

REDUCING SAMPLES OF AGGREGATE TO TESTING SIZE

AASHTO T 248

GLOSSARY

Nominal Maximum size - The smallest sieve opening through which the entire amount of the aggregate is permitted to pass.

Saturated Surface Dry (SSD) - An aggregate is considered to be in a saturated surface dry condition when there is no free moisture present but the aggregate is in a nonabsorbent state.

Air Dry - When the aggregate appears to be dry but still has some absorbed moisture in the pore structure.

SCOPE

The field samples of aggregate must generally be reduced to an appropriate size for testing to determine physical characteristics, such as, sieve analysis, soundness, hardness, etc. The methods described in this test method are intended to minimize variations in the aggregate characteristics between the smaller test sample and the larger field sample.

Several methods of sample reduction will be described. The technician must be sure to use the appropriate technique dependent on such factors as aggregate size and moisture content.

The reduction methods include:

Method A - Mechanical Splitter

Method B - Quartering

Method C - Miniature Stockpile

In some circumstances, reducing the field sample prior to testing is not recommended. Substantial differences may unavoidably occur during sample reduction, i.e., in the case of an aggregate having relatively few large size particles in the sample. These few particles may be unequally distributed among the reduced size test samples. If the test sample is being examined for certain contaminants occurring as a few discrete particles in a small percentage, the reduced test sample may not be truly representative of the total aggregate as produced. In these cases, the entire original field sample should be tested.

Failure to carefully follow the procedures in these methods of sample reduction may result in providing a nonrepresentative sample for subsequent testing, resulting in inaccurate test results, and ultimately, failure of the aggregate to perform as intended.

SUMMARY OF PROCEDURE

Aggregate and other materials sampled in the field need to be reduced to appropriate sizes for testing. It is, therefore, necessary to reduce field samples while minimizing the chance of variability during handling. In some instances a few particles on a given sieve might effect a gradation significantly enough to alter an interpretation of the field sample and subsequently the entire material's compliance with specifications.

The appropriate field sample reduction method is dependent chiefly on the nominal maximum size of the aggregate, the amount of free moisture in the sample, and the equipment available.

The following chart should be used in selecting the appropriate reduction method for the aggregate to be tested.

Mechanical Splitter	Quartering	Miniature Stockpile
Fine Aggregates - Air Dry	Fine Aggregates –Free Moisture on the Particle Surface	Fine Aggregates – Free Moisture on the Particle Surface
Coarse Aggregates	Coarse Aggregates	Not Appropriate for Coarse Aggregates
Combined Aggregates	Combined Aggregates with Free Moisture on the Particle Surface	Not Appropriate for Combined Aggregates

METHOD A -- MECHANICAL SPLITTER

Apparatus

The mechanical sample splitter shall have an even number of equal width chutes, not less than eight for coarse or combined aggregate, or twelve for fine aggregate. The chutes shall discharge alternately to each side of the splitter. For coarse and combined aggregate the width of the individual chutes shall be approximately twice the largest size particle in the sample to be reduced. For dry fine aggregate in which the entire sample will pass the 3/8 in. (9.5 mm) sieve, the minimum width of the chutes shall be at least fifty percent larger than the largest particles in the sample with a maximum width of 3/4 in. (20 mm).

The splitter shall be equipped with at least two receptacles (catch pans) to hold the two halves of the sample during splitting. It shall also be equipped with a hopper or straight-edge pan with 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 into the chutes.

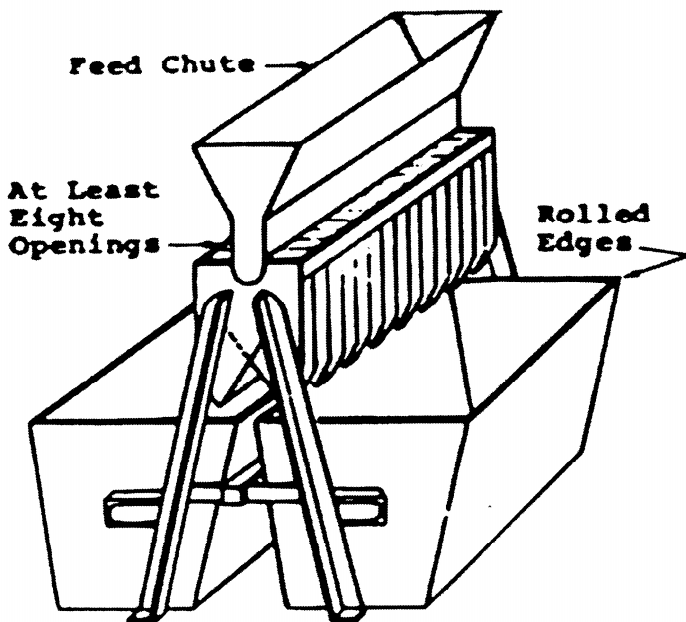
The splitter and accessories shall be designed to allow the sample to flow smoothly without restriction or loss of material.

Mechanical splitters are commonly available in sizes adequate for aggregate having the largest particle size not over 1 1/2 in. (37.5 mm).

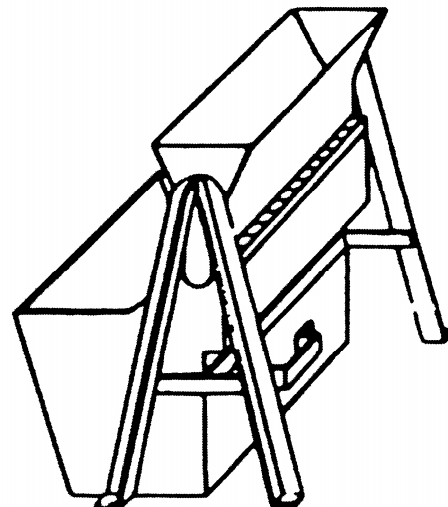
Procedure

1. Place the original sample, or portion thereof, in the hopper or pan and uniformly distribute it from edge to edge being sure the sample appears homogenous (well-blended). Carefully introduce the sample into the chutes in a manner to allow the aggregate to flow freely through the openings and into the catch pans. Continue this procedure until the entire sample has been halved, being careful that catch pans do not overflow.
2. Remove the catch pans and set aside. Continue splitting one half of the material. Follow this procedure, being sure to split entire increments, until the desired test sample size is obtained. Retain the unused material until all desired tests are performed in case a retest is needed.

Note: Sometimes a significant amount of fines may be lost in the splitting process if the sample is extremely dry and the action of pouring the sample through the splitter chutes creates a large dust cloud, suspending the fines in the air above the splitter. If this is a serious concern, then add a small amount of water to the original sample and mix thoroughly before splitting the sample. The extra moisture will prevent many of the fines from becoming suspended in the air and drifting off. Remember to not add so much water that the moisture content ends up being at or greater than the SSD condition, in which case the mechanical splitting method would no longer be valid. In any case, be sure to perform the splitting procedure in a well-ventilated area while wearing a suitable dust mask.

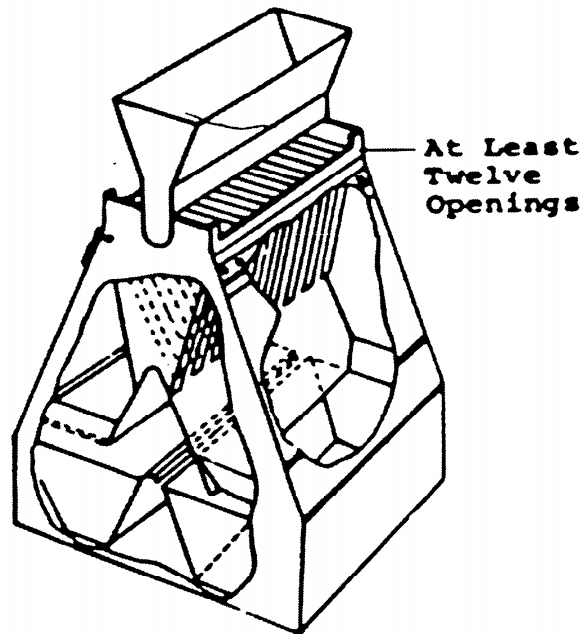
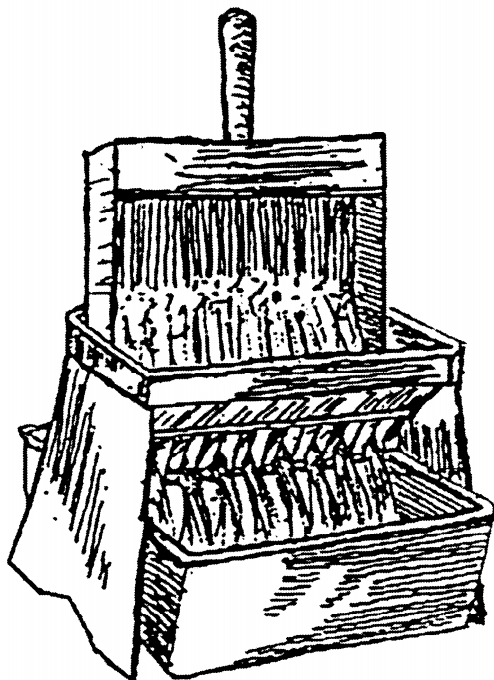


Riffle Sample Splitter



Riffle Bucket and Separate Feed Chute Stand

(a) Large Riffle Samplers for Coarse Aggregate.



NOTE—May be constructed as either closed or open type. Closed type is preferred. (b) Small Riffle Sampler for Fine Aggregate.

Figure 1
Sample Splitters

MECHANICAL SAMPLE SPLITTER



SPA
گروه مهندسی سانا پی

Mechanical Splitter



Sample in Splitter



Sample Being Split

METHOD B -- QUARTERING

Apparatus

Straight-edged scoop.

Flat-edged shovel or trowel.

Broom or brush.

Alternate method only - canvas blanket measuring approximately 6 ft. x 8 ft (2 m by 2.5 m).

Procedure

1. Place the original sample on a hard, clean, level surface. Mix the material thoroughly by turning the entire sample over with the shovel at least three times. With the last turning, shovel the entire sample into a conical pile by depositing each shovelful on top of the preceding one. Carefully flatten the conical pile to a uniform thickness and diameter by pressing down the apex with the shovel so that each quarter section of the resulting pile will contain the material originally in the pile. The pile diameter should be approximately four to eight times the thickness.
2. Divide the flattened pile into four equal quarters with the shovel or trowel. Remove two diagonally opposite quarters, including all fine material. Brush the cleared spaces clean. Successively mix and quarter the remaining material in the same fashion as the original sample. Continue this process until the desired quantity is obtained.

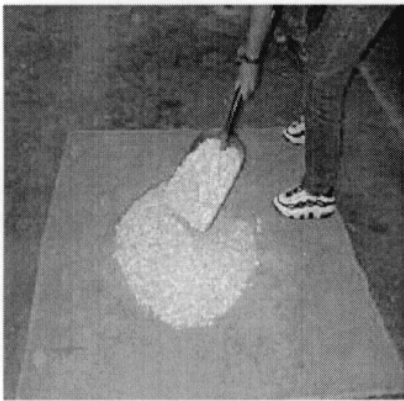
Save the unused portion of the original field sample until all testing is completed in case a retest is needed.

METHOD B -- ALTERNATIVE

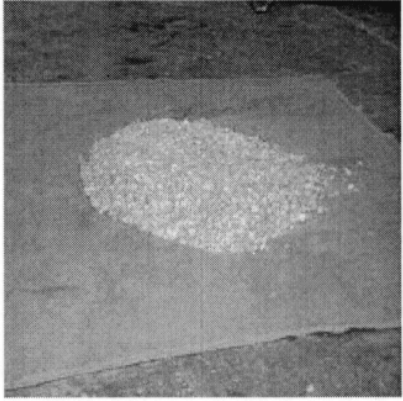
As an alternative to Method B, when the floor surface is uneven, the field sample may be placed on a canvas blanket and mixed with a shovel, or by alternatively lifting each corner of the blanket and pulling the blanket over the sample toward the diagonally opposite corner causing the material to be rolled. Flatten and divide the pile as described in Method B, or if the surface beneath the blanket is too uneven, insert a stick or pipe dividing the pile into two equal parts. Remove the stick leaving a fold in the canvas between the sample halves. Slide the stick under the canvas blanket again at a right angle to the first division and dissecting the two halves of the sample through their centers. Lift the stick evenly from both ends dividing the sample into equal quarters. Remove two diagonal parts including the fine material and clean the area. Successively mix and quarter the remaining material until the desired sample size is obtained.

Note: The quartering method is fairly time intensive and thus is generally used in situations where an adequate mechanical splitter is unavailable. Diligence and care is required to ensure that the samples obtained by quartering remain representative of the entire field sample.

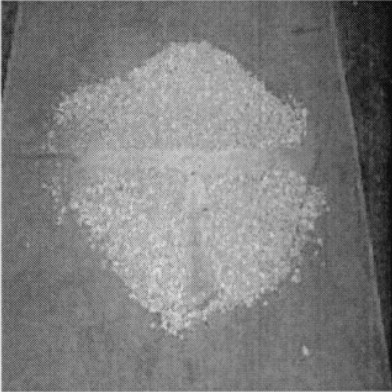
METHOD B



Mix by Forming New Cone

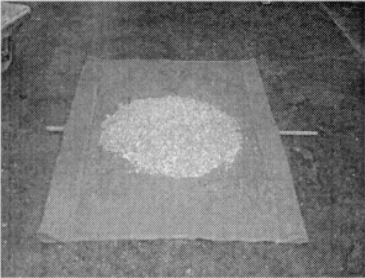


Flatten Cone

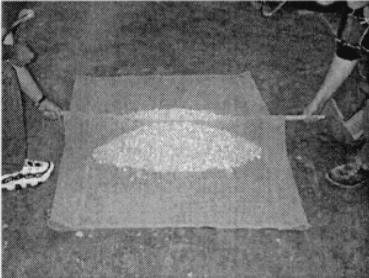


Method B (alternative)

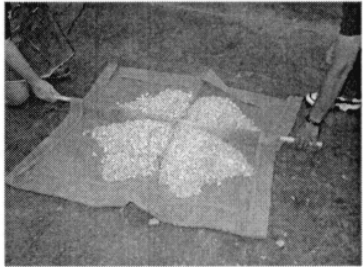
Divide Sample Into Quarters



Stick Placed Under Flattened Sample



Sample Divided in Half



Sample Divided Into Quarters

METHOD C -- MINIATURE STOCKPILE

Apparatus

Straight-edge scoop.

Shovel or trowel (for mixing the aggregate).

Small sampling thief, small scoop, or spoon.

Procedure

This method is for damp, fine aggregate only.

1. Place the field sample on a hard, clean, level surface where there will be no loss of material or contamination. Mix the sample by turning the entire sample over three times with a shovel. With the last turning, shovel the entire sample into a conical pile by depositing each shovelful on top of the preceding one.
2. Obtain a sample for each test to be performed by selecting at least five increments of material at random locations from the miniature stockpile using a sample thief, small scoop, or spoon.



Miniature Stockpile



Taking One of at Least Five Samples