ATT-57/22, REDUCING SAMPLES TO THE TESTING SIZE

1.0 SCOPE

This method describes the procedures for reducing samples using the splitting or quartering methods so that the reduced sample:

a) meets the minimum sample size for testing,
b) has minimum segregation, and
c) is representative of the original sample.

2.0 EQUIPMENT

2.1 Splitting Method

- sample splitter – must contain an even number of equally width chutes, with not less than a total of eight for coarse aggregate, or twelve for fine aggregate, which discharge alternately to each side of the splitter.
- The splitter must be equipped with at least two receptacles (catch pans) to hold the two halves of the sample during splitting.
- The splitter shall be equipped with a hopper, or straight edge pan, with a width equal to, or slightly less than, the overall width of the feed chutes, by which the sample may be fed at a controlled rate into the chutes.
- Two large drying pans and a brush.

2.2 Quartering Method

square nosed shovel
2.0 m x 2.5 m tarpaulin (or a sheet of plywood)
broom (or brush)
two large drying pans

3.0 PROCEDURE

Original samples are reduced to the testing size using the splitting or quartering methods. The splitting method is used for materials having a maximum topsize of 25 000 µm. The quartering method is used for materials with a topsize larger than 25 000 µm, or if a splitter is not available.

3.1 Splitting Method

1. Ensure the splitter and catch pans are clean.
2. Place an empty catch pan on each side of the splitter.
3. Stand on one side of the splitter and pour half of the sample through the chutes, avoiding loss of material.

4. Carefully pour the sample into the feed chute in a manner which allows the aggregate to flow freely through the openings and into the catch pans.

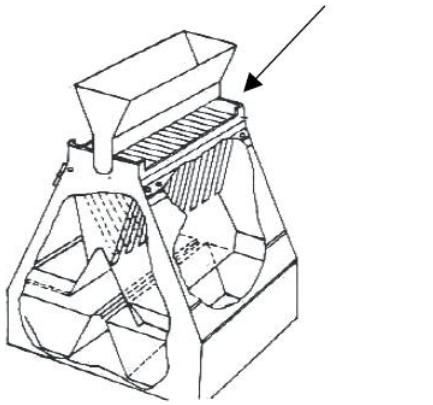
5. Switch sides and repeat steps 3 and 4 with the remainder of the sample. Ensure both catch pans have approximately the same amount of material.

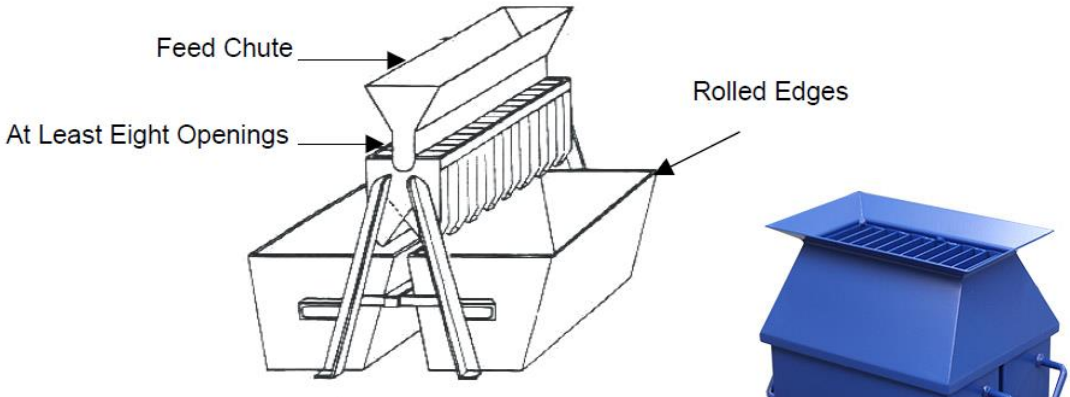
6. Take care that the catch pans do not overflow.

7. Remove both catch pans (A & B) and pour each split sample into separate tare pans.

8. 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. Retain the unused material until all desired tests are performed in case a re-test is required.

Small Sample Splitter for Fine Aggregates





Large Sample Splitter for Coarse Aggregates

9. Replace the catch pan with the least material with any empty one.

10. Weigh the pail containing the least material. Calculate the weight of the aggregate and plan the splitting process that will give the minimum sample required. Try to avoid splitting processes which result in larger samples than required.

    NOTE: Test procedures show the **minimum dry weight** of testing samples. If the sample is not dry, the required weight of the split should account for the amount of water in the sample.

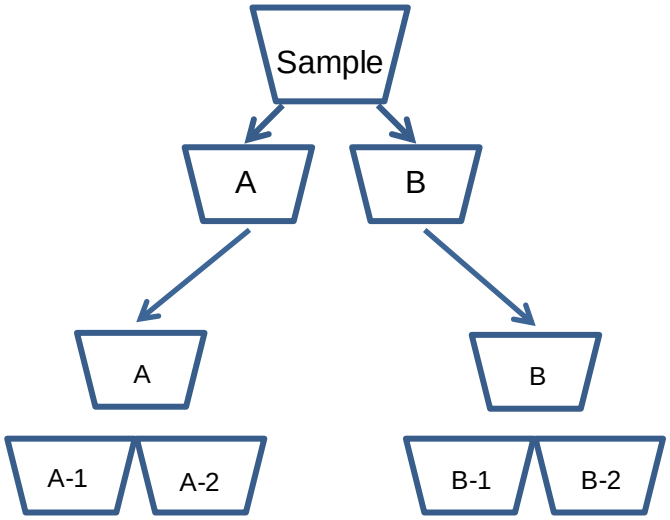
11. Continue splitting the sample in the planned manner until at least the minimum sample required, but not too large of a sample, is obtained.

12. On the last split, place the material in both catch pans into two tared large drying pans.

Adjustable Chute Size Sample Splitter

A-1 for moisture content

A-2 for sieve analysis



13. Weigh and record both aggregate sample weights,
(one for the moisture content and the other for the sieve analysis).

14. Calculate the percent difference between the two samples as follows:

    a) Calculate the weight difference between the two samples.
    b) Determine the average weight of the two samples.
    c) The percent difference is then

$$\% \text{ Difference} = \frac{\text{Weight Difference Between Samples}}{\text{Average Weight of the Two Samples}} \times 100\%$$

15. If the percent difference is less than 10%, proceed to step 16. If it is more than 10% but the average weight meets the minimum sample size:

    a) Combine the two split samples.
    b) Re-split the combined sample.
    c) Re-weigh each split sample.
    d) Calculate the new percent difference

    If, after a couple of tries, the result is still unacceptable, replace the splitter.

16. If the % difference is acceptable, but the average of the two weights is lower than the minimum sample size required, repeat the splitting procedure using the original sample. **NEVER scoop out any material to make up for the difference between samples.** Samples must be reduced using this method or the Quartering Method (Section 3.2).

3.2 Quartering Methods

These two methods reduce a sample by successively mixing, dividing into quarters and keeping two opposite quarters of the sample.

3.2.1 Quartering on a Smooth Surface

1. Pour all the component samples onto a hard, clean, level surface: such as a clean tarpaulin, a plywood sheet, or a concrete floor.

2. Use the square nosed shovel to blend the aggregate thoroughly by turning the entire sample over three times.

3. With the last turning, shovel the entire sample into a cone shaped mound by depositing each shovelful on top of the preceding one, as shown in FIGURE 1 below.

4. With the shovel, press down the top of the conical pile until the pile is flattened to a uniform thickness and diameter. The diameter should be approximately four to eight times the thickness.

5. Split the mound down the middle, then split each half mound through the center so that four equally sized piles are obtained.

6. Remove the material from two opposite quarters, including all fine material and discard it.

7. Use the brush or a broom to clean the empty spaces.

8. Re-mix the remaining quarters and repeat the process until you obtain the desired sample size from the diagonally opposite quarters.

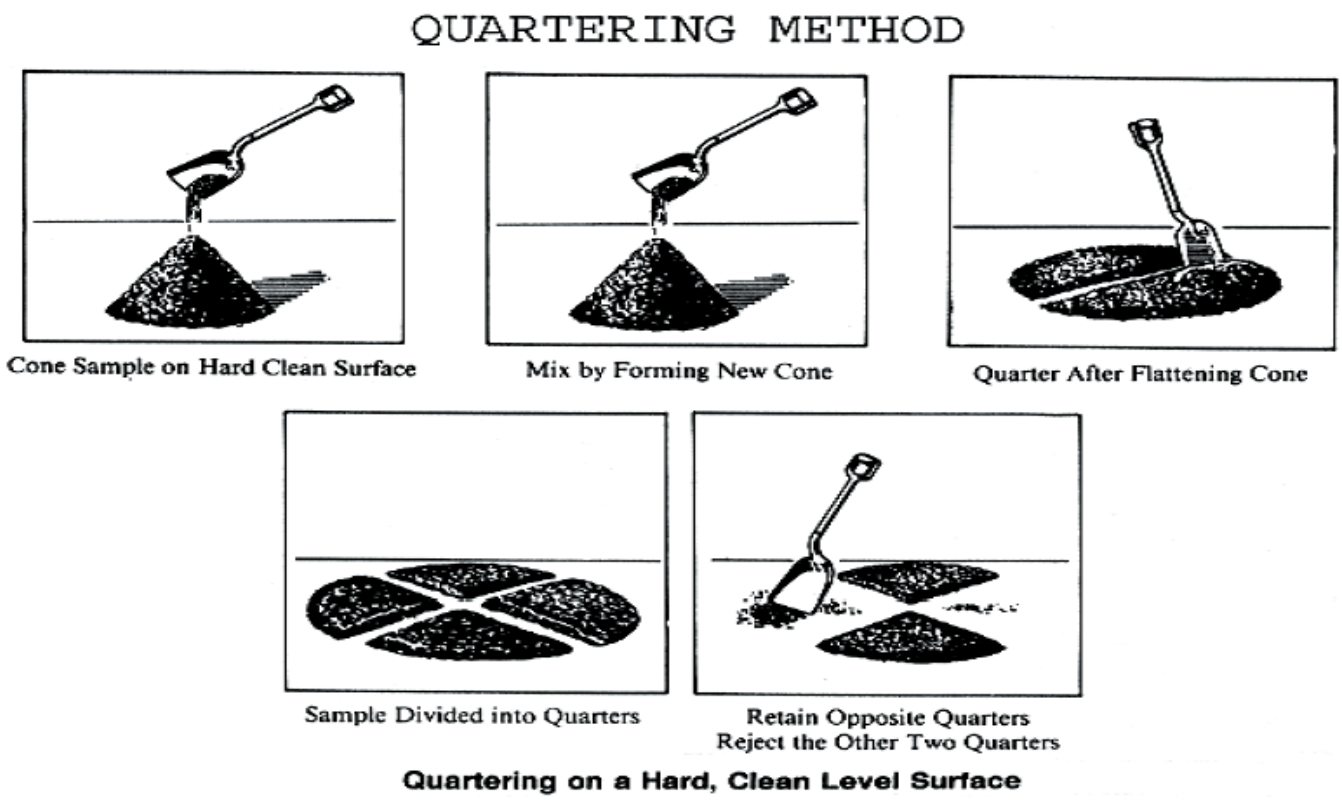


FIGURE 1

3.2.2 Quartering on a Rough Surface

As an alternative to method "3.2.1 Quartering on a Smooth Surface", when the floor surface is uneven, the aggregate sample can be placed on a tarpaulin and mixed as shown below.

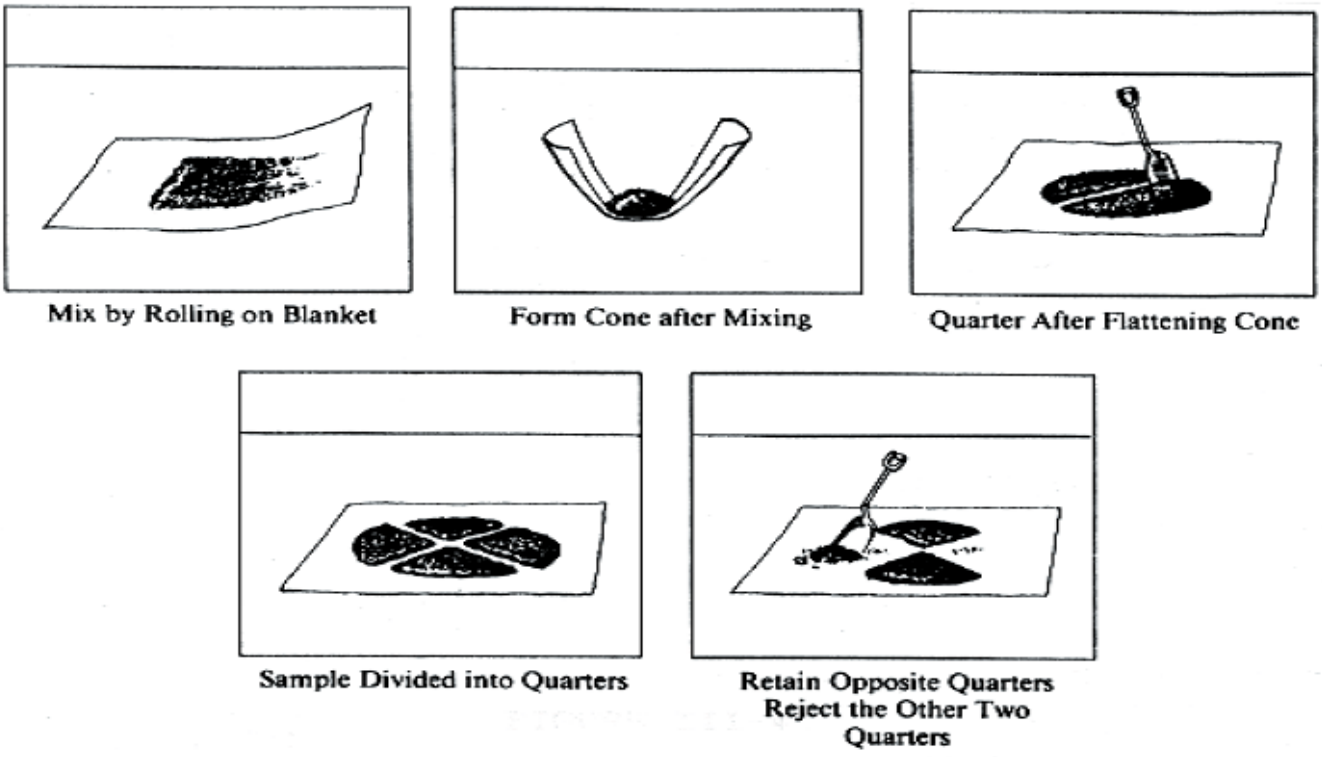
1. Place all the component samples onto a clean tarpaulin.

2. Alternately lift each corner of the tarpaulin and then pull it over the sample toward the diagonally opposite corner until the aggregate is thoroughly mixed.

3. Hold the two corners on one end of the tarpaulin at a slight inward angle as shown below in Figure 2, then lift up. Do the same for the other end of the tarpaulin until a conical mound is formed.

4. Repeat steps 4 to 7 of Section 3.2.1.

5. Repeat steps 1 to 3 above followed by steps 4 to 7 of Section 3.2.1 with the remaining material until the required sample size is obtained.



Quartering on a Canvas Blanket

FIGURE 2

Alternative method for a very rough surface.

If the surface beneath the tarpaulin is very rough, and it is impractical to use the shovel to divide the flattened sample, proceed as follows:

a) Insert a stick or pipe beneath the tarpaulin under the center of the mound, then lift both ends of the stick, dividing the sample into two equal parts.

b) Remove the stick leaving a fold of the tarpaulin between the divided portions.

c) Insert the stick at right angles to the first division and again lift both ends of the stick, dividing the sample into four equal parts.

4.0 HINTS AND PRECAUTIONS

1. ***SEGREGATION of the test samples MUST BE AVOIDED***.

2. Failure to uniformly pour the field sample from edge to edge while placing it in the hopper or pan prior to pouring it through the chutes of the splitter may cause sample reduction errors.

3. Pouring the sample too quickly into the chutes of the splitter may cause the sample to plug up and bridge the chute gaps, causing unequal amounts in the catch pans.

4. The mixing and coning of the sample may be performed using either procedure described in Section 3.2.1 or 3.2.2 or a combination of both.

5. **DO NOT** adjust the weight of the split sample to an even number, such as 500g, 750g, or 1000g, etc. by scooping out material. Use the entire split sample. Usually one of the splits is used for the Moisture Content sample, and the other is used for the Sieve Analysis sample.

6. When using the quartering method, failure to brush the cleared spaces clean of fines after removing the two diagonally opposite quarter sections from the flattened field sample will result in a sample that is not representative.

7. **DO NOT** attempt to obtain a sample of an exact predetermined weight.

8. Divide, then re-divide, a large sample until the sample size is within the desired sample size range.

9. The splitter openings should be sufficiently wide to permit easy passage of the largest particles in the sample.

   For coarse aggregate and mixed aggregate, the minimum chute width shall be approximately 50% larger than the largest particle in the sample to be split. For dry fine aggregate with 100% passing the 10mm (3/8") sieve, use a splitter with chutes 12.5mm to 20.0mm (1/2" to 3/4") wide.

10. A sample that has free moisture may be dried to at least saturated surface dry (SSD) condition, at a temperature that does not exceed those specified in any of the tests, that will be completed on the sample. A quick method to determine SSD is if the fine aggregate retains its shape when molded in the hand, it is wetter than SSD.

11. For a very dry sample, uniformly dampen the material to prevent segregation and loss of fines.

12. Past experience has shown that *when adjustable splitter openings are adjusted too wide, or too narrow, improper splitting will occur*.

13. ***The use of a riffle sample splitter is always preferable to hand quartering.***

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