

Colorado Procedure 32-03

Standard Practice for

Reducing Field Samples of Soil and Aggregate to Testing Size

1. SCOPE

- 1.1 These methods cover the reduction of field samples of soil and aggregate to the appropriate size for testing employing techniques that are intended to minimize variations in measured characteristics between the test samples selected and the field sample. CP 55 is used for the reduction of samples of HMA to test size.
- 1.2 The values stated in acceptable English units are to be regarded as the standard.

2. REFERENCED DOCUMENTS

2.1 *AASHTO Standards:*

- T 2 Sampling Aggregates
- T 84 Specific Gravity and Absorption of Fine Aggregate

2.2 *Colorado Procedures:*

- CP 20 Dry Preparation of Disturbed Soil Samples for Test
- CP 30 Sampling of Aggregates
- CP 55 Reducing Field Samples of Hot Mix Asphalt to Testing Size

- CP-L 4102 Specific Gravity and Absorption of Fine Aggregate

3. SIGNIFICANCE AND USE

- 3.1.1 The necessity for selecting representative samples and reducing them to test specimen size is emphasized in many test procedures. Using the proper equipment for the type of material to be reduced in size is important. However, unless used correctly, the final test specimen will not necessarily be representative of the total sample.
- 3.1.2 Specifications for aggregates indicate the sampling portions of the material required for testing. Other factors being equal, larger samples will tend to be more representative of the total aggregate source. These methods provide for reducing the large sample obtained in the field to a convenient size for conducting a variety of tests to describe the material and to measure its quality in such a manner that the smaller portion is most likely to be a true representation of the field sample, and thus of the total aggregate source. The individual test methods indicate the minimum weights of material to be tested.

- 3.2 Under certain circumstances, reduction in size of the field sample prior to testing is not recommended. Substantial differences between the selected test samples sometimes cannot be avoided, as for example, in the case of an aggregate having relatively few large size particles in the field sample. The laws of chance dictate that these few particles may be unequally distributed among the reduced size test samples. Similarly, if the test sample is being examined for certain contaminants occurring as a few discrete fragments in only small percentages, caution should be used in interpreting results from the reduced size test sample. Chance inclusion or exclusion of only one or two particles in the selected sample may importantly influence interpretation of the characteristics of the field sample. In these cases, the entire field sample should be tested.
- 3.3 Failure to carefully follow the procedures in these methods could result in providing a non-representative sample to be used in subsequent testing.

4. SELECTION OF METHOD

- 4.1 The use of a riffle sample splitter is always preferable to hand quartering. A riffle splitter should be used whenever one exists with the proper sized openings. The splitter openings should be sufficiently wide to permit easy passage of the largest particles in the sample. When splitters with adjustable openings are used, the width of the openings should be adjusted to approximately 1-1/2 times the size of the largest particle in the sample.
- 4.2 Fine Aggregate - Field samples of fine aggregate that are drier than the saturated-surface-dry condition (Note 1) shall be reduced in size by a mechanical splitter according to Method A. Field samples having free moisture on the particle surfaces may be reduced in size by quartering according to Method B or by treating it as a miniature stockpile as described in Method C.
- 4.2.1 If the use of Method B or Method C is desired, and the field sample does not have free moisture on the particle surfaces, the sample may be first moistened to achieve this condition, and then it should be thoroughly mixed prior to the sample reduction being performed.

Note 1: The method of determining the saturated-surface-dry condition is described in AASHTO T 84. As a quick approximation, if the fine aggregate retains a balled shape when molded in the hand, it may be considered to be wetter than saturated-surface-dry.

- 4.2.2 If use of Method A is desired and the field sample has free moisture on the particle surfaces, the entire field sample may be dried to at least the surface-dry condition, using temperatures that do not exceed those specified for any of the tests contemplated, and then the sample reduction performed. Alternatively, if the moist field sample is very large, a preliminary split may be made using a mechanical splitter having wide chute openings 1-1/2 in. (38 mm) or more to reduce the sample to not less than 5000g. The portion obtained is then dried, and the reduction to test sample size is completed using Method A.
- 4.3 *Coarse Aggregates and Mixtures of Coarse and Fine Aggregates* - Reduce the sample using a mechanical splitter in accordance with Method A (preferred method) or by quartering in accordance with Method B. The miniature stockpile Method C is not permitted for coarse aggregates or mixtures of coarse and fine aggregates.

Note 2: Past experience has shown that when adjustable splitter openings are adjusted too wide or too narrow improper splitting will occur (see Subsection 6.1).

5. SAMPLING

- 5.1 The field sample of aggregate shall be taken in accordance with CP 30 or as required by individual test methods. When tests for sieve analysis only are contemplated, the size of the field sample listed in CP 30 is usually adequate. When additional tests are to be conducted, the tester shall satisfy himself that the initial size of the field sample is adequate to accomplish all intended tests.
- 5.2 Soil samples to be reduced to test specimen size shall be prepared in accordance with CP 20.

METHOD A - MECHANICAL SPLITTER

6. APPARATUS

- 6.1 *Sample Splitter* - Sample splitters shall have an even number of equal width chutes, but not less than a total of eight for coarse aggregate, or twelve for fine aggregate, which discharge alternatively to each side of the splitter. For coarse aggregate and mixed aggregate the minimum width of the individual chutes shall be approximately 50 percent larger than the largest particles in the sample to be split (Note 3). For dry fine aggregate in which the entire sample will pass the 3/8 in. (9.5-mm) sieve, a splitter having chutes 1/2 to 3/4 in. (12.5 to 20 mm) wide shall be used. The splitter shall be equipped with a minimum of two collection pans, having a width equal to or slightly less than the overall assembly of chutes in the splitter to hold the two halves of the sample following the splitting. It shall also be equipped with a hopper, a flat scoop, or straight-edged pan which has a width equal to or slightly less than the overall width of the assembly of chutes, by which the sample may be fed at a controlled rate to the chutes. The splitter and accessory equipment shall be so designed that the sample will flow smoothly without restriction or loss of material (Figure 32-1). A splitter brush should be used to clean the chutes of adhering fines.

Note 3: Mechanical splitters are commonly available in sizes adequate for coarse aggregates in which the largest particle does not exceed 1-1/2 in. (37.5 mm).

7. PROCEDURE

- 7.1.a **Riffle Splitters Without Control Flow Hoppers** - After placing the sample in a large flat-bottomed mixing pan, mix the sample thoroughly by turning the entire sample over three times. Using a flat scoop equal in length to the overall width of the riffles (feeder pan) remove the material from the mixing pan and uniformly distribute the material in the scoop so that when it is introduced to the splitter equal amounts of material will flow through each chute. Pour half of the sample through the riffles in a manner to allow the material to flow freely through the chutes without clogging any riffle. Reverse the ends of the feeder pan and pour the other half through the splitter. Continue this process until the entire sample has been introduced to the splitter.
- 7.1.b **Riffle Splitters With Control Flow Hoppers** - Place the entire sample in the closed hopper and uniformly distribute it from edge to edge. Using the handle, slowly release the material from the hopper through the chutes in a manner to allow the material to flow freely through the chutes without clogging any riffles. The first split is only to assist in mixing the sample. Remove both catch pans. Uniformly distribute the material in the first of the pans and pour it into the closed hopper by pouring half of the sample into the closed hopper, then reversing the ends of the pan, pouring the remaining half into the closed hopper. Repeat this process with the second pan. Place the emptied pans beneath the splitter under the riffles. With the material uniformly distributed in the closed hopper and using the handle, slowly release the material through the chutes as noted above.

- 7.2 Reintroduce the portion of the sample from alternating receptacles into the splitter as noted in Subsections 7.1.a or 7.1.b as many times as necessary to reduce the sample to at least the minimum size required for the intended test. Clean the riffles and the splitter with a brush after each split. Retain the portion from the other receptacle in case it becomes necessary to re-run the test.

METHOD B - QUARTERING

8. APPARATUS

- 8.1 Apparatus shall consist of a straight-edge scoop, or a flat, square end shovel; a broom or brush; and a canvas blanket at least 6 by 8 ft (2 by 2.5 m).

9. PROCEDURE

- 9.1 The field sample shall be placed on a canvas blanket laid on a clean, hard, level surface. Mix the material thoroughly by turning the entire sample over three times. With the last turning, shovel the entire sample into a conical pile by depositing each full shovel on top of the preceding one. Alternatively lift each corner of the canvas and pull it over the sample toward the diagonally opposite corner causing the material to be rolled. Carefully flatten the conical pile to a uniform thickness and diameter by pressing down the apex with a shovel so that each quarter sector of the resulting pile will contain the material originally in it. The diameter should be approximately four to eight times the thickness. Divide the flattened mass into four equal quarters with a shovel or trowel. If the surface beneath the blanket is uneven, insert a stick or pipe beneath the blanket and under the center of the pile, then lift both ends of the stick, dividing the sample into two equal parts. Remove the stick leaving a fold of the blanket 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 equal parts. Remove two diagonally opposite quarters, being careful to clean the fines from the blanket. Brush the cleared spaces clean and include the material in the sample. Successively mix and quarter the remaining material until the sample is reduced to the desired size (Figure 32-2). Save the remaining two quarters in case a retest is necessary.

METHOD C - SELECTION BY SCOOP

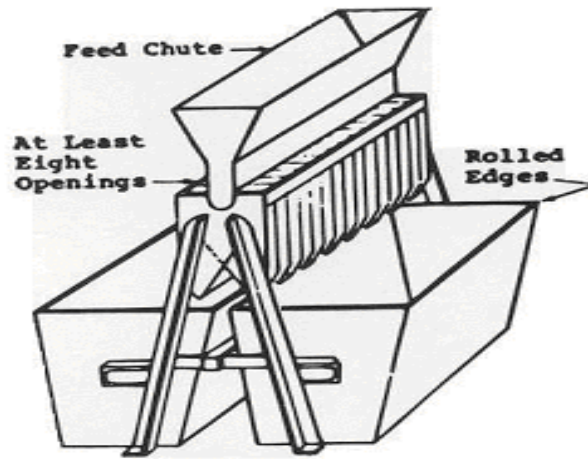
[Damp Fine (minus 3/8 in. (9.5 mm)) Aggregate Only]

10. APPARATUS

- 10.1 Apparatus shall consist of a small, flat, square end scoop with sides and a large flat- bottomed mixing pan.

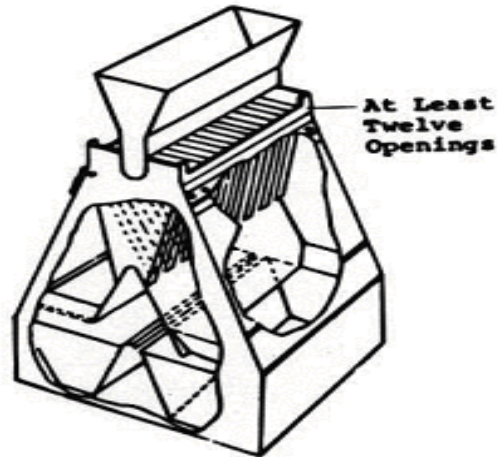
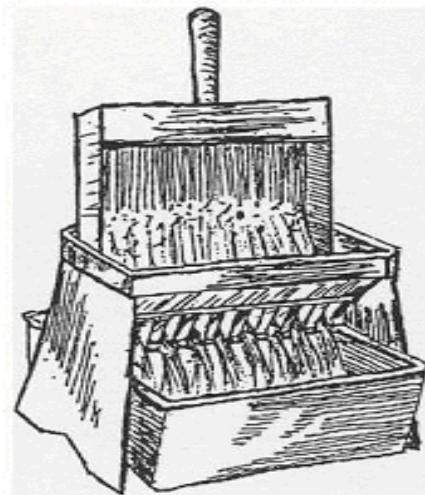
11. PROCEDURE

- 11.1 Place the field sample of damp fine aggregate in the mixing pan where there will be neither loss of material nor the accidental addition of foreign material. Mix the material thoroughly by turning the entire sample over three times. Flatten the sample in the pan to a uniform depth. Obtain a sample for each test by selecting at least three increments of material at random locations from the miniature stockpile, using a small flat square end scoop. Insert the scoop to the full depth of the material. Every attempt should be made to minimize the loss of particles over the sides of the scoop. Combine the portions to obtain a test specimen having the required weight. Save the remaining portion of the sample until tests are completed.



Riffle Sample Splitter

(a) Large Sample Splitter for Coarse Aggregate



(b) Small Sample Splitters For Fine Aggregate

NOTE: May be constructed as either closed or open type. Closed type is preferred.

FIGURE 32-1: Sample splitters (Riffles)

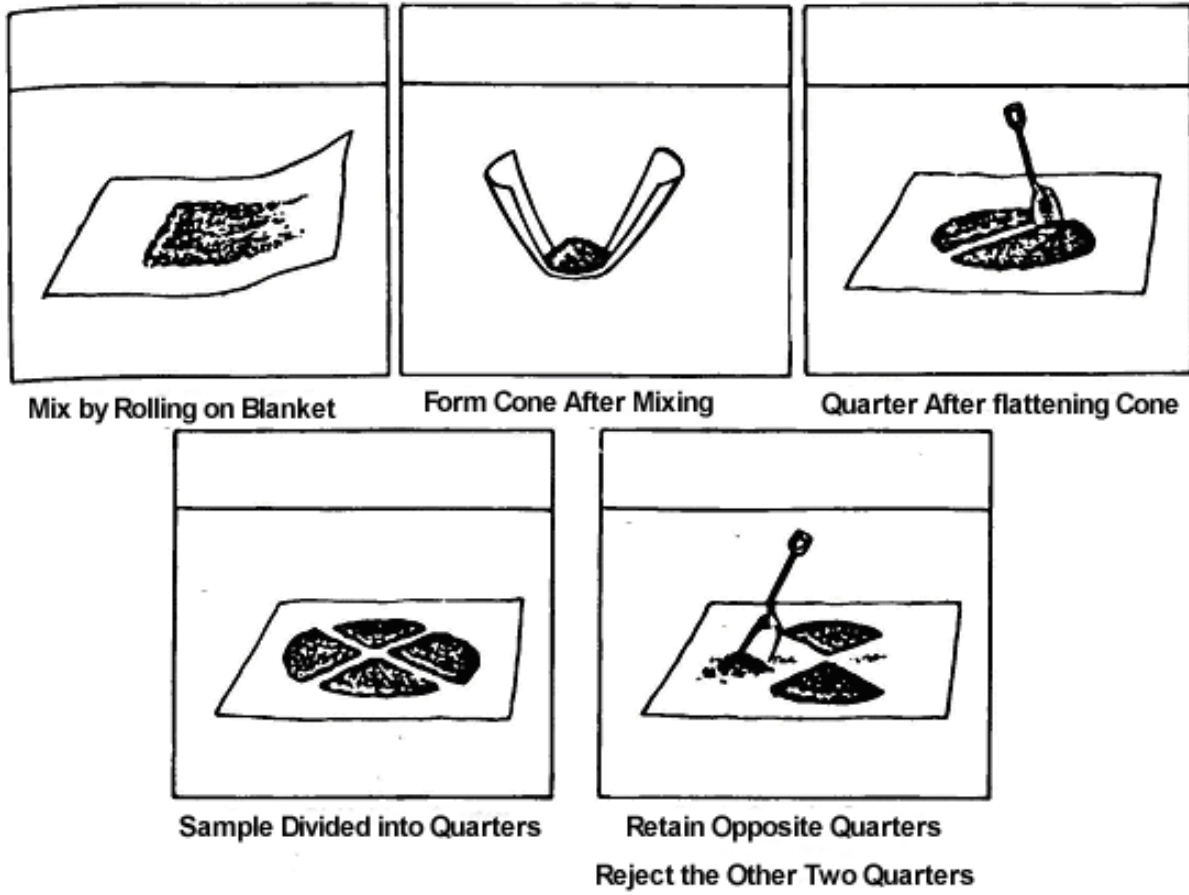


FIGURE 32-2: Quartering on a Canvas Blanket