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AMERICAN SOCIETY FOR TESTING AND MATERIALS
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Standard Test Method for Hydrogen Gas Generation of Aluminum Emulsified Asphalt Used as a Protective Coating for Roofing[1]

This standard is issued under the fixed designation D 6356; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method covers a hydrogen gas and stability test for aluminum emulsified asphalt coatings.

1.2 The values stated in inch-pound units are to be regarded as the standard. The SI units given in parentheses are for information only.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*

D 1079 Terminology Relating to Roofing, Waterproofing, and Bituminous Materials

D 2939 Test Methods for Emulsified Bitumens Used as Protective Coatings[2]

E 1 Specification for ASTM Thermometers[3]

3. Summary of Test Method

3.1 A 200 g sample of water based aluminized coating is heated to 125 ± 2°F (51.7 ± 1°C) in an Erlenmeyer flask and the volume in millilitres of hydrogen gas evolved is measured. The test is conducted for one week (168 h) with a reading taken every 24 h. The test room is to be maintained at 73.4 ± 3.6°F in order to standardize gas collection temperature in the burette recepticle.

4. Significance and Use

4.1 This procedure measures the amount of hydrogen gas generation potential of aluminized emulsion roof coating. There is the possibility of water reacting with aluminum pigment to generate hydrogen gas. This situation is to be avoided, so this test was designed to evaluate coating formulations and assess the propensity to gassing.

5. Apparatus and Materials

5.1 The assembly of the hydrogen gas generation test apparatus is illustrated in Fig. 1. Details of the component part are as follows:

5.1.1 *Wide Mouth Glass Erlenmeyer Flask*, 250-mL capacity.

5.1.2 *Beaker*, glass, 250-mL.

5.1.3 *Burette*, standard glass 100-mL graduated with glass stop cock and 0.2 mL divisions.

5.1.4 *Condenser*, glass jacketed, having the dimensions shown in Fig. 2.

5.1.5 *Glass Tubing*, standard glass ¼ in. (6.35 mm) inside diameter 5⁄16 in. (7.94 mm) outside diameter and 5 in. (127 mm) length for forming the J tube.

5.1.6 *Tubing*, pure latex amber rubber tubing, ¼ in. (6.35 mm).

5.1.7 *Neoprene Rubber Stopper*, No. 8 with one hole (preferred connection for glass condenser to 250-mL Erlenmeyer flask).

5.1.8 *Oil or Water Bath*—Constant temperature immersion circulating bath capable of temperature control.

5.1.9 *Oil*—Commercially available mineral oil or suitable heat transfer fluid.

5.1.10 *Thermometer*—ASTM thermometer having a range from 30 to 180°F (–2 to + 80°C) and conforming to the requirements for thermometer 15F or 15C as prescribed in Specification E 1.

6. Sampling

6.1 Sample the material in accordance with Test Methods D 2939.

7. Procedure

7.1 Weigh 200 g of the sample directly in the 250-mL Erlenmeyer flask assuring that none coats the neck where the stopper is placed.

7.2 Insert the filled flask into the oil or water bath (temperature controlled to 125 ± 2°F (51.7 ± 1°C) and connect the glass condenser - stopper into the neck of the flask. Flask should be supported internally via flask holder or externally with a suitable clamping device.

7.3 Fill the 250-mL beaker with water and insert the

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[2] *Annual Book of ASTM Standards*, Vol 04.04.

[3] *Annual Book of ASTM Standards*, Vol 14.01.

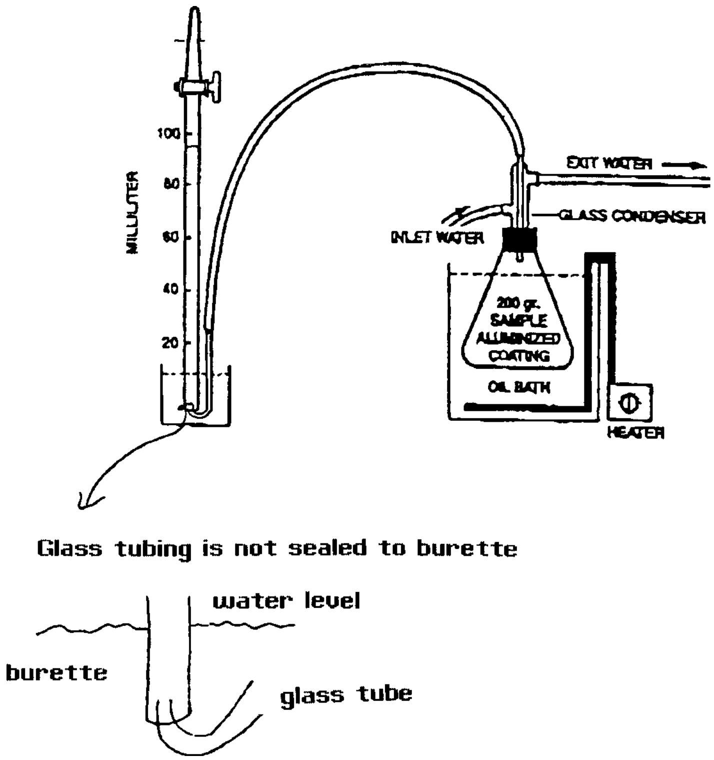

FIG. 1 Hydrogen Gas Generation Test Apparatus

100-mL burette and J-tube into the water. Avoid the introduction of water into the J-tube.

7.4 Draw the water level to the 100-mL mark on the burette and close the stopcock.

7.5 Record the time as the start of the induction period.

7.6 After a 1 h induction period, record the time and the water level point on the burette. The latter figure is the zero point. Do not include the one hour induction period level point in the calculation and report.

7.7 Unless otherwise specified, conduct the test at a room temperature of 73.4 ± 3.6°F (23.0 ± 2°C) for one week, (168 h), with a reading taken every 24 h at the corresponding time that the zero point was taken. It is recognized that test duration is seven days per week and readings may not be practical on weekends or holidays.

7.8 If the gas quantity approaches the confines of the burette, the test should be terminated.

8. Calculation and Report

8.1 *Hydrogen Gas Evolution*—Calculate the total millilitres of hydrogen gas evolved to the nearest 0.1-mL as follows:

$$H = V - Z \tag{1}$$

where:

H = hydrogen gas evolved in mL,
V = volume of water in burette at 168h, and
Z = zero point volume of water in burette.

8.2 Report the results as the hydrogen gas content to the nearest 0.1 mL.

9. Precision and Bias

9.1 See Table 1.

10. Keywords

10.1 emulsified asphalt; hydrogen gas; roofing; stability;

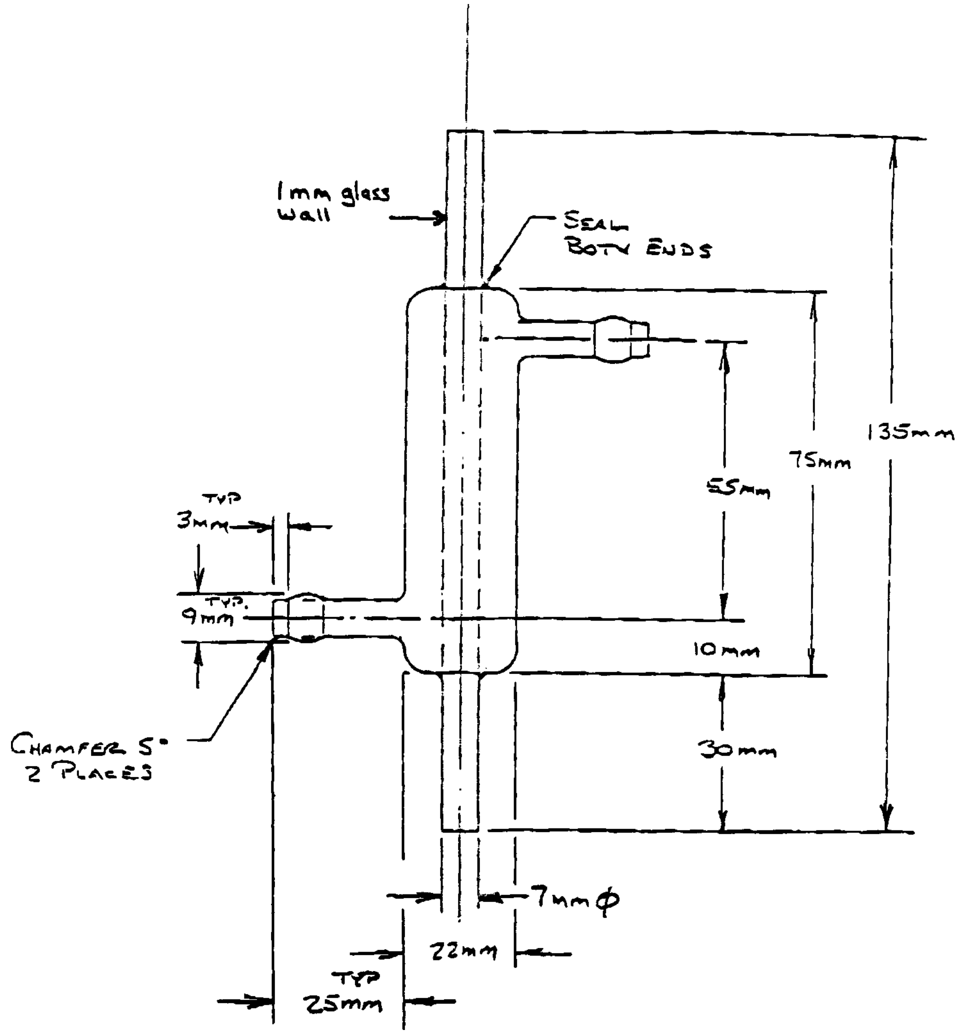

FIG. 2 Condenser

TABLE 1 Statistical Analysis for Gas Evolution of Emulsion Aluminum Coatings Round Robin Results

Material	*n*	Variance Component Estimate for Laboratory	Variance Component Estimate Between Laboratories	Repeatability $2.83\sqrt{Var_{Mat}}$	Reproducibility $2.83\sqrt{Var_{Mat} + Var_{Lab}}$
E interlaboratory	10	0.92	1.88	2.71	4.74
F interlaboratory	11	1.42	6.19	3.37	7.81
G interlaboratory	11	3.09	13.72	5.0	11.6
H interlaboratory	11	7.25	9.85	7.62	11.7
All materials All laboratories	11	20.00	5.92	12.6	14.4

water based aluminum