Appendix G

Determination of Specific Gravity of Bituminous Concrete Mix for Field Density Control

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This method of test is intended for a field method of determining the specific gravity of bituminous concrete mix within the accuracy necessary for field density control of pavement courses.

APPARATUS

The apparatus shall consist of the following:

A Torsion Balance of 2 kilogram capacity sensitive to 0.10 gram and a suitable set of weights.

A Volumeter having a sample chamber of 1350 cc capacity and a secondary chamber of 675 cc capacity. (See Fig. A).

Aluminum Inserts 4 inches in diameter; 5 each at 200 cc volume; 1 at 100 cc volume and 1 at 50 cc volume.

A Hand Pump suitable for pressurizing sample chamber of volumeter.

A Mercury Pressure Gauge (open manometer type) calibrated from 0 to 40 inches.

Ointment Cans 4 inches in diameter 3 inches deep perforated every ½ inch with ⅛-inch holes on bottom, side and top.

PROCEDURE

For each specific gravity determination fill 3 perforated ointment cans with loose mix from a truck or the paver hopper. Place lids on the cans and allow to cool to atmospheric temperature.

After cooling, the cans filled with loose mix are weighed to the nearest 1/10 gram. The weight of the cans, having been previously determined, is subtracted from the weight of the can and mix to give the weight of the mix.

A can filled with mix is then placed in the sample chamber of the volumeter with inserts to fill the chamber. The sample chamber is then closed and pressurized to approximately 41 inches on the mercury pressure gauge. At the end of one minute the pressure in the sample chamber is bled off until the mercury pressure gauge reads exactly 40 inches. The valve to the secondary chamber on the volumeter is then partially opened and the pressure between the sample chamber and the second-

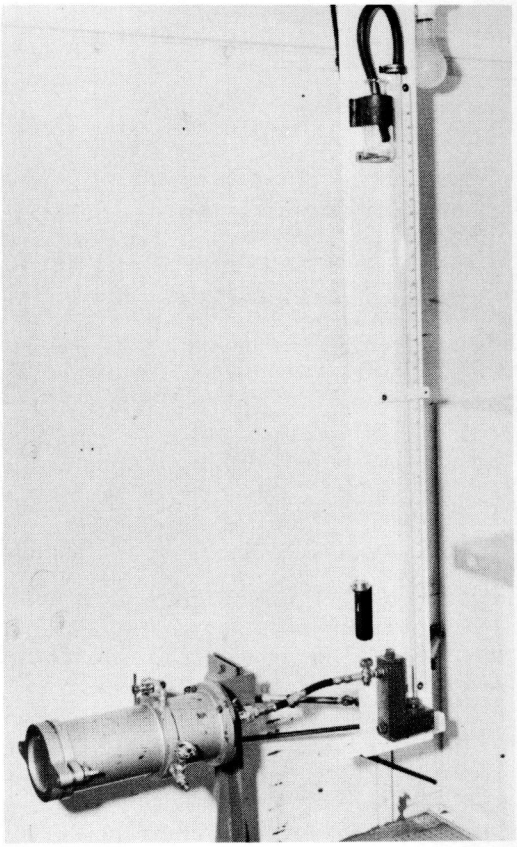

Figure 13. Volumeter for determination of specific gravity of bituminous concrete mixtures (courtesy Ohio Dept. of Highways.)

*The volumeter is calibrated with the use of 4 inch diameter inserts of known volume in sufficiently small increments of volume that a smooth curve results. From the calibration curve a table is prepared for volumes corresponding to gauge readings. In use, a greater degree of accuracy is obtained, if the sample chamber is filled with inserts after sample has been placed in the chamber.

ary chamber allowed to equalize and then the valve is entirely opened.

After one minute the pressure gauge is read and the volume of can and mix is read from the table prepared from a calibration curve *. The volume of the can, which has been previously determined, is subtracted from the volume of the can and mix giving the volume of the mix.

The weight of the mix in grams is divided by the volume of the mix in cc giving the specific gravity of the mix. The average of the 3 specific gravities so determined is the value used.

Appendix H

Skid Resistance of Bituminous Pavements

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The degree of slipperiness of a road surface is a matter of grave concern to everyone as it so often is the cause of collision, upset, and other accidents resulting in death and property damage. To decrease this cause of destruction to the absolute minimum should be the aim of all those engaged in the design, construction, and maintenance of our highways.

One characteristic common to all high types of pavement, either bituminous or cement concrete, lies in some coefficient of friction between the surface and the tires of a moving vehicle. The magnitude of this coefficient is demonstrated in the tendency of a vehicle to slide or skid on deceleration or stopping suddenly, during which period the wheels are locked and unable to turn.

As side slippage and spin are caused by factors other than the condition or character of the surface material, they will not be referred to further.

The degree of slipperiness of a road surface can be most easily and simply determined by the distance it takes a car to stop after suddenly applying the brakes to a point where the wheels cannot turn, or are locked.

By using an indicator to mark the pavement at the point at which the brakes are applied, the distance of the forward movement of the car in a straight line skid can be measured quite accurately. By this simple means, the relative slipperiness of the different types of surface may be determined.

Moyer (A) initially, and by means of rather complicated apparatus, made an exhaustive study of the coefficient of friction between rubber tires and various types of road surfaces.

Shelburne and Sheppe (B), using a standard light car equipped with a chalk gun, connected with the break pedal, determined the relative skid resistance of thirty-two pavement surfaces, involving more than a thousand measurements. Nineteen of these surfaces were Virginia standard bituminous plant mixes consisting of eleven with fine graded and eight with coarse graded aggregates. The distance the car skidded forward was determined, at speeds of ten, twenty, thirty, and forty miles per hour by measuring the distance from the chalk mark on the pavement to the projected location of the gun attached to the running board of the car.

In this work the driver reaction time was not considered, but it is an important factor in the overall stopping distance. For example, at forty miles an hour a vehicle travels 59 feet per second, which when added to the AASHO maximum safe stopping distance of 113 feet at this speed means a total distance of 172 feet will possibly be covered from the point at which the impulse to stop originated and the vehicle's final stopping point.

The overall results of these skidding tests verified Moyer's (A) conclusions and those of other investigators (C).

TEXTURE

Surface texture is controlled by the grading and maximum size of particles of aggregate in the bituminous mixtures. The shape of the larger particles may also be a contributing factor.