

## **Tex-461-A, Degradation of Coarse Aggregate by Micro-Deval Abrasion**

### **Overview**

This method covers a procedure for testing coarse aggregate for resistance to abrasion and weathering using the Micro-Deval apparatus.

### **Definitions**

The following term is referenced in this test procedure.

- ◆ Constant Weight - Test samples are dried at a temperature of  $110 \pm 5$  °C ( $230 \pm 9$  °F) to a condition such that it will not lose more than 0.1 percent moisture after 2 hours of drying. Such a condition of dryness can be verified by weighing the sample before and after successive 2-hour drying periods. In lieu of such determination, samples may be considered to have reached constant weight when they have dried at a temperature of  $110 \pm 5$  °C ( $230 \pm 9$  °F) for an equal or longer period than that previously found adequate for producing the desired constant condition under equal or heavier loading conditions of the oven.

### **Apparatus**

The following apparatus is required:

- ◆ Micro-Deval Abrasion Machine and accessories that meet TxDOT specification No. 845-49-40 dated June, 2002
- ◆ Set of standard U.S. sieves and pans, meeting the requirements of Test Method "Tex-907-K, Verifying the Accuracy of Wire Cloth Sieves," including:
  - 19.0 mm (3/4 in.)
  - 12.5 mm (1/2 in.)
  - 9.5 mm (3/8 in.)
  - 6.3 mm (1/4 in.)
  - 4.75 mm (No. 4).
- ◆ Oven, capable of maintaining a temperature of  $110 \pm 5$  °C ( $230 \pm 9$  °F).
- ◆ Balance, accurate and readable to 0.1 g or 0.1% of the mass of the test sample, whichever is greater.
- ◆ Timer, accurate to the nearest 1/4 minute
- ◆ Tachometer, capable of measuring the rpm of the Micro-Deval containers to within one revolution. Example: Monarch Model 4KF47.
- ◆ Remote Optical Sensor

- capable of measuring 1 – 1000 rpm
  - stainless steel sensor 0.625 in. diameter, with visible red LED light source and green LED on-target indicator; compatible with tachometer. Example: Monarch Model 4KF55.
- ◆ Reflective tape, compatible with remote optical sensor.

## Test Sample

The test sample shall be washed and oven dried at  $110 \pm 5$  °C ( $230 \pm 9$  °F) to constant weight, separated into individual size fractions according to Test Method "Tex 401-A, Sieve Analysis of Fine and Coarse Aggregate," and recombined to meet the grading as shown. Limestone rock asphalt shall be dried at  $60 \pm 5$  °C ( $140 \pm 9$  °F).

- ◆ For bituminous aggregate, use the following standard gradation:

Bituminous Aggregate		
Passing	Retained	Weight (g)
12.5 mm (1/2 in.)	9.5 mm (3/8 in.)	750
9.5 mm (3/8 in.)	6.3 mm (1/4 in.)	375
6.3 mm (1/4 in.)	4.75 mm (No. 4)	375

- ◆ For concrete aggregate, use the following standard gradation:

Concrete Aggregate		
Passing	Retained	Weight (g)
19.0 mm (3/4 in.)	12.5 mm (1/2 in.)	660
12.5 mm (1/2 in.)	9.5 mm (3/8 in.)	330
9.5 mm (3/8 in.)	6.3 mm (1/4 in.)	330
6.3 mm (1/4 in.)	4.75 mm (No. 4)	180

## Procedure

The following table outlines the procedure for testing coarse aggregate for resistance to abrasion and weathering using the Micro-Deval apparatus.

Testing Coarse Aggregate	
Step	Action
1	<ul style="list-style-type: none"> <li>◆ Prepare a representative <math>1500 \pm 5</math> g sample according to the applicable standard grading. A maximum of 10% of an adjacent size material from the standard grading may be substituted if the sample does not contain appropriate weights.</li> <li>◆ Record the weight to the nearest 1.0 g, as 'A' under 'Calculations.'</li> </ul>
2	Saturate the sample in $2000 \pm 500$ mL (0.5 gal.) of tap water (temperature $20 \pm 5$ °C [ $68 \pm 9$ °F]) for a minimum of 1 hour either in the Micro-Deval container or in another suitable container.
3	<ul style="list-style-type: none"> <li>◆ Place the sample, water, and <math>5000 \pm 5</math> g of stainless steel balls in the Micro-Deval container.</li> <li>◆ Place the Micro-Deval container on the machine.</li> </ul>
4	<ul style="list-style-type: none"> <li>◆ Set the timer and start the machine. <ul style="list-style-type: none"> <li>• Concrete aggregate samples will be tested at <math>100 \pm 5</math> rpm for <math>120 \pm 1</math> minute.</li> <li>• Bituminous aggregate samples will be tested at <math>100 \pm 5</math> rpm for <math>105 \pm 1</math> minute.</li> </ul> </li> <li>◆ Record the rpms registered by the tachometer at the end of the test period.</li> </ul>

5	<ul style="list-style-type: none"> <li>◆ Stack a No. 4 (4.75 mm) and a No. 16 (1.18 mm) sieve together and carefully decant the sample over them. Take care to remove the entire sample from the stainless steel jar.</li> <li>◆ Wash the retained material with water until the wash water is clear and all materials smaller than No. 16 (1.18 mm) pass the sieve.</li> </ul>
6	<ul style="list-style-type: none"> <li>◆ Remove the stainless steel balls using a magnet or other suitable means.</li> <li>◆ Discard material passing the No. 16 (1.18 mm) sieve.</li> </ul>
7	<ul style="list-style-type: none"> <li>◆ Oven-dry the sample to constant weight at <math>110 \pm 5</math> °C (<math>230 \pm 9</math> °F).</li> <li>◆ Oven-dry limestone rock asphalt to constant weight at <math>60 \pm 5</math> °C (<math>140 \pm 9</math> °F).</li> </ul>
8	<ul style="list-style-type: none"> <li>◆ Weigh the sample to the nearest 1.0 g.</li> <li>◆ Record the oven-dry weight as 'B' under 'Calculations.'</li> </ul>

### Calculations

Calculate the Micro-Deval abrasion loss as follows:

$$\text{Percent loss} = (A - B) / A \times 100$$

Record to the nearest percent.