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# Standard Guide for the Comparison, Detection, and Identification of the Odors of Paints, Inks, and Related Materials[1]

This standard is issued under the fixed designation D6165; 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 guide is intended to provide direction in order to assist the producers and users of paints, inks, and related coatings, and others who may also be exposed, to detect, compare and identify the odors that may originate from these materials.

1.2 This guide is intended to provide references for establishing guidelines to assist in identifying and verifying the sources of odors and other related issues. Further information may be found in DS-48A (**1**).[2]

1.3 This guide is intended to assist in establishing guidelines as follows:

*(1)* Comparing products for their odor characteristics,

*(2)* Determining the perception threshold of odors,

*(3)* Isolating and identifying the chemical nature of the odor, and

*(4)* Confirming the results.

1.4 For hazard information and guidance, see the supplier's Material Safety Data Sheet.

1.5 *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:*[3]

D1292 Test Method for Odor in Water

D1296 Test Method for Odor of Volatile Solvents and Diluents

D2650 Test Method for Chemical Composition of Gases by Mass Spectrometry

D3686 Practice for Sampling Atmospheres to Collect Organic Compound Vapors (Activated Charcoal Tube Adsorption Method)

D3687 Practice for Analysis of Organic Compound Vapors Collected by the Activated Charcoal Tube Adsorption Method

D4339 Test Method for Determination of the Odor of Adhesives

E253 Terminology Relating to Sensory Evaluation of Materials and Products

E544 Practices for Referencing Suprathreshold Odor Intensity

E679 Practice for Determination of Odor and Taste Thresholds By a Forced-Choice Ascending Concentration Series Method of Limits

E769 Test Methods for Odor of Methanol, Ethanol, *n*-Propanol, and Isopropanol (Withdrawn 2011)[4]

E1207 Guide for Sensory Evaluation of Axillary Deodorancy

E1432 Practice for Defining and Calculating Individual and Group Sensory Thresholds from Forced-Choice Data Sets of Intermediate Size

E1593 Guide for Assessing the Efficacy of Air Care Products in Reducing Sensorly Perceived Indoor Air Malodor Intensity

## 3. Terminology

3.1 The definitions in Terminology E253 are applicable to this guide.

## 4. Significance and Use

4.1 This guide is intended to direct the user to the appropriate existing standards and literature in order for the user to become knowledgeable of the operations that need to be done to effectively compare, detect and identify the odors of paints, inks, and related materials.

[1] This guide is under the jurisdiction of ASTM Committee D01 on Paint and Related Coatings, Materials, and Applications and is the direct responsibility of Subcommittee D01.24 on Physical Properties of Liquid Paints and Paint Materials.

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[2] The boldface numbers in parentheses refer to the list at the end of this guide.

[3] 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] The last approved version of this historical standard is referenced on www.astm.org.

4.2 This guide directs the user to specific standards and literature sources that allow the user to accomplish the primary steps to complete the following task:

*(1)* Comparing products for their odor characteristics,

*(2)* Determining the perception threshold of odors,

*(3)* Isolating and identifying the chemical nature of the odor, and

*(4)* Confirming the results.

## 5. Hazards

5.1 Many paints, inks, and related materials contain solvents, diluents, and residual monomers that may be hazardous or toxic. For hazard information and guidance, see the supplier's Material Safety Data Sheet. Take special precautions while determining the odor of these products. The tests should be made only as frequently as is necessary for control and the evaluations should be conducted in a manner that provides the least possible amount of exposure.

5.2 Provide adequate ventilation to maintain solvent or diluent concentration below the personnel exposure limit value established for the general work area.

5.3 Other hazards may also be present: These may be, but are not limited to, flammable, combustible, corrosive, or explosive (monomers) hazards.

## 6. Defining the Approach

6.1 A major consideration for the accomplishment of the task being undertaken by the user of this guide is how to operate with untrained people such as paint users, plant workers, and community residents. The following resources are suggested as initial references for review (see also Test Methods E769 and Practice E1207):

*(1)* STP 682 (**2**)[2] Chapter 1, Background and Chapter 3, General Evaluation Factors,

*(2)* STP 433 (**3**) Part I & II,

*(3)* STP 434 (**4**) Chapter I, Part B, and

*(4)* STP 1035 (**5**) Product Testing with Consumers for Research Guidance.

## 7. Odor Comparisons

7.1 Test Method D1296 covers a comparative procedure for observing the characteristic and residual odors of volatile organic solvents and diluents to determine their odor acceptability. However, this test method might be suitable for other materials if modified. Practice E679 is an example of a standard practice for determining the odor acceptability of several specific compounds; Test Method D4339 is used to determine the odor of a formulated product (adhesives).

7.1.1 Annex A1 of Test Method D1292 provides a suggested system for classifying odors.

7.1.2 A general reference for odor character profiles is given in DS 61 (**6**).

## 8. Determining Odor Perception Threshold

8.1 The first step is to determine at what concentration in the atmosphere a product's odor is perceptible or at what concentration a specific odor is detectable over the product's base odor. Because perception threshold can vary with the individual, a sufficiently large number of observers is necessary. (See STP 434 (**2**) Chapter I, Section B Test Subjects, 1b Number of Panel Members.)

8.2 Practice E679 is used to determine the threshold while Practice E544 is used to calibrate the threshold versus 1-butanol to define the concentration reference.

8.3 By defining the odor threshold, the investigator is able to confirm that a difference in odor exists when comparing one product to another product as used as a control. The presence of a different odor is likely to result in a significantly lower perception threshold. Practice E1432 is used to define and calculate individual and group sensory thresholds.

## 9. Isolation and Identification of the Chemical Nature of the Odor

9.1 *Isolation*—Gas Chromatography (GC) and Mass Spectrometry techniques such as those contained in Practices D3686, D3687 and Test Method D2650 can be used to separate and identify the volatile fractions of the product, some of which are prime contributors to the product's odor.

9.1.1 Construction requirements for tests chambers are specified in STP 433 (***3***) part II, "Concentration of Odor Vapors in Test Chambers" and in Practice E1593, Appendix X1.3.

9.1.2 A sample can also be captured by trapping the odor using carbon adsorption of a gas stream above the vapor space of a container of the product.

9.2 *Identification*—While the above methods are capable of separating and identifying the volatile components, they do not establish which compounds contribute to the odor. Each separated component needs to be evaluated by a trained sensory panel using odor profiling methods such as those outlined in MNL 13 (**7**) to determine what fraction or fractions contribute to the odor. The component, or components, suspected of causing differences in odor can be compared to referenced materials in DS 48A (**1**). Preparative GC may be needed to provide an identified fraction of sufficient size for further fractionation, identification, and odor profiling.

## 10. Confirming the Results

10.1 The product odor must be confirmed by using the conclusions of the isolation and identification effort to reconstitute the odor using the identified components and concentration. This reconstituted odor concentrate is then evaluated by a trained sensory panel using the above methods, to confirm its similarity to the product under investigation.

## 11. Follow Up Action

11.1 Upon confirmation by Section 10, efforts should be made to reduce or eliminate the main odor contributors from use, open storage, or open handling. If 10.1 does not produce a positive confirmation, then the investigator must look for surfaces, objects, etc. that could absorb or chemically alter the objectionable components in the handling, transport, and storage phase of the investigation.

## 12. Keywords

12.1 evaluation panel; odor; odor threshold; sensory evaluation

## REFERENCES


**(1)** Fazzalari, F.A., ed., *DS 48A Compilation of Odor and Taste Threshold Values Data*, ASTM, 1978.

**(2)** Schaefer, E. E., ed., *Manual on Consumer Sensory Evaluation, ASTM STP 682*, ASTM, 1979.

**(3)** *Basic Principles of Sensory Evaluation, ASTM STP 433*, Committee E18, ASTM, 1968.

**(4)** *Manual on Sensory Testing Methods, ASTM STP 434*, ASTM, 1968.

**(5)** Wu, L. S., ed., *Product Testing with Consumers for Research Guidance, ASTM STP 1035*, ASTM, 1989.

**(6)** Dravnieks, A., compiler *DS 61 Atlas of Odor Character Profiles*, ASTM, 1985.

**(7)** Hootman, R.C., ed., *MNL 13 Manual on Descriptive Analysis Testing for Sensory Evaluation*, ASTM, 1992.