

Flat and Elongated Particles

Purpose

- Determine the percentage of flat and elongated particles in coarse aggregate sample
- Standard Test
 - Method for Determining Flat and Elongated Particles in Coarse Aggregate
 - SC-T-77
 - Reference ASTM D4791

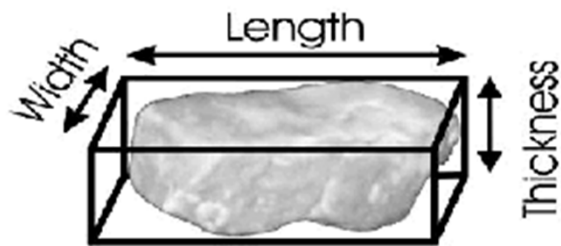
Definitions

- Elongated = Length 5+ times larger than width
- Flat = Length or width 5+ times larger than thickness
- Use proportional calipers to determine results
- Is the maximum dimension 5 times larger than the minimum dimension?

Test Procedure

- Sieve the sample
- Discard material passing $\frac{3}{8}$ in. sieve
- Select approximately 100 particles of each size fraction retained. If a sieve has less than 100 particles retained, that particular sieve is not tested.
 - ie. 1" approx 100 pieces; $\frac{3}{4}$ " approx 100 pieces; $\frac{1}{2}$ " approx 100 pieces; etc.
- Measure each particle for 5:1 ratio using proportional calipers.
 - Exceeds 5:1 ratio - flat and elongated
 - Less than or equal to 5:1 ratio - not flat and elongated

5:1 Ratio



Particle Count

- Percentage of flat and elongated (f/e) particles
= $\frac{\text{Number of f/e particles}}{\text{Total number of particles}} \times 100\%$
- Example:
 - 100 particles retained on $\frac{3}{8}$ in. sieve
 - 9 particles flat and elongated
 - $(9/100) \times 100\%$
 - Percentage = 9.0%

Total Flat and Elongated Particles

- Calculate percentage for each size fraction retained
- Average all percentages and record to nearest 0.1%
- Example:
 - 9.0% for 3/4 in. fraction
 - 12 out of 114 particles are flat and elongated on 1/2 in. sieve
 - $(12/114) * 100 = 10.5\%$
 - 10 out of 105 particles are flat and elongated on 3/4 in. sieve
 - $(10/105) * 100 = 9.5\%$
 - Calculate average percentage $(9.0+10.5+9.5)/3 = 9.7\%$

SCDOT Specifications

Material Use	Specification
Used in HMA (SC-M-402)	10% Max (5:1 Ratio)

Common Errors

- Not obtaining a representative sample
- Not reducing sample properly
- Not sieving completely
- Incorrect particle positioning in calipers
- Calipers not set at proper ratio
- Assure that caliper are in good working order (no damage)