

# Aggregate Sampling

# Aggregate Stockpiles



# Stockpile Segregation



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# Aggregate Sampling

Aggregate sampling is the process of taking a sample of aggregate that is truly representative of the nature and condition of the aggregate in the stockpile. The size of the **field sample** is large to ensure that it is truly representative. Special effort must be made to ensure that the sample is not skewed by the effects of segregation.

The required size of the field sample and the sampling procedures are specified in ASTM D75.



This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.



**Designation: D75/D75M – 14**

American Association State  
Highway and Transportation  
Officials Standard  
AASHTO No.: T2

## **Standard Practice for Sampling Aggregates<sup>1</sup>**

This standard is issued under the fixed designation D75/D75M; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### **1. Scope**

1.1 This practice covers sampling of coarse and fine aggregates for the following purposes:

1.1.1 Preliminary investigation of the potential source of supply,

1.1.2 Control of the product at the source of supply,

1.1.3 Control of the operations at the site of use, and

1.1.4 Acceptance or rejection of the materials.

NOTE 1—Sampling plans and acceptance and control tests vary with the type of construction in which the material is used.

1.2 The text of this standard references notes and footnotes which provide explanatory material. These notes and footnotes (excluding those in tables and figures) shall not be considered as requirements of the standard.

1.3 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in

### **2. Referenced Documents**

2.1 *ASTM Standards*:<sup>2</sup>

**C125** Terminology Relating to Concrete and Concrete Aggregates

**C702** Practice for Reducing Samples of Aggregate to Testing Size

**D8** Terminology Relating to Materials for Roads and Pavements

**D2234/D2234M** Practice for Collection of a Gross Sample of Coal

**D3665** Practice for Random Sampling of Construction Materials

**D3666** Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials

**E105** Practice for Probability Sampling of Materials

**E122** Practice for Calculating Sample Size to Estimate, With Specified Precision, the Average for a Characteristic of a

# Aggregate Sampling

Obtaining unbiased field samples from stockpiles is notoriously difficult, but it can be done with care and attention to detail. A bucket loader makes the process easier and assures a more representative sample. The loader can quickly extract material from a number of locations and elevations in the pile then combine and mix the portions in a smaller pile for direct sampling.

# Aggregate Sampling

If you need to sample a stockpile manually, start at the top and take at least three samples from the top, middle and bottom of the pile. Remove and discard the surface material and collect the samples from the underlying material with a shovel or scoop. Pushing a board into the uphill side of the sampling point prevents additional material from falling into the sampling area.



# Aggregate Sampling



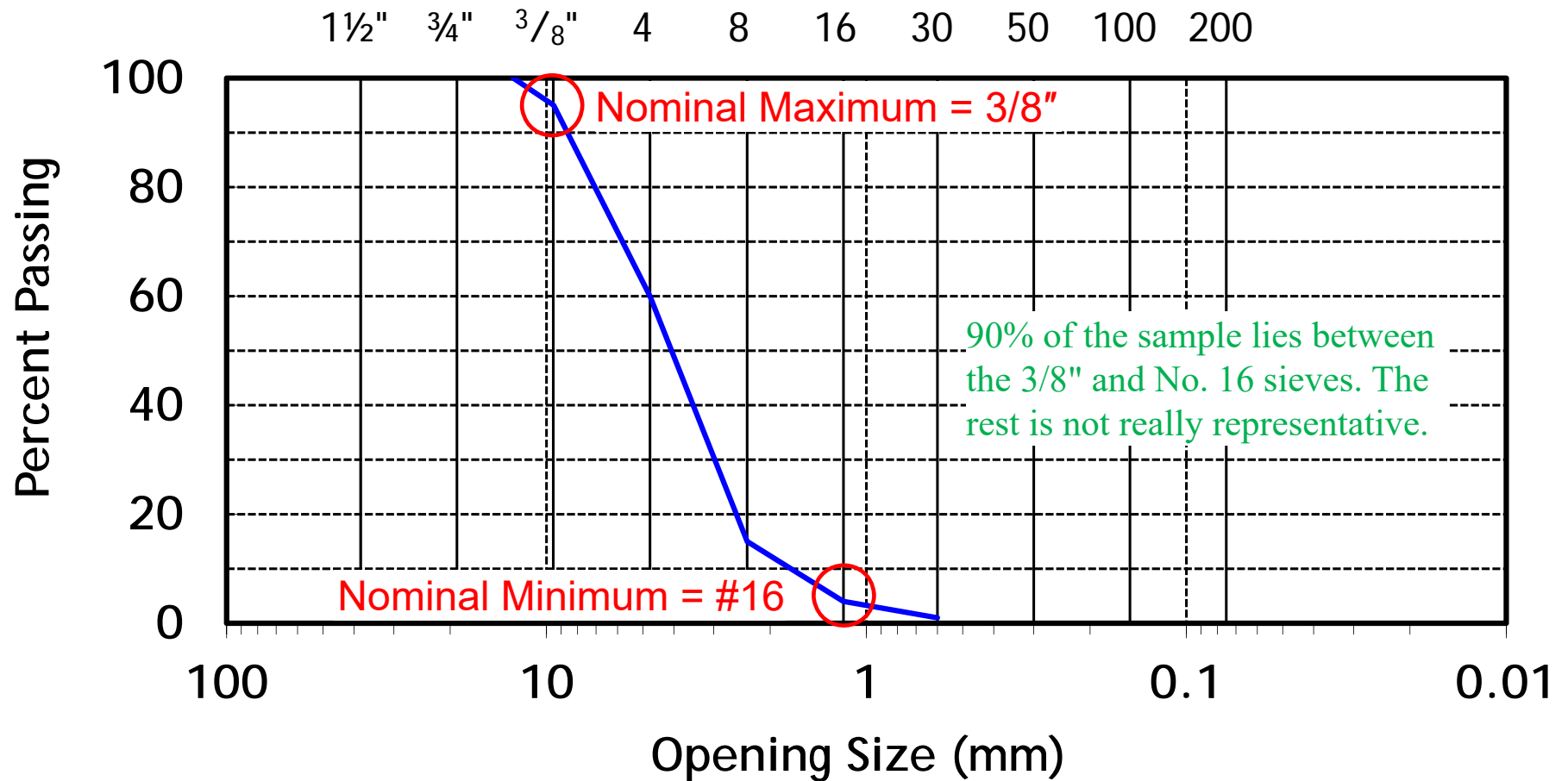
# How much do you need?

## Field Sample Size for Fine and Coarse Aggregate (from ASTM D75)

<i>Type</i>	<u><i>Nominal Maximum Size</i></u> <i>(sieve size)</i>	<i>Approximate Minimum Mass</i> <i>Field Sample [lb and (kg)]</i>
Fine aggregate	No. 8 (2.36 mm)	25 (10)
	No. 4 (4.75 mm)	25 (10)
Coarse aggregate	$\frac{3}{8}$ in. (9.5 mm)	25 (10)
	$\frac{1}{2}$ in. (12.5 mm)	35 (15)
	$\frac{3}{4}$ in. (19.0 mm)	55 (25)
	1 in. (25.0 mm)	110 (50)
	1 $\frac{1}{2}$ in. (37.5 mm)	165 (75)
	2 in. (50 mm)	220 (100)
	3 in. (75 mm)	330 (150)

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# Nominal Aggregate Sizes



# More Aggregate Terms

## Maximum aggregate size

The smallest standard sieve through which 100% of the material passes.

## Nominal maximum aggregate size

The largest sieve that retains some of the aggregate but generally not more than 10 percent by weight.

# Superpave Definitions

## Nominal maximum aggregate size

One standard sieve larger than the first sieve to retain more than 10 percent of the material.

## Maximum aggregate size

One standard sieve larger than the nominal maximum size.



# More Aggregate Terms

Nominal minimum aggregate size

The largest sieve that passes some of the aggregate but generally not more than 10 percent by weight.



Designation: C 136 – 06

## Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates<sup>1</sup>

This standard is issued under the fixed designation C 136; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

*This standard has been approved for use by agencies of the Department of Defense.*

### 1. Scope\*

1.1 This test method covers the determination of the particle size distribution of fine and coarse aggregates by sieving.

1.2 Some specifications for aggregates which reference this test method contain grading requirements including both coarse and fine fractions. Instructions are included for sieve analysis of such aggregates.

1.3 The values stated in SI units are to be regarded as the standard. The values in parentheses are provided for information purposes only. Specification E 11 designates the size of sieve frames with inch units as standard, but in this test method the frame size is designated in SI units exactly equivalent to the inch units.

1.4 *This standard does not purport to address all of the*

E 11 Specification for Wire Cloth and Sieves for Testing Purposes

2.2 *AASHTO Standard:*

AASHTO No. T 27 Sieve Analysis of Fine and Coarse Aggregates<sup>3</sup>

### 3. Terminology

3.1 *Definitions*—For definitions of terms used in this standard, refer to Terminology C 125.

### 4. Summary of Test Method

4.1 A sample of dry aggregate of known mass is separated through a series of sieves of progressively smaller openings for determination of particle size distribution.

# Minimum Sample Size

## Sample Size for Sieve Analysis of Fine and Coarse Aggregate (from ASTM C136)

<i>Type</i>	<i>Nominal Maximum Size (Sieve Size)</i>	<i>Size of Sample [g (Approximate)]</i>
Fine aggregate	No. 8 (2.36 mm)	300
	No. 4 (4.75 mm)	300
Coarse aggregate		<i>[kg (minimum)]</i>
	3/8 in. (9.5 mm)	1
	1/2 in. (12.5 mm)	2
	3/4 in. (19.0 mm)	5
	1 in. (25.0 mm)	10
	1 1/2 in. (37.5 mm)	15
	2 in. (50 mm)	20
	3 in. (75 mm)	60

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# Sample Reduction

The goal of sample reduction is to reduce the large field sample to a size that is convenient for use in laboratory tests in such a way that the test sample is still representative of the field sample, and thus of the total aggregate supply.

For the test sample to be truly representative, sample reduction must be accomplished with a minimum of operator interaction.

This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.



**Designation: C702/C702M – 11**

American Association State  
Highway and Transportation  
Officials Standard: T 248

## **Standard Practice for Reducing Samples of Aggregate to Testing Size<sup>1</sup>**

This standard is issued under the fixed designation C702/C702M; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

*This standard has been approved for use by agencies of the U.S. Department of Defense.*

### **1. Scope**

1.1 This practice covers three methods for the reduction of large samples of aggregate to the appropriate size for testing employing techniques that are intended to minimize variations in measured characteristics between the test samples so selected and the large sample.

1.2 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

NOTE 1—Sieve size is identified by its standard designation in Specification E11. The alternative designation given in parentheses is for information only and does not represent a different standard sieve size.

1.3 *This standard does not purport to address all of the*

### **3. Terminology**

3.1 *Definitions*—The terms used in this practice are defined in Terminology C125.

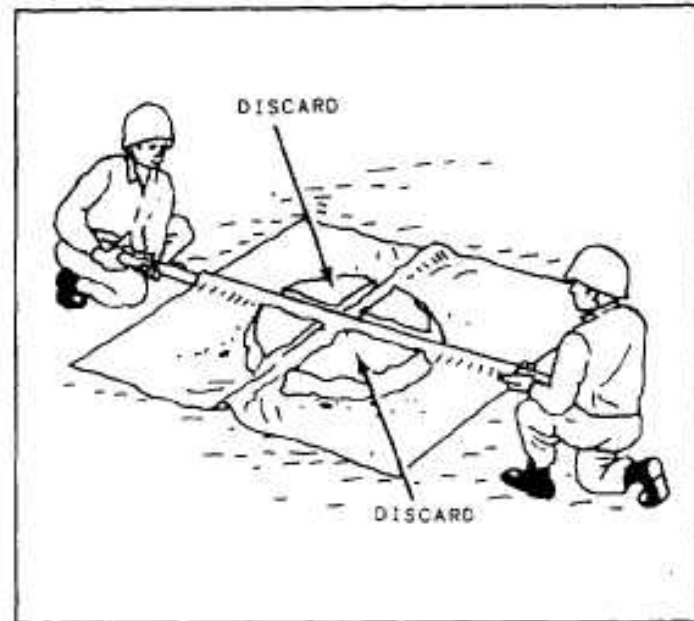
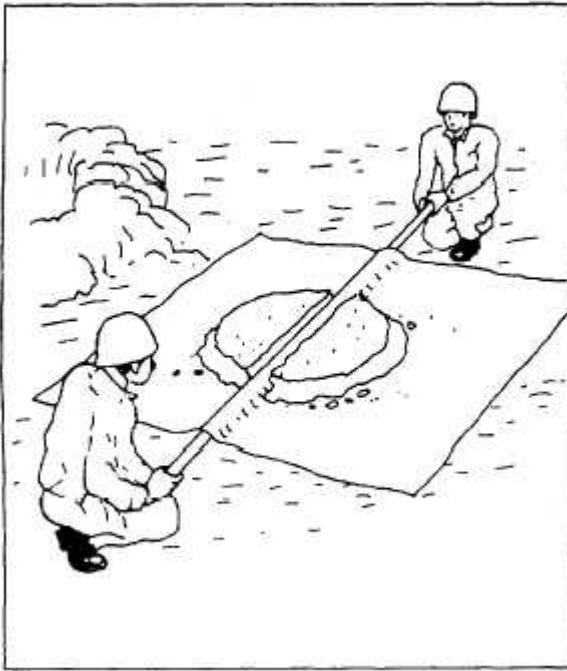
### **4. Significance and Use**

4.1 Specifications for aggregates require sampling portions of the material for testing. Other factors being equal, larger samples will tend to be more representative of the total supply. This practice provides procedures for reducing the large sample obtained in the field or produced in the laboratory to a convenient size for conducting a number of tests to describe the material and measure its quality in a manner that the smaller test sample portion is most likely to be a representation of the larger sample, and thus of the total supply. Failure to carefully follow the procedures in this practice could result in providing a nonrepresentative sample to be used in subsequent testing. The individual test methods provide for minimum amount of

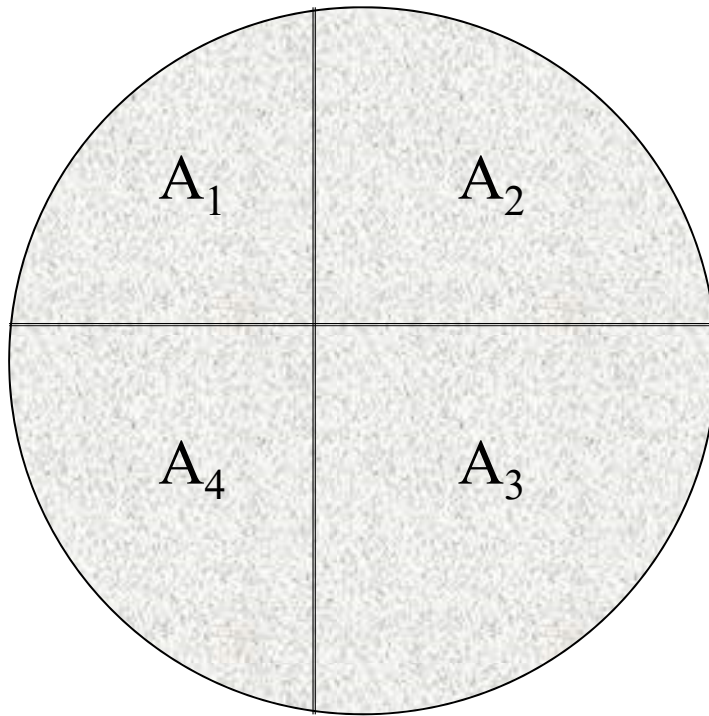


# Method 1 – Quartering

(on an uneven surface)



# Why Discard Opposite Corners?



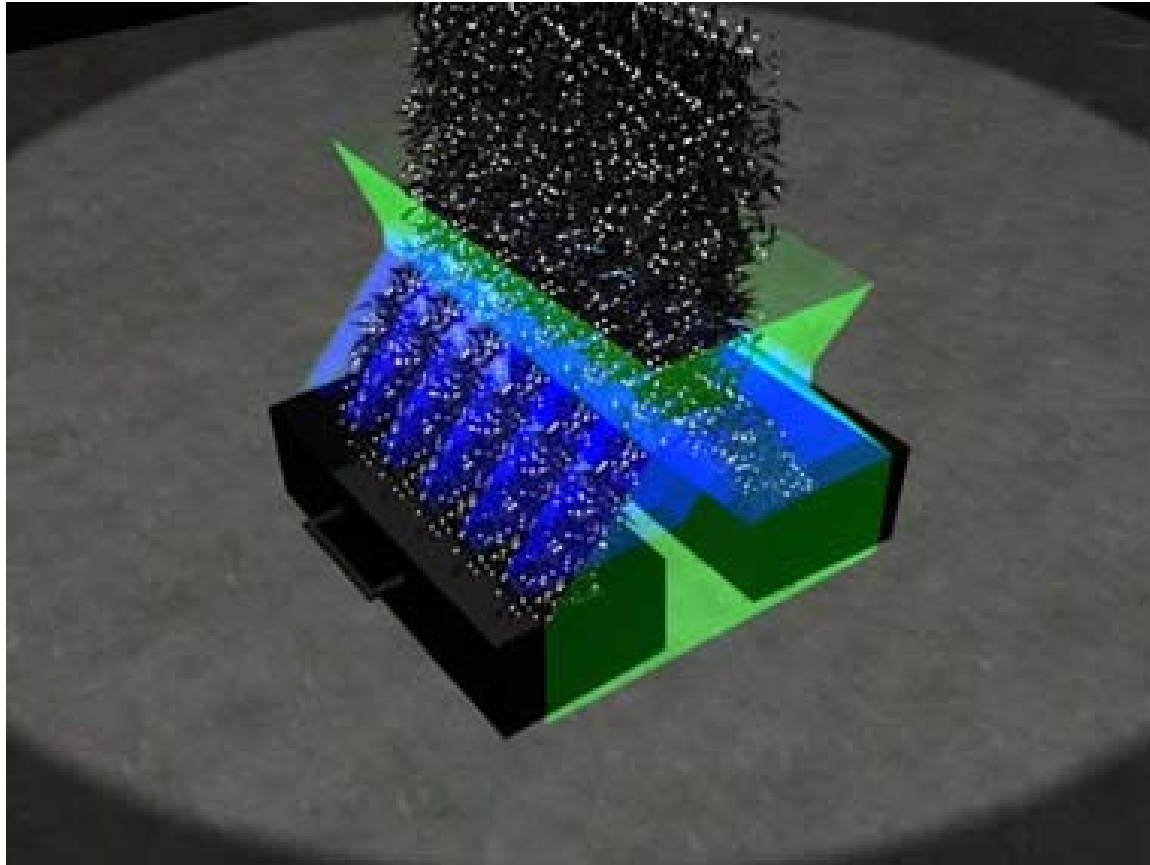
$$A_1 + A_3 \approx A_2 + A_4$$

# Method 1 – Quartering

(on a flat, level surface)



# Method 2 – Riffle Splitter



# Method 2 – Riffle Splitter





# Example

A new barge load of aggregate has arrived at the plant and been deposited in a stockpile by a conveyor belt. You need a sample on which to perform a gradation analysis. If the nominal maximum aggregate size is 1" what size field sample do you need and how will you reduce it to the size required by the gradation test?

# Example

## Field Sample Size for Fine and Coarse Aggregate (from ASTM D75)

<i>Type</i>	<i>Nominal Maximum Size (sieve size)</i>	<i>Approximate Minimum Mass Field Sample [lb and (kg)]</i>
Fine aggregate	No. 8 (2.36 mm)	25 (10)
	No. 4 (4.75 mm)	25 (10)
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	$\frac{3}{4}$ in. (19.0 mm)	55 (25)
	1 in. (25.0 mm)	110 (50)
	1 $\frac{1}{2}$ in. (37.5 mm)	165 (75)
	2 in. (50 mm)	220 (100)
	3 in. (75 mm)	330 (150)

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# Example

## Sample Size for Sieve Analysis of Fine and Coarse Aggregate (from ASTM C136)

<i>Type</i>	<i>Nominal Maximum Size (Sieve Size)</i>	<i>Size of Sample [g (Approximate)]</i>
Fine aggregate	No. 8 (2.36 mm)	300
	No. 4 (4.75 mm)	300
Coarse aggregate		<i>[kg (minimum)]</i>
	3/8 in. (9.5 mm)	1
	1/2 in. (12.5 mm)	2
	3/4 in. (19.0 mm)	5
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	1 1/2 in. (37.5 mm)	15
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# Example

