



Designation: D5325 – 03 (Reapproved 2021)

# Standard Test Method for Determination of Weight Percent Volatile Content of Water-Borne Aerosol Paints<sup>1</sup>

This standard is issued under the fixed designation D5325; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

## 1. Scope

1.1 This test method is for the determination of the weight percent volatile content of water-borne paints in aerosols.

1.2 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

## 2. Referenced Documents

2.1 *ASTM Standards:*<sup>2</sup>

D2369 Test Method for Volatile Content of Coatings

D3792 Test Method for Water Content of Coatings by Direct Injection Into a Gas Chromatograph

D4017 Test Method for Water in Paints and Paint Materials by Karl Fischer Method

E180 Practice for Determining the Precision of ASTM Methods for Analysis and Testing of Industrial and Specialty Chemicals (Withdrawn 2009)<sup>3</sup>

<sup>1</sup> This test method is under the jurisdiction of ASTM Committee D01 on Paint and Related Coatings, Materials, and Applications and is the direct responsibility of Subcommittee D01.21 on Chemical Analysis of Paints and Paint Materials.

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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

<sup>3</sup> The last approved version of this historical standard is referenced on [www.astm.org](http://www.astm.org).

2.2 *Other Standard:*

Method 36 Determination of Percent Volatile Organic Compounds (VOC) in Water Based Aerosol Paints<sup>4</sup>

## 3. Summary of Test Method

3.1 The propellant is released from the can and the content remaining is tested for percent water and nonvolatiles.

## 4. Significance and Use

4.1 Calculation of the weight percent volatile organic content of water-borne paints, requires that the water content be known. This test method provides a direct way to determine the weight percent volatile organic matter of water-borne aerosol paints minus the matter content. This test method is modeled after Method 36.<sup>4</sup>

## 5. Apparatus

5.1 *Freezer.*

5.2 *Ice Pick.*

5.3 *Hammer.*

5.4 *Applicator Sticks.*

5.5 *Masking Tape.*

5.6 *Tin Snips or Metal Cutter.*

5.7 *Shaker*, similar to Eberbach shaker in Fig. 1.

## 6. Procedure

6.1 *Preparation of Aerosol Contents for Analysis:*

6.1.1 Mix the aerosol paint container thoroughly for about 15 min, using a shaker similar to the Eberbach shaker shown in Fig. 1, at the low speed setting. It is essential that the samples be well mixed to obtain valid results.

6.1.2 Remove the cap and actuator from the can. Put the cap on the can and weigh the can to 0.01 g.

6.1.3 Place the can in an upside down position in a freezer for 2 h at a temperature that is 0°C.

6.1.4 Put the can upside down in a fume hood. Puncture the bottom of the can near the edge with a very sharp ice pick.

<sup>4</sup> Bay Area Air Quality Management District, (BAAQMD) *Manual of Procedures*, Vol III, 939 Ellis St., San Francisco, CA 94109.

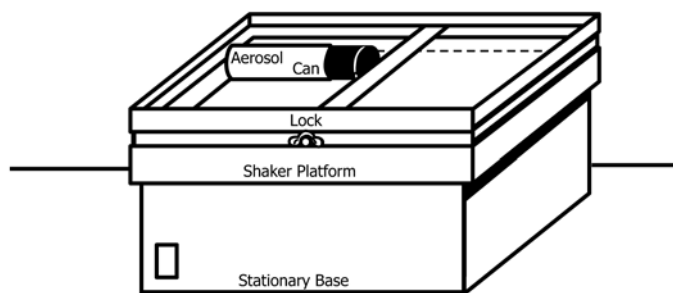


FIG. 1 Aerosol Can on Eberbach Shaker

Slowly remove the ice pick from the hole. Leave the hole uncovered for about 12 to 16 h to allow most of the propellant to escape.

6.1.5 Enlarge the hole slightly by tapping the ice pick further into the can. Swirl the can gently for 1 to 2 min to remove any remaining propellant.

6.1.6 Wipe off any condensate that may have accumulated on the can. Weigh the can to  $\pm 0.01$  g.

6.1.7 Plug the hole with a small applicator stick (about  $\frac{1}{2}$  cm long) and then place masking tape over the plugged hole.

6.1.8 Place the can on the shaker in a position so that the hole is at the highest possible position to prevent leakage of contents. Shake the can for about 15 min at the low speed setting.

6.1.9 Cut the bottom of the can using a metal cutter. Stir the contents with a spatula, then transfer the contents to a pint can with lid.

6.1.10 Rinse the aerosol can, agitators, and bottom several times using solvent. Allow the can, agitators, and the bottom to dry. Weigh to  $\pm 0.01$  g.

## 7. Calculations

7.1 Calculate the weight percent nonvolatile content (NV), of the paint in accordance with Test Method D2369.

7.2 Calculate the total weight percent nonvolatile content (TNV), in the aerosol can as follows:

$$TNV, \% = \frac{(NV)(W_3)}{W_4} \times 100 \quad (1)$$

where:

$$W_4 = W_1 - W_3,$$

$$W_5 = W_2 - W_3,$$

$W_1$  = total weight of aerosol container plus contents, g,

$W_2$  = total weight of aerosol container minus propellant, g,

$W_3$  = empty weight of aerosol container, g,

$W_4$  = contents including propellant, g, and

$W_5$  = contents minus propellant, g.

7.3 The total volatile percent (TV) in the aerosol container may be calculated by difference as follows:

$$TV, \% = 100 - TNV \quad (2)$$

7.4 Determine the water content of the coating in accordance with Test Method D3792 or Test Method D4017.

7.5 The weight percent volatile content (VC), equals total volatile percent TV, minus percent of water.

7.6 The percent of grams of volatile content/grams of solids equals  $\frac{VC}{TNV}$ .

## 8. Precision and Bias

8.1 *Precision*—Estimates are based on an interlaboratory study in which 1 operator in each of 5 laboratories analyzed in duplicate on 2 different days 1 sample of a water-borne aerosol containing 69 to 72 % organic volatiles. The coatings were commercially supplied. The results were analyzed in accordance with Practice E180. The within laboratory coefficient of variation was found to be 1.67 % relative at 9 df and the between laboratory coefficient of variation was 2.14 % relative at 7 df. Based on these coefficients, the following criteria should be used for judging the acceptability of results at the 95 % confidence level.

8.1.1 *Repeatability*—Two results, each the mean of duplicate determinations, obtained by the same operator on different days should be considered suspect if they differ by more than 5.36 % relative.

8.1.2 *Reproducibility*—Two results each the mean of duplicate determinations obtained by operators in different laboratories, should be considered suspect if they differ by more than 7.16 %.

8.2 *Bias*—Bias cannot be determined because there are no accepted standards for weight percent volatile content of water-borne aerosol paints.

## 9. Keywords

9.1 aerosols; volatile content; water-borne paints

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