

Method of Test for
SIEVE ANALYSIS OF MINERAL FILLER
DOTD Designation: TR 102

I. Scope

- A. This procedure is intended to determine the particle size distribution of mineral fillers by sieve analysis.
- B. Reference Documents
 - 1. DOTD TR 108, Splitting and Quartering Samples
 - 2. DOTD TR 113, Dry Sieve Analysis of Fine and Coarse Aggregates
 - 3. AASHTO M 92, Wire Cloth Sieves for Testing Purposes
 - 4. DOTD Materials Sampling Manual

II. Apparatus

- A. Balance – A balance having a capacity of 1 kg or more , sensitive to 0.1 g
- B. Sieves – Sieves conforming to AASHTO Designation M92
- C. Drying Apparatus
 - 1. Oven – an oven capable of maintaining a temperature of $230 \pm 5^{\circ}\text{F}$
 - 2. Hot Plate – electric or gas hot plate , equipped with a suitable heat dispersing shield , to evenly distribute heat to sample drying pan

Note 1: The use of hot plate drying in the field is allowed where ovens are not available. Open flame hot plates shall be so equipped as to not allow direct contact of the flame with the drying pan.

- D. Stirring Apparatus – A mechanically operated string apparatus, including special dispersion cups. The stirring device shall have an electric motor with a no load speed of not less than 10,000 rpm, attached to a vertical shaft fitted with paddles made of metal, plastic, or hard rubber, similar to that shown in Figure 1 shall be used to contain the sample while it is being dispersed.
- E. Desiccator – Jar or other suitable container with tightly fitting lid, containing water-absorbing agent, such as silica gel, for allowing samples to cool without absorbing hygroscopic moisture.
- F. Goggles and face mask / filter
- G. Worksheet – Aggregate Test Report , DOTD Form No. 03-22-0745 (Figure 2)

III. Health Precautions

Handling of mineral fillers and similar materials can generate a significant amount of dust. Proper ventilation and the use of goggles and face mask / filters is necessary to ensure personal health as well as for safety compliance.

IV. Sample

Sample shall be obtained in accordance with the DOTD Materials Sampling Manual, and consist of not less than 1500 g of dry material.

V. Procedure

- A. Reduce the size of the sample in accordance with DOTD TR 108 to obtain a representative portion of material of approximately 100 g. Determine and record the mass to the nearest 0.1 g on the worksheet as Initial Dry Total Mass.
- B. Place sample in dispersion cup, and add water until the cup approximately 2/3 full.
- C. Mount cup into stirring device and disperse the sample for 5 minutes.
- D. Remove the cup and pour the dispersed sample onto a No. 270 for 5 minutes.
- E. Wash the sample on the sieve with a low velocity water stream, gently agitating the sieve during the washing process.
- F. Continue the washing/agitating process until the wash water is relatively clear.
- G. Place the sieve containing the sample in the oven and dry to constant mass at $230 \pm 5^{\circ}\text{F}$

Note 2: Constant mass or drying purposes is defined as less than 0.1% by mass loss between successive mass determinations no less than 15 minutes apart.

- H. Remove sample from the oven and place it in the desiccator and allow to cool to room temperature.
- I. Using the sieve sizes required by the specifications of the particular project, sieve the sample in accordance with DOTD TR 113.
- J. After sieving, determine the mass of the portion of the sample remaining on each sieve and record on the worksheet to the nearest 0.1 g.

VI. Calculations

- A. Calculate the percent retained on each sieve (R) to the nearest 0.01 percent using the following formula :

$$R = \frac{A}{W_T} \times 100$$

Where:

- A = Mass of material retained on sieve, g
- W_T = Initial mass of sample tested, g
- 100 = Constant, to convert answer to %

Example:

$$A = 0.1\text{g}$$

$$W_T = 100.2\text{g}$$

$$\begin{aligned} R &= \frac{0.1}{100.2} \times 100 \\ &= 0.000998 \times 100 \\ &= 0.0998 \\ R &= 0.10 \end{aligned}$$

- B. Calculate to the nearest 0.01 % the percent coarser for each sieve size (C_x) using the following formula :

$$C_x = \Sigma(R_{x+1} \dots R_{x+i}) + R_x$$

Where:

R_{x+i} = percent retained on the each sieve used with larger openings than sieve X.

R_x = percent retained on sieve X

Note 3: For the largest sieve used for a particular sample, the percent coarser equals the percent retained.

Example:

$$R_{30} = 0.00$$

$$R_{80} = 0.09$$

$$R_{200} = 0.49$$

$$R_{270} = 1.09$$

C_{30} = % coarser than the No. 30 sieve

$$C_{30} = 0.00$$

$$R_{30} = 0.00$$

and

C_{80} = % coarser than the No. 80 sieve

$$C_{80} = 0.00 + 0.09$$

$$C_{80} = 0.09$$

and

C_{200} = % of coarser than the No. 200 sieve

$$C_{200} = 0.00 + 0.09 + 0.49$$

$$C_{200} = 0.58$$

and

C_{270} = % coarser than the No. 270 sieve

$$C_{270} = 0.00 + 0.09 + 0.49 + 1.09$$

$$C_{270} = 1.67$$

- C. Calculate the percent passing (P_x) for each sieve size to the nearest 1% using the following formula :

$$P_x = 100.00 - C_x$$

Where:

C_x = percent coarser than sieve X

100.00 = constant

Example:

$$C_{30} = 0.00$$

$$C_{80} = 0.09$$

$$C_{200} = 0.58$$

$$C_{270} = 1.67$$

$$P_{30} = 100.00 - 0.00$$

$$= 100.00$$

$$P_{30} = 100$$

$$P_{80} = 100.00 - 0.09$$

$$= 99.91$$

$$P_{80} = 100$$

$$P_{200} = 100.00 - 0.58$$

$$= 99.42$$

$$P_{200} = 99$$

$$P_{270} = 100.00 - 1.67$$

$$= 98.33$$

$$P_{270} = 98$$

VII. Report

Report the percent Passing (P) each sieve required by the appropriate specifications to the nearest whole percent.

VIII. Normal Test Reporting Time

Normal test reporting time is 3 days.

TOLERANCES FOR STIRRING PADDLES

- (a) diameter - 0.75 ± 0.062
- (b) longest diameter - 0.097 ± 0.062

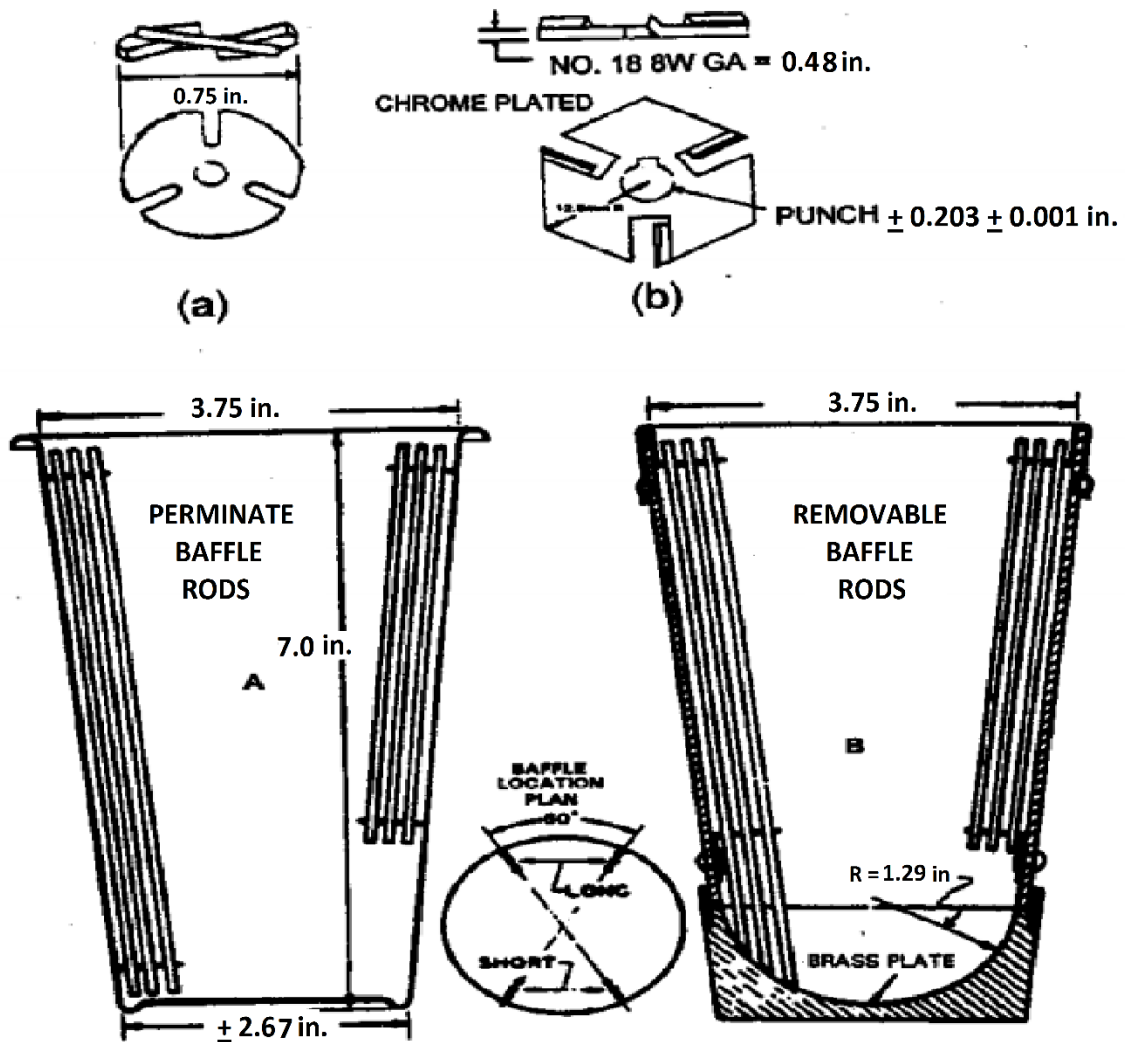


Figure 1

*Upper: Detail of Stirring Paddle
Lower: Dispersion Cups*

MATT MENU SELECTION - 2

Louisiana Department of Transportation and Development
AGGREGATE TEST REPORT

DOTD 03-22-0745
Rev. 7/95

Project No. 222-22-2222 Material Code 439 Lab No. 22-999169
Date Sampled 10-19-96 Submitted By 0304 Quantity 500
Purpose Code 3 Source Code AAD4 Spec Code L P.O. No. _____
Date Tested 10-29-96 Ident MF-069 Plant Code _____ Frict. Rating (1-4) _____
Item No. _____ Date Rec'd (lab) 10/29/96 Sampled By: M.J.

Remarks 1 _____

Tested By H.S. Date 10/29/96 Checked By J.B.W. Date 11/01/96

DOTD TR 102, 112, 113 & 309					DOTD TR 428	
Unit <input type="checkbox"/> 1 = grams 2 = pounds					Liquid Limit _____	Plastic Limit _____
Sieve	mm	in.	Wt. Retained	% Retained	% Coarser	% Passing
63	2 1/2					
50	2					
37.5	1 1/2					
31.5	1 1/4					
25.0	1					
19.0	3/4					
16.0	5/8					
12.5	1/2					
9.5	3/8					
4.75	No. 4					
Wt. Mat. in Pan _____			Wt. Cup + Wet Soil, g _____			
Acc. Total _____			Wt. Cup + Dry Soil, g _____			
Initial Dry Total Wt _____			Wt. Water _____			
% Diff: _____			Factor _____			
Unit <input checked="" type="checkbox"/> 1 = grams 2 = pounds			Cup No. _____			
Sieve	mm/cm	No.	Wt. Retained	% Retained	% Coarser	% Passing
2.36	8					
2.00	10					
1.18	16					
600	30		0.0	0.00	0	100
425	40					
300	50					
180	80		0.1	0.09	0	100
150	100					
75	200		0.5	0.49	1	99
53	270		1.1	1.09	2	98
Wt. Mat. in Pan _____			Wt. Cup, g _____			
Decant Loss _____			Wt. Dry Soil _____			
Acc. Total _____			% Moisture _____			
Initial Dry Total Wt _____			Plasticity Index _____			
Dry Wt After Washing _____			Absorption (TR4 or TR5) _____			
% Diff: 0			Spec Grav SSD (TR4 or TR5) _____			
Remarks 2: _____			Spec Grav APP (TR 300) _____			
_____			Effective Spec Grav (TR 300) _____			
_____			Opt Moist Content, % (TR 418) _____			
_____			Maximum Density (TR 418) _____			
_____			Lab Comp Method (TR 418) _____			
_____			Cement, % (TR 432 or SPECIFIED) _____			
_____			Lime, % (TR 418 or SPECIFIED) _____			
_____			Other (Additive) Code _____ % _____			
_____			Clay Lumps, % (TR 119) _____			
_____			Friable Particles, % (TR 119) _____			
_____			Clay Lumps & Friable Particles % (TR 119) _____			
_____			Flat or Elongated Part, % (TR 119) _____			
_____			Coal & Lignite, % (TR 119) _____			
_____			Glassy Particles, % (TR 119) _____			
_____			Iron Ore, % (TR 119) _____			
_____			Wood, % (TR 119) _____			
_____			Total (Clay Lumps, Fri. Part., Iron Ore, Coal & Lignite, Wood), % (TR 119) _____			
_____			Foreign Matter, % (TR 108) _____			
_____			Clam Shell, % (TR 110) _____			
_____			Soundness, % Loss (T 104) _____			
_____			Abrasion, % Loss (T 98) _____			
_____			Colorimetric Test (1 = Pass, 2 = Fail) (T 21) _____			
_____			Asphalt Content, % (TR 307) _____			
_____			Retained Asphalt Coating, % (TR 317) _____			
_____			Percent Crushed (TR 308) _____			
_____			Retained Marshall Stability (TR 313) _____			
_____			Resistivity (TR 428) _____			
_____			pH (TR 430) _____			
_____			Organic Content, % (TR 413) _____			
_____			Sand Equivalent (TR 120) _____			
_____			Approved By: _____ Date: _____			

Figure 2

Aggregate Test Report (02-22-0745)