Distillation of Cut-Back Asphaltic Products

Lab Experiment #2

Submitted to:

Matthew Church

CE 361: Highways Materials Laboratory

Prepared by:

Christopher M. Smemoe
Thursday, 8:00 AM

Brigham Young University
Provo, UT 84602

May 5, 1994

Table of Contents

II. Results

Table 2.1 describes the results of the distillation test for samples A and B:

Sample A
Sample B

1st Drop Temp (F):
315
320

Distilled at 437F (mL):
0.5
2

Distilled at 500F (mL):
14
14

Distilled at 600F (mL):
32.5
34

Distilled at 680F (mL):
41.5
44

Specific gravity:
0.917
0.945

Total Weight (g):
183.40
188.90

Total Volume (mL):

200
200

Volume of residue after Distillation (mL):
158.50
156.00

% of Residue Remaining:

% Residue at 437F (%)
99.75
99.00

% Residue at 500F (%)
93.00
93.00

% Residue at 600F (%)
83.75
83.00

% Residue at 680F (%)
79.25
78.00

Distilled at 437F (%):
1.20
4.55

Distilled at 500F (%):
33.73
31.82

Distilled at 600F (%):
78.31

77.27

Distilled at 680F (%):
100.00
100.00

III. Discussion

Procedure

After the specific gravity of materials A and B were determined in the first experiment, the mass which would create 200 mL of asphaltic material was calculated from the respective specific gravities. The distillation test was then conducted on each specimen. As each specimen was heated, the temperature at which the first drop of distillate fell was measured. Next, the volume of distillate was observed and recorded when the asphalt specimens reached 437, 500, 600, and 680 degrees F. From these measurements, the percent

Answers to "Observations and Discussion"

1. Derivation of the formulas used in this test:

2. Why is freshly boiled, distilled water used? Freshly boiled, distilled water was necessary for this test because of large concentrations of ions and impurities which exist in tap water. These ions create a higher density than the exact density of pure, distilled water, which is exactly 1 g/cm^3 (62.428 lb/ft^3).

What would the percent error in the results be if tap water had been used, assuming the unit weight of tap water to be 62.52 lbs. per cubic feet?

3. How the result of this test used? The specific gravities of asphaltic materials (as well as any other materials) are used to determine relationships between the volume and mass of that asphaltic material. These relationships can be used to determine the amount of voids in compacted mixes and to correct volumes measured at high temperatures.

Uses of the test

The uses of the Specific Gravity Test are outlined in the answer to question 3 above.

Advantages/Disadvantages

The primary advantage of the specific gravity test is that it is a fast and highly accurate method of measuring the specific gravity of fluids when an accurate scale is used. But the leading disadvantage of the specific gravity test is that the testing of solid asphaltic materials is difficult and the testing of permanently solid materials is impossible.

Possible Errors

A major source of error in this specific gravity test was that it was difficult to calibrate the scale exactly to zero. This may have resulted in an error of .06 g. in some of the masses, causing a small difference in some of the densities. No other major sources of error were observed in the specific gravity experiment.

Limitations of this Lab

Among the limitations of this lab, as mentioned under the section above entitled "advantages/disadvantages", is that is difficult to test the specific gravity of solid asphaltic materials using the pycnometer. By melting the solid asphaltic material and allowing it to cool in the pycnometer, however, the specific gravity can be determined. In addition, an accurate weight scale is also required to obtain exact values of specific gravity using the pycnometer method on any fluid material.

IV. Conclusions

Properties of the paving material

From this study, it was determined that the two fluid asphaltic materials had similar specific gravities. Material A was found to have a specific gravity of .917 at 77/77F and material B was found to have a specific gravity of .945 at 77/77F.

Engineering Significance of this lab

The specific gravity of materials are important for a wide range of uses. In particular, the specific gravity of bituminous materials are particularly important in determining mass-volume relationships such as when determining an optimum mixture for an asphaltic concrete. In this experiment, the specific gravities of materials A and B had importance in determining the weight of the specimen to use for the next experiment, the distillation test.

V. Appendix

Calculations and Data: