GDT 133

A. Scope

For a complete list of GDTs, see the Table of Contents.

Use this test method to determine the percentages of friable particles in coarse aggregate by manipulating individual particles of aggregate between the fingers to determine the percentage of friable particles.

Friable particles in coarse aggregates are those particles of coarse aggregates that lack competency due to weathering, alteration, fracturing or inherent physical properties and, as a result, are easily broken into finer particles.

Friable aggregate particles are inherently weaker than the other particles and may have a detrimental effect on Portland cement concrete and bituminous mixes. This test method provides a rapid means to examine particles for compliance with specifications that limit friable particles.

Referenced documents for this test include:

AASHTO Standards:

M 92	Wire-cloth Sieves for Testing Purposes
M 231	Weighing Devices Used in the Testing of Materials
T 2	Methods of Sampling Aggregates
T 27	Sieve Analysis of Fine and Coarse Aggregate
T 248	Reducing Field Samples of Aggregate to Testing Size

B. Apparatus

1. Scale – Ensure the scale has sufficient capacity, and be readable to at least 0.1 % of the sample mass, and conform to the requirements of AASHTO M 231.
2. Containers – Rust-resistant containers of a size and shape that will permit the spreading of the sample on the bottom in a thin layer.
3. Sieves – Sieves conforming to AASHTO M 92.

C. Sample Size and Preparation

Sample the aggregate in accordance with AASHTO T 2.

1. Perform a sieve analysis on the sample in accordance with AASHTO T 27 and discard all material that passes the No. 4 (4.75 mm) sieve. Recombine and thoroughly mix the remainder of the sample
2. Based on the gradation as determined by AASHTO T 27 and the table below, look to the left side of the table and select the nominal maximum sieve size (the smallest sieve size that more than 90% of the sample will pass through).
3. Next, look to the top row of the table and find the largest sieve size that less than 10% of the sample will pass through. The mass (in grams) listed where the two sieve sizes intersect is the minimum mass of material to be tested.
4. In the event that more than 10% of the sample passes the No. 4 sieve (4.75 mm), use the mass listed in the row where the nominal maximum sieve size in the left column and the No. 4 sieve column intersect.
5. Reduce the sample in accordance with AASHTO T 248 to obtain the representative sample size determined from the above procedure.

Nominal Maximum Sieve Size	No. 4 (4.75 mm)	3/8" (9.5 mm)	1/2" (12.5 mm)	3/4" (19.0 mm)	1" (25.0 mm)	1-1/2" (37.5 mm)
3/8" (9.5 mm)	100					
1/2" (12.5 mm)	300	200				
3/4" (19 mm)	900	800	600			
1" (25 mm)	2400	2300	2100	1500		
1-1/2" (37.5 mm)	6900	6800	6600	6000	4500	
2" (50 mm)	18800	18600	18600	18000	16500	12000

NOTE: As well as consisting of the minimum mass that is specified above, ensure that a sample consists of at least 150 particles.

6. Wash the sample over a No. 4 (4.75 mm) sieve to remove fine material.
7. Dry the sample and allow to cool.

D. Procedure

1. Weigh the sample to the accuracy specified in Section B.
2. Spread the sample out in a large pan or bowl. Three separate containers should be designated for friable and/or weathered particles, non-friable and/or unweathered particles, and particle inspection. While holding individual particles over the particle inspection container, manipulate each one between the thumbs and forefingers in an attempt to break each particle into smaller pieces. Special attention should be paid to pieces that are stained or oxidized. Do not snap particles or use the fingernails to break up particles or press the particles against the sides of the container or each other. A simple twist and/or roll of the particle between the fingers should be adequate to determine whether or not the particle is friable or weathered.
3. If a third or more of the particle crumbles, all of the particle should be placed in the friable and/or weathered particles container. If none or less than one third of the particle crumbles then the remaining particle and all of the smaller pieces removed during manipulation should be placed in the non-friable and/or unweathered particles container. In the event that a particle does produce a clean snap during manipulation, that particle should be placed in the non-friable and/or unweathered particle container.
4. After all particles are tested in this manner, weigh the material in the friable and/or weathered container to the accuracy specified in Section B.

E. Calculations

1. Determine the dry total weight of particles for each sample tested.
2. Determine the dry weight of particles for each sample classified as friable and/or weathered.
3. Calculate the percentage of particles for each sample classified as friable and/or weathered.
4. The calculation will be:

$$A = (B \div C) \times 100\%$$

where:

A = percent friable and/or weathered particles

B = dry weight of friable and/or weathered particles

C = total dry weight of sample

F. Report

Report results to the nearest 0.1%.