



Designation: F2923 – 11

Standard Specification for Consumer Product Safety for Children's Jewelry¹

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 reappraisal. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reappraisal.

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 and under, 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).

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:

Title	Section
Scope	1
Referenced Documents	2
Definitions	3
Age-Labeling	4
Specifications for Lead in Children's Jewelry	5
Specifications for Children's Body-Piercing Jewelry	7
Specifications for Antimony, Arsenic, Barium, Cadmium, Chromium, Mercury and Selenium in Paint and Surface Coatings of Children's Jewelry	8
Specifications for Cadmium in Substrate Materials of Children's Jewelry	9
Specification for Nickel in Metal Components of Children's Jewelry	10
Specifications for Liquid-Filled Children's Jewelry	11
Mechanical Requirements for Children's Jewelry	12
Test Methods	13
Annexes	Annex A1 Annex A2

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

E1613 Test Method for Determination of Lead by Inductively Coupled Plasma Atomic Emission Spectrometry (ICP-AES), Flame Atomic Absorption Spectrometry

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.

Current edition approved Nov. 1, 2011. Published November 2011. DOI: 10.1520/D2393-11.

² Any product which is predominately used for play value is a toy. Toys are subject to the requirements of Consumer Safety Specification F963.

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.

(FAAS), or Graphite Furnace Atomic Absorption Spectrometry (GFAAS) Techniques

F963 Consumer Safety Specification for Toy Safety

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 BS Standard:

BS EN 1811 :2011; EN 12472

BS EN 71-3 :1995 Safety of toys. Specification for migration of certain elements

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 1500.50-53 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.

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 elements⁴
- 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.

⁴Bobby 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.

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 and under. 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 and under.
 - (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 and under.
- e. Labeled in a manner indicating that the product is designed and intended primarily for children 12 and younger (for example, “For children 3+,” “For ages 4 – 8.”)

3.2.4 *hazardous magnet*—As defined in the current published version of Consumer Safety Specification **F963**.

3.2.5 *hazardous magnetic component*—As defined in the current published version of Consumer Safety Specification **F963**, except that chains with a length greater than 6 inches 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.

⁴ Available from U.S. Consumer Product Safety Commission (CPSC), 4330 East West Hwy., Bethesda, MD 20814, <http://www.cpsc.gov>.

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.

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; and

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

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 and 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 (3/4 × 3/8 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 where it is likely to be seen by the purchaser, such as a retail shelf card.

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 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 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).

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
Metal components (plated or unplated)	300 ppm until August 14, 2011 100 ppm after August 14, 2011 ^A
Plastic and rubber components, including acrylic, polystyrene, plastic beads and stones, or polyvinyl chloride (PVC)	200 ppm until August 14, 2011 100 ppm after August 14, 2011 ^A
Materials not otherwise listed in Table 2 (including aragonite, bayldonite, boleite, cerussite, crocoite, ekanite, linarite, mimetite, phosgenite, samarskite, vanadinite and wulfenite; natural decorative or other materials treated to add lead, etc.)	200 ppm until August 14, 2011 100 ppm after August 14, 2011 ^A
Glass, ceramic or crystal decorative components, including cat’s eye, cubic zirconium or CZ, rhinestones and cloisonne	200 ppm until August 14, 2011 100 ppm after August 14, 2011 ^A
Paint or surface coating	90 ppm

^A This limit applies to children’s jewelry manufactured after August 14, 2011. 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 – S66296, 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)

^AProvided it is not treated in any way to add lead.

5.2.1 Test Method: CPSC-CH-E1003-09 – Standard Operating Procedure for Determining Lead (Pb) in Paint and Other Similar Surface Coatings, April 26, 2009

5.2.2 Test Method: CPSC-CH-E1002-08, Standard Operating Procedure for Determining Total Lead (Pb) in Non-Metal Children’s Products, February 1, 2009

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.

6.2 *Rationale*—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.

7. Specification for Children’s Body-piercing Jewelry

7.1 Body-piercing jewelry designed and intended primarily for children 12 and under 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**. 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**; BS EN 71-3. 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**, 8.3.4, Note 7.

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

^AGrades 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 ⁴	60	25	1000	75	60	60	500

⁴Due to interlaboratory variability, Consumer Safety Specification **F963** and BS EN 71-3 establish the following analytical correction factors (in %): Sb, As and Se: 60%; Hg: 50%; Ba, Cd, and Cr: 30%.

8.3 Rationale—Consumer Safety Specification **F963** establishes limits on soluble heavy metals in paint and surface coatings of toys. The standards for surface coatings are identical to those set forth in the European toy safety standard, BS EN 71-3. Consumer Safety Specification **F963** adopts the BS EN 71-3 procedure. The limitations of migration or solubility tests, and possibility of inter-laboratory variation, are wellknown and have resulted in adoption of correction factors for soluble heavy metals tested per BS EN 71-3. 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.

8.3.1 The method and limits of Consumer Safety Specification **F963** and BS EN 71-3 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 are predicated on an assumed weight of a very young child weighing 7.5 kg. See **Note 2**. 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 3**.

NOTE 2—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.⁵

NOTE 3—A 2008 report prepared by the Netherlands National Institute for Public Health and the Environment (RIVM) explained: “The present methodology of BS EN 71-3 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).”⁶

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 4**.) 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 4—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 1,580 ppm) all passed EN-71-3 testing, and modified EN-71-3 testing at 4, 8 and 24 h.⁷

9.2 Rationale—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.

9.2.1 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.”⁸ This conclusion is consistent with

⁵ See Mean Body Weight, Height and Body Mass Index, United States, 1960 – 2002; Ogden, C., Fryar, C., Carroll, M, Flegal, K., Advance Data for Vital Health and Statistics, Number 347, Center for Disease Control, October 27, 2004, available at <http://www.cdc.gov/nchs/data/ad/ad347.pdf>.

⁶ Chemicals in Toys, RIVM Report 320003001/2008, p. 67.

⁷ Cookson Precious Metals, Cadmium Overview Comments, April 19, 2010.

⁸ Memorandum to Kristina Hatlelid from Ian A. Elder, Assessment of Cadmium Migration from Materials, June 3, 2010, contained in Consumer Product Safety Commission Staff Report: Cadmium in Children’s Metal Jewelry, October, 2010, p. 55.

TABLE 5 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

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.

9.2.2 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 %.¹⁰ This average migration rate was found to 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.¹¹ In both these tests and the CPSC tests, jewelry components containing around 1.35 % cadmium or less resulted in non-detectable or low migratable cadmium.¹²

9.2.3 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.

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 Cornell. Tests were sponsored by FIATA. 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. Exponent Technical Report, Evaluation of Cadmium in Metal Jewelry, November, 2010.

¹⁰ Memorandum to Kristina Hatlelid from Ian A. Elder, Assessment of Cadmium Migration from Materials, June 3, 2010, contained in Consumer Product Safety Commission Staff Report: Cadmium in Children's Metal Jewelry, October, 2010.

¹¹ Exponent Technical Report, Evaluation of Cadmium in Metal Jewelry, November, 2010.

¹² 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.

9.2.4 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. **Table 5.**

9.2.5 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 polymeric 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 BS EN 71-3 and Consumer Safety Specification **F963**. 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.

9.2.6 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 BS EN 71-3, 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