: 2583 g

Splitter pan #2: 2544 g

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

Alternative to Mechanical Splitter Check

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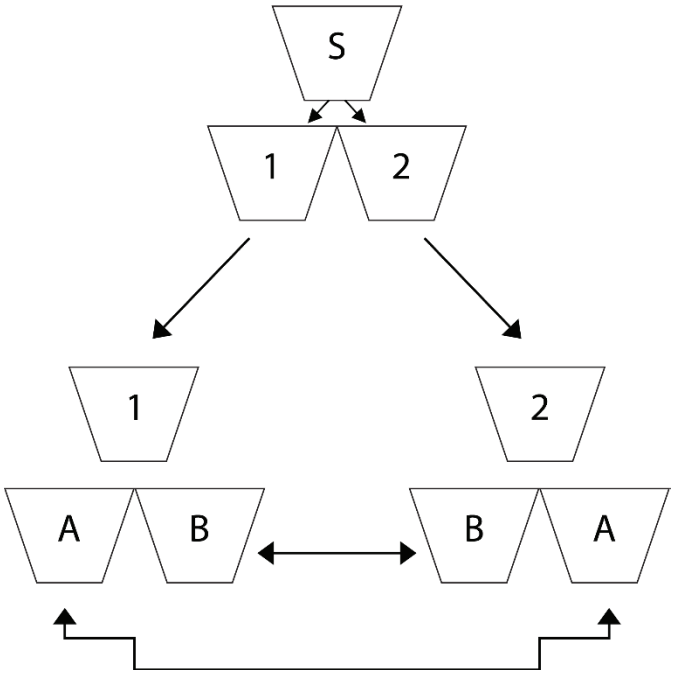
- In lieu of determining the mass of each reduced portion, use the method illustrated in Figure 1 or 2 during reduction.

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

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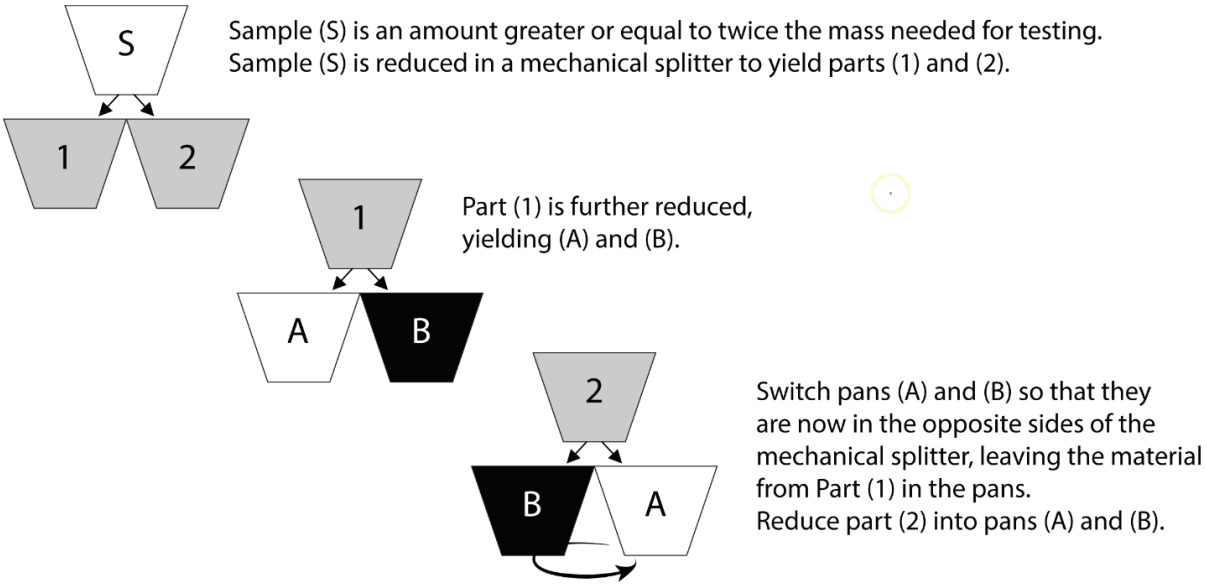

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Flattening pile

Dividing pile

27

28

Method B – Quartering

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

Procedure 1: Quartering on a clean, hard, level 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.

Procedure 2: Quartering on a 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.

Mixing the sample

Quartered sample

Tips!

32

- Remember, the reduced sample must be representative of the whole.
- Method A – mechanical splitter – is preferred.
- Method A cannot be used for FA wetter than SSD condition.
- Keep the mechanical splitter dry to avoid having particles "stick" to it.
- Make sure your splitter is level.

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REVIEW QUESTIONS

1. When using the mechanical splitter for FA, the minimum width of the individual chutes should be approximately how much larger than the largest particles in the sample to be split?

2. What is the maximum width of the chute for material passing the 9.5 mm (3/8 in) sieve?

3. How does the moisture content of the sample influence reduction?

4. Define the SSD condition.

5. Describe two methods of mixing the sample.

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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
Method A - Splitting		
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?	_____	_____
Method B - Quartering		
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?	_____	_____
7. Two diagonally opposite quarters, including all fine material, removed?	_____	_____
8. Process continued until desired sample size is obtained when two opposite quarters combined?	_____	_____

Comments: First attempt: Pass_____Fail_____ Second attempt: Pass_____Fail_____

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Examiner Signature _____ **WAQTC #:**_____

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SAMPLING ASPHALT MATERIALS
FOP FOR AASHTO R 66

01

Significance

The quality of asphalt materials has a tremendous impact on a roadway project. The grade of binder

02

selected is based on a number of factors, including local temperature extremes and characteristics of expected traffic. Using a grade of binder material other than that specified will have serious impacts on roadway performance and durability.

Scope

The procedure covers obtaining samples of liquid asphalt materials in accordance with AASHTO R 66-16. Sampling of solid and semi-solid asphalt materials – included in AASHTO R 66 – is not covered here.

Agencies may be more specific on exactly who samples, where to sample, and what type of sampling device to use.

03

Warning: Always use appropriate safety equipment and precautions for hot liquids.

04

Terminology

- Asphalt binder: Asphalt cement or modified asphalt cement that binds the aggregate particles into a dense mass.
- Asphalt emulsion: A mixture of asphalt binder and water.
- Cutback asphalt: Asphalt binder that has been modified by blending with a chemical solvent.

Containers

Sample containers must be new, and the inside may not be washed or rinsed. The outside may be wiped with a clean, dry cloth.

05

All samples shall be put in 1 L (1 qt) containers and properly identified on the outside of the container with contract number, date sampled, data sheet number, brand and grade of material, and sample

Metal cans

06

Wide-mouth plastic jar

Sampling liquid binder

Sampling from the spray bar

Tips!

- Remember to identify sample on outside of container.

number. Include lot and sublot numbers when appropriate.

- Asphalt binder and cutbacks: Use metal cans.
- Emulsified asphalt: Use wide-mouth plastic jars with screw caps. Protect the samples from freezing since water is a part of the emulsion. The sample container should be completely filled to minimize a skin formation on the sample.

Note: The filled sample container shall not be submerged in solvent, nor shall it be wiped with a solvent saturated cloth. If cleaning is necessary, use a clean dry cloth.

Procedure

1. Coordinate sampling with contractor or supplier.
2. Allow a minimum of 4 L (1 gal) to flow before obtaining samples.
3. Obtain samples of:
   - Asphalt binder from the line between the storage tank and the mixing plant while the plant is in operation, or from the delivery truck.
   - Cutback and emulsified asphalt from distributor spray bar or application device, or from the delivery truck before it is pumped into the distributor: Sample emulsified asphalt at delivery or before dilution.

Report

- On forms approved by the agency
- Sample ID
- Date
- Time
- Location
- Quantity represented

REVIEW QUESTIONS

1. Describe how liquid asphalt material is obtained at an asphalt mixture plant.

2. Describe how liquid asphalt material is obtained from a spray distributor.

3. Describe the containers used for sampling.

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PERFORMANCE EXAM CHECKLIST (ORAL)
SAMPLING ASPHALT MATERIALS
FOP FOR AASHTO R 66

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. Describe the container that is used to sample bituminous liquids. a. New metal can, 1 L (1 qt) in size.	_____	_____
2. Describe the container that is used to sample emulsified liquids. a. New wide mouth plastic jar, 1 L (1 qt) in size. (Alaska uses 1 gal)	_____	_____
3. How much material must be wasted before a sample can be obtained? a. A minimum of 4 L (1 gal).	_____	_____
4. At a hot plant where must a sample be taken? a. In the line between storage tank and mixing plant or from delivery vehicle.	_____	_____
5. Where is an emulsified sample taken? _____ a. Spray bar or application device, if not diluted. b. From delivery vehicle or prior to dilution, if diluted.	_____	_____

Comments: First attempt: Pass____ Fail____ Second attempt: Pass____ Fail____

Examiner Signature_____ WAQTC : _____

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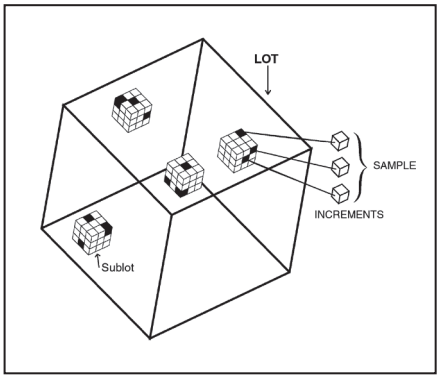
SAMPLING ASPHALT MIXTURES
FOP FOR AASHTO R 97



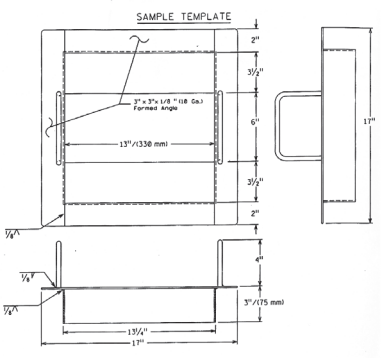
Sampling from a lot

01

02

Asphalt mixture sample

03



Cookie Cutter Sampling Device

04

05

06

Significance

Testing asphalt mixtures in the field begins with obtaining and preparing the sample to be tested. Standardized procedures for obtaining a representative sample have been established. Producing strong, durable, reliable pavement in roadways requires careful sampling and accurate testing.

Technicians must be patient and follow these procedures. If one considers that the specifications require tests to be performed on only a small portion of the total material placed, the need for a truly representative sample is apparent.

Scope

This procedure covers sampling of asphalt mixtures from plants; haul units, and roadways, in accordance with AASHTO R 97-19. Sampling is as important as testing. Use care to obtain a representative sample. Avoid segregation and contamination of the material during sampling.

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.

Apparatus

- Shovel or Metal Scoops, or Other Equipment: square-head metal shovels at least 125 mm (5.5 in.) wide.
- Sample containers: cardboard boxes, metal cans, stainless steel bowls, or other agency-approved containers
- Sampling plate: thick metal plate, minimum 8 gauge, sized to accommodate sample requirements, with a wire attached to one corner long enough to reach from the center of

the paver to the outside of the farthest auger extension. A minimum of one hole 6 mm (0.25 in.) in diameter must be provided in a corner of the plate.

- Cookie cutter sampling device: formed steel angle with two 100 by 150 mm by 9 mm (4 in. by 6 in. by 3/8 in.) handles, sized to accommodate sample requirements. Minimum 50 mm (2 in.) smaller than the sampling plate when used together.

  Example: Sampling plate 380 mm (15 in.) square and a cookie cutter sampling device 330 mm (13 in.) square.

- Mechanical sampling device: a permanently attached device that allows a sample receptacle 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.

- Release agent: a non-stick product that prevents the asphalt mixture from sticking to the apparatus and does not contain solvents or petroleum-based products that could affect asphalt binder properties.

Sample Size

07 Sample size depends on the test methods specified by the agency for acceptance. Check agency requirement for the size required.

Procedure

08

General

- Select sample locations using a random or stratified random sampling procedure, as specified by the agency. The material shall be tested to determine variations. The supplier/contractor shall provide equipment for safe and appropriate sampling including sampling devices on plants, when required.

09

- Ensure the container(s) and sampling equipment are clean and dry before sampling.

- For dense graded mixture samples use cardboard boxes, stainless steel bowls or other agency approved containers.
- For hot open graded mixture samples use stainless steel bowls. Do not put open graded mixture samples in boxes until they have cooled to the point that asphalt binder will not migrate from the aggregate.

Attached Sampling Devices

10 These are normally permanently attached devices that allow a sample container to pass perpendicularly through the entire stream of material Operation may be manual, pneumatic, or hydraulic and allow the sample container to pass 12 through the stream twice without overfilling. A sampling device may divert the entire stream of material into the container.

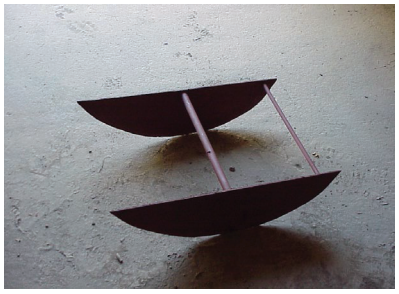
Attached sampling device

11

1. Lightly coat the container attached to the sampling device with an agency-approved release agent or preheat it, or both to approximately the same discharge temperature of the mix.
2. Pass the container twice, once in each direction, through the material perpendicularly without overfilling the container.
3. Repeat until proper sample size has been obtained.
4. Combine the increments to form a single sample.
5. Transfer the asphalt mixture to an agency-approved container without loss of material.

13 **Conveyor Belts**
14

1. Avoid sampling at the beginning or end of an asphalt mixture production run due to the potential for segregation.
2. Stop the belt containing asphalt mixture.
3. Set the sampling template into the asphalt mixture on the belt, avoiding intrusion by adjacent material.



Belt template

4. Remove the asphalt mixture from inside the template, including all fines, and place in a sample container.
5. Repeat, obtaining equal size increments, until proper sample size has been obtained.
6. Combine the sample increments to form a single sample.

Ouadrants in a load

Haul Units

1. Visually divide the haul unit into approximately four equal 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 to form a sample of the required size.

Asphalt mixture in a haul unit

Paver Auger

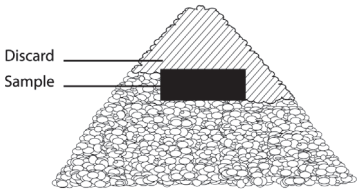
1. Obtain samples from the end of the auger using a square head shovel.
2. Place the shovel in front of the auger extension, with the shovel blade flat upon the surface to be paved over.
3. Allow the front face of the auger stream to cover the shovel with asphalt mixture, remove the shovel before the auger reaches it by lifting as vertically as possible.
4. Place asphalt mixture in a sample container.
5. Repeat until proper sample size has been obtained.
6. Combine the sample increments to form a sample of the required size.

Note 1: First full shovel of material may be discarded to preheat and 'butter' the shovel.

Sampling from paver auger

Windrow

1. Obtain samples from the windrow of a transport unit. Avoid the beginning or the end of the windrow section.



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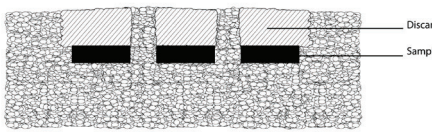
Windrow cross section



Windrow side view

2. Visually divide the windrow from the haul unit into approximately three equal sections.
3. Remove approximately 0.3 m (1 ft) from the top.
4. Fully insert the shovel into the flat surface as vertically as possible, exclude the underlying material, roll back the shovel and lift the material slowly out of the windrow to avoid material rolling off the shovel.
5. Place in a sample container.
6. Repeat, obtaining equal size increments, in each of the remaining thirds.
7. Combine the increments to form a sample of the required size.

Roadway before Compaction

24

There are two conditions that will be encountered when sampling asphalt mixtures from the roadway before compaction. The two conditions are:

- Laying asphalt mixture on grade or untreated base material requires Method 1.
- Laying asphalt mixture on existing asphalt or laying a second lift of asphalt mixture requires Method 2.

25

Cookie cutter and plate

SAFETY:

Sampling is performed behind the paving machine and in front of the breakdown roller. For safety, the roller must remain at least 3 m (10 ft.) behind the sampling operation until the sample has been obtained and the hole filled with loose asphalt mixture.

Method 1 requires a plate to be placed in the roadway in front of the paving operation. There is always concern when working in the path of moving equipment. It is safest to stop the paving train while a plate is installed in front of the paver. When this is not possible the following safety rules must be followed.

1. The plate placing operation must be at least 3 m (10 ft.) in front of the paver or pickup device. The technician placing the plate must have eye contact and communication with the

paving machine operator. If eye contact cannot be maintained at all times, a third person must be present to provide communication between the operator and the technician.

2. No technician is to be between the asphalt supply trucks and the paving machine. The exception to this rule is if the supply truck is moving forward creating a windrow, in which case the technician must be at least 3 m (10 ft.) behind the truck.

If at any time the Engineer feels that the sampling technique is creating an unsafe condition, the operation is to be halted until it is made safe, or the paving operation will be stopped while the plate is being placed.

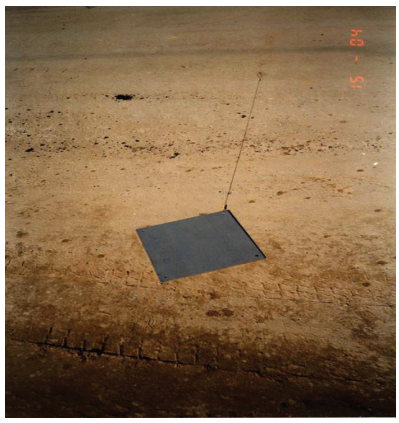


Plate on untreated base

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Method 1 - Obtaining a Sample on Grade or Untreated Base (Plate Method)

1. Following the safety rules detailed above, the technician is to:
   a. Smooth out a location in front of the paver at least 0.5 m (2 ft.) inside the edge of the mat.
   b. Lay the plate down diagonally with the direction of travel, keeping it flat and tight to the base with the lead corner facing the paving machine.

Note 2: The plate may be secured by driving a nail through the hole in the lead corner of the plate.

2. Pull the wire, attached to the outside corner of the plate, taut past the edge of the asphalt mixture mat and secure it. Let the paving operation pass over the plate and wire.
3. Using the exposed end of the wire, pull the wire up through the fresh asphalt mixture to locate the corner of the plate.

29

   a. Plate only:
      i. Using a small square head shovel, scoop, or both, remove the full depth of the asphalt mixture from the plate.

Take care to prevent sloughing of adjacent material.

ii. Place asphalt mixture, including any material adhering to the plate and scoop or shovel in a sample container.

iii. Remove the plate from the roadway. The hole made from the sampling must be filled by the contractor with loose asphalt mixture.

b. "Cookie Cutter":

i. Place the "cookie cutter" sampling device, just inside the end of the wire; align the cutter over the plate. Press "cookie cutter" device down through the asphalt mixture to the plate.

ii. Using a small square tipped shovel, scoop, or both, carefully remove all the asphalt mixture from inside of the cutter and place in a sample container.

iii. Remove the sample cutter and the plate from the roadway. The hole made from the sampling must be filled by the contractor with loose asphalt mixture.

Using the cookie cutter

Method 2 – Obtaining a Sample on Asphalt Surface (Non-plate Method)

1. After the paving machine has passed the sampling point, immediately place the "cookie cutter" sampling device on the location to be sampled.
2. Push the cutter down through the asphalt mixture until it is flat against the underlying asphalt mat.
3. Using a small square-tipped shovel or scoop, or both, carefully remove all the asphalt mixture from inside of the cutter and place in a sample container.

4. Remove the cutter from the roadway. The hole made from the sampling must be filled by the contractor with loose asphalt mixture.

Stockpiles

31 Remove at least 0.1 m (4 in.) from the surface before sampling; mixtures in a stockpile may develop an oxidized crust.

Method 1 – Loader

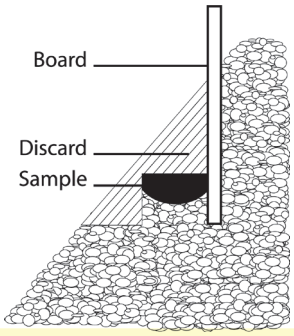
32
1. Direct the loader operator to enter the stockpile with the bucket at least 0.3 m (1 ft) above ground level without contaminating the stockpile.
2. Obtain a full loader bucket of the asphalt mixture; tilt the bucket back and up.
3. Form a small sampling pile at the base of the stockpile by gently rolling the asphalt mixture out of the bucket with the bucket just high enough to permit free flow of the mixture. Repeat as necessary.
4. Create a flat surface by having the loader "back-drag" the small pile.

33
5. Obtain approximately equal increments from at least three randomly selected locations on the flat surface at least 0.3 m (1 ft) from the edge.
6. Fully insert the shovel, exclude the underlying material, roll back the shovel and lift the asphalt mixture slowly out of the pile to avoid mixture rolling off the shovel.
7. Combine the sample increments to form a sample.

Method 2 – Stockpile Face

34
1. Create horizontal surfaces with vertical faces in the top, middle, and bottom third of the stockpile with a shovel or a loader if one is available.

35
2. Shove a flat board against the vertical face behind the sampling location to prevent sloughing of asphalt mixture. Discard the



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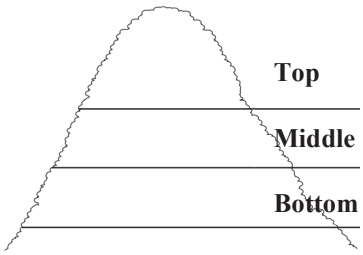
Sampling from a stockpile face 37



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Tips!

24

Check agency requirements for:

- Sample size needed
- Sampling device requirements
- Allowable sampling techniques

sloughed mixture to create the horizontal surface.

3. Obtain the sample from the horizontal surface as close as possible to the intersection of the horizontal and vertical faces.
4. Obtain at least one sample increment of equal size from each of the top, middle, and bottom thirds of the pile.
5. Combine the increments to form a single sample.

Identification and Shipping

1. Identify sample containers as required by the agency.
2. Ship samples in containers that will prevent loss, contamination, or damage.

Report

- On forms approved by the agency
- Sample ID
- Date
- Time
- Location
- Quantity represented

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REVIEW QUESTIONS

1. Asphalt mixture sample sizes are based on what?

2. What types of containers are used for asphalt mixture samples?

3. Describe how samples are obtained from:

   - Plants with attached sampling devices
   - Conveyor belt
   - Haul units
   - Auger
   - Windrow
   - Roadway
   - Stockpile

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PERFORMANCE EXAM CHECKLIST

SAMPLING ASPHALT MIXTURES
FOP FOR AASHTO R 97

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**
Attached Sampling Device		
1. Container coated or preheated or both?	_____	_____
2. Sampling device passed through stream twice perpendicular to material?	_____	_____
3. Sampling device not over filled?	_____	_____
Conveyor Belt		
4. Belt stopped?	_____	_____
5. Sampling template set on belt, avoiding intrusion of adjacent material?	_____	_____
6. Sample, including all fines, scooped off?	_____	_____
Haul Units		
7. Unit divided into four quadrants?	_____	_____
8. Increment obtained from each quadrant, 0.3 m (1ft.) below surface?	_____	_____
9. Increments combined to make up the sample?	_____	_____
Paver Auger		
10. Shovel blade flat on the surface to be paved?	_____	_____
11. Shovel lifted vertically after it is filled?	_____	_____
Windrow		
12. Beginning and end avoided?	_____	_____
13. Equal increments obtained from three sections?		
14. Approximately 0.3 m (1 ft) removed from top of each section?	_____	_____
15. Underlying material excluded?	_____	_____
Roadway Before Compaction (Method 1)		
16. Plate placed well in front of paver?	_____	_____
17. Wire pulled to locate plate corner?	_____	_____

OVER

Procedure Element	**Trial 1**	**Trial 2**
18. Cookie cutter (if used) placed on asphalt and pushed through to plate?	_____	_____
19. All material removed from inside the cutter?	_____	_____
Roadway Before Compaction (Method 2)		
20. Cookie cutter placed on asphalt and pushed through to underlying material?	_____	_____
21. All material removed from inside the cutter?	_____	_____
Stockpile Method 1– (Loader sampling)		
22. Loader operator directed to enter the stockpile with the bucket at least 0.3 m (1 ft) above ground level without contaminating the stockpile?	_____	_____
23. The loader 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 three locations at least 0.3 m (1 ft) from the edge by fully inserting the shovel into the flat pile as vertically as possible, care taken to exclude the underlying material?	_____	_____
Stockpile Method 2 (Stockpile Face)		
27. Created horizontal surfaces with vertical faces?	_____	_____
28. Sample obtained from the horizontal face as close as possible to the vertical face?	_____	_____
29. At least one increment taken from each of the top, middle, and bottom thirds of the stockpile?	_____	_____
General		
30. Sample placed in appropriate container?	_____	_____
31. Sample size meets agency requirements?	_____	_____
32. Sample identified as required?	_____	_____

Comments: First attempt: Pass_____Fail_____ Second attempt: Pass_____Fail_____

_____

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Examiner Signature _____ **WAQTC #:**_____

PERFORMANCE EXAM CHECKLIST (ORAL)

SAMPLING ASPHALT MIXTURES
FOP FOR AASHTO R 97

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. At the hot plant, how must a sample be obtained using an attached sampling device?		
a. Coat or preheat sample container.	____	_____
b. Sampling device passed through stream twice, once in each direction, perpendicular to material.	____	_____
c. The sampling device cannot be overfilled.	____	_____
2. How is a sample obtained from a conveyor belt?		
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.	_____	_____
3. What must be done to sample from transport units?		
a. Divide the unit into four quadrants.	_____	_____
b. Obtain increments from each quadrant, 0.3 m (1 ft) below surface.	_____	_____
4. How is a sample obtained from the paver auger?		
a. Shovel blade is placed flat on the surface to be paved in front of the auger extension.	_____	_____
b. Shovel is filled and removed by lifting as vertically as possible.	_____	_____
5. Describe the procedure for sampling from a windrow.		
a. Do not sample from the beginning or end of the windrow.	_____	_____
b. Approximately 0.3 m (1 ft) removed from the top.	_____	_____
c. Underlying material is excluded	_____	_____
d. Equal increments obtained from 3 locations along the windrow.	_____	_____

OVER

Procedure Element	Trial 1	Trial 2
6. Describe how to take samples from the roadway using Method 1 (plate).		
a. Place the plate well in front of the paver.	_____	_____
b. Pull the wire to locate the corner of the plate.	_____	_____
c. Place the cutter (if used) on the asphalt material above the plate and push it down to the plate.	_____	_____
d. Collect all the material inside the cutter.	_____	_____
7. Describe how to take samples from the roadway using Method 2.		
a. Place the cutter on the asphalt material and push it down to the underlying material.	_____	_____
b. Collect all the material inside the cutter.	_____	_____
8. Describe the procedure for sampling a stockpile Method 1 (Loader Sampling).		
a. Loader removes surface and creates sampling pile.	_____	_____
b. Loader back drags pile to create a flat surface.	_____	_____
c. Take three approximately equal increments from at least 0.3 m (1 ft) from the edge, excluding the underlying material.	_____	_____
9. Describe the procedure for sampling a stockpile Method 2 (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.	_____	_____
10. Increments combined to form a sample of required size?	_____	_____
11. What types of containers can be used?		
a. Cardboard boxes, stainless steel bowls, or other agency approved containers.	_____	_____
12. What dictates size of sample?		
a. Agency requirements.	_____	_____
b. Specified by test method.	_____	_____

Comments: First attempt: Pass_____Fail_____ Second attempt: Pass_____Fail_____

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Examiner Signature _____ **WAQTC #:**_____

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REDUCING SAMPLES OF ASPHALT MIXTURES TO TESTING SIZE FOP FOR AASHTO R 47

Mix sample

Significance

01 Samples of asphalt mixtures taken in accordance with the FOP for AASHTO R 97 are composites and typically large in size. Materials sampled in the field need to be reduced to appropriate sizes for testing. It is extremely important that the procedure used to reduce the field sample not modify the material properties.

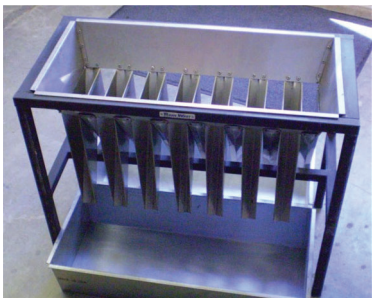
Scope

02 This procedure covers sample reduction of asphalt mixtures to testing size in accordance with AASHTO R 47-19. The reduced portion is to be representative of the original sample.

Apparatus

03
- 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, drywall taping knives, or a combination thereof; for removing asphalt mixture samples from the quartering device, cleaning surfaces used for splitting, etc.
- Square-tipped flat-bottom scoop, shovel, or trowel for mixing asphalt mixture before quartering.
- Miscellaneous equipment: hot plate, non-asbestos heat-resistant gloves or mittens, pans, buckets, and cans.

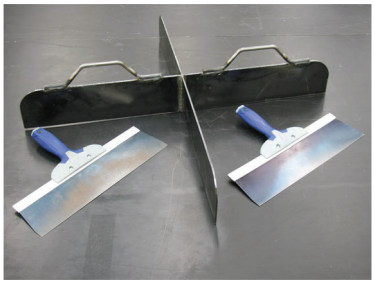
04
- Sheeting: Non-stick heavy paper or other material as approved by the agency.
- Agency-approved release agent, free of solvent or petroleum-based material that could affect asphalt binder.



Mechanical Splitter Type B (Riffle)

07

- 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 asphalt mixture through the chutes without segregation or loss of material. Sample receptacles of sufficient width and capacity to receive the reduced portions of asphalt mixture from the splitter without loss of material.



Quartering template and straight edges

08

- 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 asphalt mixture by an amount allowing complete separation of the quartered sample. Height of the sides must exceed the thickness of the flattened cone of asphalt mixture.
- Non-stick mixing surface that is hard, heat-resistant, clean, level, and large enough to permit asphalt mixture samples to be mixed without contamination or loss of material.

Sampling

Obtain samples according to the FOP for AASHTO R 97.

Sample Preparation

9

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 asphalt mixture may be performed by a combination of the following methods, as approved by the agency.

The methods for reduction are:

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

Procedure

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

Mechanical Splitter Type B (Riffle) Method

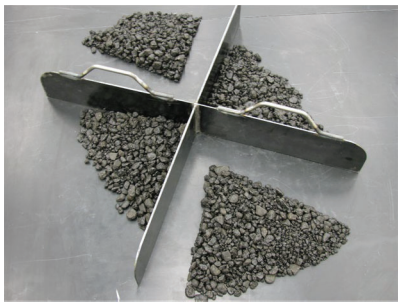
1. Clean the splitter and apply a light coating of approved release agent to the surfaces that will come in contact with the asphalt mixture (hopper or straight-edged pan, chutes, receptacles).
2. Place two empty receptacles under the splitter.
3. Carefully empty the asphalt mixture from the agency-approved container(s) into the hopper or straight-edged pan without loss of material. Uniformly distribute from side to side of the hopper or pan.

4. Discharge the asphalt mixture at a uniform rate, allowing it to flow freely through the chutes.
5. Any asphalt mixture that is retained on the surface of the splitter shall be removed and placed into the appropriate receptacle.
6. Reduce the remaining asphalt mixture as needed by this method or a combination of the following methods as approved by the agency.
7. Using one of the two receptacles containing asphalt mixture, repeat the reduction process until the asphalt mixture contained in one of the two receptacles is the appropriate size for the required test.
8. After each split, remember to clean the splitter hopper and chute surfaces if needed.
10. Retain and properly identify the remaining unused asphalt mixture sample for further testing if required by the agency.

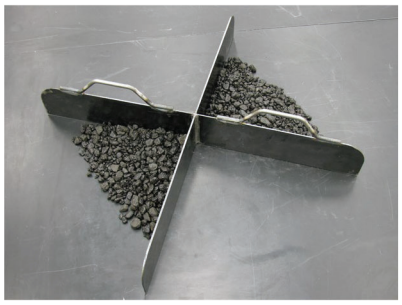
Quartering Method

Quartering Template (In Place)

1. If needed, apply a light coating of release agent to quartering template.
2. 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.
3. 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.



Quartered sample



Diagonally opposite quarters removed

4. 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.
5. Divide the flattened cone into four equal quarters using the quartering template or straightedges assuring complete separation.
6. Reduce to appropriate sample mass by full quartering or by apex.

Full Quartering

a. Remove diagonally opposite quarters, including all of the fine material, and place in a container to be retained.
b. Remove the quartering template, if used
c. Combine the remaining quarters.
d. If further reduction is necessary, repeat Quartering Method Step 4 through 6.
e. Repeat steps until appropriate sample mass is obtained. The final sample must consist of the two remaining diagonally opposite quarters.
f. Retain and properly identify the remaining unused portion of the asphalt mixture sample for further testing if required by the agency.

Asphalt mixture from the apex of the quarter to the outer edge.

Equal portion from the diagonally opposite quarter

Mixing the sample

Reducing by Apex

a. Using a straightedge, slice through a quarter of the asphalt mixture from the center point to the outer edge of the quarter.

b. Pull or drag the material from the quarter with two straight edges or hold one edge of the straightedge in contact with quartering device.

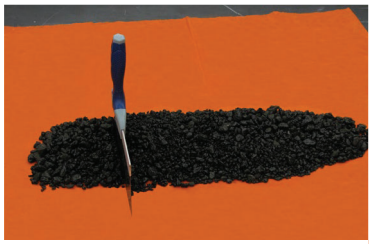
c. Remove an equal portion from the diagonally opposite quarter and combine these increments to create the appropriate sample mass.

d. Continue using the apex method with the unused portion of the asphalt mixture until samples have been obtained for all required tests.

e. Retain and properly identify the remaining unused portion of the asphalt mixture 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.



Slicing off one quarter

Appropriate sample mass dropped into container

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 the edge of the counter and drop into a container.
   b. Use a straightedge at least as wide as the full loaf to slice off material and place into a container.
7. Obtain an appropriate sample mass for the test to be performed, by either:
   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 at least as wide as the full loaf to slice off cross sections of the material until proper sample mass has been obtained and place into container.

Note 1: 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.
9. Retain and properly identify the remaining unused portion of the asphalt mixture sample for further testing if required by the agency.

Tips!

34

- Remember, the reduced sample must be representative of the whole.
- Proceed quickly so that splitting is done when the material is hot.
- Check agency requirements about what splitting device(s) or method(s) may be used.
- Inspect mechanical splitter surfaces for build-up of asphalt mixture, ensuring they are cleaned such that the material falls into the appropriate receptacles.
- With full quartering, remember that the final sample consists of the two remaining diagonally opposite quarters.

REVIEW QUESTIONS

1. Describe how the material is mixed before quartering.

2. Describe how the equipment is heated?

3. What is the difference between full quartering and quartering by apex?

4. Are any of the reduction methods preferred? When and why?

5. Can multiple splitting methods be used in reducing a sample?

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PERFORMANCE EXAM CHECKLIST

REDUCING SAMPLES OF ASPHALT MIXTURES 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?	_____	_____
2. Splitting apparatus and tools, if preheated, not exceeding maximum mixing temperature from the JMF?	_____	_____
Mechanical Splitter Type B (Riffle) Method		
1. Splitter cleaned, and surfaces coated with release agent?	_____	_____
2. Two empty receptacles placed under the splitter?	_____	_____
3. Sample placed in hopper or straight edged pan without loss of material and uniformly distributed from side to side?	_____	_____
4. Material discharged across chute assembly at controlled rate allowing free flow of asphalt mixture through chutes?	_____	_____
5. Splitter surfaces cleaned of all retained asphalt mixture allowing it to fall into appropriate receptacles?	_____	_____
6. Further reduction with the riffle splitter:		
a. Material from one receptacle discharged across chute assembly at controlled rate, allowing free flow of asphalt mixture through chutes?	_____	_____
b. Splitting process continued until appropriate sample mass obtained, with splitter surfaces cleaned of all retained asphalt mixture after every split?	_____	_____
7. Remaining unused asphalt mixture stored in suitable container, properly labeled?	_____	_____

OVER

Procedure Element	Trial 1	Trial 2
Quartering Method		
1. Sample placed in a conical pile on a hard, non-stick, heat-resistant splitting surface such as metal or sheeting?	_____	_____
2. Sample mixed by turning the entire sample over a minimum of 4 times?	_____	_____
3. Conical pile formed and then flattened uniformly to diameter equal to about 4 to 8 times thickness?	_____	_____
4. Sample divided into 4 equal portions either with a metal quartering template or straightedges such as drywall taping knives?	_____	_____
5. Reduction by Full Quartering:		
a. Two diagonally opposite quarters removed and placed in a container to be retained?	_____	_____
b. Two other diagonally opposite quarters combined?	_____	_____
c. Process continued, if necessary, until appropriate sample mass has been achieved?	_____	_____
6. Reduction by Apex:		
a. Using two straightedges or a quartering device and one straightedge, 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?	_____	_____
7. Remaining unused asphalt mixture stored in suitable container, properly labeled?	_____	_____

OVER

Procedure Element	Trial 1	Trial 2
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?	_____	_____
3. Conical pile formed?	_____	_____
4. Asphalt mixture 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 asphalt mixture stored in suitable container, properly labeled?	_____	_____

Comments: First attempt: Pass_____Fail_____ Second attempt: Pass_____Fail_____

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Examiner Signature _____ **WAQTC #:**_____

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The End