



Designation: E619 – 17 (Reapproved 2023)

Standard Practice for Evaluating Foreign Odors and/or Flavors from Paper Packaging¹

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This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope

1.1 This practice covers the evaluation of odors in paper packaging and establishes smelling and testing procedures for trained sensory panels.

1.2 This practice covers the evaluation of odors and flavors transferred to various food media from paper packaging.

1.3 This practice covers effective techniques for determining the type and source of the odor/ flavor and establishing the severity of the off-note.

1.4 The techniques used in this practice are applicable to all paper packaging products and to auxiliary components, such as coatings, inks, and adhesives, as well as plastic materials used in conjunction with paper.

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

1.6 *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.*

1.7 *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. Summary of Practice

2.1 Under the guidance of the panel leader, qualified and trained assessors individually examine sample specimens by one or more of the test procedures described in this practice. Assessors judge the intensity of a perceived off-notes in terms

¹ This practice is under the jurisdiction of ASTM Committee E18 on Sensory Evaluation and is the direct responsibility of Subcommittee E18.05 on Sensory Applications—General.

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of a numerical rating scale and also attempt to give a qualitative description of the off-odor and/or off flavor. The assembled observations are then interpreted by the panel leader.

3. Significance and Use

3.1 *Use*—This practice should be used by assessors, trained as described in ASTM STP 758,² under the direction of a knowledgeable panel leader.

3.2 *Significance*—This practice can be used to evaluate type and intensity of indigenous and foreign odors and/or flavors in paper packaging materials. A knowledgeable panel leader may be able to determine the source of a foreign odor/ flavor from the information obtained from this procedure.

4. Sensory Test Panel Selection and Training

4.1 *General*—Sensory panel selection and training are described in STP 758 and in references therein.

4.2 *Size*—The panel on a specific odor and/or flavor problem should consist of at least five (5) members. When possible, the assessors should be drawn from a larger pool of qualified assessors.

4.3 *Selection*—The important criteria in panel selection are: (a) normal ability to detect and identify odors and flavors; (b) ability to discriminate differences, and reproduce results; and (c) interest in the testing work for which the assessors are to be trained. Usually a suitable panel can be recruited from available employees unless their number is limited. It is helpful if panel members have a scientific background, with some knowledge of chemistry or food technology; however, this should not be a criterion for selection. Nontechnical personnel have often proved to be excellent panel members after appropriate training. No willing and available person should be excluded from consideration. Panel members should be re-qualified periodically.

² *Guidelines for the Selection and Training of Sensory Evaluation Panels*, ASTM STP 758, ASTM, 1981.

5. Testing Facilities and Apparatus

5.1 *General*—Appropriate physical conditions for sensory panel operations are described in MNL 26.³

5.2 *Testing Room*—Detection of low levels of odor requires a working space in which individual members of the panel can concentrate on the task. The room should be comfortable as to temperature, humidity, and noise, and relatively free of laboratory industrial odors. If ambient odor levels are too high, testing of the samples must be transferred to another location. Interruptions and other distracting influences should be avoided.

5.3 *Sample Containers*—Clean, dry, closed, odor-free containers of appropriate sizes are needed for storing samples and for confining specimens to maintain sample integrity. Laboratory glassware, capped glass jars, glass battery jars with plate glass lids, and aluminum foil are suitable for this purpose. Rubber gaskets or stoppers should not be used. Closures should provide adequate protection and contribute no odors of their own.

6. Materials

6.1 *Water*—Moistening of material to intensify odors or to develop potential odors is frequently necessary. The water, whether distilled, bottled, or tap, should be smelled and tasted before use to assure it does not impart additional odor or flavor. When necessary, water may be further purified by filtering through charcoal.

6.2 *Fatty Materials*—Various materials containing oil or fat may be used to pick up certain types of odors in transfer tests such as those described in 7.4. Mineral oil (odorless), cream, butter, and milk chocolate are recommended.

6.3 *Standard Samples*—It is good practice to include reference materials. Commercially produced packaging material representing either satisfactory levels of odor and/or flavor, maximum permissible levels of odor and/or flavor, or a currently used product are suitable to use as a control/reference. However, maintenance of such standards is usually difficult, since age and storage conditions may drastically alter odor properties. As part of quality control practices, a schedule should be established for acquiring and discarding standard samples; when appropriate, this schedule should be accepted in advance by both manufacturer and purchaser. (When a product normally contains traces of specific solvents, gas chromatographic analysis is often used to help in selecting standards of uniform quality.)

7. Methods for Preparing Test Specimens for Examination

7.1 *General*—A single method will not suffice for the preparation of test specimens because of the wide range of materials that may be tested and the many types of odors/flavors that may be present. The more common methods are described in this section. Each laboratory should select and

standardize the particular preparation procedures that seem best for specific products with which it is concerned.

7.2 *Methods that Utilize Direct Examination*—There are two categories of direct testing methods: immediate examination without prior confinement and examination after samples have been confined appropriately in a closed container to enhance odor intensity.

7.2.1 *Direct Examination Without Confinement*—This approach is usual in the preliminary investigation of an odor problem. Testing may be done by one or two experienced persons rather than a full sensory panel. Typical useful techniques are as follows:

7.2.1.1 *Examining Single Sheets*—Crumple one or more individual sheets of the sample into a loose ball, then partially open and sniff immediately while holding up to the face. To sample a large roll, cut or tear a conveniently sized representative specimen and test in the same way.

7.2.1.2 *Examining Stacks of Sheets*—Riffle a stack of sheets to expose many fresh surfaces in rapid succession, while simultaneously sniffing at the edge of the stack.

7.2.1.3 *Examining Samples in Bundles*—When a stack or bundle of sample sheets is received appropriately wrapped in aluminum foil, open one end temporarily and sniff while gently squeezing and releasing the package to expel puffs of air.

7.2.1.4 *Opening Fresh Surfaces*—Valuable information about the origin and severity of an odor contamination can often be obtained by exposing fresh surfaces at the instant of smelling. For example, coated paper board and corrugated sheets can be torn apart into two layers from a corner or edge; several layers may be separated sequentially from more complex laminar constructions; wax can be scraped with a knife; or glued joints can be broken open.

7.2.2 *Direct Examination After Confinement*—The following confinement methods have been used successfully in preparing paper packaging materials for odor examination:

7.2.2.1 *Confining in Glass Jars*—Confine the sample in the glass jar, with foil or polytetrafluoroethylene (PTFE) lined lid, for a standardized period (16 h to 24 h) at room temperature (20 °C to 25 °C) or for appropriate periods at elevated temperature at 40 °C or 60 °C. Refer to Table 1 (end of document). Restrict specimen size so as to maintain a minimum of 25 % head space in a jar. Normally, prepare a separate jar for each assessor. (If the amount of sample is limited, the same jar may be smelled twice, after waiting a minimum of 1 h without opening the jar, in order to allow the headspace to equilibrate.)

7.2.2.2 *Confining in Covered Glass Battery Jars*—Store in battery jars (or similar large containers) for a standardized period (16 h to 24 h) at room temperature (20 °C to 25 °C). Use a sample of appropriate size. Prepare one jar per sample; this will normally suffice for the whole panel.

7.3 *Methods That Involve Moistening of Samples*—Water brings out some types of odors. The following techniques may be used, and are particularly appropriate for products that normally may be subjected to moisture (see 5.1 for water quality):

7.3.1 *Examination After Moistening*—Put a measured amount of water on the sample to dampen, and smell immediately or after confining at room temperature (20 °C to 25 °C)

³ ASTM Manual 26 MNL26–26 2ND, *Sensory Testing Methods: Second Edition*.

TABLE 1 Sample Preparation Methods to Examine Common Paper Packaging Off-Notes

		Odor Direct		Odor Moistening		Odor or Flavor Transfer					Relevant Packaged Product
		No Confinement	After Confinement	Dampen with water	Store over Water	Water	Mineral Oil	Butter	Cream	Milk Chocolate	
Paper and board	Inherent Kraft	x	x	x	x						
	Musty or Moldy (ground wood, old news paper, waste)	x	x	x	x ^A						
	Chlorinated phenol (additive for slime control)	x	x								
Paper and Board, coated: waxed or polyethylene	Sour (decomposed starch)	x	x	x							
	Volatile additives (casein decomposition)	x	x ^B			x ^B					x
Glassine, coated	Waxy, oxidized (burnt) polyethylene		x ^B			x ^B	x	x	x	x	x
	Inherent in coating; solvent, plasticizer		x ^B			x	x			x	x
Ink and varnish	Oxidizing oils, solvent, plasticizer	x	x	x		x	x		x		x
Adhesive joints (after drying)	Solvents, sour starch, added perfume	x	x ^C			x		x			x
Wax	Oil, residual oxidized solvent	x	x ^D			x					x ^{D,E}

Special Conditions:

^A4 h at 40 °C or 60 °C.

^B16 h to 24 h at 40 °C or 60 °C.

^CFresh and after 16 h to 24 h at 40 °C or 60 °C.

^DFresh shavings at room temperature in small containers.

^EConfined with cheese, for example.

or elevated temperature (40 °C to 60 °C) for a standardized period (16 h to 24 h).

7.4 Methods That Examine Transfer to an Oily Substance—The following are useful procedures to aid in identifying off-odors and/or off-flavors and in estimating their potential for contaminating fatty foods:

7.4.1 Examination for Transfer to Mineral Oil—Place the specimen in a glass dish adjacent to, but not in contact with, 10 mL of odorless mineral oil in a covered 100 mm glass Petri dish. For a reference sample, put mineral oil in a covered dish without the specimen. After a standardized storage period (16 h to 24 h) at room temperature (20 °C to 25 °C), smell the test specimen of oil and the control oil. As an alternative, form a pouch from the specimen, fill to an appropriate level with oil, and test in the same way. Oil soluble contaminants such as printing ink solvents, kerosene, etc., can be detected by smelling the oil and comparing with an oil reference.

7.4.2 Examination for Transfer to Butter—Prepare a sandwich consisting of a pat of butter between two pieces of the specimen, and place in a covered glass Petri dish or a suitable screw cap jar. (A single test sandwich is adequate for a panel of five assessors.) For a reference sample, place a similar pat directly in a covered dish without the specimen. After a standardized storage period (16 h to 24 h) at room temperature (20 °C to 25 °C), smell and taste the test specimen of butter and the control butter.

7.4.3 Examination for Transfer to Cream—Place strips of the test specimen in a Petri dish and cover with cream. For a reference sample, place a similar amount of cream directly in a covered dish without the specimen. Refrigerate at 5 °C to 7 °C for a standardized period (16 h to 24 h) and examine the cream, first by smelling and then by tasting. As an alternative, form a tray or pouch from the specimen, fill to an appropriate

level with cream, and test in the same way. This procedure has been widely used for printing ink odors, and is very sensitive.

7.4.4 Examination for Transfer to Milk Chocolate—Place the specimen adjacent to an appropriate amount of plain milk chocolate in a covered glass Petri dish or a suitable screw cap bottle. For a reference sample, place a similar amount of milk chocolate directly in a covered dish without the specimen. After 1 to 2 days at room temperature (20 °C to 25 °C) taste the control chocolate.

7.5 Methods That Examine Transfer to an Odor and/or Flavor-Sensitive Commercial Product—To help gauge the practical significance of a known or alleged off-odor or off-flavor in a packaging material, use the specimen material to prepare a package for the appropriate commercial product. Hold for an appropriate time at a selected temperature, and then smell the product and taste it if appropriate, in comparison with a control and/or other packaging material products.

7.6 Common Off-Odors and Off-Flavors in Paper Packaging Materials and Suggested Methods for Their Detection—The information in **Table 1** has been assembled to aid in selecting appropriate procedures for the preparation of specimens.

8. Test Panel Examination

8.1 General—If preliminary examination by a method or methods selected from Section 7 has shown that there probably is a significant off-odor and/or off-flavors problem, then sample specimens should be evaluated by the panel using appropriate sensory techniques. These techniques should have been learned during panel training.

8.2 Procedure of Panel Examination:

8.2.1 General Instructions: