

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
MATERIALS CONTROL, SOILS AND TESTING DIVISION

MATERIALS PROCEDURE

METHOD OF DETERMINATION OF PERCENT OF
THIN OR ELONGATED PIECES IN COARSE AGGREGATE

1.0 PURPOSE

1.1 The orientation and excessive amounts of thin or elongated pieces of aggregate can create structural and workability problems in base course, portland cement concrete and bituminous concrete mixtures resulting in a loss in strength, skid resistance and wearing ability. Their presence may cause internal and/or external damages when utilized in the previously mentioned applications and consequently the quality of the finished product can be, in part, directly related to the presence of thin or elongated pieces.

2.0 SCOPE

2.1 This method of determination is applicable to all coarse aggregates, both natural and crushed and is applied when a test for thin or elongated pieces is required.

3.0 EQUIPMENT

3.1 Pans - Large pans suitable for spreading of the sample.

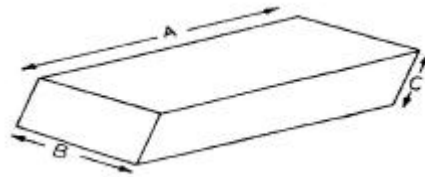
3.2 Balance - A balance or scale with a capacity of 5000 grams and an accuracy of 1 gm.

3.3 Calipers - Precision built calipers that will maintain a constant 4 to 1 ratio.

4.0 DEFINITIONS

4.1 Thin Aggregate - One in which the ratio of the width to the thickness of its circumscribing rectangular prism is greater than 4:1.

- 4.2 Elongated Aggregate - One in which the length to the width of its circumscribing rectangular prism is greater than 4:1.
- 4.3 For consistency in evaluating aggregate for possible thin or elongated pieces, the following diagram is provided so as not to confuse one measured dimension with another.



Where:
A = length
B = width
C = thickness

5.0 TEST PROCEDURE

- 5.1 Obtain from the field sample a test portion in excess of 5000 grams by use of a sample splitter.
- 5.2 Wash the test portion over a 4.75 mm sieve and oven dry to a constant weight.
- 5.3 Weigh and record approximately 5000 grams of the material to be tested.
- 5.4 Spread the test portion in a thin layer in the bottom of a larger flat pan.
- 5.5 Make a preliminary separation of all material which is obviously neither thin nor elongated.
- 5.6 Determine the maximum thickness of the possible thin piece of aggregate by using the small opening of the calipers.
- 5.6.1 Remove the aggregate particle from the caliper without disturbing the setting of the opening and place the greatest width of the particle in the large opening.
- 5.6.2 If the greatest width of the aggregate particle is larger than the large opening of the calipers, it shall be considered a thin piece of aggregate and shall be placed aside for future reference.

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- 5.7 Determine the maximum width of the possible elongated pieces of aggregate by using the small opening of the calipers.
- 5.7.1 Remove the aggregate particle from the caliper without disturbing the setting of the opening and place the greatest length of the particle in the large opening.
- 5.7.2 If the greatest length of the aggregate particle is larger than the large opening of the calipers, it shall be considered an elongated piece of aggregate and shall be placed aside for future reference.
- 5.8 Combine all pieces of aggregate classified as either thin or elongated and weigh to the nearest gram and record.

6.0 CALCULATION

- 6.1 The percent of thin and/or elongated pieces is determine in the following manner:

$$P = \frac{W_1 + W_2}{W_3} \times 100$$


Where:

P = percent of thin and/or elongated pieces

W₁ = weight of thin pieces

W₂ = weight of elongated pieces

W₃ = oven dry weight of test portion



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