



Designation: D5582 – 22

Standard Test Method for Determining Formaldehyde Levels from Wood Products Using a Desiccator¹

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1. Scope

1.1 This test method covers a small scale procedure for measuring formaldehyde emission potential from wood products under defined test conditions. The formaldehyde level is determined by collecting air-borne formaldehyde in a small distilled water reservoir within a closed desiccator. The quantity of formaldehyde is determined by a modification of the National Institute for Occupational Safety and Health (NIOSH) 3500 chromotropic acid test procedure. Other analytical procedures may be used to determine formaldehyde emission potential provided that such methods give similar results to the chromotropic acid procedure. However, the test results and test report must be properly qualified and the analytical procedure employed must be noted. Procedures based on acetylacetone and pararosaniline have been found to give similar results to chromotropic acid in other test methods used in determining formaldehyde emission potential from wood products (see Test Method E1333).

1.2 Wood products typically evaluated by this test method are made with urea-formaldehyde adhesives and include particle-board, hardwood plywood, and medium-density fiberboard. This test method is used for product quality control and is a small bench test method that correlates with the large-scale acceptance test for determining formaldehyde levels from wood products, Test Method E1333. Alternative conditioning intervals may give better correlation, such as seven day conditioning that parallels Test Method E1333. The general desiccator testing procedure may be modified for different conditioning times to accommodate its use in manufacturing quality control. However, the test results must be properly qualified and the conditioning time employed must be noted.

NOTE 1—If modifications are made to the conditioning period for quality control purposes, it is important that the modification is consistently applied. Otherwise, the results may not be comparable.

1.3 The values stated in SI units are to be regarded as standard. The values given in parentheses after SI units are provided for information only and are not considered standard.

¹ This test method is under the jurisdiction of ASTM Committee D07 on Wood and is the direct responsibility of Subcommittee D07.03 on Panel Products.

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1.4 *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.* For specific hazard statements, see Section 6 and 8.2.5.

1.5 *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:²

E77 Test Method for Inspection and Verification of Thermometers

E337 Test Method for Measuring Humidity with a Psychrometer (the Measurement of Wet- and Dry-Bulb Temperatures)

E1333 Test Method for Determining Formaldehyde Concentrations in Air and Emission Rates from Wood Products Using a Large Chamber

2.2 HUD Document:

24 CFR 3280, Manufactured Home Construction and Safety Standards, Federal Register, Vol 49, No. 155³

2.3 NIOSH Document:

Formaldehyde Method 3500, U.S. Department of Health, and Human Services³

2.4 Other Documents:

Minnesota Statutes Section 144.495, 325F.18, and 325F.181, Formaldehyde Gases in Building Materials⁴

California Air Resources Board (CARB), California Code of Regulations Sections 93120-93120.12, Title 17 Airborne

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ Available from Standardization Documents Order Desk, DODSSP, Bldg. 4, Section D, 700 Robbins Ave., Philadelphia, PA 19111-5098, <http://www.dodssp.daps.mil>.

⁴ Available from Print Communications, Dept. of Administration, 117 University Ave., St. Paul, MN 55155.

Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products⁵
EPA TSCA Title VI 40 CFR Section 770, Formaldehyde Standards for Composite Wood Products⁶

3. Significance and Use

3.1 Limitations have been established on formaldehyde emission levels for wood panel building products made with urea-formaldehyde adhesives and permanently installed in homes or used as components in kitchen cabinets and for similar industrial products. This test method is used in conjunction with the test method referenced by HUD Rules and Regulations 24 CFR 3280 for manufactured housing, California Air Resources Board (CARB) regulation 93120, EPA TSCA Title VI 40 CFR Section 770, and by Minnesota Statutes Section 144.495 for housing units and building materials. This test method provides a means of testing small-size samples to determine formaldehyde emission potential.

3.2 This test method incorporates a desiccator, with the desiccant removed, having a 250 mm (10 in.) inside diameter and a volume of approximately 10.5 L (641 in.³) with the desiccator lid in place. Conditions controlled in the procedure are as follows:

- 3.2.1 Conditioning of panel products prior to testing,
- 3.2.2 Specified number, size, and edge sealing of wood specimens to be placed in the desiccator,
- 3.2.3 Test desiccator temperature, and
- 3.2.4 Samples from the 25 mL distilled water collection medium in the petri dish bottom are analyzed for formaldehyde at the end of a 2-h period in the closed desiccator.

3.3 This test method employs a single set of environmental conditions to assess formaldehyde emission potential from certain wood products. When the relationship between desiccator test values and large-chamber test values are to be determined, the values for the specific wood panel product type shall be plotted. This test method does allow a comparison of formaldehyde levels from different products for the same use.

3.3.1 Care must be exercised in the extension of the results to actual formaldehyde emission from products under actual use conditions.

4. Interferences

4.1 The NIOSH 3500 analytical method lists phenols as a negative interference when present at an 8:1 excess over formaldehyde. Modifications in the analytical procedure shall be made when this test method is used to accurately determine the formaldehyde emission potential from wood products made with phenol-formaldehyde adhesive systems.^{7, 8}

⁵ Available from California EPA website: <http://www.arb.ca.gov/toxics/compwood/compwood.htm>.

⁶ Available from United States Environmental Protection Agency (EPA), William Jefferson Clinton Bldg., 1200 Pennsylvania Ave., NW, Washington, DC 20460, <http://www.epa.gov>.

⁷ Hakes, D., Johnson, G., and Marhevka, J., *Procedure for Elimination of Phenol Interference in the Chromotropic Acid Method for Formaldehyde*, American Industrial Hygiene Association, April 1984.

⁸ *Technical Bulletin No. 415*, National Council of the Paper Industry for Air and Stream Improvement Inc. (NCASI), 1983.

5. Apparatus

5.1 *Desiccator*—The interior volume of the desiccator shall be 10.5 L (641 in.³). Any desiccant shall have been removed, the interior of the desiccator thoroughly cleaned, and the porcelain desiccator plate replaced in the desiccator. The bearing areas of the desiccator and desiccator lid shall be greased so that the container will be air tight during the duration of the 2-h test.

5.2 *Petri Dish and Beaker*—A clean 400 mL beaker to be inverted as a reservoir support and the bottom of a 100 mm by 20 mm petri as a distilled water reservoir dish shall be available for each desiccator test.

5.3 *Test Room or Area*—A room or test area capable of being maintained at 24 °C ± 1 °C (75 °F ± 2 °F) shall be available for conducting desiccator tests.

NOTE 2—If liquid-in-glass thermometers are used for determining or checking the temperature of the test area, see Test Method E77.

5.4 Examples of acceptable reagents, materials, and equipment are provided in Appendix X1.

6. Hazards

6.1 *Chromotropic Acid Reagent Treatment (see 8.2.4 and A3.5)*—During this hazardous operation, the operator shall wear rubber gloves, apron, and a full face mask or be protected from splashing by a transparent shield such as a hood window. The solution becomes extremely hot during the addition of sulfuric acid. Add slowly to avoid loss of sample due to splattering.

6.2 *Cleaning Chemicals for Glassware*—Appropriate precautions shall be taken if cleaning chemicals are considered to be hazardous.

7. Test Specimens

7.1 Use eight 70 mm ± 2 mm by 127 mm ± 2 mm (2¾ in. ± 0.08 in. by 5 in. ± 0.08 in.) by panel thickness specimens for each desiccator test. Cut specimens from the sample panel or panel segment to obtain adequate representation of areas within the panel or panel segment. The fresh cut edges and ends of each specimen shall be at least 25 mm (1 in.) from the edges and ends of the sample panel or panel segment. When a product has significantly different emission characteristics for each surface and has only one surface exposed to the building space, also use sixteen 70 mm ± 2 mm by 127 mm ± 2 mm (2¾ in. ± 0.08 in. by 5 in. ± 0.08 in.) test pieces to prepare eight double-piece back-to-back specimens.

7.2 *Specimen Edge Sealing*—Remove sawdust and loose splinters from each test specimen. Coat the edges and ends of each single or double-piece specimen by immersion in melted paraffin wax. Apply at least two coats. The wax shall cover no more than 5 mm (¾ in.) of either face around the coated perimeter.

7.3 *Specimen Conditioning*—Then condition the specimens on edge, spaced apart, so air can freely circulate across all surfaces for seven days ± 4 h at 24 °C ± 1 °C (75 °F ± 2 °F)