Standard Method of Test for

Recovery of Asphalt Binder from Hot Mix Asphalt by Means of the Rotavapor Apparatus

SCDOT Designation: SC-T-95

1. SCOPE

1.1 This method covers the recovery of asphalt binder from Hot Mix Asphalt (HMA) samples used to determine the absolute viscosity of the asphalt binder.

Safety Notice: This procedure involves temperatures in the range of (100-163°C), as well as the handling of asphalt binder and solvents. The procedure will require the technician to wear appropriate safety protection during portions of the testing. Some steps in the procedure, which are known to involve high temperatures, are in bold print to make the technician aware of the need for proper safety equipment. The absence of a warning does not necessarily mean that all material and equipment are safe to handle. The technician should use caution during each step of the procedure.

2. REFERENCED DOCUMENTS

2.1 AASHTO Standards
T 170
T 202

2.2 SC Test Methods
T 64
T 72
T 75

3. SUMMARY OF TEST METHOD

3.1 The asphalt binder is recovered from HMA samples in accordance to this procedure. Asphalt binder is extracted and is separated by means of a distillation process using the Rotavapor apparatus. The asphalt binder recovered is tested to determine the absolute viscosity.

4. SIGNIFICANCE AND USE

4.1 The purpose of this procedure is to recover the asphalt binder from HMA by means of the Rotavapor apparatus.

5. APPARTUS

5.1 A Rotavapor apparatus, complete with vacuum system capable of reducing the ambient pressure to below 30mm of Hg. Digital manometer and vacuum controller that maintains consistent vacuum and an oil bath capable of maintaining temperatures of up to 180 degrees C. The rotavapor apparatus must be capable of rotating the flask with speeds up to 100 rev / min. A complete apparatus must include all necessary glass parts such as one or more recovery flasks, one or more rotational flasks, and a main distillation assembly. The apparatus must have a 2000 ml flask to store recovered solution from the extraction, complete with an in-line valve to assist in the slow transfer of solution to the rotavapor apparatus.

5.2 One 2000 ml glass flask to store extracted solution for test.

5.3 One 100 ml glass beaker to collect recovered asphalt binder.

5.4 One pair of high-temperature resistant gloves.

5.5 One or more cloth rags for cleaning oil residue.

5.6 Wash bottle full of trichloroethylene solvent for cleaning flasks, etc.

6. TEST SPECIMEN

6.1 Obtain the sample through normal sampling procedures and reduce it to testing size of no greater than 1500 gms. Ensure that test method SC-T-64 is strictly followed until step 5D; then transfer the sample to the 2000 ml flask attached to the Rotavapor apparatus.

Test Specimen	Suggested mass of sample, gms
HMA Sample, RAP Sample, or Roadway Core Sample	1200 - 1500

7. PROCEDURE

7.1 Pre-heat Rotavapor oil bath to 100º C

7.2 Insert Distillation flask and rotational flask onto Rotavapor apparatus. Lower the rotovapor instrument so approximately half of the rotational flask is in the oil bath. Begin rotation of the rotational flask at a rate of 30-40 rev/min.

7.3 Begin cold-water (<25º C) flow through the rotavapor instrument at a rapid flow rate.

7.4 Set vacuum on vacuum controller to 400 mm of Hg. Begin vacuum process and allow the vacuum to reach set point.

7.5 Gradually adjust the transfer value and begin allowing solution to transfer from the 2000 ml flask to the rotational flask at a rate of 20-40 ml/min. Transfer the solution very slowly to ensure that no foaming or back pressure builds in the distillation flask. Transfer the solution so that no more than half of the distillation flask is full at any time. Continue to distillate until no more solution is left in the 2000 ml flask. After all solution is removed from the flask, close in-line valve and continue to distill until approximately 150 -200 ml of solution remain in the distillation flask.

7.6 Stop the rotation on the Rotavapor instrument, allowing the rotational flask to drip oil back into the bath.

7.7 Remove rotational flask from Rotavapor and wipe any excess oil from outside of flask. Increase oil bath temperature to 163º C.

7.8 Pour contents out of rotational flask into 250ml centrifuge bottle; wash out any residue left in rotational flask with a trichloroethylene wash bottle and fill centrifuge bottle to top of neck of bottle.

7.9 Place bottle in centrifuge and counter-balance the centrifuge with another bottle of trichloroethylene to level the load. Centrifuge samples at 3500 rpm for 30 minutes.

7.10 Transfer solution from centrifuge bottle to a clean rotational flask. Clean the centrifuge bottle with a trichloroethylene wash bottle to get the residue out, being careful to not disturb the separated fines in the bottom of the centrifuge bottle.

7.11 Place rotational flask onto rotavapor apparatus and lower into the preheated oil bath to the same level as before. Begin rotation at 60-80 rev/min. Be sure to check and see that the water flow is still maintained through the rotavapor coils, and set vacuum to 400 mm of Hg.

7.12 Begin vacuum and continue to do distillation until 1-2 drops per minute are witnessed in the recovery flask. The vacuum must be increased to 200 mm of Hg (1-2 drops), and then to increased to 75 mm of hg and distill for 15 minutes.

7.13 Discontinue distillation process by increasing pressure (decreasing vacuum) to ambient pressure, cutting water supply off, and stop rotation. Lift the rotavapor apparatus, and allow the rotational flask to drip oil back into the bath briefly. Wipe all oil residues from the flask, and immediately

pour recovered binder sample into a 100 ml beaker. Transfer the beaker to a 135º C oven for 10 minutes.

7.14 Take the recovered binder sample out of the warming oven and stir the sample to a homogenous state. Immediately pour the samples into the appropriate absolute viscosity tubes as per AASHTO T 202.

8. CALCULATION

8.1 None

9. REPORT

9.1 None