Test Procedure for

SIEVE ANALYSIS OF FINE AND COARSE AGGREGATE

TxDOT Designation: Tex-401-A

Effective Date: August 1999

1. SCOPE

1.1 Use this method to determine the particle size distribution of mineral fillers and coarse and fine aggregates for portland cement concrete.

1.2 The values given in parentheses (if provided) are not standard and may not be exact mathematical conversions. Use each system of units separately. Combining values from the two systems may result in nonconformance with the standard.

2. APPARATUS

2.1 *Standard U.S. sieves and pans*, meeting the requirements of Tex-907-K, in the following sizes:

- 75 mm (3 in.)
- 63 mm (2-1/2 in.)
- 50 mm (2 in.)
- 37.5 mm (1-1/2 in.)
- 25.0 mm (1 in.)
- 19.0 mm (3/4 in.)
- 12.5 mm (1/2 in.)
- 9.5 mm (3/8 in.)
- 4.75 mm (No. 4)
- 2.36 mm (No. 8)
- 1.18 mm (No. 16)
- 600 µm (No. 30)
- 300 µm (No. 50)
- 150 µm (No. 100)
- 75 µm (No. 200).

2.2 *Quartering machine, sample splitter, or quartering cloth.*

2.3 *Mechanical sieve shaker.*

2.4 *Balance,* Class G2 in accordance with Tex-901-K.

2.5 *Drying oven,* maintained at 110 ± 5°C (230 ± 9°F).

2.6 *Round pans,* to fit sieves.

2.7 *Small scoop, brushes, etc.*

3. SAMPLING AND SIEVING FINE AND COARSE AGGREGATE

3.1 Sample the aggregate in accordance with Tex-400-A.

3.2 When material is a combination of coarse and fine aggregate, sieve sample over a 4.75 mm (No. 4) sieve to separate coarse and fine aggregates.

4. PREPARING SAMPLE

4.1 *Coarse Aggregate Method:*

4.1.1 Reduce the sample into the test sample sizes shown in Table 1.

4.1.2 Dry the sample in an oven to a constant mass and cool to room temperature.

4.1.2.1 For rapid check of the gradation in the field, but not for project acceptance, it is not necessary to dry the coarse aggregates before the test.

4.1.2.2 Sample size may be in accordance with Tex-406-A, Part I.

4.1.3 Record the total dry mass of the sample to the nearest gram.

Table 1—Test Sample Sizes (Coarse Aggregate)

Nominal Maximum Size	Minimum Mass
9.5 mm (3/8 in.)	1 kg (2 lb.)
12.5 mm (1/2 in.)	2 kg (4 lb.)
19.0 mm (3/4 in.)	5 kg (11 lb.)
25.0 mm (1 in.)	10 kg (22 lb.)
37.5 mm (1-1/2 in.)	15 kg (33 lb.)
50.0 mm (2 in.)	20 kg (44 lb.)
63.0 mm (2-1/2 in.)	35 kg (77 lb.)
75.0 mm (3 in.)	60 kg (130 lb.)

4.2 *Fine Aggregate—Laboratory Method:*

4.2.1 Select a representative sample of approximately 500 g from material that has been thoroughly dried at a temperature of 110 ± 5°C (230 ± 9°F). Where the fine aggregate is a combination of sands, the sample should contain these sands in the proportion by dry mass in which they will be used.

Note 1—Do not include mineral filler in the sieve analysis.

4.2.2 Record the total dry mass of the sample.

4.2.3 Determine the amount of material finer than the 75 µm (No. 200) sieve in accordance with Tex-406-A, Part I.

4.2.4 Weigh the sample and record its mass to the nearest 0.1 g.

4.3 *Fine Aggregate—Field Method:*

4.3.1 Secure a representative sample of approximately 500 g of the sand to be tested. Where the fine aggregate is a combination of sands, the sample should contain these sands in the proportion by mass in which they will be used.

4.3.2 Dry the sample to below saturated surface-dry condition either in the sun or by artificial heat.

4.3.3 Record the total mass of the sample to the nearest 0.1 g.

4.4 *Mineral Filler:*

4.4.1 Oven-dry the mineral filler to a constant mass.

4.4.2 Quarter material into a test sample of approximately 200 g.

4.4.3 Perform the sieve analysis immediately after removing the sample from the oven.

5. PROCEDURE

5.1 Using the sieve sizes required by the specification, arrange sieves in descending order with the largest size on top.

5.2 If using a mechanical sieve shaker, place the set of sieves onto a pan and pour the prepared aggregate onto the top sieve, cover the stack of sieves and pan, turn on the machine, and set it to shake for at least 5 minutes.

5.2.1 If hand sieving, start with the largest size, and progress toward the smaller sieve sizes; move the sieves in lateral and vertical motions accompanied by a jarring action to keep the material moving continuously over the surface of the sieves. Hand manipulation without forcing particles through the sieve is permitted.

5.3 For either mechanical or hand sieving, sieve the material until not more than 1% by mass of the residue on any individual sieve will pass that sieve during 1 minute of continuous hand sieving.

5.4 Using a scale with a capacity large enough to obtain the mass of the total sample, determine the mass of the fine aggregate to the nearest 0.1 g and coarse aggregate to the nearest 1 g.

5.4.1 First, determine the mass of the aggregate retained on the largest sieve size and record the value.

5.4.2 Add the contents of the next largest sieve size on the scale, obtain the cumulative mass of the two sizes and record this mass.

5.4.3 Finally, add the contents of the next size, and repeat this operation until the contents of the smallest sieve size used is empty, and cumulative mass has been obtained and recorded.

5.4.4 When the specifications require percent passing, record the weights retained on each sieve individually.

Note 2—For sieves with openings smaller than the 4.75 mm (No. 4), the mass retained on any sieve at the completion of the sieving operation should not exceed 6 kg/m^2 (4 g/in.^{2}) of sieving surface. No more than 200 g of material should be retained on any single 203 mm (8 in.) diameter sieve.

6. CALCULATIONS

6.1 Calculate percent retained:

$$PR = 100(MR / MTS)$$

Where:

PR = Percent Retained

MR = Mass Retained

MTS = Mass of Total Sample.

Note 3—For both the coarse and fine aggregate laboratory methods, use the total dry mass prior to washing as the basis for calculating all the percentages.

6.2 When the specifications require percent passing, record the weights retained on each sieve individually and calculate the weight passing each sieve. Then calculate the percent passing each sieve.

7. REPORTING TEST RESULTS

7.1 Report the cumulative percent retained on each sieve to the nearest whole percent, beginning with the largest sieve size.

7.2 In performing this analysis, use caution not to lose any of the sample during the shaking or weighing operations. If there is an insignificant discrepancy between the original total dry mass of the sample and the sum of the masses of the various parts, assume this difference to have passed the smallest sieve size and use the original total mass.

7.3 When the specifications require percent passing, report the percent passing each sieve according to the specifications.