Test Procedure for

DETERMINING DELETERIOUS MATERIAL AND DECANTATION TEST FOR COARSE AGGREGATES (BITUMINOUS MIXTURES)

TxDOT Designation: Tex-217-F

Effective Date: July 2019

1. SCOPE

1.1 Use Part I to determine the percent by weight of deleterious material in coarse aggregate.

1.2 Use Part II to determine the percent by weight of detrimental fine dust, clay-like particles, and silt present as a coating in coarse aggregate.

1.3 Use Part III to determine the percent by weight of deleterious material contained in processed recycled asphalt shingles.

1.4 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.

PART I—DETERMINING DELETERIOUS MATERIAL IN COARSE AGGREGATES

2. SCOPE

2.1 Use this procedure to determine the percent by weight of deleterious material in coarse aggregate.

3. APPARATUS

3.1 *Balance*, class G2 in accordance with Tex-901-K, with a minimum capacity of 4,000 g.

3.2 *Heating oven*, capable of attaining a temperature of at least 200 ± 5°F (93 ± 3°C).

3.3 *Sample splitter, quartering cloth, quartering machine, or shovel and a smooth surface*.

3.4 *Standard U. S. sieves,* in accordance with Tex-907-K, in the following sizes:

- 3/8 in. (9.5 mm),
- No. 4 (4.75 mm), and
- No. 8 (2.36 mm).

3.5 *Dishpan,* or similar container.

3.6 *Pans, scoops, trowels, and other normal laboratory supplies and equipment.*

4. PROCEDURE

4.1 Obtain a representative sample of aggregate for testing in accordance with Tex-221-F.

Note 1—Select samples of crushed limestone rock asphalt from the processing plant before addition of the flux oil.

4.2 Oven-dry the aggregate to a constant weight at a minimum temperature of 200°F (93°C). Oven-dry limestone rock asphalt aggregates, when used, to a constant weight at a maximum temperature of 140°F (60°C).

4.3 Remove the sample from the oven and allow to cool to room temperature.

4.4 Obtain a minimum laboratory size sample of 2,000 g using one of the following methods:

- Sample splitter,
- Quartering cloth,
- Quartering machine,or
- Mix on a smooth clean surface with a large flat scoop or shovel until blended, and quarter with a straightedge.

Note 2—When testing aggregates from the hot bins, the sample should consist of aggregates combined in the same proportions used in the mixture being produced.

4.5 Sieve the dried test sample over the No. 4 (4.75 mm) sieve in such a manner as to avoid breaking up any clay or loam lumps that may be present. Test the material retained on the No. 8 (2.36 mm) sieve for compliance with the deleterious material requirements if the sample contains an aggregate that predominately passes the No. 4 (4.75 mm) sieve.

4.6 Weigh the aggregate particles retained on the No. 4 (4.75 mm) sieve to the nearest 0.1 g. Weigh the aggregate particles retained on the No. 8 (2.36 mm) sieve to the nearest 0.1g, if the aggregate size requires this sieve to be used. Record the weight as *W* in Section 5.

4.7 Discard the portion of material passing the No. 4 (4.75 mm) sieve. Discard the portion of material passing the No. 8 (2.36 mm) sieve, when using the No. 8 (2.36 mm) sieve in Section 4.6.

4.8 Spread the aggregate sample (portion retained on the No. 4 [4.75 mm] or No. 8 [2.36 mm] sieve) out on an area of the worktable large enough to examine the individual particles carefully.

4.9 Separate and classify each type of deleterious matter from the remainder of the sample by visual inspection. Material may be wetted, or other suitable methods may be used to aid in identification.

4.10 Dry and weigh all objectionable material removed from the aggregate sample to the nearest 0.1 g and record the weight as *D* in Section 5.

5. CALCULATIONS

5.1 Calculate the percentage of each or a combination of deleterious materials:

$$P = \frac{D}{W} \times 100$$

Where:

P = Percentage of deleterious matter by weight

D = Weight of deleterious substances, g

W = Weight of total sample (retained on No. 4 [4.75-mm] or No. 8 [2.36-mm]), g

5.2 Report deleterious matter content test results to the nearest 0.1%.

PART II—DECANTATION TEST FOR COARSE AGGREGATE

6. SCOPE

6.1 Use this procedure to determine the percent by weight of fine material adhering to the coarse aggregate due to handling or contamination by silt or clay.

7. APPARATUS

7.1 *Balance*, class G2 in accordance with Tex-901-K, with a minimum capacity of 4,000 g.

7.2 *Heating oven*, capable of attaining a temperature of at least 200 ± 5 °F (93 ± 3 °C).

7.3 *Sample splitter, quartering cloth, quartering machine, or shovel and a smooth surface*.

7.4 *Mechanical sieve shaker*.

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

- 3/8 in. (9.5 mm),
- No. 4 (4.75 mm),
- No. 8 (2.36 mm), and
- No. 200 (75 μm).

7.6 *Dishpan,* or similar container.

7.7 *Pans, scoops, trowels, and other normal laboratory supplies and equipment.*

8. PROCEDURE

8.1 Obtain a representative sample of aggregate for testing in accordance with Tex-221-F.

Note 3—Select the sample of crushed limestone rock asphalt from the processing plant before addition of the flux oil.

8.2 Oven-dry the aggregate to constant weight at a minimum temperature of 200°F (93°C). Oven-dry limestone rock asphalt aggregates, when used, to constant weight at a maximum temperature of 140°F (60°C).

8.3 Remove the sample from the oven and allow it to cool to room temperature.

8.4 Obtain a minimum laboratory size sample of 1,500 g using one of the following methods:

- Sample splitter,
- Quartering cloth,
- Quartering machine, or
- Mix on a smooth clean surface with a large flat scoop or shovel until blended, and quarter with a straightedge.

Note 4—When testing aggregates from the hot bins, the sample should consist of aggregates combined in the same proportions used in the mixture being produced.

8.5 Stack the 3/8 in. (9.5 mm) and No. 4 (4.75 mm) sieves on a sieve pan.

8.6 Place half the sample on the top sieve, cover the stack, and shake in the shaker for three min. Test the material retained on the No. 8 (2.36 mm) sieve for compliance with the specification requirements if the sample contains an aggregate that predominately passes the No. 4 (4.75 mm) sieve.

8.7 Remove any material other than coated particles of aggregate that will slake down during the test.

Note 5—The remaining material constitutes the decantation test sample.

8.8 Remove the stack of sieves and empty each into a dry pan, discarding the material passing the No. 4 (4.75 mm) sieve. Discard material passing the No. 8 (2.36 mm) sieve, when using the No. 8 (2.36 mm) sieve in Section 8.6.

8.9 Empty all sieves into one pan of convenient size.

8.10 Repeat Sections 8.5–8.9 for the remaining material.

8.11 Weigh the material retained on the No. 4 (4.75 mm) sieve to the nearest 0.1 g. Weigh the material retained on the No. 8 (2.36 mm) sieve to the nearest 0.1 g, if the aggregate size requires this sieve to be used. Record the weight as *B* in Section 9.

8.12 Place the test sample in the dishpan, cover with water, and let sample soak for at least 12 hr.

8.13 Agitate the contents of the pan vigorously with the hands, and immediately pour the wash water over the No. 200 (75-µm) sieve. Agitate vigorously to completely separate all particles finer than the No. 200 (75-µm) sieve from the coarse particles and to bring the fine material into suspension so that it will be removed by decantation.

8.14 Repeat until the wash water is clear.

8.15 Return all the material retained on the No. 200 (75-µm) sieve to the washed sample.

8.16 Dry the washed aggregate to a constant weight, as indicated in Section 8.2.

8.17 Weigh the dried aggregate to the nearest 0.1 g and record the weight as *C* in Section 9.

9. CALCULATIONS

9.1 Calculate the percent loss by decantation:

$$Percent\ \ Loss = \frac{B - C}{B} \times 100$$

Where:

B = original dry weight, g

C = dry weight after washing, g

9.2 Report decantation test results to the nearest 0.1%.

PART III—DETERMINING DELETERIOUS MATERIAL IN RECYCLED ASPHALT SHINGLES (RAS)

10. SCOPE

10.1 Use this procedure to determine the percent by weight of deleterious material in processed recycled asphalt shingles (RAS).

11. APPARATUS

11.1 *Balance*, class G2 in accordance with Tex-901-K, with a minimum capacity of 5,000 g.

11.2 *Drying oven*, capable of attaining a temperature of at least 140 ± 5°F (60 ± 3°C).

11.3 *Mechanical sieve shaker*.

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

- 3/8 in. (9.5 mm),
- No. 4 (4.75 mm),
- No. 8 (2.36 mm), and
- No. 30 (0.6 mm).

11.5 *Rectangular pan,* at least 14 in. wide.

11.6 *Sample splitter or quartering device.*

11.7 *Small scoop.*

11.8 *Metal collection device*, a rectangular, nonferrous tray, 12 in. wide, at least 20 in. long, with walls at the two long sides and both short ends open, with a 12 × 2-in. magnet fixed under the tray perpendicular to the walls, as shown in Figure 1.

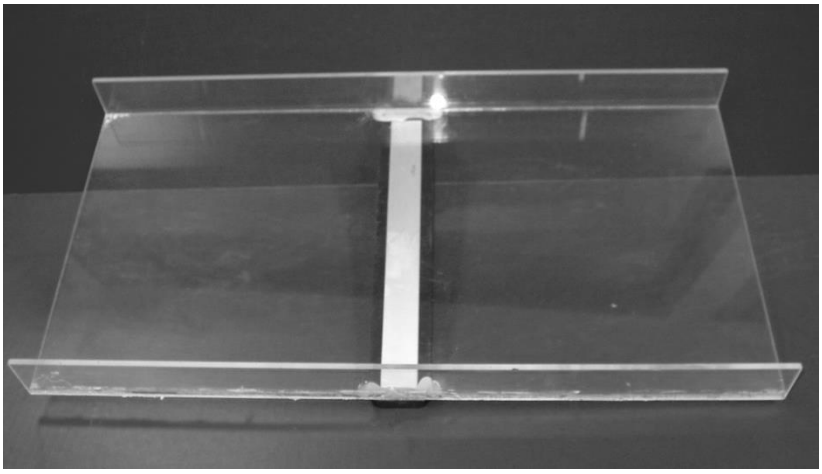

Figure 1—Metal Collection Device

12. SAFETY CONSIDERATIONS

12.1 Always use the appropriate personal protective equipment (PPE) when handling RAS.

12.1.1 Wear a long-sleeved lab coat.

12.1.2 Use a cartridge respirator or disposable paper mask to prevent inhalation of particulate.

12.1.3 Wear disposable gloves.

12.1.4 Use safety glasses.

12.2 Discard all excess RAS in a secured plastic bag.

13. PROCEDURE

13.1 Obtain a representative sample from the RAS stockpile in accordance with Tex-222-F.

13.2 Oven-dry the sample to constant weight at 140 ± 5°F (60 ± 3°C).

13.3 Remove the sample from the oven and allow to cool to room temperature.

13.4 Obtain a representative test sample of 1,000 g using one of the following methods:

- Sample splitter,
- Quartering cloth, or
- Quartering machine.

13.5 Weigh the sample to the nearest 0.1 g. Record the weight as W_T in Section 14.1.

13.6 Place a pan on the scale and tare its weight.

13.7 Place the metal collection device on the pan and angle one of the open ends down into the pan.

13.8 Tilt the metal collection device to an angle of 45° or more and pour the sample over the device. Ensure the sample particles pass over the magnet before falling into the pan.

13.9 Gently shake the metal collection device to remove material not retained by the magnet. Remove the device from the pan and discard the metal fragments retained by the magnet.

13.10 Weigh the material in the pan on the tared scale to the nearest 0.1 g. Record as *A* in Section 14.1. Save this material for future testing described in 13.12.

13.11 Calculate the weight of metal fragments in the sample in accordance with Section 14.1.

13.12 Stack the 3/8 in. (9.5 mm), the No. 4 (4.75 mm), the No. 8 (2.36 mm), and the No. 30 (0.6 mm) sieves on a sieve pan.

13.13 Place the sample on the top sieve, cover the stack, and shake in the shaker for approximately 10 min.

13.14 Discard the portion of material passing the No. 30 (0.6 mm) sieve.

13.15 Test the material retained on each sieve for all deleterious content including but not limited to wood, paper, plastic, and felt paper.

13.15.1 Spread the portion of the sample retained on the 3/8 in. (9.5 mm) sieve out in a pan large enough to examine the individual particles carefully.

13.15.2 Separate and remove the deleterious matter from the remainder of the sample by visual inspection.

13.15.3 Weigh all objectionable material removed from the RAS sample retained on the 3/8 in. (9.5 mm) sieve to the nearest 0.1 g and record the weight as $N_{3/8}$ in Section 14.2.

13.16 Repeat Sections 13.15.1–13.15.3 for the material retained on the No. 4 (4.75 mm), the No. 8 (2.36 mm), and the No. 30 (0.6 mm) sieves.

13.17 Record these weights as N_4, N_8, and N_{30} respectively in Section 14.2.

14. CALCULATIONS

14.1 Calculate the weight of the metal fragments in the original sample:

$$M = W_T - A$$

Where:

M = weight of material retained by the magnet, g

W_T = total weight of sample, g

A = weight of material not retained by the magnet, g

14.1.1 Report weight of metal fragment test results to the nearest 0.1 g.

14.2 Calculate the percent by weight of deleterious material in the sample:

$$P = \frac{M + N_{3/8} + N_4 + N_8 + N_{30}}{W_T} \times 100$$

Where:

P = percent of deleterious matter by weight

M = weight of material retained by the magnet, g

$N_{3/8}$ = weight of deleterious substance retained on the 3/8 in. (9.5 mm) sieve, g

N_4 = weight of deleterious substance retained on the No. 4 (4.75 mm) sieve, g

N_8 = weight of deleterious substance retained on the No. 8 (2.36 mm) sieve, g

N_{30} = weight of deleterious substance retained on the No. 30 (0.6 mm) sieve, g

14.2.1 Report deleterious matter test results to the nearest 0.1%.

15. REPORT FORMS

15.1 Deleterious Materials and Decantation for Coarse Aggregate

16. ARCHIVED VERSIONS

16.1 Archived versions are available.