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**DEPARTMENT OF COMMERCE.**

**BUREAU OF STANDARDS.**

**George K. Burgess, Director.**

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[APRIL 8, 1924.]

**UNITED STATES GOVERNMENT MASTER SPECIFICATION FOR ASPHALT PRIMER FOR ROOFING AND WATERPROOFING.**

**FEDERAL SPECIFICATIONS BOARD.**

**SPECIFICATION No. 87.**

This specification was officially adopted by the Federal Specifications Board on December 29, 1923, for the use of the Departments and Independent Establishments of the Government in the purchase of asphalt primer for roofing and waterproofing.

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**1. GENERAL.**

This specification applies to asphalt primer intended for use, when specified, as a priming coat for concrete, gypsum, and other masonry surfaces over which asphalt built-up roofing, waterproofing, or damp proofing are to be applied. It shall consist of an asphaltic base thinned to suitable brushing consistency with a volatile solvent, and when tested by the methods contained in this specification shall meet the following requirements:

(a) The asphaltic base shall be not less than 35 per cent by weight.

(b) The asphaltic base separated as under 3 (b) shall have the following characteristics:

(1) Melting point, 131 to 170° F.

(2) Penetration, 15 to 50.

(c) The solvent used shall be a hydrocarbon distillate having an end point on distillation not exceeding 500° F., of which not more than 20 per cent shall distill under 248° F. The solvent shall be completely removed by the method given under 3 (b).

If required, deliveries will, in general, be sampled and tested by the following methods, but the purchaser reserves the right to use any additional information to ascertain whether the material meets the specification.

## 2. SAMPLING.

From each shipment or portion thereof, the inspector shall select at random a number of packages equivalent to the cube root of the total number of packages in the lot. If the cube root as calculated proves to be a fractional number, it shall be expressed as the next higher whole number.

By means of a paddle, the contents of each package selected shall be thoroughly stirred so as to get a homogeneous mixture. One pint of the primer shall then be immediately drawn from each package and transferred to a clean receptacle of suitable size, which, in turn, shall be kept tightly covered except when samples are being introduced. After all the pint samples have been added, the contents of the container shall be thoroughly stirred, and two 1-quart samples of the composite sample shall be transferred to a clean, dry container which shall immediately be stoppered with a new clean cork or well-fitting cover or cap, sealed, and distinctly labeled. One sample shall be transmitted to the testing laboratory, the other shall be retained for check analysis in case of dispute.

## 3. LABORATORY EXAMINATION.

(a) WEIGHT OF ASPHALTIC BASE.—A portion of the sample shall be placed in a stoppered bottle or weighing pipette and weighed. About 1.5 g of the sample shall be transferred to a flat-bottomed metal dish about 8 cm in diameter (a friction top can plug). The container shall be weighed again and the exact weight of the portion of the sample transferred to the weighed dish shall be computed by difference. The dish with its contents shall be heated in an oven maintained at 105 to 110° C. (221 to 230° F.) for three hours, cooled, and weighed. From the weight

of the residue left in the dish and the weight of the sample taken, the percentage of nonvolatile residue (asphaltic base) shall be computed.

(b) SEPARATION OF ASPHALTIC BASE FOR EXAMINATION.—One hundred g of the primer shall be distilled with steam at a temperature of 130 to 140° C. (266 to 284° F.) and the distillate collected in a separatory funnel. The distillation shall be stopped when 400 cc of water has distilled over. The residue from the distillation shall be dried at 105 to 110° C. (221 to 230° F.) for five hours, and then gradually heated until all the moisture is expelled, but the temperature must not exceed 150° C. (300° F.).

(c) EXAMINATION OF ASPHALTIC BASE.—The asphaltic base separated in 3 (b) shall be tested for melting point and penetration as follows:

(1) *Melting point.*—The melting point shall be determined by the "Standard method of test for the softening point of bituminous materials other than tar products" (ring and ball method), D 36-21, A. S. T. M. Standards, 1921, page 739, which is essentially as follows:

*Apparatus.*—(1) A brass ring five-eighths inch (15.9 mm) in inside diameter and one-fourth inch (6.4 mm) deep; thickness of wall three thirty-seconds inch (2.4 mm). A variation of 0.01 inch (0.25 mm) on inside diameter and thickness of ring will be permissible. This ring shall be attached in a convenient manner to a No. 15 B & S gauge brass wire (diameter 0.0703 inch = 1.79 mm). (See fig. 1.)

(2) A steel ball three-eighths inch (9.5 mm) in diameter weighing between 3.45 and 3.55 g.

(3) A glass beaker not less than 3 $\frac{1}{3}$  inches (8.5 cm) in diameter and measuring 4 $\frac{1}{8}$  inches (10.5 cm) in depth from the bottom of the flare. (A 600 cc beaker, low form, meets this requirement.)

(4) A thermometer which shall conform to the following specifications:

Total length, 370-400 mm (14.57-15.75 inches).

Diameter, 6.5-7.5 mm (0.256-0.295 inch).

Bulb length, not over 14 mm (0.55 inch).

Bulb diameter, 4.5-5.5 mm (0.177-0.217 inch).

The scale shall be engraved upon the stem of the thermometer, shall be clear cut and distinct, and shall run from 0 to 80° C. (32 to 176° F.) in  $\frac{1}{5}$ ° C. divisions. It shall commence not less than 7.5 cm (2.95 inches) above the bottom of the bulb. The thermometer shall be furnished with an expansion chamber at



the top and have a ring for attaching tags. It shall be made of a suitable quality of glass and be so annealed as not to change its readings under conditions of use. It shall be correct to  $0.25^{\circ}\text{C}$ . ( $0.45^{\circ}\text{F}$ .) as determined by comparison at full immersion with a similar thermometer calibrated at full immersion by the U. S. Bureau of Standards.

*Preparation of sample.*—The asphalt shall be melted and stirred thoroughly, avoiding incorporating air bubbles in the mass, and then poured into the ring so as to leave an excess on cooling. The ring, while being filled, should rest on a brass plate which has been

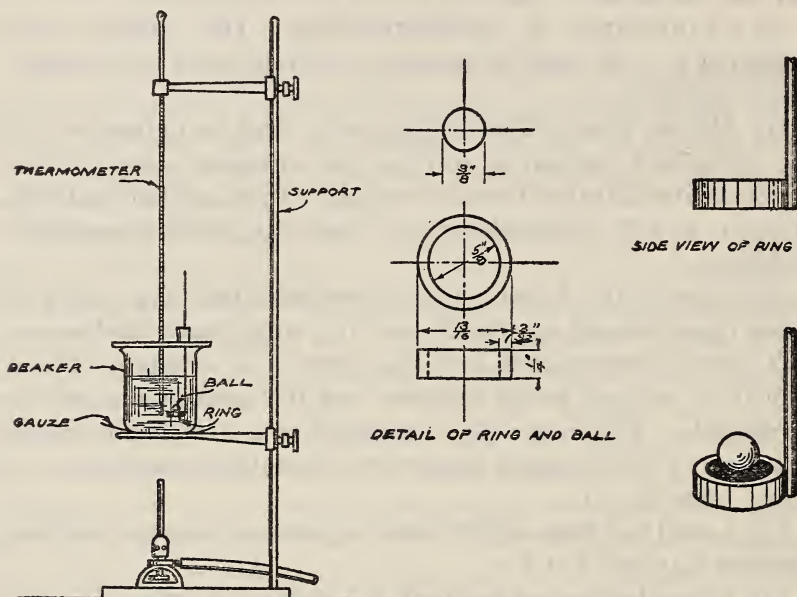


FIG. 1.—Melting-point apparatus.

amalgamated to prevent the asphalt from adhering to it. After cooling, the excess asphalt shall be cut off cleanly with a slightly heated knife.

*Procedure.*—Assemble the apparatus as shown in Figure 1. Fill the beaker to a depth of approximately  $3\frac{1}{4}$  inches (8.25 cm) with freshly boiled distilled water at  $5^{\circ}\text{C}$ . ( $41^{\circ}\text{F}$ .). Place the ball in the center of the upper surface of the asphalt in the ring and suspend it in the water so that the lower surface of the filled ring is exactly 1 inch (2.54 cm) above the bottom of the beaker and its upper surface is 2 inches (5.1 cm) below the surface of the water. Allow it to remain in the water for 15 minutes before

applying heat. Suspend the thermometer so that the bottom of the bulb is level with the bottom of the ring and within one-fourth inch (0.64 cm), but not touching the ring.

Apply the heat in such a manner that the temperature of the water is raised  $5^{\circ}\text{C}$ . ( $9^{\circ}\text{F}$ .) each minute until the asphalt melts and touches the bottom of the beaker.

The temperature recorded by the thermometer at the instant the asphalt touches the bottom of the beaker shall be taken as the melting point.

The rate of rise of temperature shall be uniform and shall not be averaged over the period of the test. The maximum permissible variation for any minute period after the first three shall be  $\pm 0.5^{\circ}\text{C}$ . ( $0.9^{\circ}\text{F}$ .) All tests in which the rate of rise of temperature exceeds these limits shall be rejected.

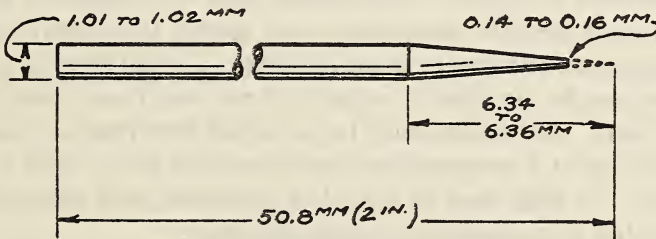


FIG. 2.—Penetration needle.

The use of freshly boiled distilled water is essential, as otherwise air bubbles may form on the specimen and affect the accuracy of the results. Rigid adherence to the prescribed rate of heating is absolutely essential in order to secure accuracy of results.

(2) *Penetration at  $77^{\circ}\text{F}$ .*—The penetration shall be determined by the "Standard method of test for penetration of bituminous materials," D 5-21, A. S. T. M. Standards, 1921, page 728, which is essentially as follows:

*Apparatus.*—(1) *Container.*—The container for holding the asphalt to be tested shall be a flat-bottomed cylindrical dish, 55 mm ( $2\frac{3}{16}$  inches) in diameter and 35 mm ( $1\frac{3}{8}$  inches) deep.<sup>1</sup>

(2) *Needle.*—The needle (fig. 2) shall be a cylindrical steel rod 50.8 mm (2 inches) long, having a diameter of 1.01 to 1.02 mm and a taper of 6.34 to 6.36 mm measured on the axis. After tapering, the point shall be blunted by grinding off to a truncated cone, the smaller base of which shall be from 0.14 to 0.16 mm in diameter.

<sup>1</sup> A Gill style ointment box, deep pattern, made by the American Can Co., and of 3-ounce capacity meets this requirement.

(3) *Water bath.*—The water bath shall be maintained at a temperature not varying more than  $0.1^{\circ}$  C. from  $25^{\circ}$  C. ( $77^{\circ}$  F.). The volume of the water shall be not less than 10 liters and the sample shall be immersed to a depth of not less than 10 cm (4 inches) and shall be supported on a perforated shelf not less than 5 cm (2 inches) from the bottom of the bath.

(4) *Penetration machine.*—Any apparatus which will allow the needle to penetrate without appreciable friction, and which is accurately calibrated to read in hundredths of a centimeter.

(5) *Transfer dish.*—The transfer dish for the container shall be a small dish or tray of such capacity as will insure complete immersion of the container during the test. It shall be provided with some means which will insure a firm bearing and prevent rocking of the container.

*Preparation of sample.*—The sample shall be completely melted at the lowest possible temperature and stirred thoroughly until it is homogeneous and free from air bubbles. It shall then be poured into the sample container to a depth of not less than 15 mm (five-eighths inch). The sample shall be protected from dust and allowed to cool in air at a temperature not lower than  $18^{\circ}$  C. ( $65^{\circ}$  F.) for one hour. It shall then be placed in the water bath along with a transfer dish and allowed to remain one hour.

*Procedure.*—In making the test, the sample shall be placed in the transfer dish filled with water from the water bath to a depth sufficient to completely cover the container. The transfer dish containing the sample shall then be placed upon the stand of the penetration machine. The needle, loaded with the specified weight (100 g) shall be adjusted to make contact with the surface of the sample and the dial adjusted to zero or its reading noted. The needle shall then be released for the specified period of time (five seconds) after which its penetration shall be measured.

At least three tests shall be made at points on the surface of the sample not less than 1 cm (three-eighths inch) from the side of the container and not less than 1 cm (three-eighths inch) apart. After each test the sample and transfer dish shall be returned to the water bath and the needle shall be carefully wiped toward its point with a clean, dry cloth to remove all adhering asphalt. The penetration reported shall be the average of at least three tests whose values shall not differ more than four points between maximum and minimum.

(d) EXAMINATION OF SOLVENT.—The solvent separated in 3 (b) shall be distilled according to the "Tentative method for test for distillation of gasoline, naphtha, kerosene, and similar petroleum products," D 86-21T, Proceedings of A. S. T. M., vol. 21, 1921, page 631. This method is also described in section 4 (f) of B. S. Circular 98, United States Government Specification for Volatile Mineral Spirits for Thinning Paints and Method 100.1 Distillation of Gasoline, Bureau of Mines Technical Paper 298, page 13.

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