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Standard Specification for Consumer Product Safety for Children's Jewelry[1]

This standard is issued under the fixed designation F2923; 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 children's jewelry.

1. Scope

1.1 This specification establishes requirements and test methods for specified elements and certain mechanical hazards in children's jewelry. It also includes recommendations for age labeling and warnings, and guidelines on identifying the primary intended users (children or adults). It does not purport to cover every conceivable hazard of children's jewelry. It does not cover product performance or quality, except as related to safety. This specification has no requirements for those aspects of children's jewelry that present an inherent and recognized hazard as part of the function of jewelry, such as small parts. This specification establishes requirements recognizing that not all jewelry is appropriate for all age groups. Jewelry is not recommended for young children 3 and under absent close parental supervision.

1.2 This specification applies only to jewelry, as defined in 3.2.1, which is designed or intended primarily for children 12 years of age and younger, as defined in 3.2.2. Children's jewelry is a product principally designed and intended as an ornament worn by a child. This includes a product or a component of the product intended to be removed and worn by a child as an item of ornamentation (that is, a shoe charm that can be placed on a bracelet). Adult jewelry, which is defined as jewelry designed and intended for use primarily by those over age 12, is covered by another ASTM standard, Consumer Safety Specification F2999.

1.3 This specification does not apply to the following:

1.3.1 Toy jewelry or any other products that are intended for use by a child when the child plays (that is, a necklace worn by a doll or stuffed animal; novelty jewelry with play value);[2]

1.3.2 Accessories (that is, Handbags, Belts);

1.3.3 Apparel (except as described in 3.2.1(p));

1.3.4 Footwear (except as described in 3.2.1(p));

1.3.5 Any other item whose primary purpose is functional (that is, 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:

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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 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]

[1] This 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] Any product which is predominately used for play value is a toy. Toys are subject to the requirements of Consumer Safety Specification F963-11.

[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.

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
F2999 Consumer Safety Specification for Adult Jewelry

2.2 *CPSC Standards:*[4]

CPSC-CH-E1003-09 Standard Operating Procedure for Determining Lead (Pb) in Paint and Other Similar Surface Coatings, April 26, 2009
CPSC-CH-E1002-08 Standard Operating Procedure for Determining Total Lead (Pb) in Non-Metal Children's Products, February 1, 2009
CPSC-CH-E1001-08 Standard Operating Procedure for Determining Total Lead (Pb) in Children's Metal Products (Including Children's Metal Jewelry)
CPSC-CH-E1004-11 Standard Operating Procedure for Determining Cadmium (Cd) Extractability from Children's Metal Jewelry

2.3 *European Standards:*[5]

CR 12471: 2002 Screening test 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

2.4 *CFR Standard:*

16 CFR 1500.4 Human experience with hazardous substances
16 CFR 1500.14 Products requiring special labeling under section 3(b) of the act
16 CFR 1500.48 Technical requirements for determining a sharp point in toys and other articles intended for use by children under 8 years of age
16 CFR 1500.49 Technical requirements for determining a sharp metal or glass edge in toys and other articles intended for use by children under 8 years of age
16 CFR 1500.50-53 Test methods for simulating use and abuse of toys and other articles intended for use by children
16 CFR 1500.91 Determinations regarding lead content for certain materials or products under section 101 of the Consumer Product Safety Improvement Act
16 CFR 1500.231 Guidance for hazardous liquid chemicals in children's products
16 CFR 1501.3 Exemptions
16 CFR 1501.4 Size requirements and test procedure

[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 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 the requirements of this standard.

3. Terminology

3.1 Refer to Annex A1 for Age Determination Guidelines for children and adult jewelry.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *jewelry*—jewelry is 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[A]
i.	Earrings or ear cuffs
j.	Necklace
k.	Pins (such as tie tacks and trading pins)
l.	Ring
m.	Body piercing jewelry
n.	Jewelry placed in the mouth for display or ornament
o.	Any component of a product listed in a – n.
p.	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 - n, as an ornament by a person.
q.	Watch in which a timepiece is a component of an ornament, excluding the timepiece itself if the timepiece can be removed from the ornament.
r.	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.

[A] 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.

3.2.2 *body piercing jewelry*—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. Earrings, unless specifically sold for a new piercing, are not body piercing jewelry. Components of children's jewelry that are not in contact with a mucous membrane are not subject to the requirements of body piercing jewelry but are subject to the other applicable requirements of this specification.

3.2.3 *children's jewelry*—Children's jewelry is jewelry designed or intended primarily for use by children 12 years of age or younger. Jewelry shall be considered children's jewelry when:

a. Represented in its packaging, display, promotion or advertising as appropriate for use by a child 12 years of age or younger.
b. Sold in conjunction with, attached to, or packaged together with other products that are packaged, displayed, or advertised as appropriate for use by children 12 years of age or younger.
c. Sized for children 12 years of age or younger and not designed or intended primarily for use by consumers 13 and older.
d. Sold in any of the following:
(i) A vending machine.
(ii) A retail store, catalogue, or online website, in which a person exclusively offers for sale products that are packaged, displayed, or advertised as appropriate for use primarily by children 12 years of age or younger.
(iii) A discrete portion of a retail store, catalogue, or online Internet Web site, in which a person offers for sale products that are packaged, displayed, or advertised as appropriate or intended for use primarily by children 12 years of age or younger.
e. Labeled in a manner indicating that the product is designed and intended primarily for children 12 years of age or younger (for example, "For children 3+," "For ages 4 – 8.")

3.2.4 *hazardous magnet*—As defined in Consumer Safety Specification F963-11.

3.2.5 *hazardous magnetic component*—As defined in Consumer Safety Specification F963-11, except that chains with a length greater than 6 in. are exempt from the definition of hazardous magnetic components.

3.2.6 *functional sharp point*—Any accessible, potentially hazardous sharp point included in the product that is essential for the intended function of the product.

3.2.7 *button cell battery*—A battery having a diameter greater than its height.

3.2.8 *suction tongue stud*—A small bead with an opening on one side only, which acts to create a vacuum and is intended for use as jewelry on the human tongue, without the need for piercing.

3.2.9 *direct and prolonged skin contact*—direct contact with the skin for 1 h or more a day.

3.2.10 *normal use*—use as designed and intended.

4. Age-Labeling

4.1 Jewelry often features decorative motifs such as animals, flowers, insects, initials or names, characters, as well as bright colors, beads and other materials. Because jewelry with these motifs can be designed and intended primarily for adults or can be designed and intended primarily for children, manufacturer age labels, marketing, advertising, distribution, size and retail store placement must be considered in determining whether jewelry is children's jewelry. In evaluating when jewelry is primarily intended for children 12 years of age or younger, the following factors should be considered:

4.1.1 A statement by the manufacturer about the intended use of the product, including a label on the product if such statement is reasonable;

4.1.2 Whether the product is represented in its packaging, display, promotion or advertising as appropriate for use by the ages specified;

4.1.3 Whether the product is commonly recognized by consumers as being primarily intended for use by a child of the ages specified; and

4.1.4 The CPSC Age Determination Guidelines: Relating Children's Ages to Toy Characteristics and Play Behavior (Age Determination Guidelines).

4.1.4.1 The Age Determination Guidelines were developed to identify toy characteristics and play behavior. They are of most value in evaluating the appropriate age grading of jewelry once the jewelry is identified as primarily intended for children 12 years of age or younger looking at the other factors. Jewelry is not recommended for children under 3 except under close parental supervision. Annex A1 outlines considerations important to determining when jewelry is children's jewelry for purposes of determining age suitability.

4.2 It is recommended that children's jewelry include an age label to provide point-of-sale guidance to consumers about the selection of appropriate jewelry for children of average abilities and interests as to safety-related aspects of children's jewelry, based on the manufacturer's design and intent, where such labeling is feasible and appropriate.

4.3 When children's jewelry is age-labeled, the label should be placed in a location likely to be seen by the purchaser under typical retail conditions. For children's jewelry that is packaged, it should appear in a location on the package where it is likely to be seen by the purchaser, since the type of package, form and format may differ. Some children's jewelry is sold with a small price tag (¾ × ⅜ in. in size) attached. Age labels and any other required warnings could appear on the back of price tags attached to individual items of unpackaged children's jewelry. Earrings are often sold on earring cards, where the side of the card facing the consumer is covered by the earring itself. The back of the card typically includes pricing and other information. The age label could be placed on the back of the price tag or earring card, or could appear in a retail location, such as a retail shelf card, where it is likely to be seen by the purchaser.

4.4 Many children's jewelry items are sold in an unpackaged form, displayed on T-Bar or similar displays, or laid out in cases or special display stands. Items may or may not include individual price tags and price information may be available at a bin, container, case or display area. For jewelry that is not packaged, the age label or other warnings may appear on the individual price tag or may be presented in the form of a retail shelf card or display card in a size and form reasonably calculated to be seen by the purchaser. Age labels for children's jewelry sold in print catalogues or online stores

TABLE 1 Lead Content Limits for Children's Jewelry

Materials Covered (Except as Excluded per Table 2)	Maximum Total Lead Limits (ppm) in Children's Jewelry
All substrates	100 ppm[A]
Paint or surface coating	90 ppm

[A] This limit will not apply to 1) any material for which the CPSC makes a finding that meeting a 100 ppm limit is not technologically feasible, and 2) any material for which an exemption from such limits has been approved by the CPSC. If the U.S. Congress adopts different standards or schedules for lead content in children's products, this standard will conform to those limits.

TABLE 2 Materials Excluded from Lead Limits in Children's 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 (at least 10 karat); sterling silver (at least 925/1000); platinum; palladium; rhodium; osmium; iridium; ruthenium; titanium
Natural or cultured pearls
Precious gemstones: diamond, ruby, sapphire, emerald
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[A]
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
Textiles (excluding after-treatment applications, including screen prints, transfers, decals or other prints) consisting of: 1) Natural fibers (dyed or undyed), including, but not limited to, cotton, kapok, flax, linen, jute, ramie, hemp, kenaf, bamboo, coir, sisal, silk, wool (sheep), alpaca, llama, goat (mohair, cashmere), rabbit (angora), camel, horse, yak, vicuna, qiviut, guanaco or 2) Manufactured fibers (dyed or undyed), including, but not limited to, rayon, azlon, lyocell, acetate, triacetate, rubber, polyester, olefin, nylon, acrylic, modacrylic, aramid, spandex
Other plant-derived and animal-derived materials, including, but not limited to, animal glue, bee's wax, seeds, nut shells, flowers, bone, sea shell, coral, amber, feathers, fur, leather in its natural state not treated in any way to add lead
CMYK printing process inks (excluding spot colors, inks that are not used in the CMYK process, inks that do not become part of the jewelry substrate, and inks used in after-treatment applications, including screen prints, transfers, decals or other prints)

[A]Provided it is not treated in any way to add lead.

should be displayed with the item or, if all children's jewelry available for sale in the area or section of the catalogue or online store is subject to the same age recommendation, the age label may be displayed in a size and form reasonably calculated to be seen by the purchaser and understood to apply to all children's jewelry in the group.

5. Specification for Lead in Children's Jewelry

5.1 Accessible components[6] of children's jewelry shall meet the lead content limits of Table 1 unless the component is excluded per Table 2. Paint and surface coatings on children's jewelry shall meet the lead content limits of Table 1.

5.2 *References:* Tests for total lead content shall be conducted in accordance with the requirements of the Consumer Product Safety Improvement Act of 2008 (CPSIA).

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

5.2.2 Test Method: CPSC-CH-E1002-08, Standard Operating Procedure for Determining Total Lead (Pb) in Non-Metal Children's Products

5.2.3 Test Method: CPSC-CH-E1001-08, Standard Operating Procedure for Determining Total Lead (Pb) in Children's Metal Products (Including Children's Metal Jewelry)

6. Exclusions from Lead Content Testing Requirements in Children's Jewelry

6.1 The materials listed in Table 2 are excluded from testing for total lead content in any component of children's jewelry. Any additional exclusions approved by CPSC are automatically incorporated by reference into this list.

7. Specification for Children's Body-piercing Jewelry

7.1 Children's body-piercing jewelry shall be made exclusively of the materials listed in Table 3.

8. Specification for Antimony, Arsenic, Barium, Cadmium, Chromium, Mercury, and Selenium in Paint and Surface Coatings of Children's Jewelry

8.1 Surface-coating materials applied on or to children's 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.

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

TABLE 3 Approved Materials for Children's Body Piercing Jewelry

Surgical implant stainless steel[A]
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

[A]Grades used must meet the lead exemption criteria in Table 2.

TABLE 4 Maximum Soluble Migrated Antimony, Arsenic, Barium, Cadmium, Chromium, Mercury and Selenium from Paint and Surface Coating of Children's 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 children's jewelry[A]	60	25	1000	75	60	60	500

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

The analytical results obtained should be adjusted in accordance with the test method in 13.3 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 13.3. An alternative test method may be used if it meets the requirements of Annex A2.

8.2 *Reference*—Consumer Safety Specification F963-11. Follow recommended instructions and shield the test material from light.

NOTE 1—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, 8.3.4, Note 7.

9. Specification for Cadmium in Certain Substrate Materials of Children's Jewelry

9.1 Accessible metal or plastic/polymeric components of children's jewelry shall be screened for total cadmium content. Covered components of children's jewelry containing 300 ppm or less total cadmium do not need to be tested for migratable cadmium. (See Note 2.) Covered components of children's jewelry that exceed this 300 ppm total content screening level and which are small parts as defined in 16 CFR 1501.4 shall be tested for soluble cadmium using an acid extraction test. The soluble level shall be determined by using the method and limits specified in 13.4 where the component is a plastic or polymeric material, and by using the method and limits specified in 13.5 where the component is metal. Covered components that are not small parts as defined in 16 CFR 1501.4 shall be tested using a saline extraction test using the method and limits specified in 13.6. An alternative test method may be used in lieu of any of these methods if it meets the requirements of Annex A2.

NOTE 2—This cadmium screening level is based on evaluation of data on total versus migratable materials in metals developed by the Consumer Product Safety Commission (CPSC) (See Staff Report, Cadmium in Metal Jewelry, October, 2010) and on research sponsored by the Fashion Jewelry and Accessories Trade Association (FJATA). The research suggests that plated metal components containing 2000 ppm or less total cadmium are unlikely to result in exposure to more than a fraction of the recommended target level of 200 µg cadmium, but the screening level is based on adoption of additional safety factors for calculation purposes. Data sponsored by Cookson Precious Metals involving jewelry materials or components containing low total cadmium (from 1 ppm to 1580 ppm) all passed EN 71-3: 1994 testing, and modified EN 71-3: 1994 testing at 4, 8 and 24 h (**1**).[7]

[7] The boldface numbers in parentheses refer to a list of references at the end of this standard.

9.2 *Exclusions from Cadmium Substrate Requirements in Children's Jewelry*—Only metal or plastic/polymeric components are subject to cadmium substrate testing. All other materials are excluded from screening or testing, or both. Other materials may be added should data or information regarding potential exposure risks to children from cadmium in other materials become available.

10. Specification for Nickel in Metal Components of Children's Jewelry

10.1 Migration of nickel in any post assemblies of children's jewelry which are inserted into pierced ears and other pierced parts of the human body shall not exceed 0.2 µg/cm^2/week (migration limit).

10.2 Migration of nickel in metal components of jewelry intended to come into direct and prolonged contact with the skin[8] shall not exceed 0.5 µg/cm^2/week. Items covered include:

(1) components of earrings (other than post assemblies),
(2) necklaces, bracelets, chains, anklets, finger rings,
(3) wrist-watch cases, watch straps and tighteners

10.3 Where the components used in items listed in 10.2 have a non-nickel coating such coating shall be sufficient to ensure that the rate of nickel release from those parts of such articles coming into direct and prolonged contact with the skin will not exceed 0.5 µg/cm^2/week for a period of at least two years of normal use of the article.

10.4 Precious metals listed in Table 2, and stainless or surgical steel grades 304, 316 and 430, are expected to comply with the requirements of 10.1 through 10.3 and do not require further testing for nickel migration.

10.5 Reference: EN 1811: 2011; CR 12741: 2002; EN 12472: 2009.

11. Liquid Filled Jewelry Requirements

11.1 *Liquid Screen*—Children's jewelry should not contain any materials listed in 16 CFR §1500.231 or materials which would require special labeling under 16 CFR §1500.14 Permitted liquids in liquid filled children's jewelry should be screened to eliminate potential hazards in accordance with Consumer Safety Specification F963-11.

12. Mechanical Requirements for Children's Jewelry

12.1 *Magnets*—This requirement is intended to address ingestion, inhalation and attachment hazards associated with

[8] Jewelry designed to be worn on clothing (exclusive of detachable charms or items that could be added to bracelets or other items or pin backs likely to touch the skin), the face of a pendant, or the tongue of a box clasp, are examples of jewelry components not likely to be in prolonged contact with the skin.

children's jewelry that contain a hazardous magnet. Magnets used in children's jewelry in applications such as: earrings or brooches to attach across earlobes or through cloth; closures or fasteners in necklaces or bracelets; attaching interchangeable charms on bracelets or necklaces; attaching pendant pairs; or locket closures on necklaces or rings must comply with the following requirements.

12.1.1 Children's jewelry shall not have an as-received hazardous magnet or an as-received hazardous magnetic component, with the exception of children's jewelry that complies with 12.1.3.

12.1.2 Children's jewelry shall not liberate a hazardous magnet or a hazardous magnetic component after being tested in accordance with the magnet use and abuse testing as specified in 13.2.

12.1.3 Children's jewelry intended for children 8 years of age or older consisting of earrings, brooches, necklaces or bracelets which contain loose as-received hazardous magnets or loose as-received hazardous magnetic components, as well as their instructions, if any, shall include a warning statement which contains the following text or substantially equivalent text which clearly conveys the same warning.

12.1.3.1 *For Earrings:* **WARNING** Contains small magnets. 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. Use only on ears. Prolonged wearing can form a hole in body tissue. Change earring position regularly to release pressure. Do not keep on overnight.

12.1.3.2 *For All Other Jewelry:* **WARNING** Contains small magnets. 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 3—Manufacturers of children's jewelry containing strong 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.

12.1.3.3 An equilateral triangle with an exclamation point shall precede the signal word. The height of the triangle shall be equal to or exceed the height of the letters of the signal word "WARNING" and separated from it by a distance at least equal to the space occupied by the first letter of the signal word. The height of the exclamation point shall be at least half the height of the triangle, and be centered vertically in the triangle. The warning statement in 12.1.3.1 and 12.1.3.2 must appear in a location where it is reasonably likely to be seen by the purchaser at the time of purchase, in accordance with 4.3 or 4.4. Signal words shall appear in all capitals. The cautionary statement shall appear in conspicuous and legible type which is in contrast by typography, layout, or color with other printed matter. Where color is the primary method used to achieve contrast, the color of the cautionary statement shall be in sharp contrast with the color of the background on which such a statement appears.

12.1.3.4 The labels of products that contain more than one item subject to the requirements of 12.1.3 may combine information, if the condensed statement contains all of the information necessary to describe the potential hazard associated with each product.

12.2 Breakaway features and releases. This section is intended to address the potential hazards associated with children's jewelry attached around the neck of a child, which may catch on objects in the child's environment resulting in entanglement or strangulation.

12.2.1 Children's jewelry intended to be attached around the neck shall release, either by designed breakaway feature, attachment design or physical properties of the material, when subjected to 15 lb of tension in accordance with the breakaway tension test described in 13.1.

12.2.1.1 No hazardous magnets or hazardous magnet components shall be released during the tension test unless the product is intended for children 8 and older and the product is labeled in conformance with 12.1.3.

12.2.1.2 No hazardous sharp points or hazardous sharp edges shall be observed during the tension test if the children's jewelry is intended for children 8 and under.

12.2.2 Looped children's jewelry which by reason of construction do not fit around the test fixture, having a circumference less than 9.4 in., shall not be subject to the requirements of this section.

12.3 *Sharp Points, Sharp Edges, Use and Abuse*—Children's jewelry shall be tested in accordance with 16 CFR 1500.48-53 mechanical requirements for children's products up to 8 years of age and not present any hazard(s).

12.3.1 Any functional sharp point on children's jewelry is exempt from 16 CFR 1500.48. An example is pin stems for pins or brooches.

12.4 *Small Parts*—Children's jewelry is subject to the applicable exemptions of 16 CFR 1501.3.

12.5 *Other Recommended Cautionary Labeling*—It is strongly recommended that the manufacturer consider the risk of earring components becoming embedded in the ear over long term wearing. This risk is increased with first time piercing, common with children, due to the healing process and potential for infection. Mechanical design such as larger backings or use of protective washers which increase the surface area can help prevent such incidents. If mechanical means are not implemented a warning notifying the consumer of the risk of embedding from continuous use, and to inspect a piercing regularly for potential embedding of earring components, is suggested.

12.6 *Children's Jewelry Containing Batteries:*

12.6.1 For all children's jewelry with batteries, batteries that fit completely within the small parts test cylinder as specified in 16 CFR 1501.4, Fig. 1 shall not be accessible, before or after testing in accordance with 16 CFR 1500.50-53 (as applicable), without the use of a coin, screwdriver, or other common household tool. Testing is performed using the recommended batteries installed.

12.6.2 *Battery-Operated Children's Jewelry*—For children's jewelry that use more than one replaceable battery in one circuit, the instructions or the product shall be marked with the following (or equivalent) information.

12.6.2.1 Do not mix old and new batteries.

12.6.2.2 Do not mix alkaline, standard (carbon-zinc), or rechargeable (nickel-cadmium) batteries.

12.6.3 *Children's Jewelry Containing Batteries*—Children's jewelry with non-replaceable batteries that are accessible with the use of a coin, screwdriver, or other common household tool shall bear a statement that the battery is not replaceable. If the manufacturer determines that it is impractical to label the product, this information shall be placed on the packaging or in the instructions.

12.6.4 *Unintentional Charging*—Battery-operated children's jewelry shall be designed so that it is not possible to charge any non-rechargeable battery. This can be achieved through physical design of the battery compartment or through the use of an appropriate electrical circuit design. This applies to situations in which a battery may be installed incorrectly (reversed) or in which a battery charger may be applied to jewelry containing non-rechargeable batteries, or both. This section does not apply to circuits having one or two non-rechargeable batteries as the only source of power. Children's jewelry having a circuit powered only by button cell type batteries are not subject to this requirement.

12.6.5 *Polarity Marking*—Children's jewelry shall be marked permanently on the battery compartment or on the area immediately adjacent to the battery compartment to show the correct battery polarity using the polarity symbols "+" and "–". Additional markings located on the jewelry or in the instructions must indicate the correct battery size and voltage. These markings are not required for non-replaceable batteries or for rechargeable battery packs that, by design, can only be inserted in the correct orientation. Battery compartments for button cell batteries are not subject to this requirement.

NOTE 4—The battery compartment door is considered part of the battery compartment.

12.7 *Suction Tongue Studs*—Suction tongue studs are prohibited as children's jewelry.

13. Test Methods

13.1 *Breakaway Tension Test*—Using a 1.5- ± 0.1-in. radius free pulley (Fig. 1), apply 15 lb force to the looped jewelry, with the other end looped around a 0.170 ± 0.01 in. radius fixed rod. Apply the 15 lb force over 5 s and hold for 10 s.

NOTE 5—The orientation of the test fixture can be vertical or horizontal, on a track. The weight of the free pulley may need to be accounted for if it is free hanging as shown in Fig. 1.

13.1.1 The looped jewelry shall be oriented with any clasp, breakaway or other feature in the most onerous position for testing, requiring the highest tensile force for release. Possible positions may include the apex of the pulley, in the free length of chain or at the apex of the fixed rod. Loops with multiple strands shall be tested using all strands, as it would be worn by the user.

13.2 *Magnet Test Methods*—Magnets in children's jewelry shall be evaluated in accordance with the magnet use and abuse testing as required in Consumer Safety Specification F963-11.

13.3 *Method to Dissolve Soluble Matter in Paint and Surface Coatings*—Soluble elements in paint and surface coatings of jewelry should be tested for compliance with the requirements of Section 8 in accordance with the method to dissolve soluble matter in paint and surface coatings of toys 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.

13.4 *Method to Determine Cadmium Availability in Children's Plastic Jewelry Components*—Plastic components of children's jewelry that exceed 300 ppm total cadmium shall be tested for migratable cadmium in accordance with Consumer Safety Specification F963-11.

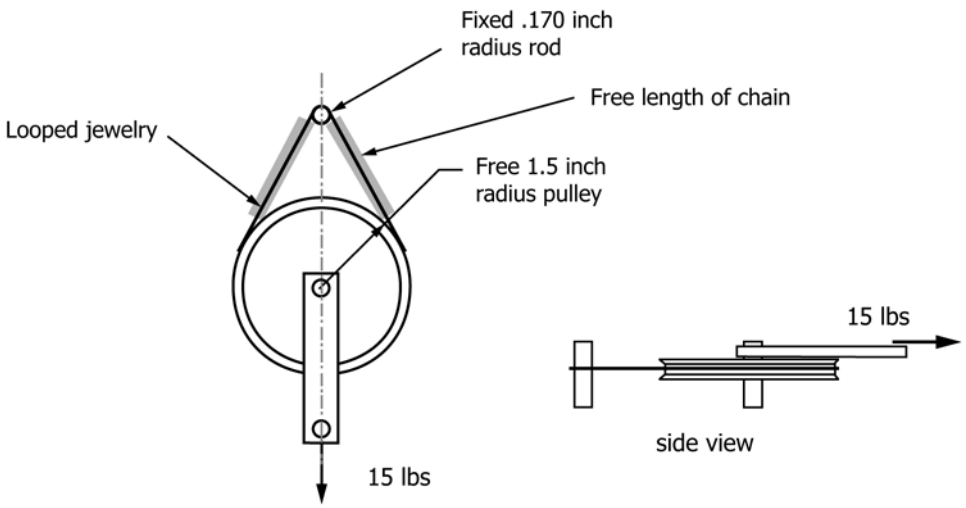

FIG. 1

13.5 *Method to Determine Cadmium Availability in Children's Metal Jewelry Components*—Metal components of children's jewelry that exceed 300 ppm total cadmium shall be tested for migratable cadmium in accordance with CPSC-CH-E1004-11, as adjusted for interlaboratory variability in accordance with 13.5.1.

13.5.1 Extracted cadmium shall not exceed 200 µg. The analytical results as determined in 13.5 shall be adjusted by subtracting the assumed inter-laboratory analytical correction factor of 30 %.

13.5.1.1 *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 µg. The result does not exceed the allowed value for migratable cadmium and is therefore acceptable.

13.5.1.2 *Example 2*—The analytical result for migratable cadmium is 300 µg; the correction factor is 30 % (0.30).

13.5.1.3 Adjusted analytical results = 300 − (300 × 0.30) = 300 − 90 = 210 µg. The result exceeds the allowed value for migratable cadmium and is therefore not acceptable.

13.6 *Saline Extraction Procedure for Plastic and Metal Components of Children's Jewelry:*

13.6.1 The saline extraction simulates exposure to metal or plastic components of children's jewelry that are not small parts 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:

13.6.1.1 Suspend the children's 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 the saline solution.

13.6.1.2 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.

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

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

13.6.1.5 Extracted cadmium shall not exceed 18 µg.

13.7 *Tests for Cleanliness and Preservative Effectiveness:*

13.7.1 *Cleanliness of Materials*—The cleanliness of cosmetics, liquids, pastes, putties, gels, and powders used in children's jewelry (excluding art materials) shall be determined using the methods in Consumer Safety Specification F963-11.

13.7.2 *Preservative Effectiveness*—The formulations of cosmetics used in children's jewelry shall be evaluated for the potential microbiological degradation, or they shall be tested for microbial control and preservative effectiveness using the methods and limits in Consumer Safety Specification F963-11.

14. Keywords

14.1 batteries; body piercing jewelry; cadmium; children's jewelry; lead; magnets; migration; nickel

ANNEXES

(Mandatory Information)

A1. AGE DETERMINATION GUIDELINES FOR JEWELRY

INTRODUCTION

Distinguishing between jewelry designed and intended for children 12 and younger and jewelry designed and intended for adult consumers (13 and older) can be challenging for those not involved in the jewelry industry. The CPSIA defines children's jewelry as jewelry designed and intended primarily for children 12 and younger. Many factors must be considered in this evaluation. Potential appeal of jewelry to a child or ability to physically wear an item is not determinative. Labeling, advertising and marketing, distribution venues, manufacturer records such as design documents and brand plans indicating age, are factors to consider. These jewelry age determination guidelines provide guidance on distinguishing between children's jewelry and adult jewelry.

A1.1 Purpose and Scope

A1.1.1 The Consumer Product Safety Improvement Act of 2008 (CPSIA) defined a "children's product" as a product designed and intended primarily for children 12 and younger. Determining the primary intended user requires an analysis of the totality of the circumstances. These guidelines provide information on factors to consider in identifying and distinguishing children's jewelry from adult jewelry.

A1.2 Guidelines for Identifying Jewelry Designed and Intended Primarily for Children 12 and Younger

A1.2.1 Children's jewelry can be identified by examining the totality of the circumstances, considering the following:

(1) Design drawings and brand or marketing plans indicating that the manufacturer's primary intended target is children 12 and under signify that the product is children's jewelry.

(2) A product label stating "For children 3 and older," "For Ages 4 – 8," or similar language indicating that the jewelry is primarily designed or intended for use by children 12 and under.

(3) A product represented in its packaging, display, promotion, or advertising as primarily designed or intended for use by children 12 years of age or younger is a children's product. This includes any explicit statement on a package or display or in advertising about the suitability for use by children 12 and under (for example, "For age 3+" or "Kids Club"). Graphics and text on jewelry packaging or displays reflecting child-oriented themes also may indicate that the product is designed and intended primarily for children 12 and under; however, the mere appearance of a brand or licensed character on a package or display does not automatically signify that the product is primarily designed and intended for children since characters often have broad appeal to all ages.

(4) Jewelry advertised to audiences comprised primarily of children 12 and under in any media is likely primarily designed or intended for use by children 12 and under. Advertising or marketing jewelry through an online store or print catalogue that exclusively advertises children's products indicates that the jewelry depicted in the online store or print catalogue is primarily designed or intended for children 12 and under. Similarly, advertising or marketing jewelry in discrete sections of an online store or catalogue which offers products for children 12 and under (for example, sections marked "Kids," "Children's Products," "Pre-teens," or "Tweens") indicates that the jewelry depicted and sold in that section of the online store or catalogue is primarily designed or intended for children 12 and under.

(5) Jewelry sold in conjunction with, attached to, or packaged together with other products packaged, displayed, or advertised as primarily designed and intended for children 12 and under indicates that the jewelry is primarily designed or intended for use by children 12 and under. An example would be a bracelet intended for personal use packaged and sold with a doll. (A doll's bracelet would be a toy, not an item of jewelry.)

(6) Placement of jewelry in stores or departments of stores (including an online store) featuring products for children or tweens indicates that the jewelry is primarily designed or intended for use by children 12 and under. Occasional misplacement of a jewelry item in a children's department or area does not indicate that the product is designed and intended primarily for children 12 and younger.

(7) Size is a key element used to identify jewelry for young children (for example, younger than age 7). Child-sized jewelry (for example bracelets that are 2 in. in diameter, 6 in. or less in length; 12-in. necklaces, excluding chokers, versus the standard 15 in. length) is generally assumed to be children's jewelry. Many jewelry items are small, so size alone is not a factor that always permits identification of an item as either "children's" or "adult" jewelry.

(8) Jewelry that depicts a celebrity, animated or other character developed primarily to appeal to children is presumed to be designed or intended primarily for children 12 and under unless labeling, advertising, or marketing, or a combination thereof, indicates that the item is a primarily intended for adults. For example, jewelry items featured in an online store with a shopping area for adult "collectibles" would be deemed primarily intended for adults, not children, as would items sold at a jewelry counter at a department store. Jewelry featuring nostalgia or holiday characters are typically designed and intended primarily for general consumer use.

(9) Jewelry sold in vending machines is designed or intended primarily for children 12 and under.

(10) Jewelry for children and for adults is sold at a wide variety of price points. While price is a factor to consider in the totality of the circumstances, it is not a determinative factor in identifying jewelry designed and intended primarily for children 12 and under, and there is no single price or cost that can be used to distinguish children's jewelry from adult jewelry.

A1.3 Guidelines for Identifying Jewelry Designed and Intended Primarily for Consumers 13 and Older

A1.3.1 The factors below may be used to identify jewelry designed or intended primarily for teens and adults.

(1) Design drawings and brand or marketing plans indicating that the manufacturer's primary intended target is adults or teens signify that the product is not a children's product.

(2) Product specifications indicating that the product should comply with requirements for non-children's products, for example, limits on lead in adult products in California and Minnesota, indicate that the product is designed and intended primarily for adults. Products that meet lead standards for non-children's jewelry sold and distributed in areas intended for adults are viewed as designed and intended primarily for adults. Such jewelry may be labeled "Meets CA and MN standards for adult jewelry"; this would also indicate that the jewelry is not designed or intended primarily for children 12 and under.

(3) Jewelry labeled "Not intended for children 12 and under" or with similar language is presumptively not designed or intended primarily for children 12 and under. Such a label may be deemed unreasonable under the totality of the circumstances if the item is sold in venues targeted to children 12 and under or with other items (for example, a doll or child's dress) intended for children.

(4) Many adult collectors enjoy collecting character- or holiday-themed jewelry. Jewelry sold as "Collectibles" in areas of online stores or print catalogues intended for collectors are not designed or intended primarily for children 12 and under. This includes character-based or holiday-themed items. A holiday-themed pin advertised in a catalogue directed to adult women or sold at the general jewelry counter of a department store is an adult item.

(5) Placement of jewelry in a teen or women's store or teen or women's department of a store indicates that the jewelry is not primarily designed or intended for use by children 12 and under, regardless of theme. Jewelry sold at the jewelry counter of a department store is not designed or intended primarily for children 12 and under unless it is in an area marked as "Children's Jewelry."

(6) Jewelry packaged or promoted as adult items are presumed to be primarily designed and intended for adults. An adult-size bracelet distributed with an adult item such as a

candle is not a children's product. A pin given as a thank-you gift to donors to a breast cancer charity or public television station is primarily designed and intended for adults.

(7) Advertising or marketing jewelry through online stores or print catalogues that exclusively advertise products for teens or women indicates that the jewelry depicted in the online store or print catalogue is not primarily designed or intended for children 12 and under. Similarly, advertising or marketing jewelry in discrete sections of online stores or catalogues which offer products for teens (for example, sections marked "Teens" or "Women") indicates that the jewelry depicted in that section of the online store or catalogue is not primarily designed or intended for children 12 and under.

(8) Jewelry for adults and for children is sold at a wide variety of price points. While price is a factor to consider in the totality of the circumstances, it is not a determinative factor in identifying jewelry designed and intended primarily for adults, and there is no single price or cost that can be used to distinguish adult jewelry from children's jewelry.

A1.4 Checklist for Age-Labeling of Children's Jewelry

A1.4.1 See Table A1.1.

A1.5 Checklist for Identifying Adult Jewelry

A1.5.1 See Table A1.2.

TABLE A1.1 Checklist for Age-Labeling of Children's Jewelry

- Does the product or product packaging include or represent a licensed or other character developed to appeal primarily to children 12 and under?
  - __ Yes
  - __ No

→ If yes, it is likely children's jewelry unless other criteria indicate it is primarily intended for teens or adults, sold as a nostalgia or collectible product, but an analysis of all factors must be conducted

- Is the jewelry intended for sale in vending machines?
  - __ Yes
  - __ No

→ If yes, it is children's jewelry; if no, continue analysis

- Is the jewelry sized for children (2 inch diameter bracelet; 13 inch necklace)?
  - __ Yes
  - __ No

→ If yes, it is likely children's jewelry, unless the necklace is a choker-type necklace that may be suitable for adults; if no, continue analysis

- Do customer specifications or requirements indicate that the product is intended primarily for children 12 and younger?
  - __ Yes
  - __ No

→ If yes, it is children's jewelry; if no, continue analysis

- Does the product packaging include graphics or copy indicating the jewelry is primarily designed or intended for children ("Kids' Club," "Kids' Collection," etc.)
  - __ Yes
  - __ No

→ If yes, it is children's jewelry; if no, continue analysis

- Will the product be supported by advertising directed primarily to children 12 and under?
  - __ Yes
  - __ No

→ If yes, it is children's jewelry; if no, continue analysis

- Will the jewelry be routinely displayed and sold in a store or department (including an online or offline catalogue or store) which features products primarily for children 12 and under (kids' department, tween department, kids' area of a jewelry counter or department, etc.)?
  - __ Yes
  - __ No

→ If yes, it is children's jewelry; if no, continue analysis

- Will the jewelry be packaged, displayed with or advertised in conjunction with another product designed or intended primarily for children 12 and under (child's dress or DVD of a child-oriented movie)?
  - __ Yes
  - __ No

→ If yes, it is children's jewelry; if no, continue analysis

- Will packaging, advertising or marketing materials show children 12 or younger wearing the product?
  - __ Yes
  - __ No

→ If yes, it is children's jewelry; if no, continue analysis

- Is a child 12 and under expected to be the primary user of the product?
  - __ Yes
  - __ No

→ If yes, it is children's jewelry; if no, continue analysis

- Are teens or adults as likely as children 12 and under to wear the product?
  - __ Yes
  - __ No

→ If yes, it is not children's jewelry

In some cases the answer to a single question establishes that the item is children's jewelry. For example, vending machine jewelry is always designed and intended primarily for children 12 and under. In others, the totality of the circumstances must be reviewed. For example, the mere appearance of a cartoon or licensed character or themes that might be appealing to children is not determinative, as these features are often equally appealing to general users. If an analysis of the factors indicates the product is children's jewelry, an age label is recommended if feasible and the product should meet all relevant requirements of this specification.

- Who is the primary intended child demographic target of the product?
  - __ Children (specify age)
    - __ Under 3
    - __ 3 – 7
    - __ 8 – 12

TABLE A1.2 Checklist for Identifying Adult Jewelry

• Does the product or product packaging include or represent a nostalgia or holiday character developed to appeal primarily to teens and adults?
__ Yes
__ No
→ If yes, it is likely adult jewelry unless other factors suggest that placement, advertising and display reflect an intent to primarily target children; if no, continue analysis
• Is a teen or adult expected to be the primary user of the product?
__ Yes
__ No
→ If yes, it is adult jewelry; if no, continue analysis
• Is the jewelry sized for adults (2 5/8 inch circumference bangle bracelet; 15 inch necklace)?
__ Yes
__ No
→ If yes, it is adult jewelry; if no, continue analysis
• Do customer specifications or requirements indicate that the product is intended primarily for teens or adults?
__ Yes
__ No
→ If yes, it is adult jewelry; if no, continue analysis
• Does the product packaging include graphics or copy indicating the jewelry is primarily designed or intended for teens or adults?
__ Yes
__ No
→ If yes, it is adult jewelry; if no, continue analysis
• Will the product be supported by advertising directed primarily to teens or adults?
__ Yes
__ No
→ If yes, it is adult jewelry; if no, continue analysis
• Will packaging, advertising or marketing materials show teens or adults wearing the product?
__ Yes
__ No
→ If yes, it is adult jewelry; if no, continue analysis
• Will the jewelry be displayed and sold in a store or department (including an online or offline catalogue or store) which features products primarily for teens and adults (women's or junior's department, general jewelry counter or department, etc.)?
__ Yes
__ No
→ If yes, it is adult jewelry; if no, continue analysis
• Will the jewelry be packaged, displayed with or advertised in conjunction with another product designed or intended primarily for adults (a women's dress, candle, etc.)?
__ Yes
__ No
→ If yes, it is adult jewelry; if no, continue analysis
• Are teens or adults as likely as children 12 and under to wear the product?
__ Yes
__ No
→ If yes, it is adult jewelry
→ If the answer to these questions is yes, the item is likely designed and intended primarily for teens or adults. The totality of the circumstances must be reviewed. For example, the mere appearance of a cartoon or licensed character or themes that might be appealing to children are not determinative, as these features are often equally appealing to general users. The product or product packaging 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. An age label such as "Not for children 12 and younger" is not determinative if unreasonable under the totality of the circumstances.

A2. ALTERNATIVE TEST METHODS

A2.1 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 13, or alternate tests which utilize apparatus or procedures, or both, other than those in Section 13. The following paragraphs sets forth the conditions under which alternate tests with apparatus or procedures other than that described in Section 13 or elsewhere in his specification will be considered reasonable and representative.

A2.1.1 Persons and firms determining the compliance of materials subject to the requirements contained in this specification, including Sections 5, 8, and 9, may base those determinations on any alternate test utilizing apparatus or procedures other than those in Section 13, if such alternate test is as stringent as, or more stringent than, the tests in Section 13. An alternate test is considered to be "as stringent as, or more stringent than" a test in Section 13 if, when testing identical specimens, the alternate test yields failing results as often as, or more often than, the test in Section 13. 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 13. For example, XRF screening could be used and determined to be a more stringent test method to the extent applicable for the material tested.

A2.1.2 The data or information required by A2.1.1 to demonstrate equivalent or greater stringency of any alternate test using apparatus or procedures other than those in Section

13 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 13.

A2.1.3 The data or information required by A2.1.1 to demonstrate equivalent or greater stringency of any alternate test using apparatus or procedures other than those in Section 13 must be retained for as long as that alternate test is used to support determinations of compliance against the requirements contained in Section 13, and for one year thereafter.

APPENDIX

(Nonmandatory Information)

X1. RATIONALES

X1.1 Exclusions from Lead Content Testing Requirements in Children's Jewelry

X1.1.1 Exclusions are based on data indicating that these materials will meet applicable total lead limits per a CPSC determination by rule. See 16 CFR 1500.91.

X1.2 Specification for Antimony, Arsenic, Barium, Cadmium, Chromium, Mercury, and Selenium in Paint and Surface Coatings of Children's Jewelry

X1.2.1 Consumer Safety Specification F963-11 establishes limits on soluble heavy metals in paint and surface coatings of toys and procedures for assessing compliance with those limits. The limitations of migration or solubility tests, and possibility of inter-laboratory variation, are well known and have resulted in adoption of correction factors for soluble heavy metals. Based on evaluations of results for migratable heavy metals in paint, it is accepted that shape, size and mass can affect the results since these factors influence exposure to material in the test solution.

X1.2.1.1 The method and limits of Consumer Safety Specification F963-11 are based on the assumption that exposure of young children to chemicals in toys may not exceed a certain health-based level (Tolerable Daily Intake, or TDI in mg/kg bw/day). The risk assessment calculation by which the limits were derived is predicated on an assumed weight of a very young child weighing 7.5 kg. See Note X1.1. The test procedure involves exposure to simulated stomach acid, also a conservative approach likely to result in an overestimation of exposure to bioavailable material since absorption of compounds principally takes place in the intestine, where the pH is higher than in the stomach. See Note X1.2.

NOTE X1.1—This is a very conservative assumption, and the referenced weight assumes a child under 1 year. Jewelry is by nature small and thus is not typically recommended for children under 3 without parental supervision. Note that based on the Center for Disease Control and Prevention's (CDC) National Health and Nutrition Examination Survey (NHANES) data (1999-2002) the mean body weights for U.S. girls age two to six are: 13.3 kg; 15.2 kg; 17.9 kg; 20.6 kg; and 22.4 kg, respectively. Boys are slightly heavier. (See Ref (**2**).)

NOTE X1.2—A 2008 report prepared by the Netherlands National Institute for Public Health and the Environment (RIVM) explained: "The present methodology of EN 71-3[: 1994] to determine the bioavailable amount of an element from a toy is probably an overestimation of the actual bioavailable amount after ingestion of the toy matrix. Absorption of compounds takes place in the intestine, with an environment of higher pH (pH 5.0-7.5). The bioavailability in the intestinal phase can be considered to be lower for these elements than in the stomach environment due to their dependence on the pH (Oomen et al., 2004a; Oomen et al., 2003b)." (Emphasis in original.) (See Ref (**3**).)

X1.3 Specification for Cadmium in Certain Substrate Materials of Children's Jewelry

X1.3.1 Although incidental mouthing or handling and touching of products are more reasonable and likely exposure pathways for heavy metals in jewelry, just as it is for toys, accidental ingestion of a product containing an element represents the most health conservative (worst-case) scenario and is therefore considered in developing screening levels. Screening levels use worst case assumptions derived from CPSC studies on total and migratable cadmium in components of children's jewelry, and adding additional safety factors as described below.

X1.3.2 CPSC has concluded that "soluble cadmium migration is not generally proportional to cadmium content" and that "product composition factors such as element content and coatings have a larger effect on cadmium migration than does total cadmium content" (**4**). This conclusion is consistent with other studies.[9] Consequently, this standard adopts a total content screening limit, with migration testing to be conducted where covered items exceed the screening level.

X1.3.3 Under an accidental ingestion scenario, it is highly implausible that 100 % of a given element in an item will be released and available for uptake in the body. In fact, available CPSC data suggests that the mass loss of metal in even an aggressive acid test where test items are subjected to constant agitation for 24 h in a 0.07 N hydrochloric (HCl) acid solution is quite low. CPSC data on cadmium migration from metal jewelry components with total cadmium content ranging from 285 ppm to 99 % suggest that migration of cadmium is, on average, 0.38 % (**6**). This average migration rate was found to

[9] Tests of jewelry samples were conducted by an independent third-party laboratory accredited by the CPSC to conduct testing for heavy metals (lead) in metal jewelry and in paint, Mutual Cornel. Tests were sponsored by FJATA. To assure control, samples containing 1, 5, and 10 % cadmium in typical jewelry shapes and sizes were created, then plated with an economy or a quality plating. Samples were exposed to a hydrochloric acid solution for 24 h under constant agitation conditions, similar to tests conducted by CPSC (**5**).

TABLE X1.1 Calculated Assumed Migration of Cadmium from Plated Metal Jewelry Components Using Worst-Case Assumptions

Component Weight (g)	Total Cadmium Content (ppm)	Assumed Migration Rate (%)	Estimated Exposure (µg)
0.1	300	3	0.9
3	300	3	27
5	300	3	45
10	300	3	90
20	300	3	180

be similar in industry-sponsored tests of samples containing 1, 5 and 10 % cadmium conducted by an independent third party testing laboratory accredited by CPSC, Mutual Cornell (**5**). In both these tests and the CPSC tests, jewelry components containing around 1.35 % cadmium or less resulted in non-detectible or low migratable cadmium.[10]

X1.3.4 Thus, for purposes of developing a screening level, an average migration rate of 0.5 % is a very conservative assumption, recognizing that cadmium migrates from certain alloys (for example, zinc) at an even lower migration rate (typically an order of magnitude less) than others, such as tin. However, for screening purposes the highest rate of migration identified in the CPSC and Mutual Cornell tests was considered. In tests of samples conducted by Mutual Cornell, the highest rate of migration (for an unplated sample) was 1.1 %. The highest rate of migration in CPSC's 24-h tests was 2.349 % (no information is available as to whether samples were plated or unplated, or the relative quality of the plating). For purposes of developing a screening level, based on the available technical data, a worst-case assumed migration rate is 3 %. Based on this data, a very conservative level for screening purposes is 300 ppm.

X1.3.5 Weight of jewelry components in children's jewelry can range from approximately 0.1 g to a maximum of 10 g, with jewelry components at the high end extremely rare in children's jewelry. Jewelry components weighing 20 g are unknown in children's jewelry. More typically, in children's jewelry a charm or pendant weighs between 2 and 4 g, with a 3 g item often used as an average weight. Using the suggested 300 ppm screening level, and an assumed 3 % migration rate (which is an order of magnitude above the average migration rate), the chart below provides an overview of maximum anticipated cadmium exposure demonstrating that exposure to harmful levels of cadmium is not anticipated, recognizing that actual migration data on jewelry components do not suggest that migratable cadmium will approach these worst-case assumed migration levels. See Table X1.1.

X1.3.6 This demonstrates the health-protective nature of this cadmium screening limit, since calculated exposure in even the heaviest sample representative of a typical weight metal jewelry component (10 g) is less than half of the CPSC's toxic endpoint for acute exposure. The table above also shows that extrapolated to an unrepresentative weight of 20 g, results will fall below the CPSC's toxic endpoint for acute exposure. Migration rates of polymerica materials are expected to be lower due to the nature of the material and its behavior in simulated stomach acid, and the bulk of migration is expected to occur within the 2-h test timeframe of Consumer Safety Specification F963-11. Consequently, 300 ppm is a reasonable screening limit based on conservative migration assumptions derived from testing of jewelry samples. This standard requires testing of jewelry components that exceed the recommended screening limit. Testing depends on the type of material and whether it may be an ingestible small part.

X1.3.7 Metal or polymeric components with total cadmium content of 300 ppm or less do not need to be tested for migratable cadmium. Data from the CPSC indicates that plated metal containing even relatively high cadmium concentrations may result in very little actual exposure under aggressive test conditions. Consequently, metal components which are small parts as defined in 16 CFR 1501.4 that exceed this screening limit are compliant if tests for migratable cadmium conducted in accordance with 13.5 yield less than 200 µg cadmium. An inter-laboratory variability factor of 30 % should be applied, consistent with inter-laboratory variability of other migration tests, such as EN 71-3: 1994, until additional inter-laboratory data from round-robin studies is available to substitute a more accurate variability factor. Plastic or polymeric jewelry components which are small parts as defined in 16 CFR 1501.4 that exceed this screening level are compliant if tests for migratable cadmium conducted in accordance with 13.4 yield less than 75 ppm cadmium. Metal or plastic/polymeric components which are not small parts as defined in 16 CFR 1501.4 that exceed this screening level are compliant if tests for migratable cadmium conducted in accordance with 13.6 yield less than 18 µg cadmium.

X1.4 Exclusions from Cadmium Substrate Requirements in Children's Jewelry

X1.4.1 The CPSC's research has identified only metal and plastic or polymeric substrate materials as posing a potential risk of exposure to cadmium. The CPSC's research has not identified other materials used in jewelry likely to pose a risk of exposure to cadmium based on either cadmium content or migration rates.

X1.5 Specification for Nickel in Metal Components of Children's Jewelry

X1.5.1 Some individuals are known to be sensitive to nickel. This specification is consistent with internationally accepted requirements.

[10] A wafer sample unrepresentative of typical jewelry shapes yielded higher cadmium results, but was tested principally to assess migration rate in comparison to other types of components. Migration rates were similar.

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(5) Exponent Technical Report, Evaluation of Cadmium in Metal Jewelry, November, 2010.

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