



Alaska Department of Transportation and Public Facilities

Alaska Sampling Module Manual

Revised December 31, 2009

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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, bituminous mixes, Portland cement concrete, soils, and soil aggregate mixture,
- asphalt cement and emulsified asphalt, and
- bituminous mixes.

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.**

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
T 2	Sampling of Aggregates	C	W, P*
T 248	Reducing Samples of Aggregate to Testing Size	C,L**	W,P*
T 40	Sampling Bituminous Materials	C	W, P*
T 168	Sampling Bituminous Paving Mixtures	C	W, P*
R 47	Reducing Samples of Hot Mix Asphalt 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.

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RANDOM SAMPLING OF CONSTRUCTION MATERIALS

01

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 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.

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- One of the greatest single sources of error in materials testing is the failure to obtain a representative sample.
- Random numbers eliminate sampling bias.
- Random numbers determine time and/or location of sampling.

03

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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 subplot. This method does not cover how to sample, but rather how to determine sampling times, locations, or points.

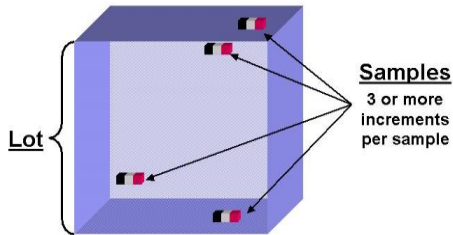
Sampling Concepts

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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.

Straight Random Sampling

One or more sample locations may be selected, using the entire lot as a single unit



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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.

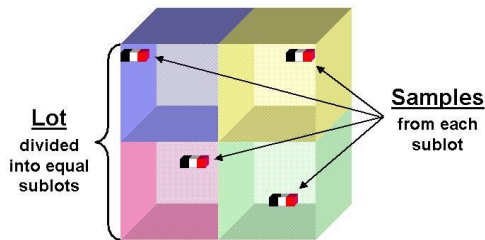
Straight Random Sampling vs. Stratified

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 subplot. Both methods result in random distribution of samples to be tested for compliance with the agency's specification.

- Straight: Entire lot is one unit.
- Stratified: Lot is divided into sublots or units.

Stratified Random Sampling

The lot is divided into two or more equal sublots. Samples are taken from each subplot



07

Agencies stipulate when to use straight random sampling or stratified random sampling. AASHTO T 2, Sampling of Aggregates, for example, specifies a straight random sampling procedure.

Picking Random Numbers from a Table

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.

08

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.

- Demonstrate. Have a participant obtain pick and random numbers using a digital watch.

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.

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 $(0.317)(1,000,000 \text{ kg}) = 317,000 \text{ kg}$ (317 t). Or $(.317) (1100 \text{ T}) = 349 \text{ T}$.

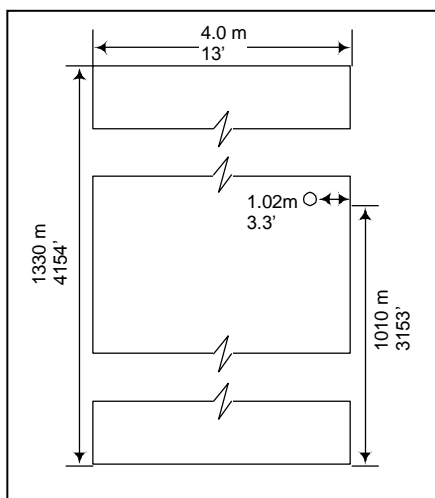
- A very small RN – say 0.001 – might not be usable. An aggregate crusher takes a few minutes to get to full production (the jaw, cones, screen decks and belts). An RN of 0.001 might result in taking a sample too soon. If this occurs, you may need to pick a new random number.

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 $(0.199)(9 \text{ hrs}) = 1.79 \text{ hr} = 1 \text{ hr}, 48 \text{ minutes}$ into the day. AASHTO T 2 permits this time to be rounded to the nearest 5 minutes.

11 **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.

12 **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 (1000 yd^3) and material is being placed 0.15 m ($0.50'$) thick and 4.0 m ($13'$) wide, then the lot is 1330 m ($4154'$) long. You would select two RNs in this case. To convert yd^3 to ft^3 multiply by 27.



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14 **Sampling from a roadway**

15 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 $(0.759)(1330 \text{ m})$ or $(4154') = 1010 \text{ m}$ or $3153'$ from the beginning. A second RN of 0.255 would specify that the sample would be taken at $(0.255)(4.0 \text{ m})$ or $(13') = 1.02 \text{ m}$ or $3.3'$ 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') to the edge. If the RN specifies a location closer than 0.3 m (1'), then 0.3 m (1') is added to or subtracted from the distance calculated.

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Sampling from a Stockpile: AASHTO T 2 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 T 2 for guidance on how to sample from a stockpile.

- Show an example from agency specifications.

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In-Place Density Testing: Agency specifications will indicate the frequency of tests. For example, one test per 500 m³ (666 yd³) might be required. If the material is being placed 0.15 m (0.50') thick and 10.0 m (33') wide, then the lot is 333 m (1090') 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') = 129 m or (422') 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') = 5.88 m or (19') 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') to the edge. If the RN specifies a location closer than 0.3 m (1'), then 0.3 m (1') is added to or subtracted from the distance calculated.

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SAMPLING OF AGGREGATES FOP FOR AASHTO T 2



Sampling aggregate

01

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.

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- Samples must be random.
- Samples must be representative.

Scope

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

05

Apparatus

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

04

Apparatus



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Procedure - General

Sampling is as important as testing, and the technician shall use every precaution to obtain samples that will show the true nature and condition of the materials the sample represents. In all situations, determine the time or location for sampling in a random manner.

- Explain why samples are taken in parts. Inconsistent operation requires mixing or averaging to represent the final product.
- Indicate that sampling is just as important as testing.

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1. Wherever samples are taken, obtain multiple increments of approximately equal size.

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2. Mix the increments thoroughly to form a field sample that meets or exceeds the minimum mass recommended in Table 1.



Belt Sampler

**TABLE 1
Sample Sizes**

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

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

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

Nominal maximum size and maximum size are not the same.

Example:

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")
 Nominal maximum size: 37.5 mm (1 1/2")
 Maximum size: 50 mm (2")



Sampling from the belt

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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. Scoop off the sample, including all fines.
4. Obtain a minimum of three increments.
5. Combine the increments to form a single sample.

Method B (From the Belt Discharge):

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

- Indicate that an automatic mechanical sampling device located at the end of the belt is the most appropriate method to ensure obtaining representative samples.
- Caution against sampling at the beginning or end of a run.
- Caution to 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.
- Suggest observing one or two cycles of the automatic sampler before collecting the actual sample.

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Sampling from windrow

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- **Transport Units**

1. Visually divide the unit into four quadrants.
2. Identify one sampling location in each quadrant.
3. Dig down and remove approximately 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 single sample.

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- **Roadways**

Method A (Berm or Windrow):

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

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

Method B (In-Place):

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

- Caution that segregation occurs in berms, as in stockpiles.

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- **Stockpiles**

Method A – Coarse, Fine, or a Combination of Coarse and Fine Aggregates:



Top, middle, bottom

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1. Create, with a loader if one is available, horizontal surfaces with vertical faces in the top, middle, and bottom third of the stockpile. When no equipment is available, a shovel may be used to create horizontal surfaces with vertical faces.

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2. Prevent sloughing by shoving a flat board in against the vertical face. Sloughed material will be discarded to create the horizontal surface.
3. Sample from the horizontal surface at the intersection of the horizontal and vertical faces.
4. Obtain at least one increment of equal size from each of the top, middle, and bottom thirds of the pile.
5. Combine the increments to form a single sample.

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Method B – Fine Aggregate (Alternative Tube Method):

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

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

- Indicate that technicians should avoid sampling at stockpiles whenever possible due to problems involved in obtaining a representative gradation of material.

Tips!

- 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 power equipment, such as loaders and backhoes, be used to collect aggregate samples?
2. Describe the process for sampling from a conveyor belt using method “A”.
3. Which sampling location should be avoided whenever possible due to problems involved in obtaining a representative gradation of material?
4. Describe sampling from roadways.

**REDUCING SAMPLES OF AGGREGATES TO TESTING SIZE
FOP FOR AASHTO T 248**

01

Significance

Aggregates and other materials sampled in the field in accordance with AASHTO T 2 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.

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- Emphasize the need to not alter the aggregate.
- Suggest strongly the field sample size should be such that, when split twice, it provides the appropriate test sample size. Excessive manipulation can cause segregation, especially with coarse aggregate.

04

Scope

This procedure covers the reduction of samples to the appropriate size for testing in accordance with AASHTO T 248. 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 procedure applies to fine aggregate (FA), coarse aggregate (CA), and mixes of the two, and may also be used on soils.

05



Mechanical splitter

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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, 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

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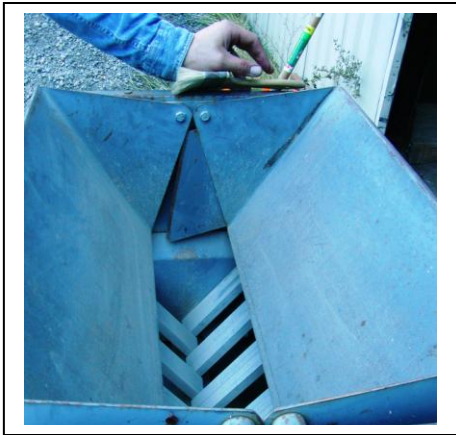


Quartered sample

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- Feed control:

Mechanical splitter



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- Hopper or straightedge pan with a width equal to or slightly less than the overall width of the assembly of chutes
- Capable of feeding the splitter at a controlled rate

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- 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
- Canvas or plastic sheet, approximately 2 by 3 m (6 by 9 ft)

- Have extra sheets on hand. Holes can develop very quickly.
- Explain SSD condition.
- Indicate that use of a mechanical splitter in accordance with Method A is preferred.
- Even with Method B, Quartering, it is best to dry the material before splitting.



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Method Selection

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

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

Samples of CA or mixtures of FA and CA may be reduced by either method. It may be undesirable to reduce some FA / CA mixtures that are over SSD condition using Method A.

- Stress why temperature control is important. For example, excess heat can change the results of the sand equivalent test covered in AASHTO T 176.
- List and/or describe drying equipment.
- Point out that a microwave oven is not a good choice for obtaining SSD, since drying occurs from inside to outside.



Mechanical splitter

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Procedure

Method A – Mechanical Splitter

1. Place the sample in the hopper or pan and uniformly distribute it from edge to edge so that approximately equal amounts flow through each chute. The rate at which the sample is introduced shall be such as to allow free flowing through the chutes into the pans below.
2. Reduce the sample from one of the two pans as many times as necessary to reduce the sample to meet the minimum size specified for the intended test. The portion of the material collected in the other pan may be reserved for reduction in size for other tests.
3. As a check for effective reduction, 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. In lieu of the mathematical check for effective reduction, the method illustrated in Figure 1 may be performed as the method for reduction.

Mathematical Splitter check:

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$$\frac{\text{Smaller Mass}}{\text{Larger Mass}} = \text{Ratio}$$

$$(1 - \text{Ratio}) \times 100 = \% \text{ Difference}$$

Total sample mass 5127

Splitter pan #1: 2583

Splitter pan #2: 2544

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

Alternate Reduction Example:

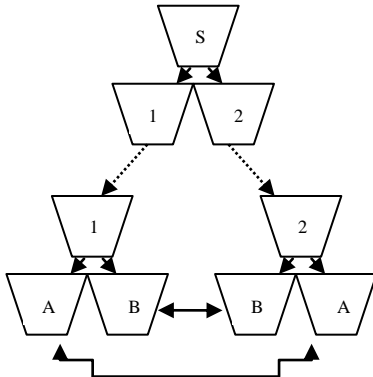


Figure 1

- Sample (S) is an amount greater than or equal to twice the mass needed for testing. Sample (S) is split 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.

- Explain how to correct an out of tolerance split.
- Either:
 - Shim the splitter to level it out, or,
 - Split the field sample in parts, and combine opposite sides to create a test sample.



Flattening pile

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Dividing pile

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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 a minimum of four times by pulling each corner of the sheet 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.
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.

- Remember, the final test sample consists of two diagonally opposite quarters.



Mixing the sample

23

Procedure #2: Quartering on a canvas or plastic sheet:

1. Place the sample on the sheet.
2. Mix the material thoroughly by turning the entire sample over a minimum of three times. Lift each corner of the sheet and pulling it over the sample toward the diagonally opposite corner, causing the material to be rolled. With the last turning, form a conical pile.

24

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.

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Quartered sample

4. Divide the flattened pile into four approximately equal quarters with a shovel or trowel, or insert a stick or pipe beneath the sheet 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 sheet 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 sheet.
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.

Tips!

- 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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PERFORMANCE EXAM CHECKLIST

**REDUCING FIELD SAMPLES OF AGGREGATES TO TESTING SIZE
FOP FOR AASHTO T 248**

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. Material spread uniformly on feeder? _____
- 2. Rate of feed slow enough so that sample flows freely through chutes? _____
- 3. Material in one pan re-split until desired mass is obtained? _____

Method B - Quartering

- 1. Sample placed on clean, hard, and level surface? _____
- 2. Mixed by turning over 4 times with shovel or by pulling sheet horizontally over pile? _____
- 3. Conical pile formed? _____
- 4. Diameter equal to about 4 to 8 times thickness? _____
- 5. Pile flattened to uniform thickness and diameter? _____
- 6. Divided into 4 equal portions with shovel or trowel? _____
- 7. Two diagonally opposite quarters, including all fine material, removed? _____
- 8. Cleared space between quarters brushed clean? _____
- 9. Process continued until desired sample size is obtained when two opposite quarters combined? _____

The sample may be placed upon a sheet and a stick or pipe may be placed under the sheet to divide the pile into quarters.

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

Examiner Signature _____ WAQTC #: _____

SAMPLING BITUMINOUS MATERIALS FOP FOR AASHTO T 40

Significance

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

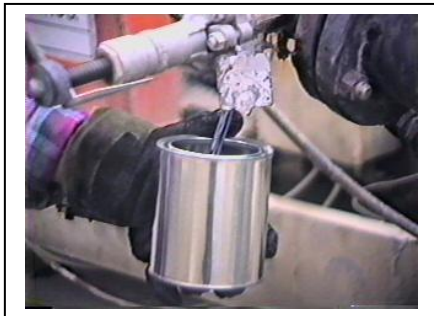
The procedure covers obtaining samples of liquid bituminous materials in accordance with AASHTO T 40. Sampling of solid and semi-solid bituminous materials – included in AASHTO T 40 – is not covered here.

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

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

Procedure

1. Coordinate sampling with contractor or supplier.
2. Allow a minimum of 4 L (1 gal) to flow before obtaining a sample(s).
3. Obtain samples of:
 - Asphalt binder from hot mix asphalt (HMA) plant: 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 prior to dilution.



Sampling liquid binder

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.

07 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 number. Include lot and subplot numbers when appropriate.

08 • 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.

• Asphalt binder and cutbacks: Use metal cans.

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.

- Yes, emulsified asphalt can freeze!

Tips!

09

- Remember to identify sample on outside of container.

REVIEW QUESTIONS

1. Describe how liquid bituminous material is obtained at an HMA plant.
2. Describe how liquid bituminous material is obtained from a spray distributor.
3. Describe the containers used for sampling.

PERFORMANCE EXAM CHECKLIST (ORAL)

**SAMPLING BITUMINOUS MATERIALS
FOP FOR AASHTO T 40**

Participant Name _____ Exam Date _____

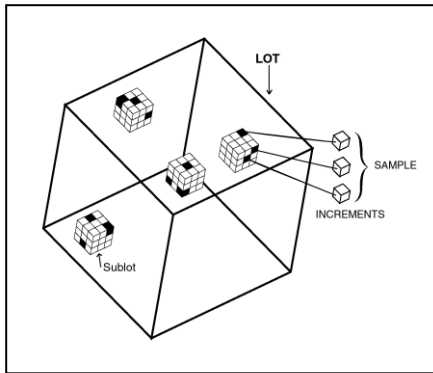
Record the symbols "P" for passing or "F" for failing on each step of the checklist.

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.	_____	_____
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 #: _____

SAMPLING OF BITUMINOUS PAVING MIXTURES FOP FOR AASHTO T 168



01
02
Sampling from a lot



03
04
HMA sample

Significance

Testing bituminous paving 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 quality tests to be made on only a small portion of the total material placed, the need for a truly representative sample is apparent.

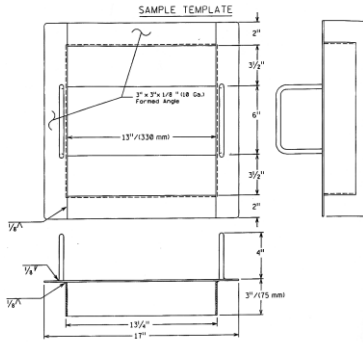
Scope

This procedure covers the sampling of bituminous paving mixtures from HMA plants; haul units, and roadways, in accordance with AASHTO T 168.

Sampling is as important as testing, and every precaution must be taken to obtain a truly representative sample.

Apparatus

- Shovel
- Sample containers: Cardboard boxes, metal cans, stainless steel bowls, or other agency-approved containers
- Scoops, trowels, or other equipment to obtain mix
- Sampling plate: Heavy gauge metal plate 380 mm x 380 mm (15 in x 15 in) minimum 8 gauge thick 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. Holes 1/4" in diameter should be provided in each corner.
- Cookie cutter sampling device: A 330 mm (13



Cookie Cutter Sampling Device

05

in.) square sampling template, constructed from 75 mm x 50 mm x 3 mm (3 in. x 2 in. x 1/8 in.) formed steel angle with two 100 mm x 150 mm x 9 mm (4 in. x 6 in. x 3/8 in.) handles. (See diagram)

Note 1: Sampling Plate and cookie cutter may be sized appropriately to accommodate sample size requirements.

- Mechanical sampling device

Sample Size

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

Sampling

06

General

1. 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.
2. Place dense graded mixture samples in cardboard boxes, stainless steel bowls or other agency approved containers. Place open graded mixture samples in stainless steel bowls. Do not put open graded mixture samples in boxes until they have cooled to the point that bituminous material will not migrate from the aggregate.

07

Attached Sampling Devices



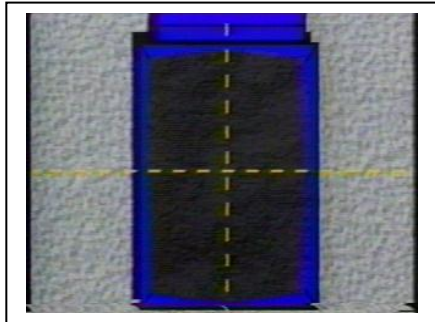
Attached Sampling device

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Some agencies require mechanical sampling devices for hot mix asphalt (HMA) and cold feed aggregate on some projects. These are normally permanently attached devices that allow a sample container to pass perpendicularly through the entire stream of material or divert the entire stream of material into the container. Operation may be hydraulic, pneumatic, or manual and allows the sample container to pass through the stream twice, once in each direction, without overflowing. Special caution is necessary with manually operated systems since a consistent speed is difficult to maintain and non-



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Quadrants in a load



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Plate on untreated base

representative samples may result. Check agency requirements for the specifics of required sampling systems.

1. Lightly coat the container attached to the sampling device with an agency-approved release agent and/or preheat it to approximately the same discharge temperature of the mix.
2. Pass the container twice through the material perpendicularly without overfilling the container.
3. Repeat until proper sample size has been obtained.
4. Transfer the HMA to an agency-approved container without loss of material.

Sampling from 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 0.3m (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.

Sampling from Roadway Prior to Compaction (Plate Method)

Plate Method using the “cookie cutter” sampling device.

There are two conditions that will be encountered when sampling Hot Mix Asphalt (HMA) from the roadway prior to compaction. The two conditions are:

Laying HMA on grade or untreated base material requires Method 1.

Laying HMA on existing asphalt or laying a second lift of HMA requires Method 2.

Cookie cutter and plate can be sized according to test sample needs.

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 taken and the hole filled with loose HMA.

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 time, 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.
3. 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.



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Method 1 - Obtaining a Sample on Untreated Base:

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.

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2. Secure the plate in place with a nail through the hole in the lead corner of the plate.
3. Pull the wire, attached to the outside corner of the plate, taut past the edge of the HMA mat and secure with a nail.
4. Let the paving operation proceed over the plate and wire. Immediately proceed with the sampling.
5. Using the exposed end of the wire, pull the wire up through the fresh HMA to locate the corner of the plate. 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 HMA to the plate.
6. Using a small square tipped shovel and/or scoop, carefully remove all the HMA from inside of the cutter and place in a sample container. Care shall be taken to prevent contamination of bituminous mixes by dust or other foreign matter, and to avoid segregation of aggregate and bituminous materials.
7. Remove the sample cutter and the plate from the roadway. The hole made from the sampling must be filled by the contractor with loose HMA.

Method 2 – Obtaining a Sample on Asphalt Surface:

1. After the paving machine has passed the sampling point, immediately place the “cookie cutter” sampling device on the location to be sampled. Push the cutter down through the HMA until it is flat against the underlying asphalt mat.
2. Using a small square-tipped shovel and/or scoop, carefully remove all the HMA from inside of the cutter and place in a sample container. The hole made from the sampling must be filled by the contractor with loose HMA.

Identification and Shipping

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

Tips!

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Check agency requirements for:

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

22

REVIEW QUESTIONS

1. Bituminous paving mixture sample sizes are based on what?

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

3. Describe how samples are obtained from:
 - Plants with attached sampling devices

 - Truck transports

 - Roadway

PERFORMANCE EXAM CHECKLIST (ORAL)

**SAMPLING BITUMINOUS PAVING MIXTURES
FOP FOR AASHTO T 168**

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 a sampling device?		
a. Coat or preheat sample container.	_____	_____
b. Sampling device passed through stream twice perpendicular to material.	_____	_____
c. The sampling device cannot be overfilled.	_____	_____
2. What must be done to sample from transport units?		
a. Divide the unit into four quadrants.	_____	_____
b. Obtain increments from each quadrant, 300 mm (12 in) below surface.	_____	_____
3. Describe how to take samples from the roadway using a 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 on the HMA above the plate and push it down to the plate.	_____	_____
d. Collect all the material inside the cutter.	_____	_____
4. What types of containers can be used?		
a. Cardboard boxes, stainless steel bowls, or other agency approved containers.	_____	_____
5. What dictates size of sample?		
a. Agency requirements.	_____	_____

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

Examiner Signature _____ WAQTC #: _____

REDUCING SAMPLES OF HOT MIX ASPHALT (HMA) TO TESTING SIZE FOP FOR AASHTO R 47



Mix sample

01

Significance

Samples of bituminous paving mixes taken in accordance with the FOP for AASHTO T 168 are composites and typically large in size. Materials sampled in the field need to be reduced to appropriate sizes for testing. As a general rule, field samples should be of a size that splitting once will result in the required test sample size. It is extremely important that the procedure used to reduce the field sample not modify the material properties.

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- Emphasize the need to not alter the bituminous paving mix.
- Suggest strongly the field sample size should be such that, when split once, it provides the appropriate test sample size. Excessive manipulation can cause segregation.

Scope

This procedure covers sample reduction of Hot Mix Asphalt (HMA) to testing size. The reduced portion is to be representative of the original sample.

04

Apparatus

- 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, and/or drywall taping knives; for removing HMA samples from the quartering device, cleaning surfaces used for splitting, etc.
- Square-tipped, flat-bottom scoop, shovel or trowel for mixing HMA prior to quartering.
- Miscellaneous equipment including hot plate, non-asbestos heat-resistant gloves or mittens, pans, buckets, and cans.



**Mechanical Splitter Type A
(Quartermaster)**



**Mechanical Splitter Type B
(Riffle)**

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- Sheeting: Non-stick heavy paper, heat-resistant plastic, 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 A (Quartermaster): with four equal-width chutes discharging into four appropriately sized sample receptacles. Splitter is to be equipped with a receiving hopper that will hold the sample until the release lever is activated with four sample receptacles of sufficient capacity to accommodate the reduced portion of the HMA sample from the mechanical splitter. Refer to AASHTO R 47, Figures 1 through 3, for configuration and required dimensions of the mechanical splitter.
- 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% 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 HMA through the chutes without segregation or loss of material. Sample receptacles of sufficient width and capacity to receive the reduced portions of HMA from the riffle splitter without loss of material.
- 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 HMA by an amount allowing complete separation of the quartered sample. Height of the sides must exceed the thickness of the flattened cone of HMA.
- Non-stick mixing surface that is hard, heat-resistant, clean, level, and large enough to

permit HMA samples to be mixed without contamination or loss of material.

Sampling

Obtain samples according to the FOP for AASHTO T 168.

Sample Preparation

08 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.

- Tools should be heated to a temperature not to exceed 110° C (230° F).
- Quartering HMA will be much easier if performed while the material and tools remain hot.

Selection of Procedure (Method)

09 Refer to agency requirements when determining the appropriate method(s) of sample reduction. It is recommended that, for large amounts of material, the initial reduction be performed using a mechanical splitter. 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 HMA may be performed by a combination of the following methods, as approved by the agency.

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- Method selection depends on initial size of sample vs. size needed to perform specific test
- Using a mechanical splitter decreases reduction time and minimizes temperature loss

The methods for reduction are:

- Mechanical Splitter Method

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- Type A (Quartermaster)
- Type B (Riffle Splitter)
- Quartering Method
 - Full Quartering
 - By Apex
- Incremental (Loaf) Method

Procedure

Mechanical Splitter Type A (Quartermaster)

1. Clean the splitter and apply a light coating of approved release agent to the surfaces that will contact HMA.
2. Close and secure hopper gates.
3. Place the four sample receptacles in the splitter so that there is no loss of material.
4. Remove the sample from the agency-approved container(s) and place in the mechanical splitter hopper. Avoid segregation, loss of HMA or the accidental addition of foreign material.
5. Release the handle, allowing the HMA to drop through the divider chutes and discharge into the four receptacles.
6. Any HMA that is retained on the surface of the splitter shall be removed and placed into the appropriate receptacle.
7. Close and secure the hopper gates.
8. Reduce the remaining HMA as needed by this method or a combination of the following methods as approved by the agency.
9. Combine the material contained in the receptacles from opposite corners and repeat the splitting process until an appropriate sample size is obtained.
10. Retain and properly identify the remaining unused portion of the HMA sample for further testing if required by the agency.

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Mechanical Splitter Type B (Riffle)

1. If heating of the testing equipment is desired, it shall be heated to a temperature not to exceed 110 °C (230°F).
2. Clean the splitter and apply a light coating of approved release agent to the surfaces that will come in contact with HMA (hopper or straight-edged pan, chutes, receptacles).
3. Place two empty receptacles under the splitter.
4. Carefully empty the HMA 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.
5. Discharge the HMA at a uniform rate, allowing it to flow freely through the chutes.
6. Any HMA that is retained on the surface of the splitter shall be removed and placed into the appropriate receptacle.
7. Reduce the remaining HMA as needed by this method or a combination of the following methods as approved by the agency.
8. Using one of the two receptacles containing HMA, repeat the reduction process until the HMA contained in one of the two receptacles is the appropriate size for the required test.
9. After each split, remember to clean the splitter hopper and chute surfaces if needed.
10. Retain and properly identify the remaining unused HMA sample for further testing if required by the agency.

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Quartering Method

1. Heat all of the testing equipment (quartering template, scoop or trowel) to a temperature not to exceed 110 °C (230°F).
2. If needed, apply a light coating of release agent to quartering template.
3. Dump the sample from the agency approved container(s) into a conical pile on a hard,

17

“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.

4. 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.

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5. 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.

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6. Divide the flattened cone into four equal quarters using the quartering template. Press the template down until it is in complete contact with the surface on which the sample has been placed, assuring complete separation.

Note 1: Straightedges may be used in lieu of the quartering device to completely separate the material in approximately equal quarters.

7. Reduce the sample by quartering the sample completely or by removing the sample from the apex.

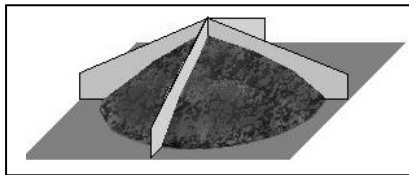
8. Full Quartering

8a Remove two diagonally opposite quarters, including all of the fine material.

8b Remove the quartering template and combine the remaining quarters, again forming a conical pile.

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**Quartering Template
(In Place)**



Quartered sample

- Leaving excessive amounts of material on the splitting surface or splitting equipment can bias the sample.

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8c Repeat steps 4, 5, 6, 8a, & 8b until a sample of the required size has been obtained. The final sample must consist of the two remaining diagonally opposite quarters.

8d Retain and properly identify the remaining unused portion of the HMA sample for further testing if required by the agency.

9. By Apex

9a Using a straightedge, slice through a quarter of the HMA from the center point to the outer edge of the quarter.

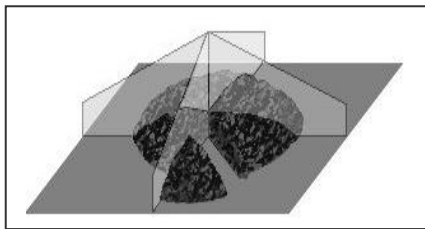
9b Pull or drag the material from the quarter, holding one edge of the straightedge in contact with quartering device.

9c Remove an equal portion from the opposite quarter and combine these increments to create the required sample size.

Note 2: Two straightedges may be used in lieu of the quartering device.

9d Continue using the apex method with the unused portion of the HMA until samples have been obtained for all required tests.

9e Retain and properly identify the remaining unused portion of the HMA sample for further testing if required by the agency.

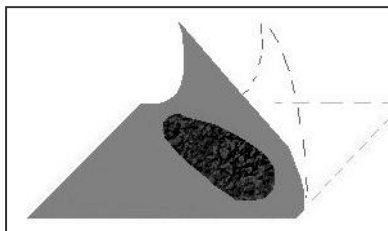


HMA from the apex of the quarter to the outer edge.

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Mixing HMA

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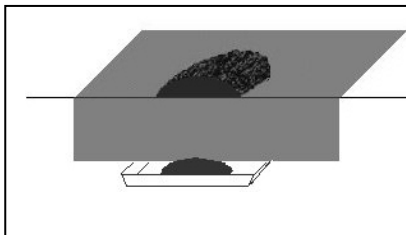
Incremental Method (Loaf)

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.



Mixing the sample

28



Material dropped into
container

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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 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.
4. 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.
5. Pull the sheeting so at least $\frac{1}{4}$ of the length of the loaf is off the edge of the counter. Allow this material to drop into a container to be saved. As an alternate, using a straightedge, slice off approximately $\frac{1}{4}$ of the length of the loaf and place in a container to be saved.
6. Pull material (loaf) off the edge of the counter and drop into an appropriate size sample pan or container for the test to be performed. Continue removing material from the loaf until the proper size sample has been acquired. As an alternate, using a straightedge, slice off an appropriate size sample from the length of the loaf and place in a sample pan or container.
7. Repeat step 6 until all the samples for testing have been obtained.

Note 3: 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.

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Sample Identification

1. Identify the sample as required by the agency.
2. Samples shall be submitted in agency approved containers and secured to prevent contamination and spillage.

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Tips!

- 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.
- With Mechanical Method (Type A), further reduction requires using HMA from diagonally opposite receptacles.
- With both Mechanical Methods, inspect splitter surfaces for build-up of HMA, 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.

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REVIEW QUESTIONS

1. Describe how the material is mixed before quartering.
2. What is the difference between full quartering and quartering by apex?
3. How many types of mechanical splitters are there and how are they different?
4. Are any of the reduction methods preferred? When & why?
5. Can multiple splitting methods be used in reducing a sample?

PERFORMANCE EXAM CHECKLIST

REDUCING SAMPLES OF HOT MIX ASPHALT (HMA) 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?	_____	_____
Mechanical Splitter Method Type A (Quartermaster)		
2. Splitter cleaned and surfaces coated with release agent?	_____	_____
3. Hopper closed and receptacles in place?	_____	_____
4. Sample placed into hopper without segregation or loss of material?	_____	_____
5. Hopper handle released allowing the HMA to uniformly flow into receptacles?	_____	_____
6. Splitter surfaces cleaned of all retained HMA, allowing it to fall into appropriate receptacles?	_____	_____
7. Further reduction with the quartermaster:		
a. Material in receptacles from opposite corners combined?	_____	_____
b. Splitting process repeated until appropriate sample size is obtained?	_____	_____
8. Remaining HMA stored in suitable container and properly labeled?	_____	_____
Mechanical Splitter Method Type B (Riffle)		
9. Splitting apparatus and tools preheated without exceeding 110°C (230°F)?	_____	_____
10. Splitter cleaned and surfaces coated with release agent?	_____	_____
11. Two empty receptacles placed under splitter?	_____	_____
12. Sample placed in hopper or straight edged pan without loss of material and uniformly distributed from side to side?	_____	_____
12. Material discharged across chute assembly at controlled rate allowing free flow of HMA through chutes?	_____	_____
13. Splitter surfaces cleaned of all retained HMA allowing it to fall into appropriate receptacles?	_____	_____

OVER

- 14. Further reduction with the riffle splitter:
 - a. Material from one receptacle discharged across chute assembly at controlled rate, allowing free flow of HMA through chutes? _____
 - b. Splitting process continued until appropriate sample size obtained, with splitter surfaces cleaned of all retained HMA after every split? _____
- 15. Remaining unused HMA stored in suitable container, properly labeled? _____

Quartering Method

- 16. Testing equipment preheated to a temperature not to exceed 110 °C (230°F)? _____
- 17. Sample placed in a conical pile on either a hard, non-stick, heat-resistant splitting surface such as metal or sheeting? _____
- 18. Sample mixed by turning the entire sample over a minimum of 4 times? _____
- 19. Conical pile formed and then flattened uniformly to diameter equal to about 4 to 8 times thickness? _____
- 20. Sample divided into 4 equal portions either with a metal quartering template or straightedges such as drywall taping knives? _____
- 21. Reduction by Full Quartering:
 - a. Two diagonally opposite quarters removed and returned to sample container? _____
 - b. Two other diagonally opposite quarters combined and process continued until appropriate sample size has been achieved? _____
- 22. Reduction by Apex:
 - a. Using two straightedges or a splitting device and one straightedge, was one of the quarters split from apex to outer edge of material? _____
 - b. Similar amount of material taken from opposite quarter? _____
 - c. Increments combined to produce appropriate sample size? _____
- 23. Remaining unused HMA stored in suitable container, properly labeled? _____

Incremental (Loaf) Method

- 24. Sample placed on hard, non-stick, heat-resistant splitting surface covered with sheeting? _____
- 25. Sample mixed by turning the entire sample over a minimum of 4 times? _____
- 26. Conical pile formed? _____
- 27. HMA rolled into loaf and then flattened? _____
- 28. The first quarter of the loaf removed by slicing off or dropping off edge of counter and set aside? _____

OVER

- 29. Proper sample size sliced off or dropped off edge of counter into sample container? _____
- 30. Process continued until all samples are obtained? _____
- 31. All remaining unused HMA stored in suitable container, properly labeled? _____

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

Examiner Signature _____

WAQTC #: _____

