Designation: D7859 – 13

StandardPractice for Spraying, Sampling, Packaging, and Test Specimen Preparation of Spray Polyurethane Foam (SPF) Insulation for Testing of Emissions Using Environmental Chambers[1]

This standard is issued under the fixed designation D7859; 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 practice describes standardized procedures for the preparation, spraying, packaging, and shipping of fresh spray polyurethane foam (SPF) insulation product samples to be tested for their emissions of volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs). These procedures are applicable to both closed-cell and open-cell SPF insulation products. Potential chemical emissions of interest include blowing agents, solvents, aldehydes, amine catalysts, diisocyanates, and flame retardants.

1.2 Typically, SPF insulation samples are prepared at one location, such as a chemical manufacturing facility or a field product installation site. The newly prepared samples are preserved in a sealed bag, placed in a secondary container, and then shipped to a laboratory for testing.

1.3 The spraying of SPF insulation products is only to be performed by trained individuals using professional spraying equipment under controlled conditions. The details of the spraying equipment and spraying procedures are based on industry practice and are outside of the scope of this practice.

1.4 This practice also describes procedures for the laboratory preparation of test specimens from open-cell and closed-cell SPF insulation product samples. These specimens are prepared for testing in small-scale chambers following Guide D5116 and in micro-scale chambers that are described in Practice D7706.

1.5 Procedures for VOC and SVOC emission testing, gas sample collection and chemical analysis are outside of the scope of this practice. Such procedures will need to address the potential for emissions of some SVOCs, for example, amine catalysts, flame retardant and isocyanates, to adhere to the chamber walls.

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

1.7 *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:*[2]

D1356 Terminology Relating to Sampling and Analysis of Atmospheres

D4840 Guide for Sample Chain-of-Custody Procedures

D5116 Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions from Indoor Materials/Products

D7706 Practice for Rapid Screening of VOC Emissions from Products Using Micro-Scale Chambers

3. Terminology

3.1 For definitions of terms commonly used for sampling and analysis of atmospheres, refer to Terminology D1356. For definitions of terms commonly used when testing products and materials for VOC emissions, refer to Guide D5116.

3.2 *A-Side*—polymeric methylene diphenyl diisocyanate (MDI) which is typically predominantly comprised of 4,4-MDI and higher molecular weight oligomers of MDI.

3.3 *B-side*—polyol system, or resin system, that is comprised mostly of polyol(s), with smaller amounts of catalyst(s), flame retardant(s), blowing agent(s), and other additives.

3.4 *Open-cell SPF*—SPF that contains cells or voids that are largely interconnected. Open-cell SPF insulation typically has a density between 6.4 to 9.6 kilograms per cubic metre when fully cured.

3.5 *Closed-cell SPF*—SPF that contains cells or voids that are not interconnected. Closed-cell SPF insulation typically has a density between 24 to 32 kilograms per cubic metre when fully cured.

[1] This test method is under the jurisdiction of ASTM Committee D22 on Air Quality and is the direct responsibility of Subcommittee D22.05 on Indoor Air.

Current edition approved April 1, 2013. Published April 2013. DOI: 10.1520/D7859-13.

[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.

4. Summary of Practice

4.1 This practice is applicable to open-cell and closed-cell spray polyurethane foam (SPF) insulation. Procedures are described for the preparation, spraying, packaging, shipping, and test specimen preparation of small, representative samples of these products. The samples are then sent to a laboratory and tested for emissions of volatile and semi-volatile organic compounds in environmental test chambers described in Guide D5116 and Practice D7706.

4.2 Samples are prepared by trained and competent operators using professional spraying equipment. Detailed instructions on the selection and operation of this equipment are outside of the scope of this practice. This practice specifies the information to be collected during the spraying operation. A test sample is sprayed to a defined thickness and size onto a defined substrate. The sample is wrapped with aluminum foil, packaged in a layered polyethylene terephthalate (PET) bag, placed in a secondary container, and sent to the laboratory on the same day it is sprayed and prepared, if possible.

4.3 Testing is to begin within 48 h of the time the sample is sprayed and prepared. When testing in a small-scale environmental chamber, the laboratory cuts the sample to create a test specimen of a defined thickness and size. The thickness varies with product type as specified in 8.3 and 8.4. The test specimen is placed into a tight-fitting stainless-steel holder with only the upper face of the product exposed. The specimen in its holder is transferred to the test chamber. Specialized procedures are described in 8.5 for preparing specimens for testing in micro-scale chambers.

5. Significance and Use

5.1 Manufacturers of SPF insulation may need to test their products for vapor-phase emissions of volatile and semi-volatile organic compounds in order to comply with voluntary standards, purchase specifications, or other requirements.

5.2 Since SPF insulation is formed by chemical reaction when combining a two-component mixture during spraying, specialized equipment and procedures are needed to reproducibly create representative samples suitable for emission testing.

5.3 SPF insulation product manufacturer's specifications and instructions must be followed carefully and detailed information regarding the spraying process must be recorded (see 7.3). Other precautions regarding handling and shipping are needed to ensure that the chemical integrity of samples is preserved to the extent possible by practical means (see 7.5).

5.4 Laboratories must prepare representative test specimens from samples of SPF insulation in a consistent manner so that emission tests can be reproduced and reliable comparisons can be made between test data for different samples.

6. Materials

6.1 *Spray gun and related spraying equipment* for application of the SPF insulation product shall be as specified by the SPF insulation product manufacturer. The main equipment components typically consist of: spray gun with impingement mixing technology for mixing the two part liquid product inside the gun, gun tip, and purge system; proportioning machine with pumps, pressure controls and heating capacity; and heated hoses. Contact the SPF equipment manufacturer for details concerning the spraying equipment. (**Warning—**DO NOT attempt to create SPF insulation samples without the proper spraying equipment or without proper training in the operation of this equipment including the use of appropriate personal protective equipment.[3])

6.2 *Substrate Material*—Clean high-density polyethylene (HDPE) sheets, cut to minimum dimensions of 30 by 30-cm, with a minimum thickness of 9-mm.

6.3 *Knife or saw,* clean and free of cutting oils and other organic contaminants.

6.4 *Circular foam coring tool* constructed of steel to cut SPF insulation samples to fit tightly into sample holders or directly into micro-scale chambers as described in Practice D7706.

6.5 *Layered polyethylene terephthalate (PET) bags,* with a middle layer of aluminum foil and an inner layer of linear low density polyethylene (LLDPE), light resistant, preferably with zipper seal (zipper seal may not be available on larger sized bags), composite layer approximately 0.127-mm thick. Bags are available commercially for food storage and should be sized to minimize headspace when the sample is placed in the bag.

NOTE 1—For open-cell SPF products, a bag size of approximately 51 by 76 cm has been found to be suitable. For closed-cell SPF products, a bag size of approximately 46 by 71 cm has been found to be suitable.

6.6 *Packaging tape, clear,* approximately 5-cm wide.

6.7 *Stainless steel sample holder with open top;* dimensions are described in 8.3.3 and 8.4.3 depending on the type of material being tested.

6.8 *Stainless steel or polytetrafluoroethylene (PTFE) shims* for sample holder, as necessary.

6.9 *Aluminum foil,* clean, heavy-gauge roll, approximately 0.024-mm thick.

6.10 *Shipping container,* sturdy and insulated secondary container such as a recreational cooler or a molded insulated shipping container housed in a cardboard box. The insulated container should be as air tight as possible.

7. Sample Preparation

7.1 Prepare and spray the SPF insulation sample either in a controlled spray booth or room at a product manufacturing location or in the field at a building application site using the equipment and processing parameters that are specified by the SPF insulation product manufacturer for application of the product in buildings. The spray booth or room should be maintained at a constant temperature of 23 ± 2°C and relative humidity of ≤80%. However, the preparer may elect to utilize different environmental parameters in the spray booth or room to mimic a particular field condition (for example, cold weather application). Environmental conditions of the spray booth or

[3] SPF applicator on-line health and safety training is available from the Center for the Polyurethanes Industry at www.spraypolyurethane.org