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# Standard Guide for Sensory Evaluation of Household Hard Surface-Cleaning Products with Emphasis on Spray Triggers<sup>1</sup>

This standard is issued under the fixed designation E2346; 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 guide presents guidelines specific to the sensory evaluation of trigger hard surface cleaners. It covers the procedure for preparing a nonporous surface with the intent to measure one or all of the various aspects of a trigger product: package, application, performance, and after-use properties, with focus on visual, tactile, fragrance, performance, and package ergonomics. It is applicable for use with assessors, highly trained assessors, and consumers.

1.2 This guide for preparing nonporous hard surfaces is intended to focus on surface preparation and evaluation, not on panel selection, training, or development.

1.3 The reader should be aware that good sensory practices are required when preparing the surfaces, and in developing and training the assessors.

1.4 The researcher is responsible for identifying the most appropriate test design and using the appropriate statistical tool to address that experimental design.

1.5 Since this guide's intended use is to provide direction on the presentation and measurement of the different aspects of spray trigger hard surface cleaners, this guide may not accurately represent all possible soils and surfaces where spray trigger hard surface cleaners may be used.

1.6 This guide provides suggested procedures and is not meant to exclude alternate procedures that may be effectively used to provide the same results.

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 to determine the applicability of regulatory requirements prior to use.*

<sup>1</sup> This guide is under the jurisdiction of ASTM Committee E18 on Sensory Evaluation and is the direct responsibility of Subcommittee E18.07 on Personal Care and Household Evaluation.

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## 2. Referenced Documents

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

D2690 Test Method for Isophthalic Acid in Alkyd and Polyester Resins (Withdrawn 2007)<sup>3</sup>

D4265 Guide for Evaluating Stain Removal Performance in Home Laundering

D5343 Guide for Evaluating Cleaning Performance of Ceramic Tile Cleaners

E253 Terminology Relating to Sensory Evaluation of Materials and Products

### 2.2 ISO Documents:<sup>4</sup>

ISO 4121 Sensory Analysis—Methodology—Evaluation of Food Products by Methods Using Scales and Categories

ISO 5492 Sensory Analysis—Vocabulary

ISO 5496 Sensory Analysis—Methodology—Initiation and Training of Assessors in the Detection and Recognition of Odors

ISO 6658 Sensory Analysis—Methodology—General Guidance

ISO 8586-1 Sensory Analysis—Methodology—General Guidance for Choosing, Training and Monitoring of Selected Assessors

ISO 11035 Sensory Analysis—Methodology— Identification of Descriptors for Establishing a Sensory Profile

## 3. Terminology

### 3.1 Definitions of Terms Specific to This Standard:

3.1.1 *nonporous surface*—refers to a solid material that cannot be permeated by liquids.

## 4. Summary of Guide

4.1 This guide provides direction on how to assess spray trigger hard surface cleaners. This guide describes sample preparation and evaluation approaches to various aspects of a

<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).

<sup>4</sup> Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036.

spray trigger hard surface cleaner: visual, tactile, fragrance, performance, and package ergonomics.

## 5. Significance and Use

5.1 The methods outlined in this guide can be used to qualitatively and quantitatively describe the sensory characteristics and performance of trigger hard surface household cleaning products for nonporous surfaces.

5.2 The methods are suited for descriptive analysis and may be adaptable for consumer acceptance research.

5.3 This guide provides the procedure for the evaluation of package, application, performance, after-use and fragrance aspects of hard surface cleaners. Depending on the test objectives, all or some of these measures may be used.

5.4 This guide, as defined by ASTM, is designed for use for product research guidance in product formulation, new product development, and quality control issues.

5.5 This guide is a compendium of information or series of options that does not recommend a specific course of action. This guide is not intended for claim substantiation, as it has not been subjected to validation testing.

5.6 This guide is for use by individuals who familiarize themselves with these procedures and who have previous experience with sensory evaluations. It is suggested that the individuals have some experience with developing and training a descriptive panel or work under the supervision of a sensory professional who has.

5.7 This guide might involve hazardous materials. This guide does not claim to address all of the safety problems associated with its use. It is the responsibility of the user of this guide to establish appropriate safety and healthy practices and to determine the applicability of limitations prior to use.

## 6. Equipment

6.1 The following equipment may be used during the preparation or evaluation process:

6.1.1 Lights for a flat horizontal surface require overhead lighting that simulates North Daylight (that is, Mac Beth Lighting). See ASTM MNL 60 (1).

6.1.2 Lights for a vertical surface may use the Mac Beth portable light box.

6.1.3 Surfaces identified as nonporous are: glass, ceramic, sheet acrylic—also known as Formica®, porcelain, enamel, painted metal, stainless steel, and chrome.

6.1.4 Spangler soil (refer to Guide D4265 for soil formula).

6.1.5 Metered sprayer.

6.1.6 Deionized water.

6.1.7 Reagent grade Acetone.

6.1.8 Cheesecloth.

6.1.9 Vertical rack for drying soiled surfaces.

6.1.10 Lint free paper towels or absorbent cotton cloths.

## 7. Procedure

7.1 These procedures are designed for the preparation of nonporous surfaces to be evaluated by trained assessors or consumers for acceptance in a Central Location Test (CLT)

environment. Not all portions of these procedures may need to be conducted and will depend on the objective and scope of the sensory test(s). Depending on the product's end-use, select the soils and surfaces on which this product should be evaluated. It is suggested consideration be given to testing on multiple surfaces or multiple soils, or both, to satisfy the objective of the test.

7.2 *Preparation of Surface for Testing*—Select the nonporous surface(s) that are appropriate for the particular hard surface cleaner to be evaluated. The test surfaces selected should be thoroughly cleaned before and between uses. The test surface has to be evaluated prior to use to determine that it is free of manufacturer defects. This will help minimize any variability from surface to surface. The surface should be cleaned sequentially as follows:

7.2.1 Wash in warm water with unscented hand dish washing liquid.

7.2.2 Rinse with deionized water.

7.2.3 Wipe surface dry of any residual water with cheesecloth. Do not allow water droplets to dry on surface.

7.2.4 Rinse surface with acetone (reagent grade).

7.2.5 Wipe surface dry of any residual acetone with cheesecloth, especially on surface edge.

7.2.6 Exposing the cleaned surfaces to a live stream of air should be used to assess the effectiveness of the surface cleaning process. Those areas not thoroughly clean will take on a white, highly reflective appearance. In such a case, the entire surface will be re-cleaned, repeating the above steps. Soiling of the test surface should not occur until the test surface has been thoroughly cleaned.

7.2.7 After cleaning, place the clean surfaces on a vertical rack. Be sure the vertical rack does not allow the surfaces to touch each other. Take caution to avoid recontaminating the clean surface.

7.3 *Application of Soils*—Select soils suitable for the hard surface cleaner of interest. Industry standard soils are available through ASTM and CSMA. The selected soil should be applied in a reproducible, uniform, and standard manner. To illustrate the specific nature of the application process, the following instruction steps should be used. The example given is when the Spangler soil is applied to a glass surface, but is applicable for other soils and surfaces.

7.3.1 The Spangler soils are applied using a metered spray onto the clean surface.

7.3.2 Prime the sprayer before use.

7.3.3 Apply a suggested  $5.5 \pm 1.0$  g of soil to a 12 by 12 in. glass plate. Uniform application of soil is accomplished by spraying two plates, side-by-side in the fume hood, at a distance of 8 in., using four horizontal sweeping sprays, then two vertical sweeping sprays for a one-coat application.

7.3.4 Repeat this process for a total of three coats to achieve the desired soil weight. To ensure a consistent weight of soil per plate, it is best to spray soil onto tare glass plates and check the final weight after complete solvent evaporation. Depending on the soiling compound, the amount of soil applied may vary from the Spangler soil protocol of three coats.

7.3.5 All plates used in the testing array should be soiled at the same time. It is suggested that plates soiled on the same day be used as a group.

7.3.6 **Warning**—The soiling process requires skill and judgment. Consideration should be given to the soil loading desired for the test objective (light, regular or heavy soil load). The soil load selected should be realistic and applicable in meeting the purpose and objective of the test. Practice is encouraged before preparing surfaces for the actual test.

7.4 *Aging of the Soils*—Soils should be aged for 24 h prior to use to ensure that the soil has cured on the hard surface and has achieved the desired soil tenacity. An exception to this is when using established soil protocol where a different aging time is provided. An example is the aging process for Spangler soil: The soiled surface must be aged at 50°C for 2 h, followed by cooling to ambient temperature, prior to application of the spray cleaner.

7.5 *Cleaning of the Surfaces*—It is recommended that the trigger spray product being evaluated be used in accordance with the product use instructions and with the marketed trigger.

7.5.1 If the surface is one that is cleaned in a vertical position, then the product usage and assessment must be made in the vertical position. For example, glass is usually seen in a vertical position (windows). Therefore, it is cleaned vertically and the area behind the glass needs to have a neutral backdrop to prevent any distraction from assessing the product performance on this surface. If the surface is one that is cleaned in a horizontal position, then the product usage and assessment needs to be made in the horizontal position. For example, sheet acrylic is usually seen in a horizontal position (counter tops). For assessing horizontal surfaces, the Mac Beth Lighting needs to be positioned such that shadows do not fall across the surface being evaluated.

7.5.2 The test objective will determine who applies the product. For example, if *application* is the area being evaluated, then the assessors or trained assessors apply the product. If *visual* is the area being assessed, the sensory professional applies the trigger products and cleans the surface. This is to ensure consistency across the treated surfaces.

7.5.3 Assessors and trained assessors wipe the surface with a lint free paper towel or an absorbent cotton cloth. Through orientations prior to evaluations trained assessors will have established the number of wipes, the direction of wipes, and the amount of pressure that they need to apply for an application assessment.

#### 7.6 *Trained Assessors:*

7.6.1 Trained descriptive panels should be used when there is the desire to obtain a detailed qualitative and quantitative product characterization and to determine the differences between products on sensory product attributes.

7.6.2 For general information on panel selection criteria and training, consult ASTM Manual 13 (2), ASTM Manual 26 (3), and ASTM STP 758 (4). Additional assessor considerations should be taken into account and screened out depending upon the test requirements. Some considerations are color blindness, olfactory acuity or lack of olfactory sensitivity, allergies, and medical conditions like pregnancy, breast feeding or chronic disease of the assessor.

#### 7.7 *Consumers:*

7.7.1 Consumer panels should be used when affective and preference information is needed.

7.7.2 Consumers should be recruited among the target population. For example, when assessing a glass cleaner, the consumer should be a user of commercially available glass cleaner and not one who makes their own glass cleaner (such as vinegar and water, or soap and water). However, the test objective will provide direction to identify the appropriate consumer population.

7.7.3 Recruiting of qualified consumers can be done in several ways; for example, mall intercept approach, pre-recruit over the phone, or use of a database.

7.8 *Evaluation Procedure*—The spray cleaner test product can be evaluated at various stages of the product usage: pre-use, application, in-use, and residual. See ASTM STP 433 (5) to apply basic sensory principles in the design of the sensory evaluation procedure (blind coding, sample presentation ordering, test booths to use, and so forth).

7.8.1 The evaluation procedure selected should be designed to meet the objective of the test.

7.8.2 The hard surface should be presented to the assessors, trained assessors, or consumers in the manner in which that surface is used. For example, most glass surfaces, such as windows and mirrors found in the home, are in a vertical position. Counter tops are horizontal and are made from sheet acrylic, also known as Formica®.

7.8.3 Attributes for product evaluation can be identified through trained assessors using descriptive procedures. In addition, attributes can also be identified from the specific test objective or using historical information on how the product performs. These attributes can be used for trained panel evaluations or can be adapted to be consumer friendly for consumer research. Examples of attributes to be measured can be found in Tables 1-5.

7.8.4 The product can also be studied to evaluate its scent/fragrance characteristics. Examples of attributes for scent measurement can be found in Table 5.

7.8.5 Consult ASTM Manual 13 (2) to select scale type and end scale points in descriptive measurements. In consumer tests, scaling can include 9-point or 7-point hedonic scales, as well as diagnostic attribute scales.

7.8.6 The limitation of samples to be evaluated in one setting should be established. Limitations may be imposed due to the volume of product dispensed by an assessor or consumer relative to safety concerns (that is, air quality) as well as assessor or consumer fatigue and ability to discriminate.

7.8.7 Consumer testing should be conducted in a central location facility, which provides adequate lighting and ventilation for the task.

## 8. Report

8.1 It is recommended that a final report be issued to document the research. A report should include the following steps; however, these steps may be reordered to fulfill the respective establishment's protocol for research documentation.