Developing a Method for Testing Tackiness of Bituminous Tack Coats

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Background

In the construction of roads, asphalt is paved in individual layers. To ensure that these layers behave as a single, cohesive unit, a bituminous tack coat is applied between layers. It is critical that this tack coat is adhesive when the hot mix asphalt is applied and non-adhesive otherwise. As of present, there is no standard method for testing the tackiness of bituminous tack coats. As such, it was determined that a standard method should be developed. The proposed method employs the use of a dynamic shear rheometer (DSR), a common fixture in asphalt binder laboratories. In this way, the method may be easily adopted by other asphalt laboratories.

Experimental

Base 1 ~9 Pen
- Level 1: 0% Additive
- Level 2: 2% Additive
- Level 3: 5% Additive

Base 2 ~16 Pen
- Level 1: 0% Additive
- Level 2: 2% Additive
- Level 3: 5% Additive

Two hard, unmodified asphalt bases were selected to test the method. Each base was split into three "levels" describing the amount by weight of additive in the base.

ASTM Standards Referenced in the Proposed Method

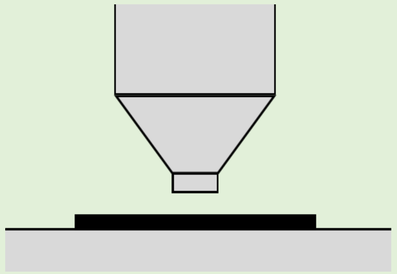
ASTM C 670
- Practice for Preparing Precision and Bias Statements for Test Methods for Construction Materials

ASTM D 8
- Terminology Relating to Materials for Roads and Pavements

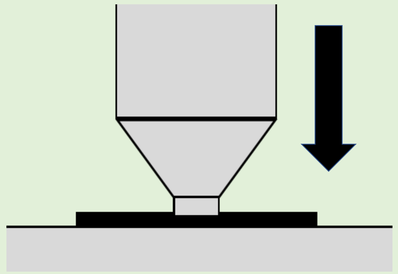
ASTM D 2872
- Test Method for Effect of Heating and Air on a Moving Film of Asphalt (RTFO Test)

ASTM D 7175
- Test Method for Determining the Rheological Properties of Asphalt Binder Using a Dynamic Shear Rheometer

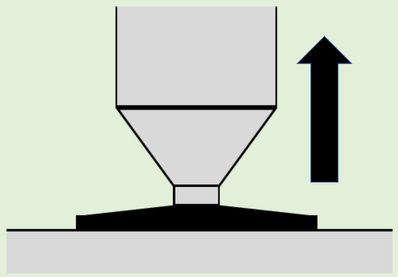
Method



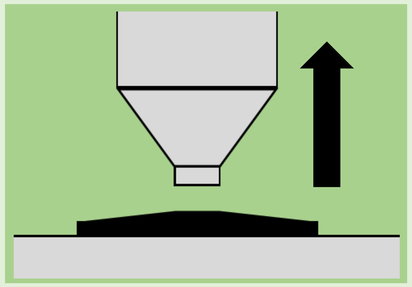
1. A sample of thickness 1.00 ± 0.25 mm is loaded onto the 25 mm lower plate and allowed to reach equilibrium test temperature (15°C).



2. The 8 mm upper geometry lowers at 15 µm/s until a 10.5 ± 0.5 N normal force is achieved. The force is maintained for 10 seconds.

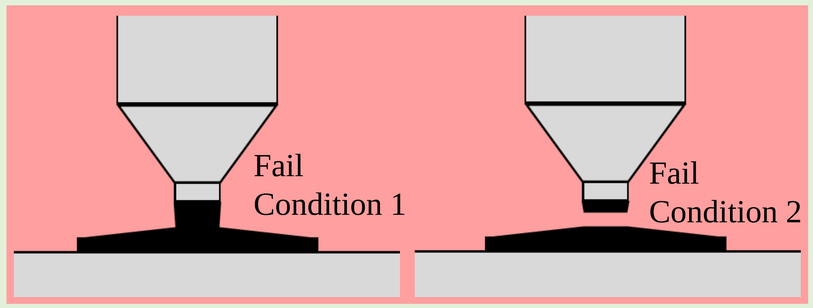


3. The upper geometry moves vertically upwards at a constant 15 µm/s.



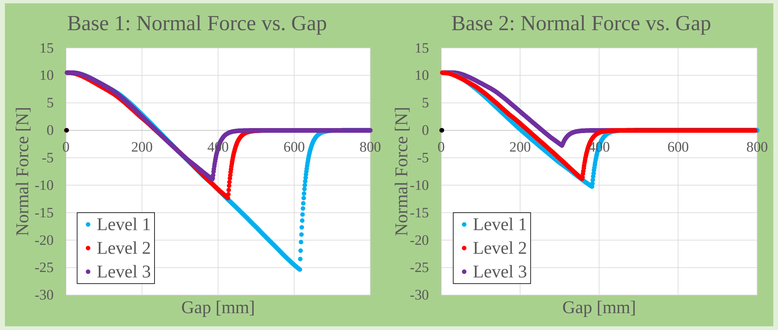
4. After a short period, contact between the upper geometry and the sample should break.

Failed Testing Conditions

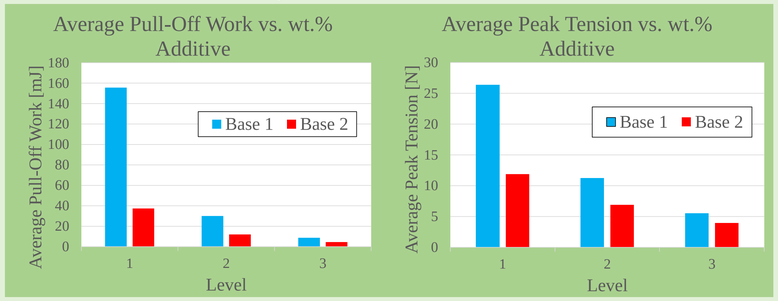


- **Fail Condition 1:** If the sample does not break, an accurate assessment of total pull-off work can not be made. This behavior may be rectified by running the test at a lower temperature or increasing the pull-off distance.
- **Fail Condition 2:** If an appreciable amount of sample is still adhered to upper geometry after the initial break, the instrument will interpret this added weight as a continued tensile load.
- **Fail Condition 3:** If the sample is of such tackiness that the peak tension is greater than the working parameters of the DSR, then either the sample will not break or the pull-off rate will be non-constant.

Results



Tackiness is qualified by the pull-off work and the peak tension during testing; it is seen to decrease as additive is introduced into the base. Additionally, the harder base is found to be less tacky than the softer base.



Conclusions & Future Work

- The proposed method was successful in ranking tack coats by average tackiness, determined by a combination of peak tensile strength and pull-off work.
- A precision and bias statement should be fully developed such that the method may be used for the acceptance or rejection of product purchasing.
- Temperatures closer to that of true paving conditions should be further investigated.

Acknowledgments

We would like to recognize Codrin Daranga and Robert D. Johnson for their helpful contributions and discussion in the development of this project.