

GDT 56

Determining Moisture Damage Resistance and Evaluating/Approving Anti-Stripping Additives for QPL Inclusion

I. Scope

For a complete list of [GDTs](#), see the Table of Contents.

- A. Use this test method to determine an anti-stripping additive's ability to improve moisture damage resistance and the heat stability of a Liquid Anti-Strip Additive (LASA) in bituminous mixtures. Use this method to evaluate the effectiveness of anti-strip additives in asphaltic concrete mixes manufactured at hot mix asphalt plants.

Additionally, this method is used to evaluate anti-strip additives prior to approval for inclusion on the appropriate Qualified Products Lists. This evaluation procedure is detailed in Section II, B. "Evaluation of QPL 26 and QPL 41".

B. Apparatus

This apparatus consists of the following:

1. Balances: Use balances that are accurate to the nearest 0.0002 lb. (0.1 g).
2. Hot-Plate, Gas Burner, or Stove
3. Watch or Timer
4. Metal Container: Use a non-corrosive metal beaker with a volume of approximately 0.5 gal (2000 ml) for boiling the asphaltic concrete mixture. The container is equipped with a shelf made of No. 10 (2.00 mm) wire mesh elevated 1-inch (25 mm) off the bottom.
5. Pans: Use shallow, 12-inch (305 mm) diameter pans, or equivalent.
6. Spatula: Use a spatula with a stiff blade.
7. Quart Can: Use a quart can or similar container for treating the asphalt binder (only used when evaluating Heat Stable Liquid Anti-Strip Additive).
8. Other Equipment: Use equipment necessary to perform AASHTO T 315.
9. Scoop: Standard Metal Scoop that holds 8-10 ounces

C. Testing Anti-Strip Additives at Hot Mix Asphalt Plants

1. Sample Size and Preparation

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| NOTE: Carefully handle the sample and maintain an adequate mix temperature, according to the type of mix you are sampling. |
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- a. Start the water boiling at the test site. It should be boiling by the time you arrive with the test sample.
- b. Prior to taking a sample from a haul vehicle, place scoop inside an oven to preheat. Keep the scoop preheated. This will ensure that the scoop doesn't cool down the mixture's temperature.
- c. As soon as the mix has been loaded onto the haul vehicle take one representative sample consisting of a large shovel full.

NOTE: Perform the next steps within 10 minutes after the mix comes out of the plant.

- d. Place the sample gently into a bag or container so that the mass remains intact.
- e. Immediately take the bag or container to the testing area where the container of water is already boiling slowly.
- f. Break open the mass of material sampled, use approximately [0.44 to 0.66 lbs. (200 to 300 g)] and test the material according to “II. Procedures” listed below.

II. Procedures

A. Stripping Test (Boil Test) for Asphaltic Concrete Mixture Using Any Anti-Stripping Additive at Asphalt Plants.

- a. Use the preheated scoop to transfer 8 to 10 ounces of the mix from the material sampled [approximate 0.44 to .66 lbs. (200 to 300 g)] into the boiling water. Boil the sample for 10 minutes.
- b. Drain off the water and dump the mix onto an absorptive paper product.
- c. Let the mix cool at room temperature until dry.
- d. Do not move or disturb the mix until you visually inspect the material. A stripped particle is one that visually appears to have the asphalt binder totally or partially removed as displayed in Example 2.



Example 1 -Non-Stripped Asphalt



Example 2 – Stripped Asphalt

B. Evaluation of QPL 26 “Heat Stable Anti-Stripping Additives” and QPL 41 “Hydrated Lime”.

- 1. Evaluating Heat Stable Liquid Anti-Stripping Additives for Inclusion on QPL 26

Asphalt Binder Evaluation

- a. Test the asphalt binder with and without the heat-stable liquid anti-strip additive in accordance with AASHTO T 315.
- b. When adding any type anti-strip additive, it shall not change the asphalt binder’s performance grade in accordance with Section 820.
- c. Approve additives based on tests performed with the laboratory standard asphalt binder. However, the specific asphalt binder to be used on the project must comply with Section 820 of the Standard Specifications.

Stripping Test (Boil Test) Evaluation for Inclusion on QPL 26 or QPL 41.

- d. Heat the asphalt binder to 325 °F (163 °C).
- e. Thoroughly mix in 0.5 percent by weight of the asphalt binder.
- f. Maintain the treated asphalt binder at 325 °F (163 °C) for 96 hours.
- g. Ensure that mixing temperatures conform to AASHTO T 245 or AASHTO T 312.

- h. Prepare two 250g batches of a laboratory standard aggregate with the gradation shown below for the stripping test.

NOTE: The laboratory-standard aggregate has a known history of stripping problems, and the laboratory-standard asphalt binder is a PG64-22/67-22 normally used in the laboratory for mix design purposes.

- i. Ensure that the mix from the stripping test meets the following aggregate gradations requirement:

| Size | Percent Passing |
|------------------|-----------------|
| 1/2 in (12.5 mm) | 90-100 |
| 3/8 in (9.5 mm) | 70-89 |
| No.4 (4.75 mm) | |
| No. 8 (2.36 mm) | 38-46 |
| No. 50 (300 µm) | |
| No. 200 (75 µm) | 4.5-7.0 |
| %AC | 5.0-6.25 |

- j. Use the optimum asphalt binder content to mix the two specimens using the laboratory-standard asphalt binder treated with the additive in question.
- k. Perform the stripping test after the 96-hour curing period and before the mix temperature falls below 250 °F (121 °C). “The 96-hour curing period applies to the boil test only”.
- l. The additive is considered heat-stable if no more than 5 percent of the particles become totally or partially uncoated.
- m. Once acceptable results of GDT 56 are achieved, proceed with AASHTO T 283 testing with the following modifications.

AASHTO T 283 Evaluation with listed Modifications

- n. Prepare nine (9) batches using laboratory standard aggregate to meet gradation provided above in section i. The laboratory standard asphalt binder is a PG64-22 or PG 67-22 normally used in the laboratory for mix design purposes.
 - o. Mix all specimens at the rate of 0.5 % by weight of asphalt binder.
 - p. Fabricate the nine (9) specimens according to T 283. Determine the bulk density of the specimens according to AASHTO T 166. AASHTO T 331 can be used as an alternative to AASHTO T 275 for specimens with water absorbed exceeding 2.0 percent of water by volume.
 - q. Two groups are subjected to accelerated conditioning in accordance with AASHTO T 283 modified for additional freeze thaw cycles. One group is conditioned for three (3) freeze thaw cycles prior to testing and the second group is conditioned for six (6) freeze thaw cycles prior to testing. The third group is used for “control” specimens.
 - r. The group subjected to six (6) freeze thaw cycles must meet the minimum strength and percentage of retained strength specified in Section 828 of GDOT’s Specifications.
2. Evaluating Hydrated Lime for Inclusion on QPL 41
 - a. When evaluating hydrated lime for inclusion on QPL 41 using AASHTO T 283, thoroughly “dry mix” the applicable dosage rate of lime (1.0 percent) into the hot aggregate immediately before adding and mixing the asphalt binder into the mixture.
 - b. Perform the same testing cycles listed above in B, 1, AASHTO T 283 Evaluation with listed Modifications using hydrated lime in lieu of LASA. (Perform only steps n, p, q, r)

III. Report

- A.** Stripping Test (Boil Test) for Asphaltic Concrete Mixture Using Any Anti-Stripping Additive (Asphalt Plant and/or Laboratory Testing for Inclusion on QPL 26 or QPL 41)
 - 1. Visual Inspection for Stripping
 - a. Report the visual inspection of the stripping test result to the nearest 5 percent for the 96-hour test or field test, whichever applies.
- B.** Evaluation of QPL 26 “Heat Stable Anti-Stripping Additives” and QPL 41 “Hydrated Lime” products.
 - 1. AASHTO T 315 Performed at the Specified Temperature for Performance Grade
 - a. Submit Original DSR Report
 - 2. AASHTO T 283 Resistance of Compacted Bituminous Mixture to Moisture Induced Damage
 - a. Submit report for all tests data and results for individual specimen tensile strengths and tensile strength ratio (TSR)