Designation: F2999 – 14

Standard Consumer Safety Specification for Adult Jewelry[1]

This standard is issued under the fixed designation F2999; 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.

INTRODUCTION

The purpose of this consumer safety specification is to establish nationally recognized safety requirements and test methods for adult jewelry.

1. Scope

1.1 This specification establishes requirements and test methods for specified elements and for certain mechanical hazards in adult jewelry. It does not purport to cover every conceivable hazard of adult jewelry. It does not cover product performance or quality, except as related to safety. This specification has no requirements for those aspects of adult jewelry that present an inherent and recognized hazard as part of the function of jewelry.

1.2 This specification applies only to adult jewelry, as defined in 3.1.3. Children's Jewelry, which is defined as jewelry designed or intended primarily for use by children 12 and under, is addressed in another ASTM standard, Specification F2923.

1.3 This specification does not apply to the following:

1.3.1 Accessories (for example, handbags, belts),

1.3.2 Apparel (except as described in 3.1.1(*q*)),

1.3.3 Footwear (except as described in 3.1.1(*q*)), and

1.3.4 Any other item whose primary purpose is functional (e.g., keys, key chains, or other items not primarily intended to be worn as a personal item of ornamentation).

1.4 This consumer safety specification includes the following sections:

1.5 The following precautionary statement pertains only to the test methods portion of this specification: *This standard does not purport to address all of the safety concerns, if any, associated with jewelry 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]

E1613 Test Method for Determination of Lead by Inductively Coupled Plasma Atomic Emission Spectrometry (ICP-AES), Flame Atomic Absorption Spectrometry (FAAS), or Graphite Furnace Atomic Absorption Spectrometry (GFAAS) Techniques

F963-11 Consumer Safety Specification for Toy Safety

F2853 Test Method for Determination of Lead in Paint Layers and Similar Coatings or in Substrates and Homogenous Materials by Energy Dispersive X-Ray Fluorescence Spectrometry Using Multiple Monochromatic Excitation Beams

F2923 Specification for Consumer Product Safety for Children's Jewelry

[1] This consumer safety specification is under the jurisdiction of ASTM Committee F15 on Consumer Products and is the direct responsibility of Subcommittee F15.24 on Jewelry.

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[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.

2.2 *Code of Federal Regulations:*[3]

16 CFR 1500.14 Products requiring special labeling under section 3(b) of the act

2.3 *CPSC Standards:*[4]

CPSC-CH-E1001-08 Standard Operating Procedure for Determining Total Lead (Pb) in Non-Metal Children's Products

CPSC-CH-E1002-08 Standard Operating Procedure for Determining Total Lead (Pb) in Children's Metal Products (Including Children's Metal Jewelry)

CPSC-CH-E1003-09 Standard Operating Procedure for Determining Lead (Pb) in Paint and Other Similar Surface Coatings

CPSC-CH-E1004-11 Standard Operating Procedure for Determining Cadmium (Cd) Extractability from Children's Metal Jewelry

2.4 *EPA Standards:*[5]

EPA 3050B Acid Digestion of Sediments, Sludges, and Soils

EPA 3051A Microwave Assisted Acid Digestion of Sediments, Sludges, Soils, and Oils

EPA 3052 Microwave Assisted Digestion of Siliceous and Organically Based Matrices

2.5 *European Standards:*[6]

CR 12471: 2002 Screening tests for nickel release from alloys and coatings in items that come into direct and prolonged contact with the skin

EN 1811: 2011 Reference test method for release of nickel from all post assemblies which are inserted into pierced parts of the human body and articles intended to come into direct and prolonged contact with the skin

EN 12472: 2009 Method for the simulation of wear and corrosion for the detection of nickel release from coated items

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *jewelry, n*—a product principally designed and intended as an ornament worn by a person and includes the following:

a. Anklet
b. Arm cuff
c. Bracelet
d. Brooch
e. Chain
f. Crown or tiara
g. Cuff link
h. Hair accessory with significant decorative elements[7]
i. Earrings
j. Ear cuffs
k. Necklace
l. Pins (such as tie tacks and trading pins)
m. Ring
n. Body piercing jewelry
o. Jewelry placed in the mouth for display or ornament
p. Any component of a product listed in *a* – *o*.
q. Any charm, bead, chain, link, pendant or other attachment to shoes or clothing designed to be removed and worn, alone or attached to an item in *a* – *o*, as an ornament by a person.
r. Watch in which a timepiece is a component of an ornament, excluding the timepiece itself if the timepiece can be removed from the ornament.
s. Jewelry components in craft kits where the final assembled jewelry product is principally designed and intended as an ornament worn by a person. Tools used to make jewelry are not jewelry.

3.1.2 *body piercing jewelry, n*—any part of jewelry that is manufactured or sold for placement in a new piercing or a mucous membrane, but does not include any part of that jewelry that is not placed within a new piercing or a mucous membrane.

3.1.2.1 *Discussion*—Earrings, unless specifically sold for a new piercing, are not body piercing jewelry.

3.1.3 *adult jewelry, n*—jewelry designed or intended primarily for use by consumers over age 12.

3.1.4 *paint and surface coating, n*—a fluid, semi-fluid, or other material, with or without a suspension of finely divided coloring matter, which changes to a solid film when a thin layer is applied to a metal, wood, stone, paper, leather, cloth, plastic, or other surface.

3.1.4.1 *Discussion*—This term does not include printing inks or those materials which actually become apart of the substrate, such as the pigment in a plastic article, or those materials which are actually bonded to the substrate, such as by electroplating or ceramic glazing.

3.1.5 *hazardous magnet, n*—a magnet with a flux index >50 as measured by the method described in Consumer Safety Specification F963-11 and which is swallowable or a small object.

3.1.6 *accessible, n*—jewelry or a jewelry component shall be considered accessible if it is swallowable, ingestible or mouthable in an as-received condition.

3.1.6.1 *Discussion*—Jewelry or a jewelry component shall be considered swallowable or ingestible pursuant to the method described in 14.7. Jewelry or a jewelry component shall be considered mouthable if it does not fit within the test apparatus described in 14.7 but has a dimension less than 5 cm in any direction.

[3] Available from U.S. Government Printing Office Superintendent of Documents, 732 N. Capitol St., NW, Mail Stop: SDE, Washington, DC 20401, http://www.access.gpo.gov.

[4] Available from U.S. Consumer Product Safety Commission (CPSC), 4330 East West Hwy., Bethesda, MD 20814, http://www.cpsc.gov. All subsequent versions of these Standard Operating Procedures approved by the CPSC staff satisfy this standard.

[5] Available from United States Environmental Protection Agency (EPA), Ariel Rios Bldg., 1200 Pennsylvania Ave., NW, Washington, DC 20004, http://www.epa.gov.

[6] Available from European Committee for Standardization (CEN), Avenue Marnix 17, B-1000, Brussels, Belgium, http://www.cen.eu. Many national organizations issue their own versions of these test methods; these versions will satisfy this standard.

[7] Bobby pins, barrettes, headbands, etc. without a significant decorative element are not hair accessories, but are grooming aids. Combs, brushes and similar items not intended to be worn as an item of personal ornamentation are not hair accessories. Novelty products such as deely boppers are not hair accessories.

TABLE 1 Lead Content Limits for Adult Jewelry

Materials Covered (Except as Excluded per Table 2)	Maximum Total Lead Limits in Adult Jewelry
Electroplated metal with suitable under and finish coats	6.0%
Unplated metal	1.5%
Plastic or rubber, including acrylic, polystyrene, plastic beads and stones, and polyvinyl chloride (PVC)	200 ppm
Materials not otherwise classified	600 ppm
Paint or surface coating	600 ppm

TABLE 2 Materials Excluded from Lead Limits in Adult Jewelry

Stainless or surgical steel within the designations of Unified Numbering System UNS S13800 – S66286, not including the stainless steel designated as 303 Pb (UNS S30360), provided that no lead or lead-containing metal is intentionally added
Precious metals: gold; sterling silver (at least 925/1000); platinum; palladium; rhodium; osmium; iridium; ruthenium; titanium
Natural or cultured pearls
Precious gemstones: diamond, ruby, sapphire, emerald
Glass, ceramic, or crystal decorative components, including cat's eye, cubic zirconia, cubic zirconium (CZ), rhinestones, and cloisonné
Semiprecious gemstones and other minerals, provided they are not based on lead or lead compounds, excluding aragonite, bayldonite, boleite, cerussite, crocoite, ekanite, linarite, mimetite, phosgenite, samarskite, vanadinite and wulfenite
Wood, provided it is not treated in any way to add lead
Paper and similar materials made from wood or other cellulosic fiber, including, but not limited to, paperboard, linerboard and medium, and coatings on such paper that soak into the paper and cannot be scraped off the surface
Elastic, fabric, ribbon, rope, or string, unless it contains intentionally added lead
All natural decorative material, including amber, bone, coral, feathers, fur, horn, leather, shell or wood, that is in its natural state and is not treated in a way that adds lead
Adhesive
Repurposed components. Repurposed components are "found" objects that are incorporated into jewelry, and may include, but are not limited to, silver or pewter utensils, bottle caps, buttons.

TABLE 3 Approved Materials for Adult Body-Piercing Jewelry

Surgical implant stainless steel
Surgical implant grade titanium
Niobium (Nb)
Solid 14 karat or higher white or nickel-free gold
Solid platinum
A dense, low-porosity plastic, including, but not limited to,Tygon or Polytetrafluoroethylene (PTFE) if the plastic contains no intentionally added lead

4. Intended User Labeling and Warnings[8]

4.1 Jewelry designed or intended primarily for use by consumers over age 12 may include an age label reflecting the primary intended user for whom the product is designed and intended, or a warning that the product is not intended for children. Examples of an age label might include, but are not limited to, "Not for children 12 and younger," "Not for <12," "For 13+," "Adult use only," or any similar language, symbol or combination designed to communicate the primary intended user. User labels, if provided, can appear in any reasonable location where they will be seen and understood by the target consumer.

5. Specification for Lead in Adult Jewelry

5.1 *Lead Content Limits for Components of Adult Jewelry:*

5.1.1 Accessible components[9] of adult jewelry shall meet the lead content limits of Table 1 unless the component is excluded per Table 2.

5.1.2 *References*—Tests for total lead content shall be conducted in accordance with a method appropriate for the material in 14.1.

5.2 *Exclusions from Lead Content Testing Requirements in Adult Jewelry:*

5.2.1 The materials listed in Table 2 are excluded from testing for total lead content in any component of adult jewelry.

6. Specifications for Adult Body-Piercing Jewelry

6.1 Body-piercing jewelry shall be made exclusively of the materials listed in Table 3.

7. Specifications for Antimony, Arsenic, Barium, Cadmium, Chromium, Mercury, and Selenium in Paint and Surface Coatings of Adult Jewelry

7.1 Surface-coating materials applied on or to adult jewelry shall not contain compounds of antimony, arsenic, barium, cadmium, chromium, mercury, or selenium, of which the metal content of the *soluble* material of these substances is in excess of the levels by weight of the contained solids (including pigments, film solids, and driers) given in Table 4. The analytical results obtained should be adjusted in accordance with the test method described in 14.2 prior to comparing them to the values in Table 4 to determine conformance. The soluble level shall be determined by dissolving the contained solids (dried film including pigments, film solids, and driers) as specified in 14.2. An alternative test method may be used if it meets the requirements of Annex A1.

7.2 *Reference*—Specification F2923; Consumer Safety Specification F963-11. Follow recommended instructions and shield the test material from light.[10]

8. Specification for Cadmium in Certain Substrate Materials of Adult Jewelry

8.1 Accessible metal or plastic/polymeric components of adult jewelry shall be screened for total cadmium content.

[8] Specification F2923 sets forth comprehensive standards for children's jewelry (jewelry designed or intended primarily for use by consumers 12 and under). The standard includes detailed guidance for age grading, as well as guidance and checklists to assist in distinguishing children's jewelry from adult jewelry.

[9] Where components are made of the same material, only one component is subject to any chemical test references in this standard.

[10] "It has been shown that the extraction of soluble cadmium can reveal a two-fold to five-fold increase when extraction is conducted in the light rather than the dark." Consumer Safety Specification F963-11, Section 8.3.4, Note 7.

TABLE 4 Maximum Soluble Migrated Antimony, Arsenic, Barium, Cadmium, Chromium, Mercury and Selenium from Paint and Surface Coating of Adult Jewelry

Element	Antimony (Sb)	Arsenic (As)	Barium (Ba)	Cadmium (Cd)	Chromium (Cr)	Mercury (Hg)	Selenium (Se)
Maximum soluble element (in mg/kg or ppm) in paint or surface coatings of adult jewelry[A]	60	25	1000	75	60	60	500

[A] Due to interlaboratory variability, Specification F2923 and Consumer Safety Specification F963-11 establish the following analytical correction factors (in %): Sb, As and Se: 60%; Hg: 50%; Ba, Cd, and Cr: 30%.

Covered components of adult jewelry containing 1.5 % or less total cadmium do not need to be tested for migratable cadmium. Compliance with the screening limits may be established by any method appropriate for the covered material in 14.1. Potentially ingestible or swallowable covered components of adult jewelry that exceed this screening level shall be tested for soluble cadmium using an acid extraction test. Swallowable parts shall be identified by the method described in 14.7. The soluble level shall be determined by using the method and limits specified in 14.3 where the component is a plastic or polymeric material, and by using the method and limits specified in 14.4 where the component is metal. Covered components that are mouthable and not ingestible or swallowable shall be tested using a saline extraction test using the method and limits specified in 14.5. If a jewelry product or component in one dimension is smaller than 5 cm, it is mouthable. An alternative test method may be used in lieu of any of these methods if it meets the requirements of Annex A1.

8.2 *Exclusions from Cadmium Substrate Testing Requirements in Adult Jewelry:*

8.2.1 Only accessible metal or plastic/polymeric components are subject to cadmium substrate testing. All other materials are excluded from screening and/or testing. Other materials may be added should data or information regarding potential exposure risks from cadmium in other materials become available.

8.2.2 *Reference*—Specification F2923.

9. Antimony, Arsenic, Barium, Chromium, Mercury and Selenium in Substrates of Adult Jewelry

9.1 This standard does not establish limits on antimony, arsenic, barium, chromium, mercury and selenium in substrate materials used in adult jewelry based on the absence of data establishing a potential safety risk.

10. Representations Regarding Nickel Exposure in Metal Components of Adult Jewelry

10.1 Representations regarding the safety of adult jewelry for adults sensitive to nickel or the limited potential for nickel to be released from metal components of adult jewelry shall be based on reasonable and representative tests, analyses or compositional assessments suitable for the application. Reasonable and appropriate test methods include, but are not limited to, those identified in 14.6. Precious metals listed in Table 2, and stainless or surgical steel grades 304, 316 or 430, are expected to meet these requirements and do not require testing.

10.2 *Reference*—EN 1811: 2011; CR 12741: 2002; EN 12472: 2009.

11. Phthalates in Adult Jewelry

11.1 This standard does not establish limits on phthalates in adult jewelry based on the absence of data establishing a safety risk.

12. Liquid Filled Jewelry Requirements

12.1 *Liquid Screen*—Adult jewelry should not contain materials which would require special labeling under 16 CFR 1500.14.

13. Mechanical Requirements for Adult Jewelry

13.1 *Hazardous Magnets*—Adult jewelry that contains hazardous magnets as received should include a warning statement which contains the following text or substantially equivalent text which clearly conveys the same warning.

13.1.1 For all adult jewelry containing hazardous magnets:

WARNING. Contains magnets. Prolonged wearing can form a hole in body tissue. Swallowed or inhaled magnets can attract through and squeeze intestines or other body tissue, causing serious injury or death. Seek immediate medical attention if swallowed or inhaled.

NOTE 1—Manufacturers of adult jewelry containing hazardous magnets should be aware that magnetic fields can affect the function of pacemakers or other implanted electronic medical devices. Consideration of additional warnings should be given.

13.2 *Adult Jewelry Containing Batteries*—This requirement is intended to address ingestion and inhalation hazards associated with adult jewelry that contains batteries.

13.2.1 For all adult jewelry with batteries, batteries that are swallowable or small objects as specified in 14.7 shall not be accessible without the use of a coin, screwdriver, or other common household tool. Testing is performed using the recommended batteries installed.

13.3 *Suction Tongue Studs*—Suction tongue studs should include a warning statement which contains the following text or substantially equivalent text which clearly conveys the same warning:

WARNING. CHOKING HAZARD. Keep away from children.

14. Test Methods

14.1 *Test Methods to Determine Total Heavy Element Content:*

14.1.1 Testing to determine total heavy element content, including for screening purposes, shall be based on any suitable method, such as:

(1) CPSC-CH-E1003-09
(2) CPSC-CH-E1001-08
(3) CPSC-CH-E1002-08
(4) EPA 3050B
(5) EPA 3051A
(6) EPA 3052
(7) Test Method F2853-10

14.1.2 Composite testing of similar or like materials in accordance with Annex A7 of Consumer Safety Specification F963-11 is acceptable.

14.2 *Method to Dissolve Soluble Matter in Paint and Surface Coatings:*

14.2.1 Soluble elements in paint and surface coatings of jewelry should be tested in accordance with the method to dissolve soluble matter in paint and surface coatings of toys as required in Consumer Safety Specification F963-11. Consistent with Consumer Safety Specification F963-11, if the sample weight of surface coating materials is less than 10 mg, the sample is not tested for soluble heavy metals in coatings.

14.3 *Method to Determine Cadmium Availability in Plastic Jewelry Components:*

14.3.1 Plastic components of jewelry that are swallowable and exceed 1.5 % total cadmium shall be tested for migratable cadmium in accordance with Consumer Safety Specification F963-11.

14.3.2 Extracted cadmium shall not exceed 75 mg/kg (75 ppm). The analytical results as determined in 14.3 shall be adjusted by subtracting the assumed inter-laboratory analytical correction factor of 30 %.

14.4 *Method to Determine Cadmium Availability in Metal Jewelry Components*—Metal components of jewelry that are swallowable and exceed 1.5 % total cadmium shall be tested for migratable cadmium in accordance with CPSC-CH-E1004-11, as adjusted for inter-laboratory variability in accordance with 14.4.1.

14.4.1 Extracted cadmium shall not exceed 200 µg. The analytical results as determined in 14.4 shall be adjusted by subtracting the assumed inter-laboratory analytical correction factor of 30 %.

14.4.1.1 *Example 1*—The analytical result for cadmium is 230 µg; the correction factor is 30 % (0.30). Adjusted analytical results = 230 − (230 × 0.30) = 230 − 69 = 161. The result does not exceed the allowed value for migratable cadmium and is therefore acceptable.

14.4.1.2 *Example 2*—The analytical result for migratable cadmium is 300 µg; the correction factor is 30 % (0.30). Adjusted analytical results = 300 − (300 × 0.30) = 300 − 90 = 210. The result exceeds the allowed value for migratable cadmium and is therefore not acceptable.

14.5 *Saline Extraction Procedure for Plastic and Metal Components of Jewelry:*

14.5.1 The saline extraction simulates exposure to metal or plastic components of adult jewelry that are not potentially ingestible or swallowable but may be mouthed. The analysis is generally performed on an intact item or component unless the component is too large. In that case a representative homogeneous sample may be cut from the item. The procedure for the saline extraction is based on CPSC Standard Operating Procedure for Measuring Lead in Children's Metal Jewelry, February 3, 2005, Section II, modified as follows:

14.5.1.1 Suspend the adult jewelry item in a flask or beaker using insulated wire so that the item does not touch the bottom or edge of the flask/beaker, but will be submerged by saline.

14.5.1.2 Add a volume in millilitres of 0.9 % saline (NaCl) solution equal to 50 times the mass in grams of the jewelry item. Record the volume added.

14.5.1.3 Extraction is conducted for 6 h at 37°C in the shaker bath.

14.5.1.4 The extracted solution is analyzed for cadmium content using an ICP spectrometer. Analysis procedure is based on methodology found in Test Method E1613.

14.5.1.5 Extracted cadmium shall not exceed 18 µg.

14.6 *Nickel Release Tests*—Statements regarding the propensity of metal components of jewelry to release or expose consumers to nickel shall be based on reasonable and appropriate tests, such as:

14.6.1 *EN 1811: 2011*—Reference test method for release of nickel from all post assemblies which are inserted into pierced parts of the human body and articles intended to come into direct and prolonged contact with the skin.

14.6.2 *EN 12472: 2009*—Method for the simulation of wear and corrosion for the detection of nickel release from coated items.

14.6.3 *CR 12471: 2002*—Screening test for nickel release from alloys and coatings in items that come into direct and prolonged contact with skin.

14.7 *Test Requirements for Identifying Swallowable Components and Small Objects:*

14.7.1 A component or product is considered swallowable or a small object when it is small enough to fit entirely, without compressing it, within a cylinder with the dimensions shown in Fig. 1.

15. Keywords

15.1 adult jewelry; antimony; batteries; body piercing jewelry; cadmium; hazardous magnets; lead; migration; nickel; phthalates

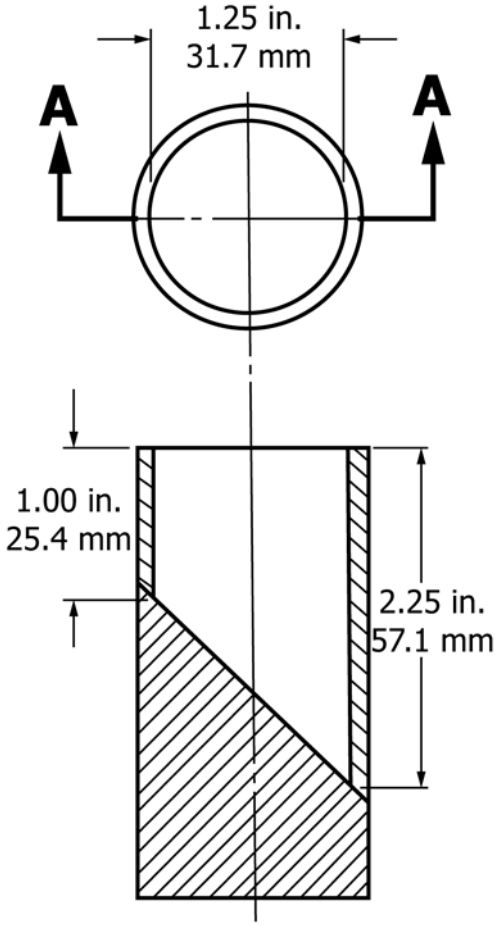

FIG. 1 Small Parts Cylinder

ANNEXES

(Mandatory Information)

A1. ALTERNATIVE TEST METHODS

A1.1 For purposes of determining compliance with the requirements contained in this safety specification, "reasonable and representative tests" shall be used. Reasonable and representative tests could be either the tests contained in Section 14, or alternate tests which utilize apparatus and/or procedures other than those in Section 14. The following paragraphs set forth the conditions under which alternate tests with apparatus or procedures other than that described in Section 14 will be considered reasonable and representative.

A1.1.1 Persons and firms determining the compliance of materials subject to the requirements contained in this standard may base those determinations on any alternate test utilizing apparatus or procedures other than those in Section 14, if such alternate test is as stringent as, or more stringent than, the tests in Section 14. An alternate test is considered to be "as stringent as, or more stringent than" a test in Section 14 if, when testing identical specimens, the alternate test yields failing results as often as, or more often than, the test in Section 14. Any person using such an alternate test must have data or information to demonstrate that the alternate test is as stringent as, or more stringent than, the test in Section 14. For example XRF screening could be used and determined to be a more stringent test method to the extent applicable for the material tested.

A1.1.2 The data or information required by Section 14 to demonstrate equivalent or greater stringency of any alternate test using apparatus or procedures other than those in Section 14 must be in the possession of the person or firm desiring to use such alternate test before the alternate test may be used to support a determination of compliance against the requirements contained in Section 14.

A1.1.3 The data or information required by paragraph A1.1.1 to demonstrate equivalent or greater stringency of any alternate test using apparatus or procedures other than those in Section 14 must be retained for as long as that alternate test is used to support determinations of compliance against the requirements contained in Section 14, and for one year thereafter.

A2. RATIONALE

A2.1 *Intended User Labeling*:

A2.1.1 Labeling to identify the primary intended user or consumer of jewelry in a manner which clarifies that the target user is a teen or adult is encouraged. Users of this standard are also encouraged to consult Specification F2923, which provides guidance on identifying children's jewelry versus adult jewelry.

A2.2 *Specification for Lead in Adult Jewelry*:

A2.2.1 The specified lead limits for adult jewelry are based on extensive test data that established the safety of these limits for various materials used in jewelry. The Subcommittee considered, and rejected, international standards, such as limits on lead in jewelry in the EU, because they apply to adult and to children's products without distinguishing the difference in how adults and children handle jewelry and thus the differing potential risks. Further, it is not apparent that those limits were established based on a consideration of the actual risks associated with migration in the event of accidental mouthing or ingestion.

A2.2.2 Exclusions from the lead limits include materials not known to contain lead or known to contain lead that is not bioavailable, for example, as in crystal, ceramics or cloisonne. An additional exclusion is permitted for repurposed materials, including "found" objects incorporated into adult jewelry. Such items are typically one of a kind; testing is infeasible as it would destroy the item, and no available data suggests that use of repurposed items or components in adult jewelry covered by this standard is associated with any risk of harm to users.

A2.3 *Specifications For Antimony, Arsenic, Barium, Cadmium, Chromium, Mercury, And Selenium in Paint and Surface Coatings of Adult Jewelry*:

A2.3.1 The specified limits are based on requirements for children's jewelry in Specification F2923. While higher limits can be justified on a scientific basis, compliant coatings are widely available that meet these requirements.

A2.4 *Specification for Cadmium in Adult Jewelry*:

A2.4.1 The recommended cadmium screening limit for adult jewelry derives from CPSC tests of migration of cadmium from metal and plastic components of children's jewelry using a 24-h acid extraction test that involves constant shaking.[11] The Subcommittee considered, and rejected, international standards, such as limits on cadmium in jewelry in the EU, because they apply to adult and to children's products without distinguishing the difference in how adults and children handle jewelry and thus the differing potential risks. Further, it is not apparent that those limits were established based on a consideration of the actual risks associated with migration in the event of accidental mouthing or ingestion. Instead, the ASTM Subcommittee looked to CPSC and similar data evaluating migration of cadmium from jewelry. The CPSC report indicates that samples containing approximately 1.3 % cadmium showed virtually no migratable cadmium. This data is the basis for adoption of the screening limit, which represents a very conservative approach to assessing cadmium exposure in metal and plastics. The screening limit has been rounded for convenience to be consistent with applicable limits for lead in unplated metal. The safety rationale for the lead limits is discussed in A2.2. Notably, the CPSC's data suggests that cadmium may bind more closely to the substrate than lead, meaning cadmium is less likely to migrate than lead. This reinforces the conservative nature of the screening limit. Materials other than metal or plastic are excluded from the cadmium limits.

A2.5 *Antimony, Arsenic, Barium, Chromium, Mercury and Selenium in Certain Substrates of Adult Jewelry*:

A2.5.1 This standard adopts migration limits on the presence of antimony, arsenic, barium, chromium, mercury and selenium only in paint and surface coatings of adult jewelry. No limits on these substances are established for substrate materials used in adult jewelry. There are no known adverse health effects associated with historic use of these materials in jewelry and jewelry components in products for either adults or children, and no limits for these materials in substrate are required for children's jewelry under Specification F2923. The ASTM Subcommittee considered and rejected the need for imposing limits on these materials in this standard. To assist users of this standard, however, use of antimony and chromium in jewelry are highlighted below.

A2.5.2 Antimony is commonly alloyed with tin, including in pewter, for example. The Federal Trade Commission's Guides for the Jewelry, Precious Metals and Pewter Industries (16 C.F.R. §23.8) requires that pewter must be made of at least 900 parts per 1000 Grade A Tin, with the remainder composed of metals appropriate for use in pewter. Antimony is such a material, as it imparts strength, hardness and corrosion-resistance to tin. Use of antimony as a substitute for lead in pewter is an early example of "green chemistry" in action. Tin itself will contain trace amounts of antimony (typically in the

[11] CPSC Staff Report: Cadmium in Children's Metal Jewelry, October, 2010, p. 55, http://www.cpsc.gov/library/foia/foia11/os/cadmiumjewelry.pdf.

range of 200 ppm). Antimony is also used in some "lead-free" solders. To achieve appropriate technical functionality in jewelry, solders must melt at a lower temperature than the substrate material it is joining, which is why the addition of a metal such as antimony provides technical functionality in the solder. In the glass and crystal industry, antimony is an essential element used as a refining agent to remove bubbles caused by the melting process. Without antimony, bubbles will remain in the crystal and the brilliance will be destroyed.

A2.5.3 As another example, chromium gives stainless and surgical steel anti-corrosion properties and is present at levels that can approach 20 %. Stainless and surgical steel are deemed extremely safe. Surgical implant steel is a recommended material for use in body piercing jewelry, for example.

A2.5.4 Based on the absence of any known health risks associated with exposure to these materials in substrates of adult jewelry, this standard does not set limits on them.

A2.6 *Representations Regarding Nickel Exposure in Metal Components of Adult Jewelry*:

A2.6.1 The standard does not impose a limit on nickel migration in adult jewelry. However, a minority of adults (10 to 20 % of the general population) may be sensitive to nickel and seek out jewelry with a statement about nickel content or exposure. The standard therefore requires that any representations regarding the safety of adult jewelry for adults sensitive to nickel in labeling or advertising must be based on reasonable and representative tests, analyses or compositional assessments suitable for the application. Some appropriate test methods are listed in 14.6. These tests are not intended to be the exclusive way that such representations may be supported. Compositional analyses, product specifications or any other reasonable method developed by the manufacturer may also provide a basis to support representations related to limited nickel exposure.

A2.7 *Phthalates in Adult Jewelry*:

A2.7.1 The ASTM Subcommittee received questions about whether limits on phthalates in adult jewelry should be established. There are no limits on phthalates in the children's jewelry standard, Specification F2923. Phthalates are plasticizers typically used to add flexibility to certain types of plastics. Flexible plastics have limited use in jewelry. No data suggests that jewelry for either adults or children is a significant source of exposure to phthalates. There is limited data supporting a correlation between the percentage of phthalate in the product and the release rate (migration). Phthalates are not acutely toxic. Depending on the phthalate or mixture, major sources of exposure to phthalates include food, personal care products, industrial materials (adhesives, caulks and sealants, paints, coatings), dust, vinyl home products, building materials and automobile interiors, medical devices and supplements/medications. As jewelry products would be inconsistently worn ("mixed and matched") and should phthalate exposure occur through occasional mouthing or accidental ingestion, this would be considered an incidental or acute exposure given the overall daily exposure to an individual from the aforementioned sources. Models for phthalate risk consider safety based on a threshold response (some level must be reached to obtain an effect); as such, it is assumed that jewelry use would be an insignificant contributor to the overall body burden. In fact, children's jewelry is not subject to limits on phthalates under the Consumer Product Safety Improvement Act (CPSIA); limits on certain phthalates apply only to toys, toys that can be mouthed, and child care articles. Consequently, the Subcommittee did not believe that a scientific basis existed to establish a limit on phthalates in adult jewelry in this standard.