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LABORATORY PROCEDURE FOR TREATING AGGREGATE WITH LIME SLURRY FOR ASPHALT CONCRETE MIX DESIGN

SCOPE

This protocol provides a laboratory procedure for treating aggregate with lime slurry for use in asphalt concrete mix design.

APPARATUS

1. *Balance* - Accurate to 0.1 g.
2. *Plastic Containers* – One liter with watertight lids for storing materials.
3. *Graduated cylinder* - 100 ml
4. *Oven and equipment from California Test 304* - for preparation of design set.
5. *Miscellaneous Apparatus and Tools* – Trowel or spoon, heat resistant gloves and safety glasses or goggles.

MATERIALS

1. *Aggregate* - Component (coarse and fine) aggregate proposed for use on the project shall be treated and marinated separately. Coarse aggregate is material retained on the 4.75 mm sieve. Fine aggregate is material passing the 4.75 mm sieve.
2. *Lime* - Lime shall be a high-calcium hydrated lime that conforms to the provisions in Section 24-1.02, "Materials," of the Standard Specifications.
3. *Water* - Water shall be free from oil and other impurities and shall contain not more than 650 parts per million of chlorides (Cl) and not more than 1300 parts per million of sulfates (SO₄).

PROCEDURE

A. Preparation of Aggregate Samples

1. Combine oven-dry samples of the component aggregate in accordance with California Test 304 and allow to cool to room temperature.

NOTE: The combined aggregate gradation shall include the lime.

2. Add 1.0 percent water by dry mass of aggregate to the respective coarse and fine aggregates and mix thoroughly.
3. Place the damp coarse and fine aggregate samples in separate plastic containers to retain moisture while preparing lime slurry.

B. Preparation of Lime Slurry

1. Determine the mass of lime required to provide the desired content by dry mass of aggregate.

NOTE: The Contractor, as part of the mix design process, shall determine the exact proportion of lime. The lime content for coarse aggregate shall be 0.4 percent to 1.0 percent by dry mass of coarse aggregate and the lime content for fine aggregate shall be 1.5 percent to 2.0 percent by dry mass of fine aggregate. The combined aggregate shall contain not less than 0.8 percent and not more than 1.5 percent lime by mass of dry aggregate. The amount of lime for open graded asphalt concrete may be reduced to between 0.5 percent and 1.0 percent.

2. Mix one (1) part of lime thoroughly with two (2) parts of water by mass.

NOTE: The lime slurry shall be free of any lime balls or clods.

C. Preparation of Aggregate-Lime Slurry Mixture

1. Use a trowel or spoon to thoroughly mix the lime slurry with the moisture-conditioned coarse aggregate prepared in Section A.
2. Use a trowel or spoon to thoroughly mix the lime slurry with the moisture-conditioned fine aggregate prepared in Section A.
3. After mixing, place the coarse and fine aggregate-slurry mixtures in separate containers to cure for a minimum of 24 hours up to a maximum of 60 days.

NOTE: The moisture content of the aggregate shall be at least 1.0 percent of the dry mass of aggregate when mixed with lime slurry to assure complete coating of aggregate particles with slurry.

4. After the lime-treated aggregates have marinated for at least 24 hours, combine the component samples of aggregate in accordance with California Test 304 and mix the composite blend thoroughly with a trowel or spoon.

NOTE: Avoid segregation. Break up any lime balls or clods during mixing, as necessary.

5. Place the lime-treated blended aggregate in a pan and oven-dry to constant weight at a temperature of $110 \pm 5^\circ\text{C}$ and proceed with the mix design in accordance with California Test 304.

NOTE: If fine particles or slurry residues stick to the pan after drying, use a short bristle brush to remove that material, and recombine them with the rest of the sample.

NOTE: Once aggregate has been treated with lime, it shall not be treated with lime again.

PRECAUTIONS

Hydrated lime is a fine powder. Extra care should be taken when working with lime. Adequate ventilation and the proper safety equipment should be utilized. Avoid contact with the skin and eyes, and avoid breathing contaminated air.