



Void Content Apparatus
for Coarse Aggregate

INTRODUCTION

The void content of coarse aggregate measurement provides an indication of angularity, sphericity and surface texture compared to other aggregates of the same grading. The test aggregate is allowed to free fall 115mm from the funnel bottom of a cylindrical hopper into a 154mm diameter by 160mm high cylindrical measure. Excess heaped aggregate is struck off using a bar, and the mass is measured.

Uncompacted void content is computed as the difference between the volume of the cylindrical measure and the absolute volume of the coarse aggregate collected in the measure (Based on bulk dry specific gravity as determined by AASHTO T85). Higher void content in samples of equal size gradation by this procedure indicate, a combination of greater angularity, less sphericity, or rougher surface texture.

CALIBRATION OF CYLINDRICAL MEASURE

Apply a light coat of grease to the top edge of the dry, empty, cylindrical measure. Determine the mass of measure, grease and glass plate. Fill the measure with freshly boiled, deionized water at 18 to 24°C. Record water temperature. Place the glass plate on the measure, taking care that no air bubbles remain. Dry all outer surfaces and determine the mass of the measure, glass plate, grease, and water to the nearest 0.1g. Also determine the mass of the clean, dry, empty measure, for subsequent tests.

Calculate the volume of the measure as follows:

$$v = 1000 (MID)$$

Where:

v = volume of cylinder, ml

M = net mass of water, g

D = density of water at temperature used. kg/m³
(see table in AASHTO T19)

Determine the volume to the nearest 0.1 ml.

PROCEDURE

AASHTO TP-56 provides three methods of void content measurement, the differences in method differing by the type of sample used:

Method A: Sample is of standard grading made up from several specified gradations in specific masses totaling 5000g.

Method B: Separate 5000g samples are tested for each of three sieve Gradations, then averaged.

Method C: An as-received 5000g sample is used, taken after removing material finer than the #4 (4.75mm) sieve.

Refer to AASHTO TP56 for details of above Methods A, B and C. The method of using the H-1686 Void Content Apparatus is the same for all methods and proceeds as follows:

1. Position the cylindrical measure under the cylindrical hopper, being sure that the measure is rested on the centering pin. Place entire apparatus in a suitable overflow pan
2. Close and lock the gate of the hopper.
3. Mix the sample until it appears homogeneous. Then pour it into the hopper. The H-4308 Material Handling Pan works well for weighing sample fraction makeup, mixing and pouring into hopper.
4. The sample must fall freely from the hopper by rapidly opening the hopper gate, and the gate doors must swing away quickly and remain out of the flow of sample. The operator should develop a technique of accomplishing this result. It may be helpful to hold the gate shut while releasing the latch, then releasing the gate manually.
5. Strike off excess heaped aggregate from the cylindrical measure being careful to avoid vibration or other disturbance that could cause compaction of sample in the cylinder. Insert strike-off bar across cylinder diameter at center of heap and work to sides. When a large piece of aggregate must be removed leaving an unusual void below the rim, replace it with one or more smaller pieces that fit below the rim.

NOTE: This replacement procedure is not mentioned in AASHTO TP56, but is recommended.

6. Determine the mass of the cylindrical measure and contents to the nearest 0.1g. Also record the mass of the empty measure.
7. Recover all aggregate particles for a second test run. Repeat as above, since reported void contents will be an average of two tests.
8. Calculate uncompacted voids percent to the nearest one tenth percent for each determination as follows:

$$U = (V - F/G) \sim \times 100$$

Where: V = volume of cylindrical measure, ml

F = net mass of coarse aggregate in measure, g

G = bulk dry specific gravity of coarse aggregate
(by AASHTO T85 procedure)

U = uncompacted voids, percent in the material

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