This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.

Designation: F963 – 17

An American National Standard

Standard Consumer Safety Specification for Toy Safety[1]

This standard is issued under the fixed designation F963; 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 for toys. Although this specification will not eliminate the need for the exercise of parental responsibility in selecting toys appropriate to the age of a child, or parental supervision in situations in which children of various ages may have access to the same toys, its application will minimize accidents in the normal, intended use and reasonably foreseeable abuse of the toys covered by this specification. This specification was developed originally as a Voluntary Product Standard under the auspices of the National Bureau of Standards, Department of Commerce, and published in 1976 (PS 72–76). The present revision is intended to update the safety requirements to include the following by reference: published federal mandatory requirements, relevant voluntary standards, certain new requirements for addressing potential hazards, and several technical revisions based on producer experience with the original standard.

1. Scope

1.1 This specification[2] relates to possible hazards that may not be recognized readily by the public and that may be encountered in the normal use for which a toy is intended or after reasonably foreseeable abuse. It does not purport to cover every conceivable hazard of a particular toy. This specification does not cover product performance or quality, except as related to safety. Except for the labeling requirements pointing out the functional hazards and age range for which the toy is intended, this specification has no requirements for those aspects of a toy that present an inherent and recognized hazard as part of the function of the toy. Such an example is a sharp point necessary for the function of a needle. The needle is an inherent hazard that is well understood by the purchaser of a toy sewing kit, and this hazard is communicated to the user as part of the normal educational process.

1.2 On the other hand, while a riding toy has inherent hazards associated with its use (for example, falling off onto the sidewalk), the possible hazards associated with its construction (sharp edges, exposed mechanisms, etc.) will be minimized by the application of this specification.

1.3 This specification covers requirements and contains test methods for toys intended for use by children under 14 years of age. Different age limits for various requirements will be found in this specification. These limits reflect the nature of the hazards and expected mental or physical ability, or both, of a child to cope with the hazards.

1.4 Articles not covered by this specification are as follows:

Bicycles
Tricycles
Non-Powered Scooters
(see Consumer Safety Specification F2264)
Recreational Powered Scooters and Pocket Bikes
(see Consumer Safety Specification F2641)
Sling shots and sharp-pointed darts
Playground equipment
Non-powder guns
Kites
Hobby and craft items in which the finished item is not primarily of play value
Model kits in which the finished item is not primarily of play value
Crayons, paints, chalks, and other similar art materials in which the material itself or the finished item is not primarily of play value, except that all art materials, whether or not a component of a toy, shall comply with LHAMA, in accordance with 4.29.1 – 4.29.3.
Sporting goods, camping goods, athletic equipment,

[1] This consumer safety specification is under the jurisdiction of ASTM Committee F15 on Consumer Products and is the direct responsibility of Subcommittee F15.22 on Toy Safety.

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[2] The Toy Association sometimes provides its interpretations of this specification through its counsel as a service to its members and others. The Toy Association's interpretations are not reviewed or approved by ASTM and should be viewed as The Toy Association's alone.

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musical instruments, juvenile products, and furniture; however, toys that are their counterparts are covered. (It is recognized that there is often a fine line between, for example, a musical instrument or a sporting item and its toy counterpart. The intention of the producer or distributor, as well as normal use and reasonably foreseeable abuse, determines whether the item is a toy counterpart.)

Powered models of aircraft, rockets, boats, and land vehicles; however, toys that are their counterparts are covered.

Constant air inflatables

1.5 General guidelines for age labeling toys and toy packaging are contained in Annex A1.

1.6 Information regarding packaging and shipping is contained in Annex A2.

1.7 This consumer safety specification includes the following sections:

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Flammability Testing Procedure for Fabrics	Annex A6
Compositing Procedure for Total Heavy Metal Analysis	Annex A7
Design Guidelines for Battery Operated Toys	Annex A8
Rationale for 2007 Revisions	Annex A9
Rationale for 2008 Revisions	Annex A10
Rationale for 2011 Revisions	Annex A11
Rationale for 2016 Revisions	Annex A12

1.8 The values stated first are to be regarded as the standard. The values given in parentheses are for information only.

1.9 The following precautionary statement pertains only to the test methods portion, Section 8, 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.*

1.10 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[3]

[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.

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D374/D374M Test Methods for Thickness of Solid Electrical Insulation
D642 Test Method for Determining Compressive Resistance of Shipping Containers, Components, and Unit Loads
D880 Test Method for Impact Testing for Shipping Containers and Systems
D999 Test Methods for Vibration Testing of Shipping Containers
D1193 Specification for Reagent Water
D2240 Test Method for Rubber Property—Durometer Hardness
D3421 Recommended Practice for Extraction and Determination of Plasticizer Mixtures from Vinyl Chloride Plastics (Withdrawn 1986)[4]
D4236 Practice for Labeling Art Materials for Chronic Health Hazards
D5276 Test Method for Drop Test of Loaded Containers by Free Fall
F404 Consumer Safety Specification for High Chairs
F406 Consumer Safety Specification for Non-Full-Size Baby Cribs/Play Yards
F1313 Specification for Volatile *N*-Nitrosamine Levels in Rubber Nipples on Pacifiers
F1148 Consumer Safety Performance Specification for Home Playground Equipment
F2264 Consumer Safety Specification for Non-Powered Scooters
F2641 Consumer Safety Specification for Recreational Powered Scooters and Pocket Bikes
F2853 Test Method for Determination of Lead in Paint Layers and Similar Coatings or in Substrates and Homogenous Materials by Energy Dispersive X-Ray Fluorescence Spectrometry Using Multiple Monochromatic Excitation Beams
F2923 Specification for Consumer Product Safety for Children's Jewelry

2.2 *ANSI Standards:*[5]
ANSI C18.1 M, Part 1 American National Standard for Portable Primary Cells and Batteries with Aqueous Electrolyte – General and Specifications
ANSI C18.1 M, Part 2 American National Standard for Portable Primary Cells and Batteries with Aqueous Electrolyte – Safety Standard
ANSI C18.2 M, Part 1 American National Standard for Portable Rechargeable Cells and Batteries – General and Specifications
ANSI C18.2 M, Part 2 American National Standard for Portable Rechargeable Cells and Batteries – Safety Standard
ANSI C18.3 M, Part 1 American National Standard for Portable Lithium Primary Cells and Batteries – General and Specifications
ANSI C18.3 M, Part 2 American National Standard for Portable Lithium Primary Cells and Batteries – Safety Standard
ANSI/UL 1012 Power Units Other Than Class 2
ANSI/UL 60950–1 Information Technology Equipment – Safety – Part 1: General Requirements
ANSI/UL 2595 General Requirements for Battery-Powered Appliances
S1.4 Specification for Sound Level Meters
Z315.1 Safety Requirements for Tricycles

2.3 *European Union Standards:*[6]
EN 71-1 Safety of toys - Part 1: Mechanical and physical properties
EN 71-3 Safety of toys - Part 3: Migration of certain elements

2.4 *Federal Standards:*[7]
15 CFR 272 Marking of Toys, Look-Alike and Imitation Firearms
16 CFR 1303 Ban of Lead-Containing Paint and Certain Consumer Products Bearing Lead Containing Paint
16 CFR 1500 Hazardous Substances Act Regulations, including the following sections:
16 CFR 1500.3 (c) (6) (vi) Definition of "flammable solid"
16 CFR 1500.14 Products requiring special labeling under section 3(b) of the act
16 CFR 1500.18 Banned toys and other banned articles intended for use by children
16 CFR 1500.19 Misbranded toys and other articles intended for use by children
6 CFR 1500.44 Method for determining extremely flammable and flammable solids
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 method for simulating use and abuse of toys and other articles intended for use by children
16 CFR 1500.83 Exemptions for small packages, minor hazards, and special circumstances
16 CFR 1500.85 Exemptions from classification as banned hazardous substances
16 CFR 1500.86 Exemptions from classification as a banned toy or other banned article for use by children
16 CFR 1500.87 Children's products containing lead: inaccessible component parts
16 CFR 1500.88 Exemptions from lead limits under section 101 of the Consumer Product Safety Improvement Act for certain electronic devices
16 CFR 1500.91 Determinations regarding lead content for certain materials or products under section 101 of the

[4] The last approved version of this historical standard is referenced on www.astm.org.
[5] Electronic copy available from American National Standards Institute website: www.ansi.org; hard copies from Global Engineering Documents, 15 Inverness Way East, Englewood, CO 80112.
[6] Available from European Committee for Standardization (CEN), Avenue Marnix 17, B-1000, Brussels, Belgium, http://www.cen.eu.
[7] Available from U.S. Consumer Product Safety Commission website: www.cpsc.gov or U.S. Government Printing Office, Superintendent of Documents; P.O. Box 371954, Pittsburgh, PA 15250-7954; website: www.gpo.gov

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Consumer Product Safety Improvement Act
16 CFR 1501 Method for Identifying Toys and Other Articles Intended for Use by Children Under 3 Years of Age which Present Choking, Aspiration, or Ingestion Hazards Because of Small Parts
16 CFR 1505 Requirements for Electrically Operated Toys or Other Electrically Operated Articles Intended for Use by Children
16 CFR 1510 Requirements for Rattles
16 CFR 1511 Requirements for Pacifiers
16 CFR 1610 Standard for Flammability of Clothing Textiles
21 CFR 110 Current Good Manufacturing Practice in Manufacturing, Processing, Packaging, or Holding Human Food
21 CFR 170-189 Food for Human Consumption
21 CFR 700-740 Requirements for Specific Cosmetic Products
21 CFR 73, 74, 81, 82 Color Additives
29 CFR 1910 Occupational Safety and Health Standards
40 CFR 141.63 Maximum Contaminant Levels (MCLs) for Microbiological Contaminants
49 CFR 173.100, 109 Definition of Class C Explosives
CPSC-CH-E1001-08.3 Standard Operating Procedure for Determining Total Lead (Pb) in Metal Children's Products (including Children's Metal Jewelry)[8]
CPSC-CH-E1002-08.3 Standard Operating Procedure for Determining Total Lead (Pb) in Non-Metal Children's Products[8]
CPSC-CH-E1003-09.1 Standard Operating Procedure for Determining Lead (Pb) in Paint and Other Similar Surface Coatings[8]
CPSC-CH-E1004-11 Standard Operating Procedure for Determining Cadmium (Cd) Extractability from Children's Metal Jewelry[8]
MIL-D-17951 Military Specification: Deck Covering, Lightweight, Nonslip, Abrasive Particle Coated Fabric, Film, or Composite and Sealing Compound
SS-T-312B Tile, Floor: Asphalt, Rubber, Vinyl, VinylAsbestos[9]
Voluntary Product Standard PS 72-76 Toy Safety[10]

2.5 *ISO and IEC Standards:*[11]

ISO 3696 Water for analytical laboratory use — Specification and test methods
ISO 3746:1995 Acoustics—Determination of Sound Power Levels of Noise Sources Using Sound Pressure—Survey Method Using an Enveloping Measurement Surface Over a Reflecting Plane
ISO 7779 Acoustics–Measurement of Airborne Noise Emitted by Computer and Business Equipment
ISO 8124-1 Safety of toys – Part 1: Safety aspects related to mechanical and physical properties
ISO 8124-3 Safety of toys – Part 3: Migration of certain elements
ISO 11201 Acoustics—Noise Emitted by Machinery and Equipment—Determination of Emission Sound Pressure Levels at a Work Station and at Other Specified Positions in an Essentially Free Field Over a Reflecting Plane with Negligible Environmental Corrections
ISO 11202 Acoustics—Noise Emitted by Machinery and Equipment—Measurement of Emission Sound Pressure Levels at a Work Station and at Other Specified Positions—Survey Method in situ
ISO 11204 Acoustics—Noise Emitted by Machinery and Equipment—Measurement of Emission Sound Pressure Levels at a Work Station and at Other Specified Positions—Method Requiring Environmental Corrections
IEC 60086–2 Primary Batteries: Physical and Electrical Specifications
IEC 60384–14 Fixed Capacitors for Use in Electronic Equipment—Part 14: Sectional Specification—Fixed Capacitors for Electromagnetic Interference Suppression and Connection to the Supply Mains
IEC 60738–1 Thermistors—Directly Heated Positive Temperature Coefficient—Part 1: Generic Specification
IEC 60950–1 Information Technology Equipment—Safety—Part 1: General Requirements
IEC 61672–1 Electroacoustics—Sound Level Meters—Part 1: Specifications
IEC 61672–2 Electroacoustics—Sound Level Meters—Part 2: Pattern Evaluation Tests
IEC 62133 Secondary Cells and Batteries Containing Alkaline or Other Non-acid Electrolytes—Safety Requirements for Portable Sealed Secondary Cells and for Batteries Made From Them, For Use in Portable Applications

2.6 *UL Standards:*[12]

UL-94 Standard for Safety of Flammability of Plastic Materials for Parts in Devices and Appliances Testing
UL 1642 Standard for Lithium Batteries
UL 2054 Standard for Household and Commercial Batteries
UL 62133 Secondary Cells and Batteries Containing Alkaline or Other Non-acid Electrolytes—Safety Requirements for Portable Sealed Secondary Cells and for Batteries Made From Them, For Use in Portable Applications
ANSI/UL 1012 Power Units Other Than Class 2
ANSI/UL 2595 General Requirements for Battery-Powered Appliances
ANSI/UL 60950–1 Information Technology Equipment—

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

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

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

[11] Available from International Organization for Standardization (ISO), 1 rue de Varembé, Case postale 56, CH-1211, Geneva 20, Switzerland, http://www.iso.ch.

[12] Available from Underwriters Laboratories (UL), 2600 N.W. Lake Rd., Camas, WA 98607-8542, http://www.ul.com.

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Safety—Part 1: General Requirements

2.7 *Canadian Standards:*[13]

CAN/CSA E62133 Secondary Cells and Batteries Containing Alkaline or Other Non-acid Electrolytes—Safety Requirements for Portable Sealed Secondary Cells and for Batteries Made From Them, For Use in Portable Applications

2.8 *Other Documents:*

CTFA Microbiological Guidelines, Methods M-1 Determination of the Microbial Content of Personal Care Products[14]

CTFA Microbiological Guidelines, Methods M-2 Examination for and Identification of *Staphylococcus aureus, Escherichia coli, Pseudomonas aeruginosa,* and *Candida albicans*[14]

CTFA Microbiological Guidelines, Methods M-3 A Method for Preservation Testing of Water Miscible Personal Care Products

CTFA Microbiological Guidelines, Methods M-6 A Method for Preservation Testing of Atypical Personal Care Products

U.S. Food and Drug Administration Bacteriological Analytical Manual[15]

United States Pharmacopeia, Volume 35 (or most current), Method 61 Microbiological Examination of Nonsterile Products: Microbial Enumeration Tests[16]

United States Pharmacopeia, Volume 35 (or most current), Method 62 Microbiological Examination of Nonsterile Products: Tests for Specified Microorganisms[16]

United States Pharmacopeia, Volume 35 (or most current), Chapter 1231 Water for Pharmaceutical Purposes[17]

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *A-weighted equivalent sound pressure level, L_{Aeq}*—the level of a steady-state sound which, in a stated time period and at a stated location, has the same A-weighted sound energy as the time-varying sound.

3.1.2 *accessible*—(part or component) describing any area of the toy that can be contacted by any portion forward of the collar of the accessibility probe as described in 16 CFR 1500.48 and 16 CFR 1500.49. (See Fig. 1.)

NOTE 1—Dimensions are provided in Fig. 1 for two probes corresponding to two age ranges of children.

3.1.3 *alkaline battery*—a non-rechargeable dry cell battery with an alkaline manganese electrochemistry.

3.1.4 *aquatic toy*—an article, whether inflatable or not, intended to bear the mass of a child and used as an instrument of play in shallow water. This does not include bath toys, beach balls, and United States Coast Guard-approved life saving devices.

3.1.5 *arrow*—projectile in the form of a shaft with a length of 150 mm or more that is intended to be discharged from a bow held by a child.

3.1.6 *art material*—any substance marketed or represented by the producer or repackager as suitable for use in any phase

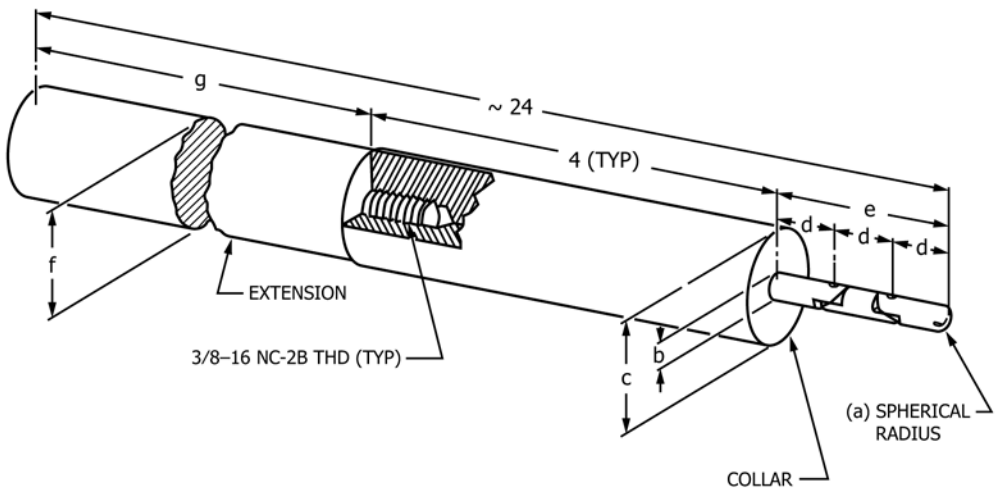
[13] Available from Canadian General Standards Board (CGSB), 11 Laurier St., Phase III, Place du Portage, Gatineau, Quebec K1A 0S5, Canada, http://www.tpsgc-pwgsc.gc.ca/ongc-cgsb.

[14] Available from Personal Care Products Council (PCPC), 1620 L St., NW, Suite 1200, Washington, DC 20036, www.personalcarecouncil.org.

[15] Available from U.S. Food and Drug Administration (FDA), 10903 New Hampshire Ave., Silver Spring, MD 20993, https://www.fda.gov/food/foodscienceresearch/laboratorymethods/ucm2006949.htm#intro.

[16] Available from U.S. Pharmacopeial Convention (USP), 12601 Twinbrook Pkwy., Rockville, MD 20852-1790, http://www.usp.org.

[17] Available from U.S. Pharmacopeial Convention (USP), 12601 Twinbrook Pkwy., Rockville, MD 20852-1790, http://www.usp.org.



		a	b	c	d	e	f	g
(CHILDREN 0–36 MONTHS INCL)	PROBE A	.110	.220	1.020	.577	1.731	1	18 9/32
(" 37–96 " ")	PROBE B	.170	.340	1.510	.760	2.280	1 1/2	17 25/32

ALL DIMENSIONS IN INCHES

FIG. 1 Accessibility Probes

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of the creation of any work of visual or graphic art of any medium. This definition includes items that become a component of the work of art such as paint, canvas, inks, crayons, chalk, solder, brazing rods, flux, paper, clay, stone, thread, cloth, and photographic film. It also includes items that are associated closely with the creation of the final work of art such as brushes, brush cleaners, solvents, ceramic kilns, silk screens, molds, mold making material, and photographic developing chemicals.

3.1.7 *ball*—any spherical, ovoid, or ellipsoidal object that is designed or intended to be thrown, hit, kicked, rolled, dropped, or bounced. The term "ball" includes any spherical, ovoid, or ellipsoidal object that is attached to a toy or article by means of string, elastic cord, or similar tether. The term "ball" also includes any multisided object formed by connecting planes into a generally spherical ovoid, or ellipsoidal shape that is designated or intended to be used as a ball. The term "ball" does not include dice, or balls permanently enclosed inside pinball machines, mazes, or similar outer containers. A ball is permanently enclosed if, when tested in accordance with 16 CFR 1500.53, it is not removed from the outer container.

3.1.8 *base material*—material upon which coatings may be formed or deposited.

3.1.9 *battery, button cell*—small round non-lithium battery, in which the overall height is less than the diameter.

3.1.9.1 *Discussion*—This definition is from ANSI C18.1M Part 1; these batteries are typically identified by a SR or LR designation; for example: SR44, LR44, SR45, LR45, SR54, LR54.

3.1.10 *battery, coin cell*—small round lithium battery, in which the overall height is less than the diameter.

3.1.10.1 *Discussion*—This definition is from ANSI C18.1M Part 1; these batteries are typically identified by a CR designation; for example: CR1620, CR2016, CR2020, CR2032, CR3032.

3.1.11 *battery-operated toy*—toy having at least one function dependent on electricity and powered by batteries.

3.1.12 *burr*—a roughness that may be found at an edge or joint of a toy or component if the material is not severed or finished cleanly.

3.1.13 *C-weighted peak sound pressure level, L_{Cpeak}*—the peak sound pressure level obtained when using standardized C-weighting.

3.1.14 *close-to-the-ear toy*—a toy that is intended to be used close to the ear, that is, the sound emitting part of such a toy is normally put against the ear of a child (example—toy telephones that emit sounds from the earpiece).

3.1.15 *coating*—all layers of material formed or deposited on the base material or toy and includes paints, varnishes, lacquers, or other substances of a similar nature, whether they contain metallic particles or not, which can be removed by scraping with a sharp blade as defined under 16 CFR 1303, et seq.

3.1.16 *collapse*—sudden or unexpected folding of a structure.

3.1.17 *compression spring*—spring which essentially returns to its initial state after compression.

3.1.18 *constant air inflatables*—structure relying on a continuous supply of air pressure supplied from one or more electrical blowers to maintain its shape, typically made of flexible fabric and designed for children's use that may include but not be limited to the following activities: bounce, climb, slide, or interactive play.

3.1.19 *cord*—a length of slender, flexible material including monofilaments, woven and twisted cord, rope, plastic textile tapes, ribbon, and those fibrous materials commonly called string.

3.1.20 *cosmetics*—for the purposes of this standard, cosmetics are items meeting the Federal Food, Drug, and Cosmetics Act definition of a cosmetic ("any articles intended or likely to be rubbed, sprinkled, or sprayed on, introduced onto, or otherwise applied to the human body for cleansing, beautifying, promoting or enhancing attractiveness, or for altering appearance") that are sold as part of or included with a toy, including such items sold for imitative or "dress-up" play, as well as similar items which are intended to be applied to a toy (examples: eye shadow or lip gloss intended to be applied to a doll's face; such items are not subject to FDCA labeling requirements). "Cosmetics" also includes temporary tattoos.

3.1.21 *crushing*—injury to part of the body resulting from compression between two rigid surfaces.

3.1.22 *curled edge*—an edge in which the portion of the sheet adjacent to the edge is bent into an arc and forms an angle of less than 90° with the base sheet, as shown in Fig. 2.

3.1.23 *detection limit of a method*—three times the standard deviation of the blank value.

3.1.24 *discharge mechanism*—a component(s) of the toy which releases or propels the projectile into free flight.

3.1.25 *edge, hazardous*—an accessible edge that presents an unreasonable risk of injury during the normal use and reasonably foreseeable abuse of a toy. Metal and glass edges on toys intended for children under the age of eight years are defined as potentially hazardous if they fail the sharp edge test described in 16 CFR 1500.49. Edges other than metal and glass are defined as potentially hazardous if they are sharp to the touch under casual handling conditions.

3.1.26 *elastic*—material that will recover its former size and shape essentially and instantaneously after being elongated at least 10 % at a testing speed of not less than 20 in. (510 mm)/min.

3.1.27 *expanding material*—any material used in a toy which expands greater than 50 % in any dimension from its as-received state (see 8.30.2), at any time interval, when

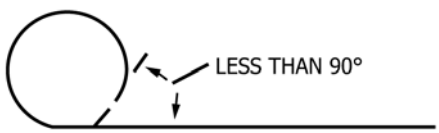


FIG. 2 Curled Edge

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measured after 6, 24, 48, and 72 hours of submersion in deionized water as specified in 8.30.3 – 8.30.5.

3.1.28 *explosive action*—the sudden release of energy characterized by the rapid expansion or bursting of a material.

3.1.29 *extension spring*—spring which essentially returns to its initial state after tension.

3.1.30 *fastener*—mechanical device which attaches two or more elements together (for example, screws, rivets, and staples).

3.1.31 *feathering*—the beveling of an edge (or decrease in thickness moving toward the edge) caused during the shearing or cutting of material.

3.1.32 *flash*—excess material that escapes between the mating parts of a mold assembly.

3.1.33 *folding mechanism*—an assembly of hinged, pivoted, folding, or sliding members that can produce a crushing, scissoring, pinching, or shearing action during operation.

3.1.34 *free flight*—unconstrained travel caused by a force, other than gravity alone, through the air in a trajectory regardless of whether the travel is ultimately constrained by means of a tether (for example, pop-gun).

3.1.35 *fuzz*—bits of fibrous-type material that can be readily removed from toys with a pile surface.

3.1.36 *hand-held toy*—a toy that is intended to be used or operated while being held in the hand. Examples include toy tools, small electronic games, stuffed animals, dolls, musical toys, and cap-firing toys.

3.1.37 *hazard*—any characteristic of a toy that presents an unreasonable risk of injury or illness during normal use or as a result of reasonably foreseeable abuse.

3.1.38 *hazardous magnet*—a magnet which is a small object (refer to 4.6 and Fig. 3) and which has a flux index ≥ 50 (as determined in accordance with the test method in 8.25.1).

3.1.39 *hazardous magnetic component*—any part of a toy that is a small object (refer to 4.6 and Fig. 3) and which contains an attached or imbedded magnet which has a flux index ≥ 50 (as determined in accordance with the test method in 8.25.1).

3.1.40 *helical spring*—spring in the form of a coil.

3.1.41 *hemmed edge*—an edge in which the portion of the sheet adjacent to the edge is folded back on the sheet itself through an angle of approximately 180°, so that the portion of the sheet adjacent to the edge is approximately parallel to the main sheet, as shown in Fig. 4.

3.1.42 *hinge-line clearance*—the distance between the stationary portion of a toy and the movable portion along, or adjacent to, a line projected through the axis of rotation, shown as Dimension A in Fig. 5.

3.1.43 *juvenile products*—consumer products designed or intended primarily for use by children which are not used primarily for play. These include, but are not limited to, items such as bassinets/cradles, bath seats, infant bath tubs, carriages and strollers, changing tables, full size cribs, gates and enclosures, handheld infant carriers, high chairs, infant

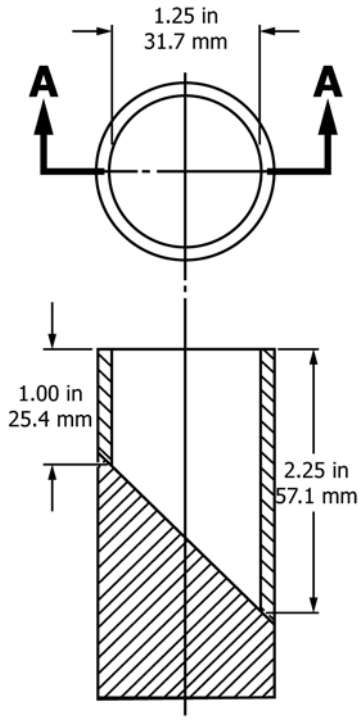


FIG. 3 Small Parts Cylinder



FIG. 4 Hemmed Edge

bouncers, infant swings, play yards/non-full size cribs, portable bed rails, portable hook-on chairs, soft infant carriers, stationary activity centers, toddler beds and walkers.

3.1.44 *lap joint*—a joint in which an edge overlaps a parallel surface but is not necessarily attached to it mechanically at all points along the length, as in the examples shown in Fig. 6.

3.1.45 *large and bulky toy*—toy that has a projected base area of more than 400 in.^{2} (0.26 m^2) or a volume of more than 3 ft^3 (0.08 m^3) calculated without regard to minor appendages.

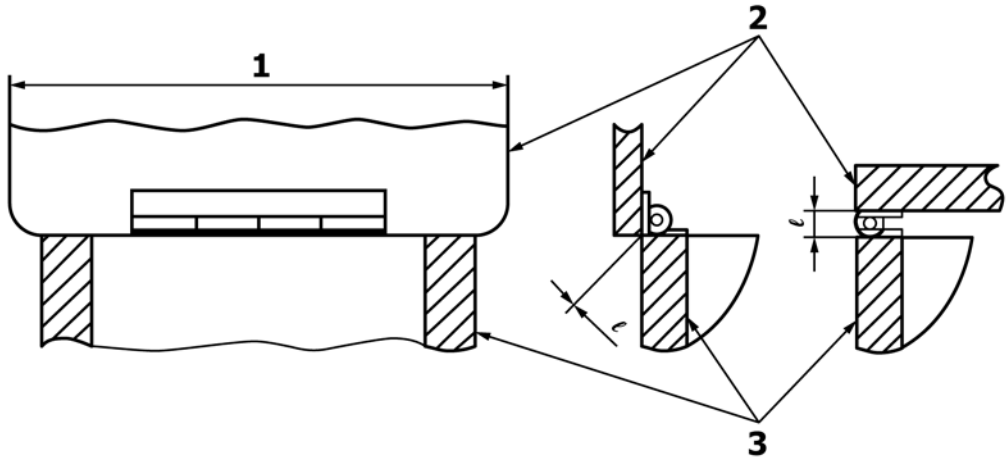
NOTE 2—The base area for toys having permanently attached legs is measured by calculating the area enclosed by straight lines connecting the outermost edge of each leg of the perimeter.

3.1.46 *latex balloon*—any toy or decorative item consisting of a latex bag that is designed to be inflated by air or gas. The term does not include inflatable children's toys that are used in aquatic activities such as rafts, water wings, swim rings, or other similar items.

3.1.47 *leading edge(s)*—the location(s) on or area(s) of the projectile (for example, tips, edges, or protrusions), which would be expected to make contact with the eyeball in the event of an intentional or unintended launch toward the eye.

3.1.47.1 *Discussion*—This would include all areas that could reasonably be expected to strike the eye in situations where the projectile may travel in unpredictable orientations (for example, tumbling). In determining whether an edge can strike the eye, the size and spherical shape of the eye should be considered.

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Key

1 Hinge line
2 Lid
3 Box

ℓ = Hinge-line clearance

FIG. 5 Changing Clearance at Hinge Line

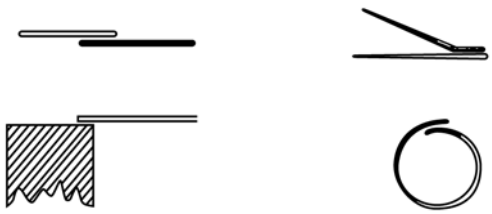


FIG. 6 Typical Lap Joints

3.1.48 *magnetic/electrical experimental set*—toy containing one or more magnets intended for carrying out educational experiments involving both magnetism and electricity.

3.1.49 *marble*—a sphere made of a hard material, such as glass, agate, marble, or plastic, that is used in various children's games, generally as a playing piece or marker. The term "marble" does not include a marble permanently enclosed in a toy or game. A marble is permanently enclosed if, when tested in accordance with 16 CFR 1500.53, it is not removed from the toy or game.

3.1.50 *materials intended to leave a trace*—graphite material in pencils, liquid in pens, and similar substances.

3.1.51 *maximum A-weighted sound pressure level, L_{AFmax}*—the maximum sound pressure level obtained when using standardized A-weighting and fast detector response (time-weighting).

3.1.52 *non-replaceable battery*—an electrochemical device that is not consumer accessible, is not intended to be replaced after the useful life of the battery, and is not accessible when tested in accordance with the normal use and, where appropriate, reasonably foreseeable abuse tests.

3.1.52.1 *Discussion*—Reasonably foreseeable abuse tests are included in 8.6 – 8.10.

3.1.53 *normal use*—play modes that conform to the instructions accompanying the toy, that have been established by tradition or custom, or that are evident from an examination of the toy.

3.1.54 *other materials, whether mass colored or not*—materials such as wood, leather, and other porous substances which may absorb coloring matter without forming a coating.

3.1.55 *packaging*—material accompanying the toy when purchased, but having no intended play function.

3.1.56 *pinching*—created when two moving or one moving and one fixed surface come together in such a way that they could entrap and compress flesh, usually resulting in a contusion or laceration.

3.1.57 *point, hazardous*—an accessible point that presents an unreasonable risk of injury during normal use or reasonably foreseeable abuse. Points on toys intended for children under the age of 8 years are potentially hazardous if they fail the sharp point test described in 16 CFR 1500.48.

3.1.58 *pompom*—lengths or strands of fiber, yarns, or threads clamped or secured and tied in the center, and brushed up to form a spherical shape. Also included are spherical-shaped attachments made of stuffed material.

3.1.59 *primary battery*—one or more primary cells, including case, terminals, and markings.

3.1.60 *primary cell*—basic functional unit providing a source of electrical energy by direct conversion of chemical energy, which consists of an assembly of electrodes, separators, electrolyte, container, and terminals, and that is not designed to be electrically recharged.

3.1.61 *principal display panel*—the display panel for a retail package or container, bin, or vending machine that is most likely to be displayed, shown, presented, or examined under normal or customary conditions of display for retail sale.

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3.1.62 *projectile*—an object intended to be launched into a free flight.

3.1.62.1 *Discussion*—This does not include self-propelled flying toys such as remote control helicopters and wind-up airplanes. (See Rationale for additional explanation.)

3.1.63 *projectile toy with stored energy*—toy with a projectile launched by means of a discharge mechanism capable of storing energy independent of the user and typically requiring at least one discrete action by the user to launch the projectile.

3.1.63.1 *Discussion*—This includes toy rockets and similar toys propelled by a chemical reaction or compressed gasses (for example, air) where the energy can be stored independent of the user. For example, in a rocket propelled by a mixture of vinegar and baking soda, the user initiates the reaction by mixing the two substances but no longer has control of the actual launching. The rocket will launch when the pressure build up overcomes the force that holds the rocket onto the launch platform.

3.1.64 *projectile toy without stored energy*—toy with a projectile propelled by energy imparted by the user or by means of a discharge mechanism incapable of storing energy independent of the user.

3.1.65 *projection, hazardous*—a projection that, because of its material or configuration, or both, may present a puncture hazard if a child should fall onto it. Excluded from this definition are puncture hazards to the eyes or mouth, or both, because of the impossibility of eliminating puncture hazards to those areas of the body by product design.

3.1.66 *protective cap or cover*—a component that is attached to a potentially hazardous edge or projection to reduce the possibility of injury.

3.1.67 *protective tip*—a component that is attached to the impacting end of a projectile to minimize injury if it should impact on the body, and also to prevent damage to the projectile upon striking a target, provide a means of attaching the projectile to the target as in the case of suction cups, or prevent damage to inanimate objects.

3.1.68 *push/pull toy*—a toy with a cord/tether or a handle attached to the toy and where the toy is intended for use on the ground with the child in a standing/upright position, typically walking, while using the toy.

3.1.69 *rattle*—a toy that is clearly designed to emit sound when shaken typically intended for children under 18 months.

3.1.70 *reasonably foreseeable abuse*—conditions to which a child may subject a toy that are not normal use conditions, such as deliberate disassembly, dropping, or using the toy for a purpose for which it was not intended. Simulated use and abuse tests for toys are given in 16 CFR 1500.50-53 (excluding the bite test, Paragraph (c), of each section).

3.1.71 *reference box*—a hypothetical surface which is the smallest rectangular parallelepiped that encloses the toy without regard to minor appendages.

3.1.72 *resilient leading edge*—a leading edge of a projectile made with any material having a Shore A scale durometer of 70 or less.

3.1.72.1 *Discussion*—The measurement shall be performed in accordance with the latest revision of Test Method D2240.

3.1.73 *rigid*—any material having a hardness greater than 70 Shore A scale durometer, as measured by the latest revision of Test Method D2240.

3.1.74 *rigid leading edge*—a leading edge of a projectile made with any material having a Shore A scale durometer greater than 70.

3.1.74.1 *Discussion*—The measurement shall be performed in accordance with the latest revision of Test Method D2240.

3.1.75 *rolled edge*—an edge in which the portion of the sheet adjacent to the edge is bent into an arc and forms an angle between 90 and 120° with the main sheet, as shown in Fig. 7.

3.1.76 *scraping*—mechanical removal of coatings down to the base material without damaging the substrate material.

3.1.77 *secondary battery*—assembly of secondary cell(s) ready for use as a source of electrical energy characterized by its voltage, size, terminal arrangement, capacity, and rate capability.

3.1.78 *secondary cell*—basic functional unit providing a source of electrical energy by direct conversion of chemical energy, which consists of electrodes, separators, electrolyte, container and terminals, and that is designed to be electrically recharged.

3.1.79 *simulated protective equipment*—toys designed to mimic products that infer some sort of physical protection to the wearer (for example, protective helmets and visors).

3.1.80 *soft-filled toy/stuffed toy*—toy, clothed or unclothed, with soft body surfaces and filled with soft materials, allowing compression of the torso readily with the hand.

3.1.81 *splinter*—sharp pointed fragment.

3.1.82 *spiral spring*—clockwork-type spring.

3.1.83 *squeeze toy*—a handheld pliable toy, intended for children under the age of 18 months, usually incorporating a noise-making feature activated by forcing air through an opening when flexed or squeezed, and which recovers to its original shape when released.

3.1.84 *steady-state sound (noise)*—noise in which there are negligibly small fluctuations of sound pressure level within the period of observation.

3.1.85 *strap*—a piece of flexible material in which the width is significantly greater than the thickness.

3.1.86 *substrate material*—all of the accessible materials present in toys, other than paint or similar surface coatings.

3.1.87 *tabletop, floor, and crib toy*—toys intended to be played with while attached to or resting on a table top, floor, or crib. Examples of such toys include, but are not limited to, toy

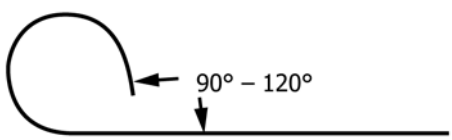


FIG. 7 Rolled Edge

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vehicles, stacking toys, large and bulky toys, games, and activity toys that attach to crib rails.

3.1.88 *tangle or form a loop*—loops that are formed by reasonably foreseeable manipulation of the cord/strap/elastic. Loops that are formed by excessive or intricate manipulations, or both, of the cord/strap/elastic shall be considered as exempt.

3.1.89 *teether*—toy designed for oral use and intended primarily for symptomatic relief of teething discomfort.

3.1.90 *tool*—screwdriver, coin, or other object which may be used to operate a screw, clip, or similar fixing device.

3.1.91 *toy*—any object designed, manufactured, or marketed as a plaything for children under 14 years of age.

3.1.92 *toy chest*—toy boxes that are designed and marketed as storage containers for toys. The products subject to the requirements are those with a volume of 1.1 ft^3 (0.031 m^3) or more.

3.1.93 *toy seat*—a stationary toy product with a seat where the amusement of the child is a primary function of the product and the play pattern intends that the child be in a seated position.

3.1.93.1 *Discussion*—Play features may include, but are not limited to, sliding or rotating features, learning toys, manually actuated music etc. with which the seated child may interact. Children's furniture products without any interactive play features such as stools, chairs, patio sets, rocking chairs, picnic tables, storage units etc. are not considered toy seats. In addition, juvenile products such as bouncers, infant seats, stationary activity centers etc. are not considered toy seats.

3.1.94 *yo yo elastic tether toy*—a toy consisting of an elastic tether that usually contains a loop on one end to wear around the finger, and a flexible object on the other end intended to be thrown and returned to the hand.

4. Safety Requirements

4.1 *Material Quality*—Toys may be made from new or reprocessed materials and shall be visually clean and free from infestation. The materials shall be assessed visually by the unaided eye rather than under magnification. If reprocessed materials are used, they shall be refined so that the level of hazardous substances conforms to the requirements of 4.3.1.

4.2 *Flammability*—Materials other than textiles (excluding paper) used in toys shall not be flammable, as defined under 16 CFR 1500.3(c)(6)(vi) under the Federal Hazardous Substances Act (FHSA) (see 16 CFR 1500). For testing purposes, any textile fabrics used in toys shall comply with 16 CFR 1610. A test procedure for testing flammability of toys, which is an interpretation of 16 CFR 1500.44, is contained in Annex A5. A procedure for testing the flammability of fabrics is contained in Annex A6.

4.3 *Toxicology:*

4.3.1 *Hazardous Substances*—Toys or materials used in toys shall conform to the FHSA and to the regulations promulgated under that act. Exemptions to this act for certain types of toys are given in 16 CFR 1500.85. The regulations define limits for substances that are toxic, corrosive, an irritant, sensitizer or pressure generating, and radioactive, flammable, and combustible materials. Testing references for hazardous substance content are given in 8.2. It should be noted that specific states may have hazardous substances regulations that are more restrictive than the Federal regulations.

4.3.2 *Manufacturing and Packaging of Food*—All food products supplied with toys shall be manufactured and packaged in compliance with 21 CFR 110, which is concerned with the sanitation practices for the manufacture, processing, packaging, or holding of human food.

4.3.3 *Indirect Food Additives*—Toy components intended to be used in contact with food, such as toy cooking utensils, shall conform to the applicable requirements of the Food, Drug and Cosmetic Act (FDCA), specifically 21 CFR 170 through 189.

4.3.3.1 *Toys in Contact with Food*—Toys comprising components intended to be used in contact with food, such as toy cooking utensils and toy tableware shall meet the requirements of 6.7 for instructional literature.

4.3.3.2 *Ceramicware, Lead, and Cadmium Contamination*—Ceramic toy components intended or likely to hold food, such as a porcelain tea set, shall conform to the applicable requirements of the FDCA, Section 402 (a) (2) (c), and FDA Compliance Policy Guides.

4.3.4 *Cosmetics*—Cosmetics shall conform to the requirements of the Federal FDCA as codified in 21 CFR. The regulations applicable to cosmetics are stated in 21 CFR 700 through 740. The color additive regulations applicable to cosmetics are found in 21 CFR 73, 74, 81, and 82.

4.3.4.1 In addition, cosmetics intended for use by children under 8 years of age shall meet all requirements of this specification and the FHSA regulations, notwithstanding the exclusions of 16 CFR 1500.81 and 1500.3(b)(4)(ii).

4.3.4.2 The requirements from the Food and Drug Administration (FDA) will therefore be additive to those existing for children's products.

4.3.5 *Heavy Elements:*

NOTE 3—While it is anticipated that the majority of testing to establish compliance with the heavy elements requirements of this standard will be conducted on complete toy samples, it is also acceptable to confirm compliance by testing of raw materials or components, or both, so long as it can be established that the results so obtained are representative of those which would be obtained by testing finished items; that is, this latter approach is only valid when it is determined that: (*1*) the manufacturing process does not in any way affect the test results obtained; and (*2*) the materials tested are representative of those in the final toy. For example, if the above conditions are met, it would be possible to demonstrate compliance with this standard for a surface coating by applying the coating to a clean glass plate, allowing it to dry, then testing the scraped-off material per section 8.3.1.

As noted above, the production process subsequent to component testing can in some instances have a significant impact on compliance, sometimes causing components previously tested and found to be compliant to become noncompliant. Those opting to test raw materials or components in lieu of finished items should take great care to be certain that results on components remain valid for the finished item, and be aware that results obtained in this manner may differ from those obtained on finished toys for a variety of reasons; among the most common are: (*1*) Substitution of raw materials occurring during production; (*2*) Contamination of the raw material occurring during production (for example, spray guns contaminated by lead used to apply compliant paint thereby rendering it noncompliant, use of contaminated thinners or solvents to thin paint or clean silk screens, etc.); (*3*) Migration of elements and their compounds from substrate (especially plasticized ones) to surface coating.

While component testing is an entirely valid approach, care shall be

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exercised to be certain that the production process subsequent to component testing does not create any change which might affect compliance.

4.3.5.1 *Paint and Similar Surface-Coating Materials*—Paint and other similar surface-coating materials applied to toys shall comply with the lead content provisions of 16 CFR 1303, issued under the Consumer Product Safety Act (CPSA), as amended by the Consumer Product Safety Improvement Act of 2008 (CPSIA).

(1) This regulation prohibits the use of paints or similar surface-coating materials that contain lead or lead compounds and in which the lead content (calculated as lead metal [Pb]) is in excess of 0.009 % (90 ppm) of the weight of the total nonvolatile content of the paint or the weight of the dried paint film.

(2) In addition, surface-coating materials shall not contain compounds of antimony, arsenic, barium, cadmium, chromium, lead, mercury, or selenium, of which the metal content of the soluble material is in excess of the levels by weight of the contained solids (including pigments, film solids, and driers) given in Table 1. The analytical results obtained should be adjusted in accordance with the test method in 8.3.4.3 prior to comparing them to the values in Table 1. 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 8.3.2.

4.3.5.2 *Toy Substrate Materials*—These requirements are intended to reduce children's exposure to heavy elements that may be contained in accessible toy substrate materials (for requirements pertaining to surface coating materials, see 4.3.5.1).

(1) Scope—This section specifies requirements and test methods for total lead and the migration of antimony, arsenic, lead, barium, cadmium, chromium, mercury and selenium in accessible substrate materials. For accessible glass, metal and ceramic toys or parts of toys, the soluble test requirements are only applied if they are small parts (that is, they fit into the test fixture specified at 16 CFR 1501 (see Fig. 3).

(a) Accessibility of parts shall be determined as defined in 3.1.2 before and after use and abuse testing described in 8.5 – 8.10.

(b) Toys and parts of toys which, due to their inaccessibility, size, mass, function, or other characteristics, cannot be sucked, mouthed, or ingested are not subject to solubility testing requirements.

NOTE 4—For the purposes of this requirement, the following criteria are considered reasonably appropriate for the classification of toys or parts likely to be sucked, mouthed, or ingested: (*1*) All toy parts intended to be mouthed or contact food or drink, components of toys which are cosmetics, and components of writing instruments categorized as toys; (*2*) Toys intended for children less than 6 years of age, that is, all accessible parts and components where there is a probability that those parts and components may come into contact with the mouth. **Please note** that the CPSIA-mandated total lead in substrate requirement applies to all accessible parts or components of toys (unless exempted as outlined in (*e*) below) for ages 12 years and under, regardless of whether they can be mouthed, licked, or sucked.

TABLE 1 Maximum Soluble Migrated Element in ppm (mg/kg) for Surface Coatings and Substrates Other Than Modeling Clay Included as Part of a Toy

Antimony, (Sb)	Arsenic, (As)	Barium, (Ba)	Cadmium, (Cd)	Chromium, (Cr)	Lead, (Pb)	Mercury, (Hg)	Selenium, (Se)
60	25	1000	75	60	90	60	500

(*c*) Packaging materials are not subject to these requirements unless they are intended to be retained as part of the toy or are intended to provide play value.

(*d*) This requirement is not intended to apply to children's jewelry, which is addressed by Specification F2923.

(*e*) In addition, materials listed in the most current revision of 16 CFR 1500.88 or 16 CFR 1500.91 as exempt from testing and certification requirements are also excluded from this requirement for the purposes of determining compliance with this standard.

NOTE 5—These exemptions are both material- and element-specific. 16 CFR 1500.91 exempts certain materials from total lead content testing. This exemption is also extended to soluble lead for the purposes of this standard. However, most of the listed materials remain subject to substrate limits for soluble levels of the other seven elements specified by this standard, until such time as CPSC establishes additional exemptions from testing for the specified materials for one or more elements in addition to lead. Notwithstanding this, paper and paperboard are exempt from substrate testing for all elements.

(*i*) Stickers consisting of a paper substrate with no laminate coating (that is, those that consist solely of paper and ink, with or without adhesive, along with any varnish or topcoat which is absorbed into the substrate and becomes inseparable from it, and is not a plastic film) are exempt from substrate testing under the paper exemption. Stickers which are printed on a plastic or other nonporous substrate or have a laminated plastic coating are to be tested as a single polymeric material per section 8.3.5.4. If scrapeable, the ink or other surface coating is tested as a surface coating and the underlying substrate is tested separately unless the substrate is exempt because it is composed of paper. Pressure-sensitive adhesive (either standard or low-tack as that used for repositionable [for example, 3M brand "Post-it" note paper] applications) applied to a porous substrate is not a surface coating as defined [see 16 CFR 1303.2(b)(1)] in that it does not dry to a solid film, but instead exists as a viscous liquid (primarily on the surface of the substrate, but also becoming inseparable from it due to "wicking" by capillary action). Since pressure-sensitive adhesives are not likely to contain appreciable amounts of any of the proscribed heavy elements, they are exempt from testing except when inseparable from and tested as part of a composite substrate.

(*ii*) Printed textiles where the printing can be easily separated (for example, pigment prints, screen inks, etc.) should have the printed matter removed and tested separately as a surface coating, and the remaining textile substrate tested per 8.3.5.4. All other textiles, (such as unprinted/undyed fabrics, textiles where the printed matter cannot be easily separated (for example, mass-dyed polymeric fibers, fiber-reactive prints on cellulosic fabrics, discharge printing of either mass or reactive dyed fabric, etc.), the entire material should be tested as a single item per 8.3.5.4.

(2) Requirements:

(a) Accessible component parts of children's products (as defined in 3.1.2 and in 16 CFR 1500.87, before and after use and abuse testing described in 8.5 – 8.10 and in 16 CFR

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1500.50-53 and 16 CFR 1500.87) shall not contain lead or lead compounds in which the lead content (calculated as lead metal [Pb]) is in excess of 0.01 % (100 ppm) of the weight of the component, except as provided at 16 CFR 1500.88 and 16 CFR 1500.91.

(b) The migration of elements from toys and parts of toys as specified in 4.3.5.2(*1*) shall not exceed the limits specified in Table 1 when tested in accordance with the methods set forth in 8.3. Modeling clays included as part of a toy shall not exceed the limits specified in Table 2 when tested in accordance with the methods set forth in 8.3. The analytical results obtained should be adjusted in accordance with the test method in 8.3.4.3 prior to comparing them to the values in Table 1 or Table 2, as appropriate. Please note that the limits in Table 2 apply only to these materials as a component of a toy; in addition, please also note that if the primary purpose of the material is to create a tangible work of art, it may in addition be subject to the requirements of 16 CFR 1500.14.

(c) In addition, metallic toys or metallic toy components which are small parts may not exhibit extraction of more than 200 µg of cadmium when tested per 8.3.5.5(*3*).

(d) Compliance with all of the above requirements [(*a*), (*b*), and (*c*)] may be established by a screening of total element content as specified in 8.3.1. If total cadmium level in the screening test is below 75 ppm, the item or component may be deemed compliant with the cadmium requirement of (*c*) above.

4.3.6 *Cosmetics, Liquids, Pastes, Putties, Gels, Powders, and Items of Avian Feather Origin*—The purpose of this requirement is to minimize the risks associated with potential lack of cleanliness, shelf life degradation, and contamination in use of cosmetics, liquids, pastes, putties, gels, powders, and items of avian feather origin (example: "marabou" items derived from poultry feathers) used in toys (excluding art materials). It sets standards for cleanliness and the ability to withstand extended shelf life or contamination, or both, during use without microbiological degradation.

4.3.6.1 Process water used in the manufacturing and filling of toys shall comply with the bacteriological standards for USP Purified Water (USP 35 <1231>) as well as for drinking water per the EPA standard (40 CFR 141.63); specifically, this requires a heterotrophic plate count of <10 colony forming units per milliliter (cfu/ml) and the absence by test of coliform bacteria.

NOTE 6—The various methods for producing purified water each present different potentials for contaminating the final product. Purified water produced by distillation is sterile, provided that the production equipment is suitable and sterile. On the other hand, ion-exchange columns, microfiltration units, and reverse osmosis units require special attention in that they afford sites for microorganisms to foul the system and contaminate the effluent. Frequent monitoring may thus be called for, particularly with the use of these units following periods of shutdown of more than a few hours.

TABLE 2 Maximum Soluble Migrated Element in ppm (mg/kg) for Modeling Clays Included as Part of a Toy

Antimony, (Sb)	Arsenic, (As)	Barium, (Ba)	Cadmium, (Cd)	Chromium, (Cr)	Lead, (Pb)	Mercury, (Hg)	Selenium, (Se)
60	25	250	50	25	90	25	500

4.3.6.2 The formulations of these products used in toys shall be such that they are not subject to microbial degradation during shelf life or reasonably foreseeable use.

4.3.6.3 The cleanliness of these products used in toys and their ingredients shall be determined in accordance with 8.4.1.

4.3.6.4 Formulations of these products (except avian feather items) shall be evaluated for potential microbiological degradation in accordance with 8.4.2.

4.3.7 *Stuffing Materials*—Loose fillers for stuffed toys shall be free of objectionable matter originating from insect, bird, rodent, or other animal infestation and of contaminants, such as splinters, glass and metal chips to the extent possible in good manufacturing practice when evaluated in accordance with 8.29.

4.3.8 *DEHP (DOP)*—Pacifiers, rattles, and teethers shall not intentionally contain DI (2-ethylhexyl) phthalate (also known as dioctyl phthalate). To prevent trace amounts of DEHP (DOP) from affecting analysis, up to 3 % of total solid content will be accepted in the result, when tested in accordance with Practice D3421.

4.4 *Electrical/Thermal Energy*—Toys operating from nominal 120-V branch circuits shall conform to 16 CFR 1505, issued under the FHSA.

4.5 *Sound-Producing Toys*—These requirements are intended to minimize the possibility of hearing damage that might be caused by toys that are designed to produce sound. These requirements are applicable before and after testing in accordance with 8.5 through 8.10. These requirements do not apply to: (*1*) sounds produced by mouth-actuated toys where the sound pressure level is determined by the blowing action of the child; (*2*) sounds such as those produced by xylophones, bells, drums, and squeeze toys where the sound pressure level is determined by the muscular action of the child. This exemption does not apply to rattles which are subject to the C-weighted peak requirement; (*3*) sounds produced by radios, MP3 players, CD players, and other similar electronic toys and toys where the sound output is dependent on the content of removable media such as discs, flash cards, or internet downloaded content; (*4*) sounds produced by toys that are connected to or interfaced with external devices such as televisions and computers where the sound pressure level is determined by the external device; (*5*) sound emitted from earphones/headphones; (*6*) sounds produced by toys that reproduce or alter the child's voice such as walkie-talkies, recording devices, megaphones, kazoos, etc; and (*7*) sounds quantified by A-weighted equivalent sound pressure level, L_{Aeq}, produced by pull and push toys as a result of pulling or pushing. This exemption does not apply to the C-weighted peak requirement which is applicable.

4.5.1 *Requirements*—When tested in accordance with 8.20, toys that are designed to emit sound shall conform to the following requirements:

4.5.1.1 The A-weighted equivalent sound pressure level, L_{Aeq}, produced by close to the ear toys shall not exceed 65 dB.

4.5.1.2 The maximum A-weighted sound pressure level, L_{AFmax}, produced by the translational motion of floor or table top toys where the motion is imparted on the toy by the child (see 8.20.1.5 for a greater description) shall not exceed 85 dB.

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4.5.1.3 The A-weighted equivalent sound pressure level, L_{Aeq}, produced by all other toys shall not exceed 85 dB.

4.5.1.4 The C-weighted peak sound pressure level, L_{Cpeak}, produced by close to the ear toys shall not exceed 110 dB.

4.5.1.5 The C-weighted peak sound pressure level, L_{Cpeak}, produced by any type of toy excluding toys using explosive action (for example, percussion caps) shall not exceed 115 dB.

4.5.1.6 The C-weighted peak sound pressure level, L_{Cpeak}, produced by a toy using percussion caps or other explosive action shall not exceed 125 dB.

4.6 *Small Objects*—These requirements are intended to minimize the hazards from choking, ingestion, or inhalation to children under 36 months of age created by small objects.

4.6.1 Toys that are intended for children under 36 months of age are subject to the requirements of 16 CFR 1501. Criteria for determining which toys are subject to these requirements are provided, in part, in 16 CFR 1500.50 and 1501 and also in Annex A1 of this specification. The requirements of 16 CFR 1501 state, in part, that no toy (including removable, liberated components, or fragments of toys) shall be small enough without being compressed to fit entirely within a cylinder of the specified dimensions as shown in Fig. 3. For the purposes of this specification, fragments of toys include, but are not limited to, pieces of flash, slivers of plastics, pieces of foam, or fine bits or shavings. Pieces of paper, fabric, yarn, fuzz, elastic, and string are excluded from this requirement.

4.6.1.1 The requirements are applicable before and after use and abuse testing in accordance with Section 8 to determine the accessibility of small objects such as small toys or components of toys including eyes, squeakers, or knobs, or pieces that break off or are removed from toys.

4.6.1.2 The following articles are exempt from the requirements: balloons; books and other paper articles; writing materials (crayons, chalk, pencils, and pens); phonograph records and compact discs (CDs); modeling clay and similar products; and fingerpaints, watercolors, and other paint sets. A listing of exempt articles is provided in 16 CFR 1501.3.

4.6.1.3 Toys that are intended to be assembled by an adult and contain potentially hazardous small objects in the unassembled state shall be labeled in accordance with 5.8.

4.6.2 *Mouth-Actuated Toys:*

4.6.2.1 This requirement relates to toys, such as noisemakers, that are intended to be actuated by blowing or sucking. Mouth-actuated toys that contain loose objects, such as spheres in a whistle, or inserts, such as reeds in a noisemaker, shall not release an object that will fit within the small parts test cylinder, as shown in Fig. 3, when air is alternately blown and sucked rapidly through the mouthpiece, when tested in accordance with 8.13.1. The procedure of 8.13.1 shall also be applied to the outlet if the air outlet is capable of being inserted into or covered by the mouth.

4.6.2.2 Projectile toys in which the projectile is launched by the user blowing into the discharge mechanism.

(1) Mouth-actuated discharge mechanisms shall include a permanently-installed means to prevent passage of the projectile backwards through the mouth end of the launcher when tested in accordance with 8.13.2. This mechanism shall not be user-removable and shall not detach during testing per applicable sections of 8.7.1, 8.8, 8.9, and 8.10. If such means to prevent passage of the projectile is integral with the mouthpiece, the mouthpiece shall not be user-removable, and shall not detach during testing per applicable sections of 8.7.1, 8.8, 8.9, and 8.10. If the toy includes user-removable mouthpieces or projectiles of different designs, or both, each design or combination, or both, shall be tested separately.

(2) Mouthpieces intended to be user-removable shall not fit entirely within the small parts test cylinder, as shown in Fig. 3. If a permanently-attached mouthpiece detaches from the discharge mechanism when subjected to applicable sections of 8.7.1, 8.8, 8.9, and 8.10, it shall not fit entirely within the small parts test cylinder, as shown in Fig. 3.

NOTE 7—The requirements of 4.6.2.2 apply to all mouth actuated projectile launchers regardless of the intended age group of the toy.

4.6.2.3 Small objects contained in an inflatable toy shall not be liberated during inflation or deflation.

4.6.3 Toys and games that are intended for use by children who are at least three years old (36 months) but less than six years of age (72 months) are subject to the requirements of 16 CFR 1500.19. With the exception of products such as paper punch-out games and similar items, any toy or game that is intended for use by children who are at least three years old (36 months) but less than six years of age (72 months) and includes a small part is subject to the labeling requirements in accordance with 5.11.2.

4.7 *Accessible Edges*—Toys shall not have accessible, potentially hazardous sharp edges. Toys that are intended to be assembled by an adult, and may contain unprotected potentially hazardous sharp edges in the unassembled state, shall be labeled in accordance with 5.8.

4.7.1 Potentially hazardous sharp metal and glass edges are defined in 16 CFR 1500.49. Toys intended for use by children under 8 years of age are subject to this requirement before or after use and abuse testing, or both, as specified in 8.5 – 8.10. An illustration of a sharp edge tester is shown in Fig. 8.

4.7.2 Toys containing potentially hazardous edges that are a necessary part of the function of a toy shall carry cautionary labeling as specified in 5.10 if the toy is intended for use by children from 48 to 96 months. Toys intended for children aged less than 48 months shall not have accessible hazardous functional sharp edges.

4.7.3 *Metal Toys*—Accessible metal edges, including holes and slots, shall be free of hazardous burrs and feathering, or shall be hemmed, rolled, or curled, or shall be covered with a permanently affixed device or finish.

NOTE 8—Regardless of the manner in which edges are finished, they are subject to the sharp edge technical requirements as described in 4.7.1. If a device is used to protect an edge, it shall not become detached after being tested in accordance with the appropriate procedures described in 8.5 – 8.10.

4.7.4 *Molded Toys*—Accessible edges, corners, or mold parting areas of molded toys should be free of hazardous edges produced by burrs and flash or so protected that hazardous edges are not exposed.

4.7.5 *Exposed Bolts or Threaded Rods*—If the ends of bolts or threaded rods are accessible, the thread shall be free of

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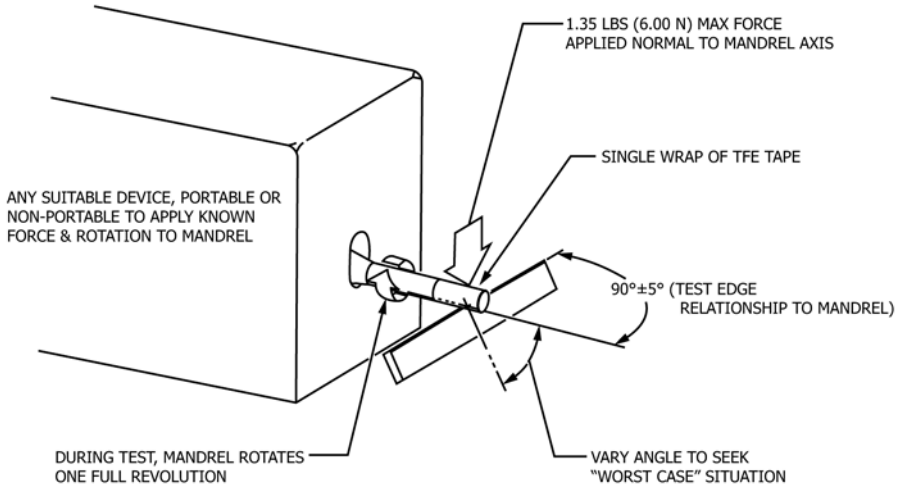


FIG. 8 Principle of Sharp Edge Test

exposed, hazardous sharp edges and burrs, or the ends shall be covered by smooth finish caps so that hazardous sharp edges and burrs will not be exposed. Any caps that are used shall be subjected to the compression test noted in 8.10, regardless of whether the cap is accessible to flat-surface contact during the appropriate impact test(s) described in 8.7. Protective caps shall also be subjected to the tension test in 8.9 and the torque test in 8.8.

4.8 *Projections*—This requirement relates to potentially hazardous projections in all toys intended for use by children under 8 years of age. This requirement is intended to minimize possible puncture hazards to the skin that might be caused if a child were to fall on a rigid projection, such as unprotected ends of axles, actuating levers, and decorative features. Due to the extremely sensitive nature of the eyes and interior of the mouth, this requirement will not, nor is it intended to, provide protection to those areas of the body. If a projection appears to present a potential skin puncture hazard, the projection shall be protected by suitable means, such as by turning back the end of a wire or by affixing a smoothly finished protective cap or cover, which effectively increases the surface area for potential contact with the skin. Toys shall meet this requirement both before and after testing in accordance with 8.5 – 8.10. Toys intended to be repeatedly assembled and taken apart shall have the individual pieces and fully assembled articles, as shown on packaging graphics, instructions or other advertising, evaluated separately. The requirements for the assembled toy do not apply to toys where the assembling makes up a significant part of the play value of the toy. Since this requirement relates to hazards arising from a child falling onto a toy, only vertical or nearly vertical projections are required to be evaluated. The toy shall be tested in its most onerous position. Corners of structures are excluded from this requirement.

4.8.1 *Bath Toy Projections*—Rigid projections on toys designed primarily for use in the bath tub may pose a specific hazard that can result in serious penetration and impalement injuries. Additional design guidelines specifically for bath toy projections are provided in Annex A4 of this specification. As there are no objective means for determining conformance with these guidelines, they are not to be used to judge compliance with this specification.

4.9 *Accessible Points*—Toys shall not have accessible, potentially hazardous sharp points that may occur because of the following: configuration of the toy; assembly devices such as wires, pins, nails, and staples that are fastened poorly; poorly sheared sheet metal; burrs on screws; and splintered wood. Toys that are intended to be assembled by an adult and may contain potentially hazardous sharp points in the unassembled state shall be labeled in accordance with 5.8.

4.9.1 Potentially hazardous sharp points are defined by 16 CFR 1500.48. Toys intended for use by children under 8 years of age are subject to this requirement before or after use and abuse testing, or both, as specified in 8.5 – 8.10. An illustration of a sharp-point tester is shown in Fig. 9.

4.9.2 Toys in which an accessible, potentially hazardous sharp point is a necessary function of the toy, such as a needle in a sewing kit, shall carry cautionary labeling as specified in 5.10, if the toy is intended for children from 48 to 96 months old. Toys intended for children less than 48 months old shall not have accessible hazardous functional points.

4.9.3 *Wood*—The accessible surfaces and edges of wood used in toys shall be free of splinters, both before and after being tested in accordance with the appropriate procedures described in 8.5 – 8.10.

4.10 *Wires or Rods*—Wires or rods used in the interior of toys shall have their ends finished to avoid potentially hazardous points and burrs, shall be turned back, or shall be covered with smoothly finished protective caps or covers, if they can become accessible after use or reasonably foreseeable abuse. Metal wires or other metal materials used for stiffening or for retention of form in toys shall not fracture to produce a hazardous point, edge, or projection hazard when tested in accordance with 8.12, if the component can be bent through a 60° arc by the applicable maximum force. When applied perpendicularly to the major axis of the component at a point 2 ± 0.05 in. (50 ± 1.3 mm) from the intersection of the component with the main body of the toy or at the end of the

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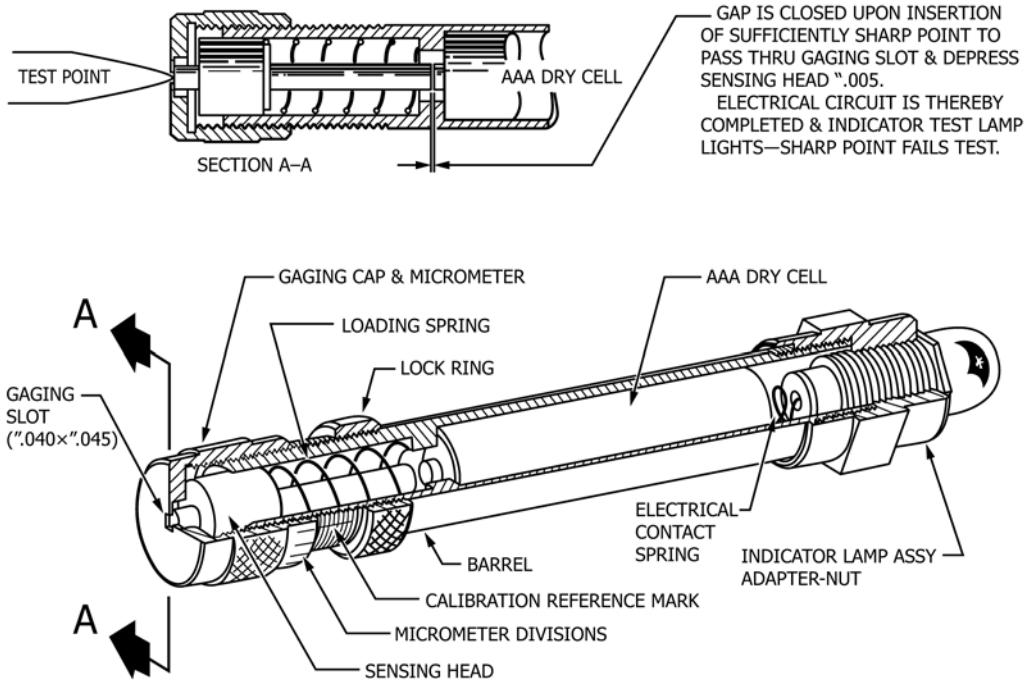


FIG. 9 Sharp Point Tester

component if the component is less than 2 in. (50 mm) long, the maximum force shall be as follows (within a tolerance of ±0.5 lb (±0.02 kg)):

10 lbf (45 N)	toys intended for use by children 18 months of age or less
15 lbf (67 N)	toys intended for use by children over 18 but not over 96 months of age

The ends of spokes on toy umbrellas shall be protected. If the protection is removed when tested according to 8.9 (tension test) the ends of the spokes shall be free from sharp edges and sharp points when tested in accordance with 4.7.1 (sharp edge test) and 4.9.1 (sharp point test). Furthermore, if the protective components are removed by the tension test, the spokes shall have a minimum diameter of 0.08 in. (2 mm) and the ends shall be smooth, rounded, and approximately spherical with no burrs.

4.11 *Nails and Fasteners*—Nails and fasteners shall not present a point, edge, ingestion, or projection hazard. Points of nails or fasteners shall not protrude so as to be accessible. Additional requirements for nails and fasteners used as axles are given in 4.17.

4.12 *Plastic Film*—This requirement is intended to minimize the possibility of asphyxiation hazards that might be caused by thin plastic films. Flexible plastic film bags and flexible plastic sheets used as packaging materials for shelf packages or used with or as part of toys shall be at least 0.00150 in. (0.03810 mm) in average thickness, but the actual thickness of any individual measure shall never be less than 0.00125 in. (0.03175 mm). Alternatively, sheeting with an average thickness of less than 0.00150 in. (0.03810 mm) shall be perforated with defined holes so that a minimum of 1 % of the area has been removed over any area of 1.18 × 1.18 in. (30 × 30 mm). The thickness shall be determined using the test method in 8.22. This requirement does not apply to the following:

4.12.1 Shrink film in the form of an over wrap that would normally be destroyed when the package is opened by a consumer.

4.12.2 Bags or plastic film with a minor dimension of 3.94 in. (100 mm) or less. Bag dimensions shall be measured while in the form of a bag, not cut open into a single thickness sheet.

4.13 *Folding Mechanisms and Hinges*—These requirements are intended to eliminate possible crushing, laceration, or pinching hazards that might occur in folding mechanisms and hinges. Examples are the sudden collapse or unexpected motion of a folding mechanism or hinge that produces a scissor action; and the changing clearances at the hinge line between two hinged portions, such that the gap will admit fingers at any one position of the hinge but not at all positions. These requirements do not relate to the recognized and familiar hazards associated with the changing clearances around the edges of doors or pivoted or hinged sections in toy truck bodies, toy earth moving machinery, and similar toys. Toys shall meet the requirements specified in 4.13.1 and 4.13.2 after they are tested in accordance with 8.5 – 8.10. Requirements for toy chests are contained in 4.41.

4.13.1 *Folding Mechanisms*—Toy furniture and other toys in which a folding mechanism, arm, or bracing is intended or likely to support the weight of a child in normal use shall have a locking device or other means to prevent unexpected or sudden movement or collapse of the product, or have adequate clearance to provide protection for the fingers, hands, and toes from crushing, laceration or pinching hazards in the event of sudden movement or collapse of the product. Examples of products to which these requirements would apply include, but are not limited to, folding mechanisms in toy strollers a child can sit in, toy chairs a child can sit in, or a child sized ironing board. One way to determine if a child can sit in a product is to verify that the seat width would accommodate the hip

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breadth of a child in the age range for which the product is intended. Examples of products to which these requirements would not apply include, but are not limited to, a doll house sized chair, a doll house sized bed, or an expandable/collapsible sphere.

4.13.1.1 Locking devices or other means to prevent unexpected or sudden movement or collapse of the product shall engage automatically when the product is placed in the manufacturer's recommended use position. During and upon completion of the testing in 8.26.1, the unit shall remain in its recommended use position. The test in 8.26.1 shall not apply to locking devices or other means where the direction of force of the occupant load opposes the direction of collapse of the mechanism.

4.13.1.2 Locking devices shall comply with either of the following:

(1) Each single action device shall require a minimum force of 10 lbf (45 N) to activate the release mechanism when tested in accordance with 8.26.2.

(2) Each double action locking device shall require two distinct and separate actions to release. There are no force requirements for double action locking devices.

4.13.2 *Hinge-Line Clearance*—Toys having a gap or clearance along the hinge line between a stationary portion and a moveable portion that weighs more than ½ lb (0.2 kg) shall be so constructed that, if the accessible gap at the hinge line will admit a 3⁄16-in. (5-mm) diameter rod, it will also admit a ½-in. (13-mm) diameter rod at all positions of the hinge.

4.14 *Cords, Straps, and Elastics*—These requirements are intended to minimize the potential entanglement and strangulation hazards that might be caused by accessible cords, straps, and elastics. These requirements are applicable before and after use and abuse testing in accordance with 8.5 – 8.10.

4.14.1 *Cords, Straps, and Elastics in Toys*—Cords, straps, or elastics included with or attached to toys intended for children less than 18 months of age (excluding pull toys, see 4.14.3) shall be less than 12 in. (300 mm) long when measured to the maximum length in a free state and under a load of 5 lb (2.25 kg). If cords/straps/elastics or multiple cords/straps/elastics can tangle or form a loop in connection with any part of the toy, including beads or other attachments on the ends of cords/straps/elastics, the loop shall not permit the passage of the head probe (Fig. 10) when tested in accordance with 8.23.

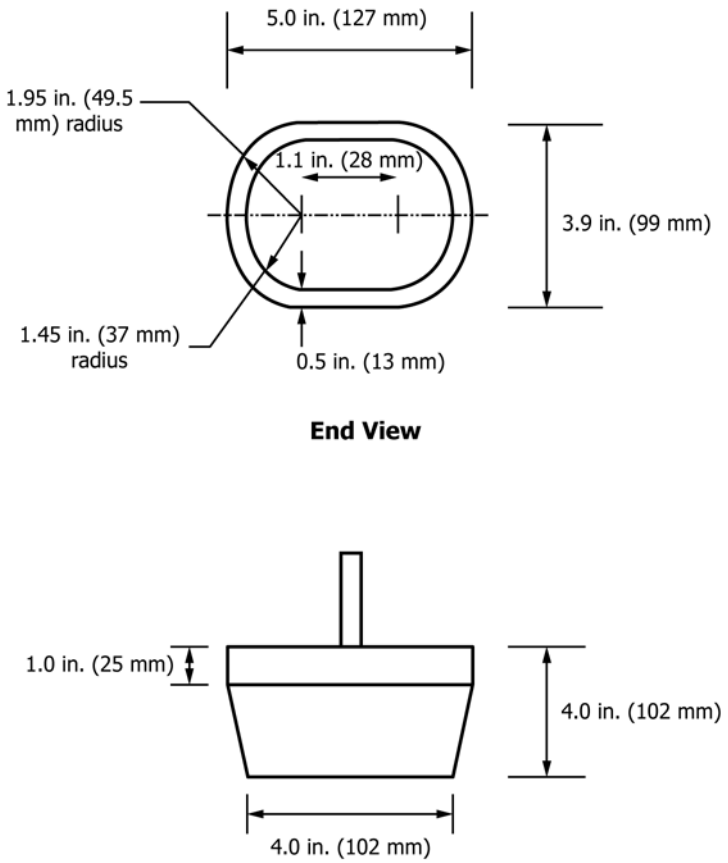


FIG. 10 Head Probe for Cords and Elastics

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Specifically, the loop shall not allow the head probe to be inserted so deep that it admits the base of the probe. The configuration of the loop shall be determined by using all components that make up the loop. For example, the configuration of the loop for the product illustrated in Fig. 11 is comprised of Cord 1, Cord 2, and the toy part.

4.14.1.1 *Cords, Straps, and Elastics Containing a Breakaway Feature*—Cords, straps, and elastics on toys that have loops that admit the base of the head probe shall contain a functional breakaway feature that prevents entanglement by releasing at a force less than 5.0 lbf (22.2 N) when tested in accordance with 8.23.3. The free length of the individual released cord, strap, or elastic should not exceed a maximum length of 12 in. (300 mm). The breakaway feature shall be capable of being reattached without altering the characteristics of the attachment.

4.14.2 *Self Retracting Pull Cords*—Accessible cords used in cord-activated mechanisms in toys intended for use by children under 18 months of age, except monofilament-type cords 1⁄16 in. (2 mm) or less in diameter, shall not retract more than ¼ in. (6 mm) when a weight of 2 lb (0.9 kg) is attached to the fully extended cord with the cord held vertical and the toy held firmly in the most favorable position for retraction. Monofilament cords, 1⁄16 in. (2 mm) or less in diameter, shall not retract under a load of 1 lb (0.45 kg) when tested in the manner described above.

4.14.3 *Pull Toys*—Cords, straps, and elastics greater than 12 in. (300 mm) long for pull toys intended for children under 36 months of age shall not be provided with beads or other attachments that could tangle to form a loop.

4.14.4 *Strings and Lines for Flying Devices*—Kite strings and handheld lines over 6 ft (1.8 m) long, attached to flying devices intended for use as playthings, shall have an electric resistance of more than 10^8 Ω/cm when tested at a relative humidity of not less than 45 % and a temperature of not greater than 75°F (24°C), when measured by a high-voltage, resistance breakdown meter.

4.14.5 *Cords on Toy Bags Intended for Children Up to 18 Months*—Toy bags made of impermeable material with an opening perimeter greater than 14 in. (360 mm) shall not have a drawstring or cord as a means of closing.

4.14.6 *Ride-on Toys*—Straps used for waist restraints on ride-on toys are exempt from the free length and loop requirements of 4.14.1.

4.15 *Stability and Over-Load Requirements:*

4.15.1 *Stability of Ride-On Toys and Toy Seats*—These requirements are intended to minimize unexpected hazards that could be caused by a toy that can tip easily. They take into account the use of the child's legs as stabilizing means and recognize that a child learns instinctively to compensate for inclined positions. The requirements listed in 4.15.2 and 4.15.3 shall apply to the following classes of toys intended for use by children aged 60 months or less: ride-on toys, with three or more load bearing wheels, such as wagons; ride-on, action-type toys such as hobby horses, rocking toys (for example, horses,

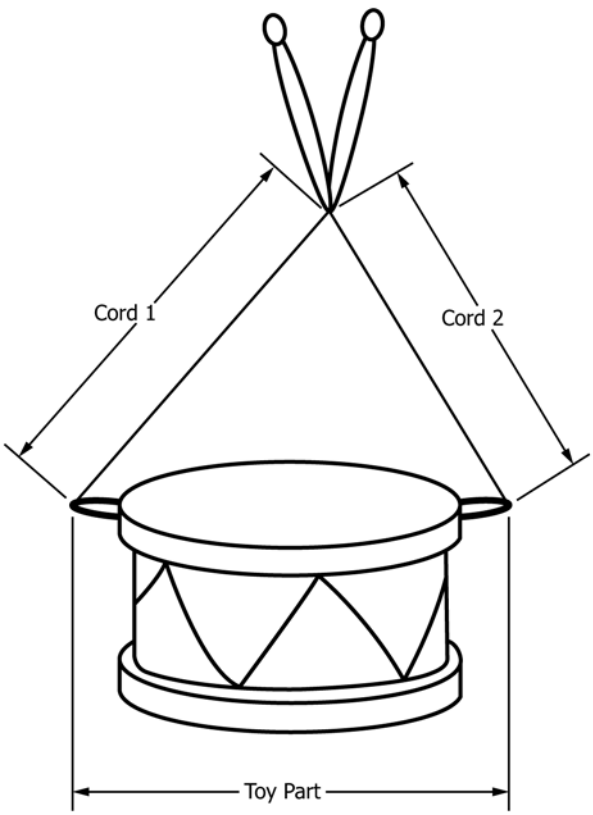


FIG. 11 Loop Example

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cars); and toy seats. Ride-on toys of spherical, cylindrical, or other shape that do not normally have a stable base are not covered by these requirements. For the purposes of this requirement, multiple wheels centered on the same axle or axis with a spacing of 5.9 in. (150 mm) or less between the centers of the outermost wheels are considered to be a single wheel. The toy shall conform to these requirements after it is tested in accordance with 8.5 – 8.10.

4.15.2 *Sideways Stability Requirements*—These requirements recognize two types of possible stability hazards: those associated with ride-on toys or toy seats in which the feet can provide stabilization, and those situations in which the feet are restricted by an enclosing structure.

4.15.2.1 *Sideways Stability, Feet Available for Stabilization*—There shall be no sideways stability test for those ride-on toys or toy seats in which the height of the seat from the ground is one third, or less than one third, of the height indicated in Table 3 at the lowest age of the age range for which the ride-on toy or toy seat is intended, and in which the legs of the child are unrestricted in their sideways motion and thus are available for stabilization. (The values given in Table 3 represent the lower of the following two numbers: (*1*) the fifth percentile group of boys at each age from 1 up to and including 5 years; and (*2*) the fifth percentile group of girls at each age from 1 up to and including 5 years.) For those ride-on toys, or toy seats in which the height of the seat from the ground is greater than one third of the height indicated in Table 3 at the lowest age of the age range for which the ride-on toy or toy seat is intended, and in which the legs of the child are unrestricted in their sideways motion and thus are available for stabilization, the toy shall not tip when tested in accordance with 8.15. When the lowest age of the intended age range falls between two ages listed in Table 3, the lower of the two shall be chosen.

4.15.2.2 *Sideways Stability, Feet Unavailable for Stabilization*—If the sideways motion of the feet or legs, or both, is restricted, such as by the enclosed sides of a toy automobile, the ride-on toy or toy seat shall not tip when tested as specified in 8.15, except that the surface shall be inclined 15° to the horizontal.

4.15.3 *Fore and Aft Stability*—This requirement relates to the stability of ride-on toys or toy seats in the forward direction with respect to the child's position, where the child cannot easily use his/her legs for stabilization, and in the backward direction with respect to the child regardless of whether his/her legs are available for stabilization. All ride-on toys or toy seats falling within the scope of 4.15 shall not tip forward or backward when the toy, which shall be loaded with a simulated child's weight, is tested both facing down and up the slope using the test method of 8.15, except that the surface shall be inclined 15° to the horizontal. The stability of ride-on toys is to be tested not only with the steering wheels in a forward position, but also at an angle of 45° to the left and to the right of the forward position.

TABLE 3 Height of Fifth Percentile Children (Values Given for Boys or Girls, Whichever is Lower)

Age, years	Height, in. (cm)
1	27 (69.8)
2	29 (74.4)
3	33 (85.1)
4	37 (93.8)
5	40 (100.5)

4.15.4 *Stability of Stationary Floor Toys*—This requirement is intended to minimize hazards that might be caused by a toy that tips when a door, drawer, or other movable portion is extended to its fullest travel. Stationary floor toys of greater than 30 in. (760 mm) in height and weighing more than 10 lb (4.5 kg) shall not tip when placed on a 10° incline with all movable portions extended to their fullest travel and facing in the direction of the downslope side. The toy shall conform to this requirement after it is tested in accordance with 8.5 – 8.10.

4.15.5 *Overload Requirements for Ride-On Toys and Toy Seats*—This requirement is intended to minimize unexpected hazards that could be caused by a toy that is not capable of withstanding an overload. All ride-on toys, toys intended for use as seats, or toys designed to support all or part of the weight of the child shall support a load applied to the seat, or to other such intended load-bearing components, without collapsing to produce a hazardous condition when tested in accordance with 8.28. Examples of hazardous conditions if collapse occurs would include the following: exposure of hazardous edges, or points, projections, crushing or pinching hazards, and power-driven mechanisms. The toy shall conform to this requirement after being tested in accordance with 8.5 through 8.10.

4.15.6 *Wheeled Ride-on Toys*—Ride-on toys incorporating wheels intended for movement along the ground shall be tested in accordance with the Dynamic Strength Test for Wheeled Ride-ons in 8.21. Wheeled ride-on toys shall be tested after being tested in accordance with 8.5 – 8.10.

4.16 *Confined Spaces*—The purpose of these requirements is to minimize the possible entrapment of children in toys that form enclosures, such as toy refrigerators, and to prevent possible suffocation in head-enclosing toys such as space helmets. Toys shall meet the requirements listed in 4.16.1 – 4.16.3 after the toys are tested in accordance with 8.5 – 8.10. See 4.41 for requirements for toy chests.

4.16.1 *Ventilation*—The purpose of these requirements is to minimize the possible entrapment of children in toys that form enclosures, such as toy refrigerators, and to prevent possible suffocation in head-enclosing toys such as space helmets. Any toy made of impermeable material and having a door or lid, which encloses a continuous volume greater than 1.1 ft^3 (0.03 m^3) and in which all internal dimensions are 6 in. (150 mm) or more, shall provide one of the following unobstructed ventilation areas:

4.16.1.1 A minimum of two openings each having a total area of at least 1 $in.^2$ (650 mm^2) placed at least 6 in. (150 mm) apart (see Fig. 12(a)).

4.16.1.2 One opening that is the equivalent of the two 1.0 $in.^2$ (650 mm^2) openings expanded to include the separation area provided this leaves opening areas of 1.0 $in.^2$ (650 mm^2) on either side of a 6 in. (150 mm) spacing (see Fig. 12(b)). The ventilation openings shall be unobstructed when the toy is placed on the floor in any position and adjacent to two vertical

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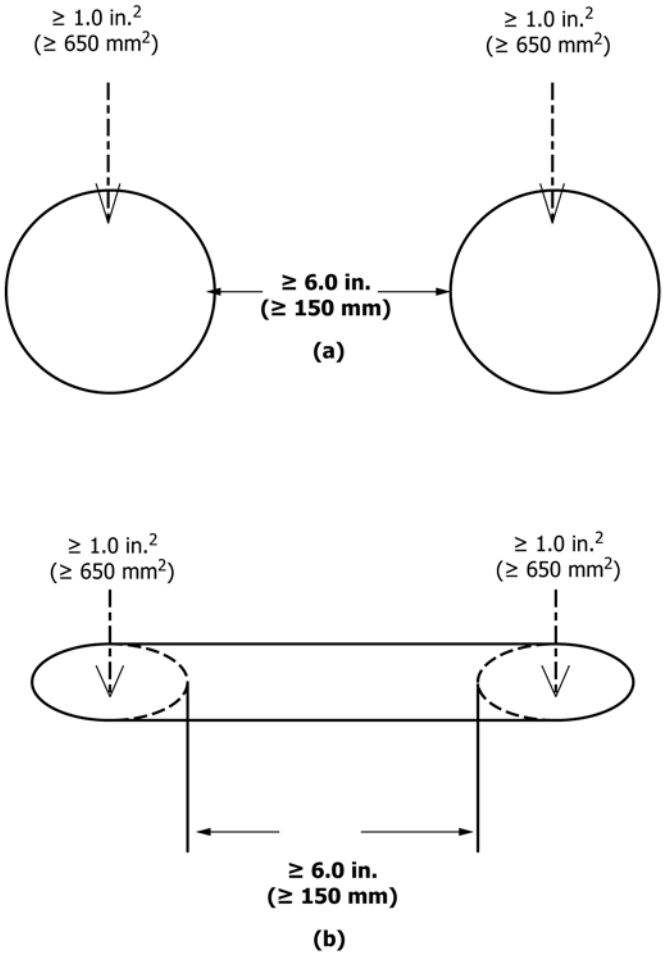


FIG. 12 Examples of Ventilation Hole Spacing

plane surfaces meeting at a 90° angle, so as to simulate the corner of a room. If a permanent partition or bars (two or more), which effectively limit the continuous space by making the largest internal dimension less than 6 in. are used to subdivide a continuous space, the ventilation area shall not be required.

4.16.2 *Closures*—Closures (such as lids, covers, and doors) to enclosures falling within the scope of 4.16.1 shall not be fitted with automatic locking devices. Closures shall be of a type that can be opened with a force of 10 lbf (45 N) or less when treated as follows:

4.16.2.1 With the closure in a closed position, apply the force in an outward direction to the inside of the closure perpendicular to the plane of the closure and anywhere within 1 in. (25 mm) from the geometric center of the closure. The force measurement shall be made by means of a force gauge with a calibrated accuracy within ±0.3 lb (0.1 kg) when measuring a force of 10 lb (45 N). The dial of the gauge shall be graduated with its finest division not exceeding 0.2 lb (0.9 N), and the full-scale range shall not exceed 30 lb (130 N).

4.16.3 *Toys that Enclose the Head*—Toys that enclose the head, such as space helmets, which are made of impermeable material, shall provide means for breathing by the incorporation of unobstructed ventilation areas. The ventilation areas shall consist of a minimum of two holes, with a total of at least 2 in.^{2} (1300 mm^2) of ventilation and at least 6 in. (150 mm) between holes.

4.17 *Wheels, Tires, and Axles*—These requirements are intended to eliminate the possibility of ingestion hazards (as described in 4.6) that might be caused by small wheels or tires that separate during normal use or reasonably foreseeable abuse, as well as laceration or puncture hazards from projecting axles, either on the toy or on wheel assemblies that may be removed from the toy during abuse. The requirements shall apply to transportation wheels on both preassembled and knocked-down toys intended for children aged 96 months or less, except for ingestion hazards from small wheels and axles, which apply to toys intended for children under 36 months of age, as covered in 4.6. In the case of knocked-down toys, the toy shall be tested in the form that it would be assembled by the purchaser, using simple household tools or special tools provided by the manufacturer, if any, or both. After being subjected to the use and abuse tests of 8.5 – 8.11, wheels, tires, or axles shall not present a laceration, puncture, or ingestion hazard as defined in 3.1.65 and 4.6.1, respectively.

4.18 *Holes, Clearance, and Accessibility of Mechanisms*—These requirements are intended to eliminate possible hazards

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that may be caused by changing clearances. Toys shall meet these requirements after they are tested in accordance with 8.5 – 8.10. The different pinch clearance requirements listed in 4.18.1 – 4.18.6 reflect the different modes of entrapment or pinching that may be encountered.

4.18.1 *Accessible Clearances for Moveable Segments*—This requirement concerns clearances between movable segments on toys intended for children under 96 months only, where the potential for pinching or crushing fingers or other appendages exists. It includes, but is not limited to, wheels and rigid-wheel wells, fenders, or the radial clearance between the wheels and chassis of ride-on toys, or the driven wheels and other parts of toys powered by electrical, spring, or inertial energy. If such accessible clearances admit a 3⁄16-in. (5-mm) diameter rod, they shall also admit a ½-in. (13-mm) diameter rod in order to prevent the trapping of fingers.

4.18.2 *Circular Holes in Rigid Materials*—This requirement is intended to prevent finger entrapment (which may cut off blood circulation) in accessible holes in sheet metal and other rigid material in toys intended for children aged 60 months or less. (Noncircular holes are believed to present no significant hazard of cutting off blood circulation in entrapped fingers.) If an accessible, circular hole in any rigid material less than 0.062 in. (1.58 mm) in thickness can admit a ¼-in. (6-mm) diameter rod to a depth of ⅜ in. (10 mm) or greater, it shall also admit a ½-in. (13-mm) diameter rod.

4.18.3 *Chains and Belts*—These requirements are to prevent finger crushing through entrapment between links of supporting chains or between chains and sprockets or pulleys and belts.

4.18.3.1 *Supporting Chains*—Chains in toys that support the weight of a child, such as hanging seats or similar indoor devices, intended for children 36 months or less in age, shall be shielded if the chain is accessible and if a 0.19-in. (5-mm) diameter rod can be inserted between two links, as in Fig. 13, with the chain in slack configuration.

4.18.3.2 *Chains or Belts for Ride-On Toys*—Power transmission chains and belts in ride-on toys shall be shielded.

4.18.4 *Inaccessibility of Mechanisms*—Clockwork, battery-operated, inertial, or other power-driven mechanisms in toys intended for children aged 60 months or less shall not have any accessible part of the mechanism present a pinch or laceration hazard. (For circular holes, also see the requirement under 4.18.2.)

4.18.5 *Winding Keys*—This requirement is to prevent the pinching or laceration of fingers by entrapment between the key and body of the toy. It applies to toys intended for children under 36 months of age that use winding keys that rotate as the mechanism unwinds. This requirement applies to keys with flat plates attached to the stem and that protrude from a rigid surface; the requirement does not apply to those circular knobs to which the torque is applied. If the clearance between the flukes of the key and body of the toy will admit a 0.25-in. (6-mm) diameter rod, it shall also admit a 0.5-in. (13-mm) diameter rod at all positions of the key. For keys covered by this requirement, there shall be no opening in the flukes of the key that can admit a 0.19-in. (5-mm) diameter rod.

4.18.6 *Coil Springs*—These requirements are intended to prevent the pinching or crushing of fingers or toes by toys containing springs. Coil springs (either compression or extension) that form part of a component that carries the weight of a child shall be shielded so as to prevent access during use or reasonably foreseeable abuse unless either of the following occurs:

4.18.6.1 A 0.12-in. (3-mm) diameter rod cannot be inserted freely; or

4.18.6.2 A 0.25-in. (6-mm) diameter rod can be inserted freely between the adjacent coils at all points in the action cycle when the spring is subjected first to a weight of 3 lb (1.4 kg) and then to a weight of 70 lb (32 kg).

4.19 *Simulated Protective Devices* (such as helmets, hats, and goggles)—These requirements are intended to minimize hazards that might be caused, for example, by goggles or space helmets if the material from which they are constructed fails; or by toys that simulate protective devices such as football helmets and pads, if the wearer uses the article as a real protective device rather than as a toy. The toy shall conform to the requirements listed in 4.19.1 and 4.19.2 after testing in accordance with 8.7.4 and 8.8 through 8.10.

4.19.1 *Eye Protection*—All rigid toys that cover the face, such as goggles, space helmets, or face shields, shall be constructed of impact-resistant material that will not have sharp edges, sharp points, or loose parts that could enter the eye before or after being tested in accordance with 8.5 – 8.10. This applies to items with cutout eye holes as well as items that cover the eyes.

4.19.2 Toys that simulate safety protective devices (examples include, but are not limited to, construction helmets and sports helmets) and their packages shall be labeled clearly in accordance with 5.9 to warn the purchaser that they are not safety protective devices.

4.20 *Pacifiers*—Infant pacifiers shall conform to the safety requirements as specified in 16 CFR 1511. Illustrations of the pacifier test fixture are shown in Fig. 14.

4.20.1 Pacifiers with rubber nipples shall conform to the nitrosamine levels as specified in Specification F1313. This specification states that a test sample of nipples, drawn from a standard production lot, shall not contain more than 10 ppb in each of three aliquots of any one nitrosamine. In addition, the total nitrosamines of the sample shall not exceed 20 ppb.

4.20.2 Toy pacifiers attached to, or sold with, toys intended for children under 36 months of age shall comply with the requirements outlined in 4.6.1 of this specification (small



FIG. 13 Clearance for Chain Links

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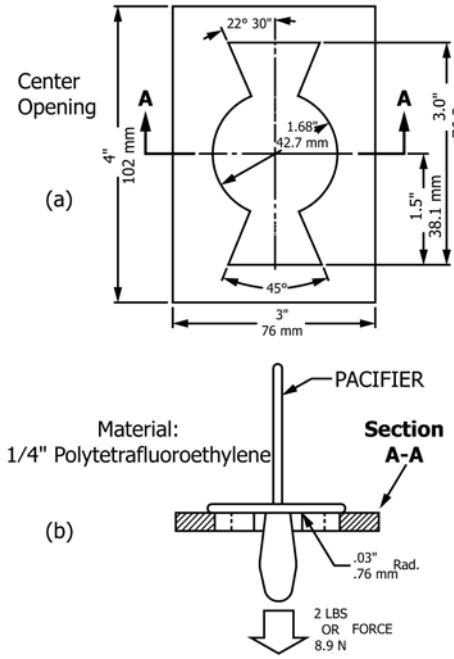


FIG. 14 Pacifier Test Fixture

objects), and either conform to the requirements of 16 CFR 1511 or have a nipple length no longer than 0.63 in. (16 mm). This measurement shall be taken from the nipple side of the shield to the end of the nipple.

4.21 *Projectile Toys*—These requirements relate to certain, but not all, potential, unexpected hazards that might be caused by projectile firing toys and by the firing of improvised projectiles from such toys. The toy shall conform to the requirements specified in this section after testing in accordance with the appropriate test methods described in 8.5 – 8.10 and 8.14 unless otherwise specified.

These requirements shall not apply to: (*1*) ground-based toys or components of toys intended to be propelled along a track, game board, tabletop, floor or another surface even if they include an element of motion in free flight, for example leaps between tracks or surfaces, or marbles or balls launched across a game board; (*2*) projectiles inaccessible to a child when they leave the discharge mechanism, for example, bagatelle or pinball games.

The requirements of 4.21.1.1, 4.21.2.2 through 4.21.2.6 and 4.21.4 shall not apply to projectiles that travel 300 mm or less when tested according to 8.14.4.

The requirements of 4.21.2.1 shall not apply to projectiles that travel 100 mm or less when tested according to 8.14.4.

4.21.1 *All Projectiles:*

4.21.1.1 Projectiles with rigid leading edges shall comply with the following:

(1) The leading edge(s) shall not protrude through the gauge shown in Fig. 15 when tested in accordance with 8.14.1.

(2) The leading edges of a projectile, as well as any corners that are adjacent to the leading edge(s) that could reasonably be expected to come in contact with the eye, shall be smooth and free of points, burrs, flash, or similar projections.

(3) For projectiles discharged by projectile toys with stored energy, the corners of the projectile that are adjacent to the leading edge(s) that could reasonably be expected to come in contact with the eye shall have rounded edges. For purposes of this requirement, a radius of 0.25 mm shall be considered sufficient. This requirement does not apply to projectiles made from paper or paperboard.

NOTE 9—There may be multiple leading edges that require evaluation, especially in situations where the projectile may travel in irregular or unpredictable orientations (for example, tumbling).

NOTE 10—For the requirement of 4.21.1.1(*3*), to determine if a leading edge or adjacent corner, or both, can strike the eye, the spherical shape of the eye should be considered, as well as the size of the projectile relative to the eye, the regularity or predictability of the flight path, and any other relevant factors.

NOTE 11—To determine compliance with the requirement of 4.21.1.1(*3*), possible methods for measuring this radius include an optical comparator or a radius gauge. If a radius gauge is used, it is suggested that a slightly larger gauge such as 0.275 mm be used. A slightly larger gauge would allow for any tolerance variation that may exist with a 0.25 mm gauge.

See Fig. 16 for examples of corners adjacent to leading edges.

4.21.1.2 Projectiles with a foam shaft and a suction cup as the leading edge where the suction cup has a diameter that is less than or equal to the diameter of the collar or foam shaft (refer to Fig. 18) when measured in the as received state shall either (*1*) not pass through the gauge shown in Fig. 17 when subjected only to the force of its own weight; or (*2*) have a length of 57 mm or more when measured in accordance with 8.14.2.

NOTE 12—The requirements of 4.21.1.2 and 4.21.1.3 apply to both suction cups that have been separately affixed to the shaft and those that are integral with the shaft (that is, one-piece moldings).

4.21.1.3 Other types of projectiles with a suction cup as the leading edge shall either: (*1*) not pass through the gauge shown in Fig. 17 when subjected only to the force of its own weight;

Dimensions and tolerances:
Height: 2 mm + 0 / – 0.1 mm
Inner diameter: 4 mm + 0.1 / – 0 mm
Outer diameter: 6 mm + 0 / – 0.1 mm

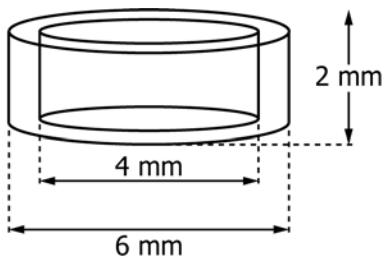


FIG. 15 Tip Assessment Gauge

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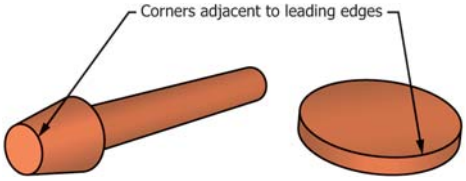


FIG. 16 Examples of Corners Adjacent to Leading Edges

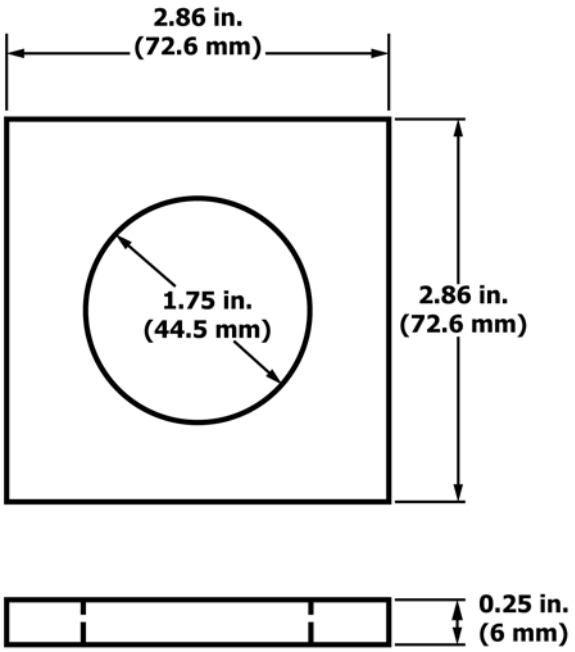


FIG. 17 Test Fixture for Small Balls

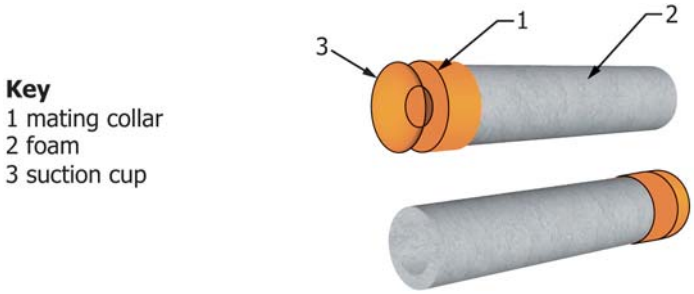


FIG. 18 Example of a Suction Cup with a Foam Shaft

or (2) have a length of 57 mm or more when measured in accordance with 8.14.2 both before and after applying the applicable tests in 8.5 – 8.10 and 8.14.3 and the suction cup shall not detach after applying the applicable tests in 8.5 – 8.10 and 8.14.3. This requirement is applicable regardless of whether the projectile can be fired from the discharge mechanism, if any, after applying the applicable tests in 8.5 – 8.10 and 8.14.3.

4.21.2 *Projectile Toys with Stored Energy:*

4.21.2.1 Projectiles launched by discharge mechanisms with stored energy shall not, whatever their orientation, fit entirely into the small parts cylinder (Fig. 3) when tested in accordance with 4.6. For products intended for children three years of age or older the following are exempted from complying with this requirement:

(1) Projectiles that travel 100 mm or less when tested according to 8.14.4.

(2) Small parts that are released from a projectile following reasonably foreseeable abuse testing (8.5 – 8.10 and 8.14.3) and that are either not capable of being launched or travel 100 mm or less when tested according to 8.14.4.

(3) Small parts of foam that are released from projectiles whose shafts are completely made of foam following reasonably foreseeable abuse testing (8.5 – 8.10 and 8.14.3).

4.21.2.2 Any projectile that has a kinetic energy that exceeds 0.08 J when tested in accordance with 8.14.5 shall have resilient leading edge(s).

4.21.2.3 Projectiles that have a kinetic energy greater than 0.08 J when tested in accordance with 8.14.5 shall not have a kinetic energy per unit area of contact, also known as Kinetic Energy Density (KED) greater than 2500 J/m^2 when tested in accordance with 8.14.6.

4.21.2.4 The resilient leading edge(s) on projectiles that have a kinetic energy exceeding 0.08 J shall either:

(1) Not become detached from the projectile when tested in accordance with the applicable tests of 8.5 – 8.10 and 8.14.3; or

(2) If the resilient leading edge(s) becomes detached from the projectile when tested in accordance with the applicable tests of 8.5 – 8.10 and 8.14.3, each separated part the projectile which can still be launched by the discharge mechanism shall continue to meet the requirements of 4.21.2.1 – 4.21.2.5.

4.21.2.5 Projectiles shall not have any sharp edges or sharp points before and after testing according to the applicable tests of 8.5 – 8.10 and 8.14.3 and the projectile shall continue to comply with the applicable requirements of this standard.

4.21.2.6 The discharge mechanisms shall be unable to launch the improvised projectiles specified in 8.14.7 in a manner determined to be hazardous without modification by the user. If any of the specified projectiles travels 300 mm or less when tested according to 8.14.4, they are considered to be non-hazardous. Determine the ability of the discharge mechanism to fire the improvised projectiles by substituting each improvised projectile for the intended projectile. When evaluating a discharge mechanism's ability to launch improvised projectiles in a hazardous manner, the following shall be considered:

(1) the repeatability and ease of loading/launching the improvised projectile,

(2) the orientation of the discharge mechanism,

(3) distance traveled,

(4) other factors considered to be relevant.

4.21.3 *Projectile Toys without Stored Energy*—Projectile toys without stored energy shall comply with the following requirements:

4.21.3.1 Mouth actuated projectile toys shall comply with the requirements of 4.6.2.2.

4.21.3.2 Projectiles shall not have any sharp edges or sharp points before and after testing in accordance with the applicable tests of 8.5 – 8.10 and 8.14.3 and the projectile shall continue to comply with the applicable requirements of this standard.

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4.21.3.3 *Arrows* intended to be launched from a bow (that is, bow and arrow set) that have a kinetic energy greater than 0.08 J when tested in accordance with 8.14.5 shall not have a kinetic energy per unit area of contact, also known as Kinetic Energy Density (KED) greater than 2500 J/m^2 when tested in accordance with 8.14.6.

4.21.3.4 Projectiles in the form of an *arrow* shall: (*1*) be provided with a protective cap, cover, or tip that is integral with the front end of the shaft; or (*2*) have a blunt front end to which a protective cap, cover, or tip is attached; or (*3*) be made of resilient material; or (*4*) have a functional tip that relies on magnetic forces. After testing in accordance with the applicable tests of 8.5 – 8.10 and 8.14.3, projectiles shall conform to the following requirements:

(a) the protective cap, cover, or tip shall not become detached from the projectile; or

(b) if the protective cap, cover, or tip becomes detached from the projectile, the projectile shall not be capable of being launched by the discharge mechanism; or

(c) if the projectile is made of a resilient material, it shall continue to have a maximum KED of 2500 J/m^2 when determined in accordance with 8.14.6.

4.21.4 *Rotors*—Rotors on projectiles intended to rotate in a horizontal plane shall be protected. Some examples of how this can be accomplished include the following and are illustrated in Fig. 19:

(1) the design of the rotor or propeller prevents access to the blade ends during operation,

(2) the rotor blades are curved or swept back,

(3) the blade ends are "clutched" or loosely attached to the rotor so that the ends are not directly powered by the rotor drive,

(4) rotors or propellers are designed to have resilient leading edges.

NOTE 13—Depending upon the rotor design selected, one or more of the design options maybe required.

4.22 *Teethers and Teething Toys*—These requirements are intended to address a potential impaction hazard associated with teethers. These requirements are applicable before and after use and abuse testing in accordance with Section 8.

4.22.1 Teethers and teething toys shall conform to the dimensional requirements for infant rattles as specified in 16 CFR 1510. Illustrations of a rattle test fixture are shown in Fig. 20. A teether shall meet this requirement when tested under the force only of its own weight and in a noncompressed state.

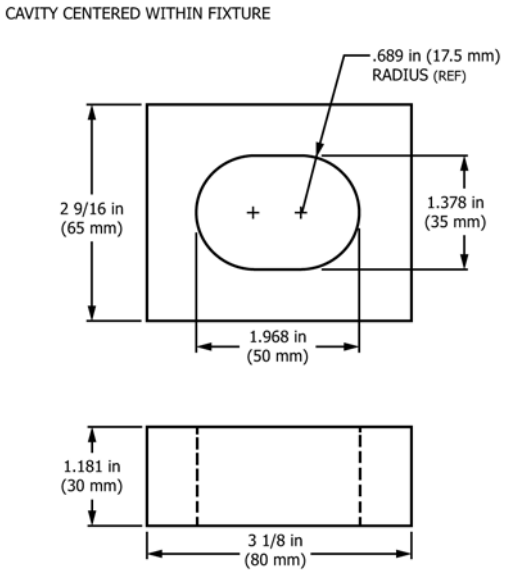


FIG. 20 Rattle Test Fixture

4.22.2 In addition, teethers and teething toys incorporating nearly spherical, hemispherical, or circular flared ends shall be designed so that such ends are not capable of entering and penetrating to the full depth of the cavity in the supplemental test fixture shown in Fig. 21. A teether shall meet this requirement when tested under the force only of its own weight and in a noncompressed state.

4.22.3 *Exclusion*—The requirements of 4.22.1 and 4.22.2 shall not apply to the following:

(1) Teething toys that are composed of liquid-filled beads that are attached to form a ring or beads that are threaded on a flexible cord or string.

(2) Soft-filled (stuffed) teething toys or soft-filled parts or parts of fabric.

(3) Rigid components having a major dimension equal to or less than 1.2 in. (30 mm) contained within soft-filled teething toys.

4.23 *Rattles*—Infant rattles shall conform to the safety requirements as specified in 16 CFR 1510. Illustrations of a rattle test fixture are shown in Fig. 20.

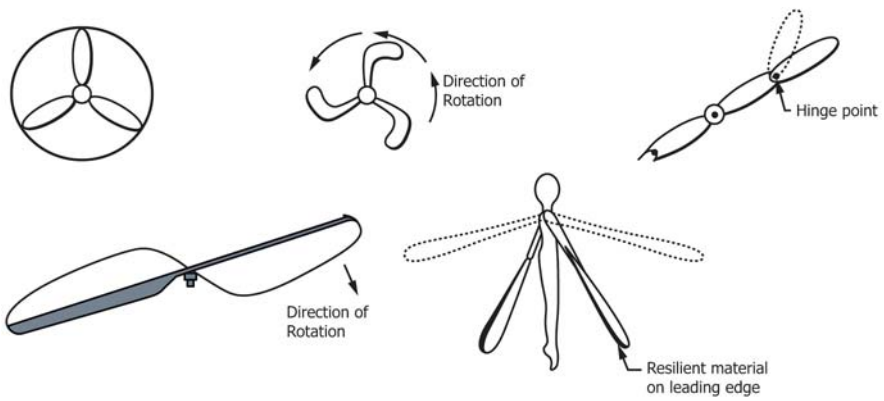


FIG. 19 Examples of Protected Rotors

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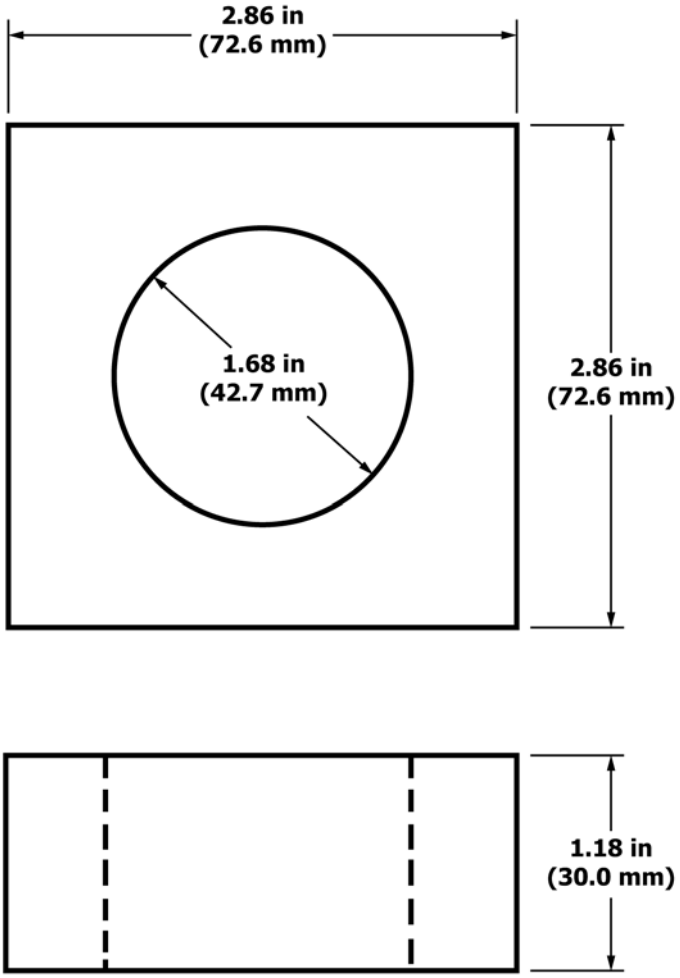


FIG. 21 Supplemental Test Fixture for Rattles, Squeeze Toys, and Teethers

4.23.1 In addition to meeting the requirements of 16 CFR 1510, rigid rattles incorporating nearly spherical, hemispherical, or circular flared ends shall be designed so that such ends are not capable of entering and penetrating to the full depth of the cavity in the supplemental test fixture illustrated in Fig. 21. A rattle shall meet this requirement when tested under the force only of its own weight and in a noncompressed state. These requirements are applicable before and after use and abuse testing in accordance with Section 8.

4.23.2 *Exclusion*—The requirements of 4.23 and 4.23.1 shall not apply to the following:

(1) Soft-filled (stuffed) rattles or soft-filled parts or parts of fabric.

(2) Rigid components having a major dimension equal to or less than 1.2 in. (30 mm) contained within soft-filled rattles.

4.24 *Squeeze Toys*—These requirements are intended to address a potential impaction hazard associated with squeeze toys intended for children under the age of 18 months. These requirements are applicable before and after use and abuse testing in accordance with Section 8. These requirements only apply to the portion of the toy which has the squeeze function. For example, if a squeeze toy is attached to another toy that is not a squeeze toy, then this attached toy would not be subject to these requirements.

4.24.1 Squeeze toys shall conform to the dimensional requirements for rattles as specified in 16 CFR 1510. Illustrations of a rattle test fixture are presented in Fig. 20. A squeeze toy shall meet these requirements when tested under the force only of its own weight and in a noncompressed state.

4.24.2 In addition, squeeze toys incorporating nearly spherical, hemispherical, or circular flared ends shall be designed so that such ends are not capable of entering and penetrating to the full depth of the cavity in the supplemental test fixture shown in Fig. 21. A squeeze toy shall meet these requirements when tested under the force only of its own weight and in a noncompressed state.

4.24.3 *Exclusion*—The requirements of 4.24.1 and 4.24.2 shall not apply to the following:

(1) Soft-filled (stuffed) squeeze toys or soft-filled parts or parts of fabric.

(2) Rigid components having a major dimension equal to or less than 1.2 in. (30 mm) contained within soft-filled squeeze toys.

4.25 *Battery-Operated Toys*—These requirements are intended to address potential risks of injury associated with battery usage in toys (for example, battery overheating, leakage, explosion and fire, and choking on or swallowing batteries). Both non-rechargeable and rechargeable batteries are subject to these requirements. Battery-operated toys shall conform to the requirements specified in this section after testing in accordance with the appropriate test methods described in 8.5 – 8.12. For purposes of ensuring compliance with these requirements, fresh alkaline batteries that meet the dimensional requirements of the latest revision of ANSI C18.1 or the latest revision of IEC 60086-2 shall be selected for test purposes. If another battery chemistry is specifically required for use in the toy by the manufacturer, testing shall be repeated using that type of battery. When rechargeable batteries are specified by the manufacturer, fully recharged batteries shall be used for testing purposes.

4.25.1 The toy 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 toy or in the instructions shall indicate the correct battery size and voltage. These markings are not required for non-replaceable batteries or secondary batteries that, by design, can only be inserted in the correct orientation. Battery compartments for button cell or coin cell batteries are not subject to this requirement if it is not practicable to mark the battery compartment due to size limitations or other considerations; in such instances, markings required by this section shall be in the instructions.

NOTE 14—The battery compartment door is considered part of the battery compartment.

4.25.1.1 Toys containing non-replaceable batteries shall be labeled in accordance with 5.15.

4.25.2 The maximum allowable direct current potential between any two accessible electrical points is 24 V nominal.

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4.25.3 Battery-operated toys 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 a toy 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.

4.25.3.1 Toys having a circuit powered only by button cell type batteries are not subject to this requirement.

4.25.4 For toys intended for children less than 3 years old, all batteries shall not be accessible before or after testing in accordance with 8.5 – 8.10, without the use of a coin, screwdriver, or other common household tool. Testing is performed using the recommended batteries installed.

4.25.5 For all toys, batteries that fit completely within the small parts test cylinder shown in Fig. 3 shall not be accessible, before or after testing in accordance with 8.5 – 8.10, without the use of a coin, screwdriver, or other common household tool. Testing is performed using the recommended batteries installed.

4.25.6 Batteries of different types or capacities shall not be mixed within any single electrical circuit. In applications requiring more than one type or capacity of battery to provide different functions or in applications requiring the combination of alternating current and non-rechargeable batteries, each circuit shall be isolated electrically to prevent current from flowing between the individual circuits.

4.25.7 The surfaces of the batteries shall not achieve temperatures exceeding 71°C.

4.25.7.1 This requirement is applicable for all battery-operated toys during normal use conditions. In addition, battery-operated toys intended for children 96 months or less shall meet this requirement after reasonably foreseeable abuse.

4.25.7.2 If external moving parts of the toy that are mechanically linked to the motor can be stalled by the user, test for a stalled motor condition according to the procedures of 8.17 to determine conformance with the temperature limits.

4.25.8 No condition shall occur that would cause the toy to fail the temperature requirements of 4.25.7 or present a combustion hazard as described in 4.25.

4.25.8.1 For rechargeable lithium ion or lithium ion polymer batteries, the toy shall comply with the temperature requirements of 4.25.11.8 during normal use charging and any discharging of the battery.

4.25.9 Battery-operated toys shall meet the requirements of 6.5 for instructions on safe battery usage. Toys which use non-replaceable batteries as the only source of power are not subject to 6.5.

4.25.10 *Battery-Powered Ride-On Toys*—These requirements apply to circuits within wheeled ride-on toys, not intended for streets or roadways, using a battery power source that is capable of delivering at least 8 amps into any variable resistor load for a minimum of one minute when tested in 8.18.2.

4.25.10.1 The maximum temperature measured on the insulation of any conductor shall not exceed the certified temperature rating of the material when tested in accordance with 8.18.3.

4.25.10.2 Battery-powered ride-on toys shall not present a risk of fire when tested in accordance with the stalled motor test of 8.18.4.

4.25.10.3 A battery-powered ride-on toy designed with a wiring system that has a user replaceable device (fuse type) for the primary circuit protection or a wiring system with user resettable primary circuit protection (manual reset fuse) shall not actuate (open or trip) when tested in accordance with the nuisance tripping test of 8.18.5.

4.25.10.4 Switches used in battery-powered ride-on toys.

(1) Polymeric materials in switches used in battery-powered ride-on toys that are used to support current-carrying parts shall carry a minimum flame rating of UL-94 V-0 or have a glow wire ignition rating of 750°C.

NOTE 15—This requirement does not apply to switches used in low-power circuits. A low-power circuit is defined as one using an effective battery power source that is not capable of delivering more than 8 amps into any variable resistor load for more than one minute.

(2) The switch body shall not result in a short-circuit condition when subjected to the switch endurance test and overload tests of 8.18.6.

(3) The switch shall not fail in a mode that could cause the vehicle to run continuously (switch stuck in the "on" position) when subjected to the endurance test and the overload test in 8.18.6.

4.25.10.5 User replaceable circuit protection devices in battery-powered ride-on toys.

(1) User replaceable circuit protection devices provided by the manufacturer in battery-powered ride-on toys shall be listed, recognized or certified by a Nationally Recognized Test Laboratory (NRTL) (that is, a laboratory recognized in accordance with 29 CFR 1910) to an appropriate electrical safety standard.

(2) All circuit protection devices used in battery-powered ride-on toys intended to be replaced by the user shall be replaceable only with the use of a tool or by a design which does not easily allow tampering such as a design requiring excessive force to open.

4.25.10.6 Batteries, as described in 4.25.10, and battery chargers.

(1) Battery connectors shall be constructed of material with a UL 94 V-0 flame rating or have a glow wire ignition rating of 750°C.

(2) The battery charging system shall not present a risk of fire due to a short-circuit condition applied to any point in the length of a charger/battery interconnecting cable when tested in accordance with 8.18.8.

(3) During charging, battery-charging voltages shall not exceed the recommended charging voltages when tested in accordance with 8.18.7.

(4) Battery chargers shall be certified to the appropriate current national standard, for example UL, CSA, or equivalent standards body.

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4.25.10.7 Wiring connected to the main/motor battery shall be short-circuit protected and shall not present the risk of fire when tested in accordance with 8.18.8.

4.25.10.8 Strain relief shall be provided to prevent mechanical stress on wires entering a connector block during routine maintenance such as battery charging, and tested in accordance with 8.18.9.

4.25.10.9 Battery-powered ride-on toys shall comply with the requirements in 5.15.1 for safety labeling, 6.6 for additional instructional literature, and 7.2 for required producer's markings.

4.25.11 *Toys that Contain Secondary Cells or Secondary Batteries:*

NOTE 16—The requirements of this section do not apply to the main drive circuit of battery-powered ride-on toys powered by batteries of any chemistry other than Lithium (covered in 4.25.10).

4.25.11.1 Cells used in lithium ion or lithium ion polymer batteries incorporated into or included with toys shall have an attestation from the battery manufacturer or other evidence that the cells comply with at least one of the following standards:

(1) ANSI C18.2M Part 2 for Portable Rechargeable Cells and Batteries, or

(2) UL 1642, Standard for Lithium Batteries, or

(3) IEC 62133 Secondary Cells and Batteries Containing Alkaline or Other Non-acid Electrolytes—Safety Requirements for Portable Sealed Secondary Cells, and for Batteries Made From Them, For Use in Portable Applications.

4.25.11.2 Lithium ion or lithium ion polymer batteries shall be compliant with one of the following standards:

(1) ANSI C18.2M Part 2 for Portable Rechargeable Cells and Batteries, or

(2) UL 2054, Standard for Household and Commercial Batteries, or

(3) IEC 62133 Secondary Cells and Batteries Containing Alkaline or Other Non-acid Electrolytes—Safety Requirements for Portable Sealed Secondary Cells, and for Batteries Made From Them, For Use in Portable Applications or Equivalent Standards.

4.25.11.3 Batteries that contain lithium ion or lithium ion polymer cells shall be provided with an enclosure that provides protection against damage to the cells and their circuitry during normal use and foreseeable abuse of the toy as specified in 8.5 – 8.10.

4.25.11.4 During charging with the provided charging device, no cell shall exceed the cell or battery manufacturer's specified charging voltage, current, and temperature values when tested in accordance with 8.19.1, 8.19.2, and 8.19.3.

(1) For batteries charged outside of the toy, if the manufacturer provides documentation that the battery and charger have not been modified by the manufacturer; have been tested as a system and the chargers are compliant with one of the following standards, then the testing and measurements required by 8.19.1, 8.19.2, 8.19.3, and 8.19.4 can be omitted:

(a) ANSI/UL 2595, General Requirements for Battery-Powered Appliances

(b) IEC 60950–1, Information Technology Equipment—Safety—Part 1: General Requirements

4.25.11.5 During charging or discharge with the provided charger and load, as well as during normal operation and stalled motor test per 8.17 if applicable, and when tested in accordance with 8.19.1, 8.19.2, 8.19.3, and 8.19.4, the maximum charge or discharge current of any cell shall not exceed the cell manufacturer's specifications. Lithium ion or lithium ion polymer cell(s) cutoff voltage shall not be less than the manufacturer's specified minimum in any operating mode. Momentary current spikes until safety devices actuate are to be disregarded.

NOTE 17—Care should be exercised when charging and discharging the battery so that the battery's physical environmental approximates normal use conditions, for example, if the battery is normally charged inside the battery compartment, the battery should be tested in this manner.

4.25.11.6 Normal use charging and discharging of a secondary battery when tested in accordance with 8.19.1, 8.19.2, and 8.19.3, shall not result in surface temperature rises on any battery surfaces or any other accessible surface of the toy exceeding: (*1*) 25°C if the surface is substantially metal, (*2*) 30°C if the surface is ceramic or glass, (*3*) 35°C if the surface is wood or plastic. If the battery is permanently installed in the toy, do not disassemble the toy to reach the battery.

4.25.11.7 Battery chargers or power adaptors that plug into the electric mains power shall be listed by a Nationally Recognized Test Laboratory (NRTL) to an appropriate electrical safety standard. External connectors to chargers and batteries shall ensure that correct polarity is used during charging. Compliance is checked by visual inspection.

4.25.11.8 Circuit wiring connected to lithium ion or lithium ion polymer and NiMH secondary batteries shall be short circuit protected and shall not present the risk of fire when tested in accordance with 8.19.5. During these tests, temperatures on any accessible surfaces of any secondary battery shall not exceed 60°C if the surface is plastic or 50°C if the surface is metal, glass or ceramic. In addition, inaccessible surfaces of lithium ion batteries shall not exceed 71°C or the cell manufacturer's maximum temperature, whichever is less. Cells shall not cause explosion or fire as evidenced by signs of burning of the battery including burning or charring of the combustible materials specified in the test. If cells vent, electrolyte shall not become accessible. Secondary batteries which are removable shall not be able to be short circuited by placing terminals of opposite polarity against a flat conductive surface, unless no hazardous condition results when tested per 8.19.5.1. For lithium ion or lithium ion polymer batteries, short circuit protection shall be incorporated into the battery.

4.26 *Toys Intended to be Attached to a Crib or Playpen*—These requirements are intended to minimize entanglement or strangulation hazards that might be caused by toys intended to be attached to a crib or playpen (see also 4.14).

4.26.1 *Protrusions*—Toys attached to a crib or playpen in the manner prescribed by the manufacturer's instructions shall not have hazardous protrusions that could contribute to entanglement injury. This requirement is applicable before and after use and abuse testing in accordance with 8.5 – 8.10. Design guidelines are provided in Annex A3.

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4.26.2 *Crib Mobiles*—Crib mobiles shall comply with the requirements listed in 5.6 for safety labeling and 6.3 for instructional literature.

4.26.3 *Crib Gyms*—Crib gyms, including crib exercisers and similar toys intended to be strung across a crib or playpen, shall comply with the requirements listed in 5.5 for safety labeling and 6.2 for instructional literature.

4.27 *Stuffed and Beanbag-Type Toys*—Stuffed and beanbag-type toys shall meet the applicable requirements of this specification after being tested in accordance with 8.9.1.

4.28 *Stroller and Carriage Toys*—Stroller and carriage toys shall comply with the requirements for safety labeling in 5.7.

4.29 *Art Materials*—The purpose of this requirement is to minimize the potential risks associated with the use of art materials that present chronic health hazards.

4.29.1 Toys and components of toys that fall within the definition of art material as found in 16 CFR 1500.14(b)(8) shall meet the requirements for toxicological review by a U.S. board-certified toxicologist. The protocol used to evaluate the art materials shall be filed with the Consumer Product Safety Commission (CPSC), and the list of ingredients shall also be filed with the commission if the material is or contains a chronically hazardous substance.

4.29.2 Toys and components of toys that are art materials and are determined to contain hazardous materials shall have appropriate warnings as defined in the Federal regulations and as noted in 5.13 of this specification. Items that do not contain hazardous materials shall also be labeled as to their conformity.

4.29.3 Toys and components of toys that have been determined to pose a chronic health hazard and require warnings are not suitable for use by children who are in pre-kindergarten, or grades one through six.

4.30 *Toy Gun Marking*—This requirement is intended to minimize the potential for a toy gun to be mistaken for a real firearm.

4.30.1 This requirement applies to all toy, look-alike, and imitation firearms which have the general appearance, shape, or configuration, or combination thereof, of a firearm. This includes, but is not limited to, nonfunctional guns, water guns, air soft guns, cap guns, light emitting guns, and guns with an opening to eject any nonmetallic projectile.

4.30.2 This requirement does not apply to the following types of guns:

4.30.2.1 Futuristic toy guns that do not have the general appearance, shape, or configuration, or combination thereof, of any firearm.

4.30.2.2 Nonfiring collector replica antique firearms that look authentic and may be a scale model but are not intended as toys.

4.30.2.3 Traditional B-B guns, paint ball guns, or pellet guns that expel a projectile through the force of compressed air, compressed gas, or mechanical spring action, or combination thereof.

4.30.2.4 Decorative, ornamental, and miniature objects having the appearance, shape, or configuration, or combination thereof, of a firearm provided that the objects measure no more than 1.50 in. (38 mm) in height by 2.75 in. (70 mm) in length, with the length measurement excluding any gun stock length measurement. This includes items intended to be displayed on a desk or worn on bracelets, necklaces, key chains, etc.

4.30.3 Items subject to this requirement shall be marked or manufactured, or both, in any one of the following ways. The marking shall be permanent and shall remain in place after being tested in accordance with 8.5 – 8.10. The word "permanent" excludes the use of ordinary paint or labels for the purposes of this section. The "blaze orange" color referred to in 4.30.3.1 and 4.30.3.2 is Federal Standard 595a, Color 12199.

4.30.3.1 A blaze orange plug, or brighter orange colored plug, affixed into the muzzle end of the barrel as an integral part of the toy. The plug shall not be recessed more than 0.25 in. (6 mm) from the muzzle end of the barrel.

4.30.3.2 A blaze orange band, or brighter orange colored band, covering the circumference of the muzzle end of the barrel for a distance of at least 0.25 in. (6 mm).

4.30.3.3 Coloration of the entire exterior surface of the toy in white, bright red, bright orange, bright yellow, bright green, bright blue, bright pink, or bright purple, either individually or as the predominant color in combination with any other color in any pattern.

4.31 *Balloons*—Packages containing latex balloons and toys or games containing latex balloons shall comply with the labeling requirements of 16 CFR 1500.19. Labeling statements for balloons are contained in 5.11.5 of this specification.

4.32 *Certain Toys with Nearly Spherical Ends*—These requirements are intended to address a potential impaction hazard associated with nearly[18] spherical, hemispherical, circular flared or dome shaped ends on toys or components of toys.

4.32.1 Nearly spherical, hemispherical, circular flared, or dome-shaped ends of toys or components of toys shall not be capable of penetrating the full depth of the cavity of the supplemental test fixture shown in Fig. 21 when tested under the force only of their own weight and in a non-compressed state. This requirement applies to toys if they meet all the following criteria:

4.32.1.1 The toy is intended for children up to the age of 18 months.

4.32.1.2 The toy or component containing the nearly spherical end weighs less than 1.1 lb (0.5 kg).

4.32.1.3 The nearly spherical, hemispherical, circular flared or dome shaped end adjoins a shaft, handle or support that has a smaller cross section.[19]

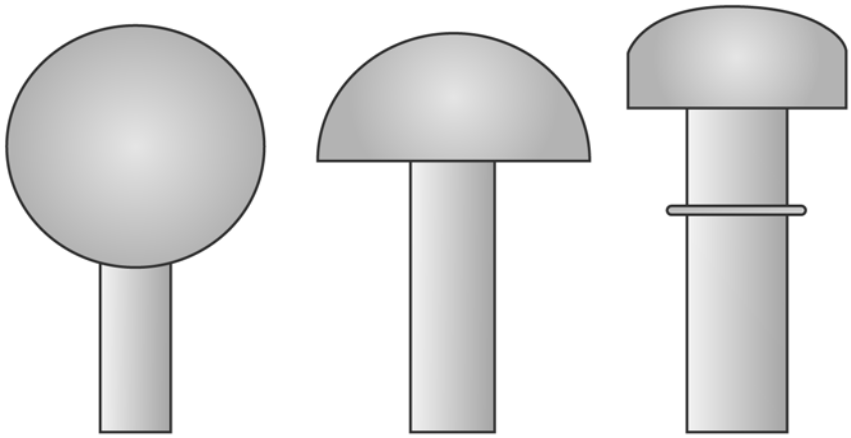
(1) Exclusion—The requirement of 4.32.1 does not apply to soft-filled (stuffed) toys or soft-filled parts of toys or parts entirely of fabric.

4.32.2 Nearly spherical, hemispherical, or dome-shaped ends of toy fasteners (for example, nails, bolts, screws, pegs) (see Fig. 22) shall not be capable of penetrating the full depth

[18] The term "nearly" is used here, consistent with the long standing and successful squeeze toy requirement.

[19] This sentence attempts to clarify that the requirements only apply to the nearly spherical end and not to non-spherical areas of the toy or component. In addition, the term "adjoins" replaces the term "attached" as the handle and spherical end may be all part of the same molded piece.

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Domed ends, with and without small flat in the center

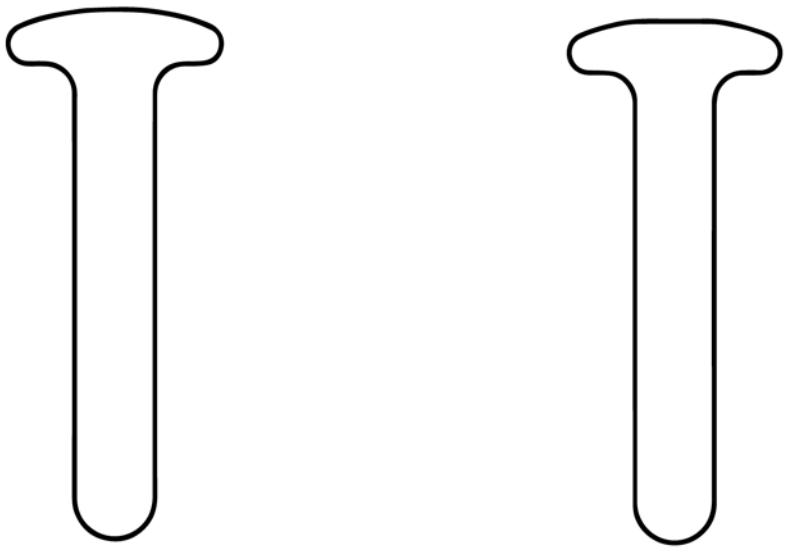


FIG. 22 Examples of Hemispherical and Domed Ends

of the cavity of the supplemental test fixture shown in Fig. 21 when tested under the force only of their own weight and in a non-compressed state. This requirement of 4.32.2 applies to toy fasteners if they meet all the following criteria:

4.32.2.1 They are intended for children aged at least 18 months but less than 48 months of age.

4.32.2.2 They have an overall length of 2.25 in. (57.1 mm) or greater.

4.32.2.3 Their nearly spherical, hemispherical or domed ends have a diameter equal to or greater than 0.6 in. (15 mm).

4.32.2.4 The distance from the apex of the fastener to the undercut is 1.75 in. (44.4 mm) or less as shown in Fig. 23.

(1) Exclusions—The requirement of 4.32.2 does not apply to the following toy fasteners:

(a) Soft-filled (stuffed) or fabric fasteners,

(b) Fasteners with non-rigid ends, and

(c) Fasteners tethered to a toy where the weight of the combined toy/fastener is more than 1.1 lb (0.5 kg) and the length of the tether is less than 12 in. (300 mm).

4.32.3 *Preschool Play Figures*—This requirement is intended to address the potential choking/obstruction hazard associated with certain preschool figures intended for children under three years of age. The characteristics that distinguish toy figures falling within the scope of this requirement include:

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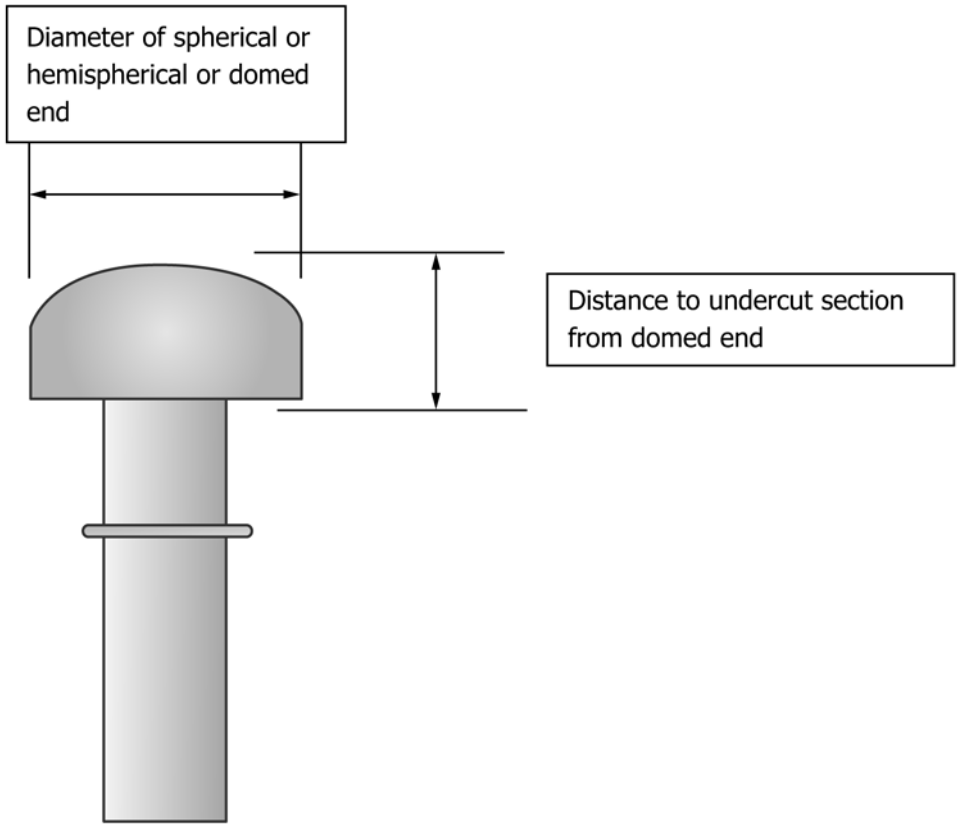


FIG. 23 Undercut and Diameter

(*1*) a round, spherical, or hemispherical end with tapered neck attached to a simple cylindrical shape without appendages, and (*2*) an overall length not exceeding 2.5 in. (64 mm) (see examples in Fig. 24). This includes figures with added or molded features such as hats or hair, which retain the rounded shape of the end.

4.32.3.1 Preschool play figures intended for children under three years of age shall be designed so that their rounded ends are not capable of entering and penetrating to the full depth of the cavity in the supplemental test fixture illustrated in Fig. 21. Test the play figure under the force of its own weight.

4.32.3.2 *Exclusion*—The requirement of 4.32.3.1 shall not apply to soft play figures made of textiles.

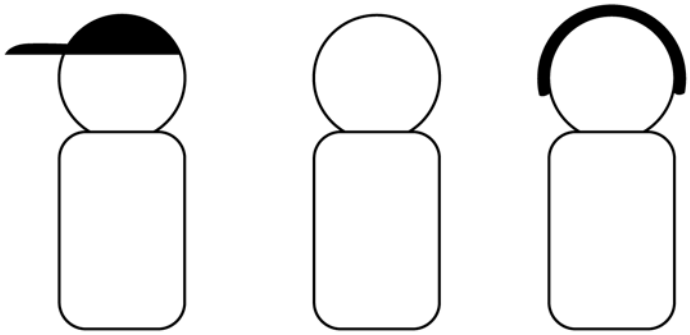


FIG. 24 Examples of Preschool Play Figures

4.33 *Marbles*—Marbles shall comply with the labeling requirements of 16 CFR 1500.19. Labeling statements for marbles are contained in 5.11.4 of this specification.

4.33.1 Toys and games intended for children at least 3 years of age but less than 8 years of age that contain a marble shall comply with the labeling requirements 16 CFR 1500.19. Applicable labeling statements are contained in 5.11.4.1 of this specification.

4.34 *Balls:*

4.34.1 Balls intended for children under 36 months of age are subject to the requirements of 16 CFR 1500.18 (a)(17). A loose ball in toys intended for children under 36 months of age shall not, under the influence of its own weight and without compression, pass entirely through the template shown in Fig. 17. A ball which does pass through the template is determined to be a "small ball."

4.34.2 Toys intended for children at least 3 years old but less than 8 years of age that contain a loose small ball are subject to the requirements of 16 CFR 1500.19. Applicable labeling statements are contained in 5.11.3 of this specification.

4.35 *Pompoms*—These requirements are intended to address choking hazards associated with pompoms on toys intended for children under three years of age that detach during 8.16. Pompoms detached during 8.16 shall not pass entirely through the 1.75-in. (44.5-mm) test fixture (see Fig. 17) under their own weight. Any components, pieces, or individual strands of the pompom that are liberated during the torque and tension tests

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should not be subject to this test. Test the pompoms by putting the free ends of fiber into the gauge.

4.36 *Hemispheric-Shaped Objects*—These requirements apply to toy cup-, bowl-, or one-half egg-shaped objects having a nearly round, oval, or elliptical opening with the minor and major inner dimensions between 2.5 in. (64 mm) and 4.0 in. (102 mm), a volume of less than 6.0 oz (177 mL), a depth greater than 0.5 in. (13 mm), and intended for children under 3 years of age. The following are exempt from this requirement:

4.36.1 Objects intended for drinking (for example, tea cups).

4.36.2 Objects intended to hold liquids in products appropriate for children at least 2 years old (for example, pots and pans).

4.36.3 Containers that shall be airtight so the contents can maintain their functional integrity (for example, modeling clay containers.)

4.36.4 Non-detachable (as determined by testing in accordance with 8.6 – 8.10 of this specification) components of larger products (for example, bowl-shaped smoke stack that is permanently attached to a toy train or a swimming pool that is molded into a larger toy playscape).

4.36.5 Containers that are part of the retail package intended to be discarded once the toy is removed from the package.

4.36.6 *Performance Requirements*—Cup/bowl/one-half egg-shaped objects shall have, as a minimum, one of the following characteristics (*a*, *b*, *c*, *d*, or *e*). For purposes of these requirements, unless otherwise specified, an opening is defined as a hole of any shape with a minor dimension of 0.080 in. (2 mm). These requirements apply before and after testing in accordance with 8.6 – 8.10 of this specification.

(a) Have at least two openings that are a minimum of 0.5 in. (13 mm) from the rim as measured along the outside contour.

(1) If the openings are placed in the base of the object, at least two of the openings shall be a minimum of 0.5 in. (13 mm) apart. (See Fig. 25.)

(2) If the openings are not placed in the base of the object, at least two of the openings shall be placed at least 30° but not more than 150° apart. (See Fig. 26.)

(b) The plane of the open end of the cup shape shall be interrupted at the center by some type of divider that extends to 0.25 in. (6 mm) or less from the plane of the open end of the cup. (See Fig. 27 for an example.)

(c) Have three openings that are at least 100° apart, located between 0.25 in. (6 mm) and 0.5 in. (13 mm) from the rim as measured along the outside contour.

(d) Have a repeating scalloped edge pattern around the entire rim. The maximum distance between center lines of adjacent peaks shall be 1 in. (25 mm) and the minimum depth shall be 0.25 in. (6 mm). (See Fig. 28 for examples of scalloped edge patterns.)

(e) Have an opening with a minor dimension of at least 0.66 in. (17 mm) located anywhere in the base or in the side wall of the object. If the opening is located in the sidewall of the object, the edge of the opening shall be at least 0.5 in. (13 mm) from the rim as measured along the outside contour.

4.37 *Yo Yo Elastic Tether Toys*—These requirements are intended to address potential strangulation hazards associated with yo yo elastic tether toys intended for children 36 months and over.

4.37.1 Toys with an end mass greater than 0.02 kg (0.044 lb) shall have a tether length less than 50 cm (20 in.) measured when the toy is rotating at any speed up to a maximum speed of 80 r/min. Testing shall be conducted in accordance with 8.24.

4.37.2 *Exemptions:*

(1) Paddle balls.

(2) Sports balls with wrist or ankle straps longer than 70 cm (27.6 in.) intended to be kicked or thrown and returned to the user. The length of the strap shall be measured when the product is placed on a horizontal surface with no load.

4.38 *Magnets*—This requirement is intended to address ingestion hazards associated with toys intended for children up to 14 years of age that contain a hazardous magnet. This requirement does not apply to magnets used in motors, relays, speakers, electrical components, and similar devices where the magnetic properties are not part of the play pattern of the toy.

4.38.1 Toys shall not contain a loose as-received hazardous magnet or a loose as-received hazardous magnetic component.

4.38.2 Toys shall not liberate a hazardous magnet or a hazardous magnetic component after being tested in accordance with the Magnet Test Methods specified in 8.25.

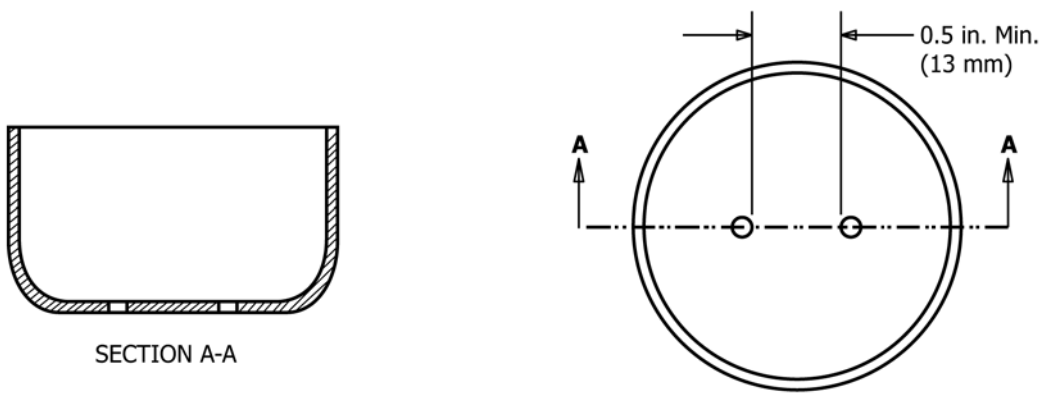


FIG. 25 Openings in Base of Bowl

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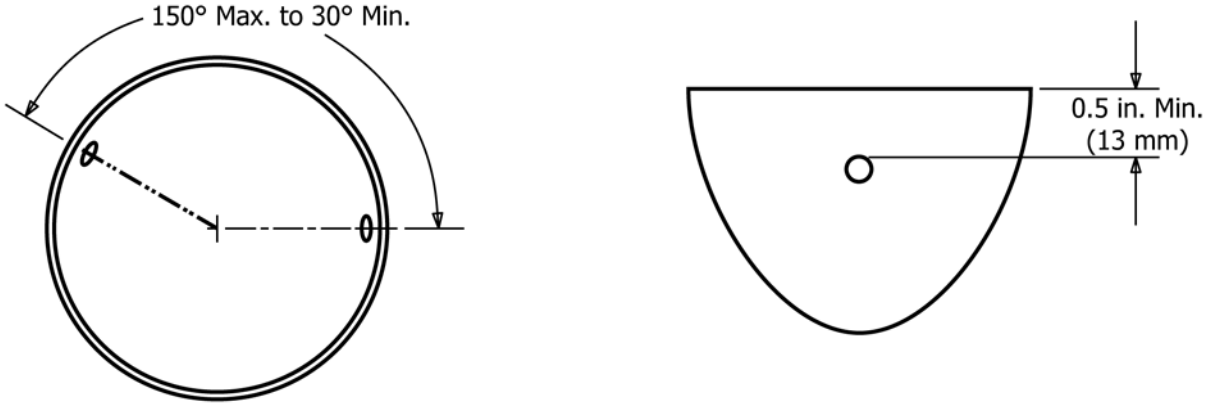


FIG. 26 Opening Placement

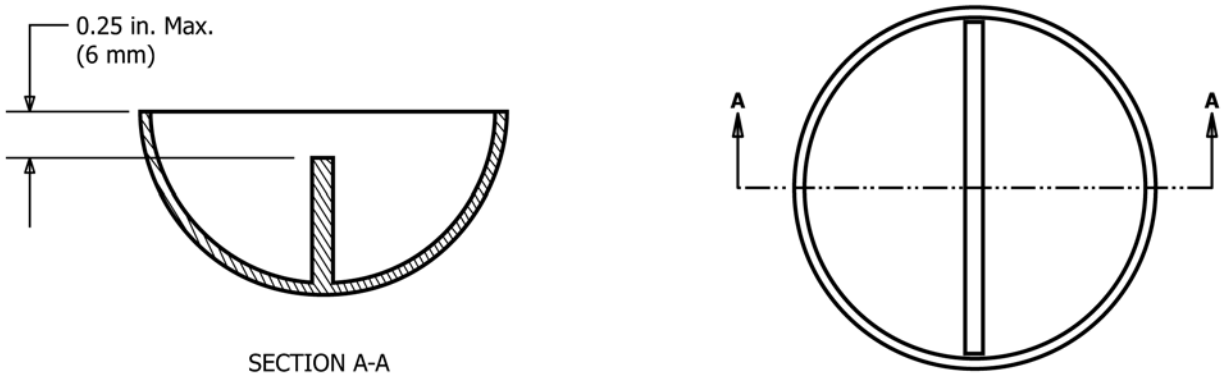


FIG. 27 Rib Through Cup Center

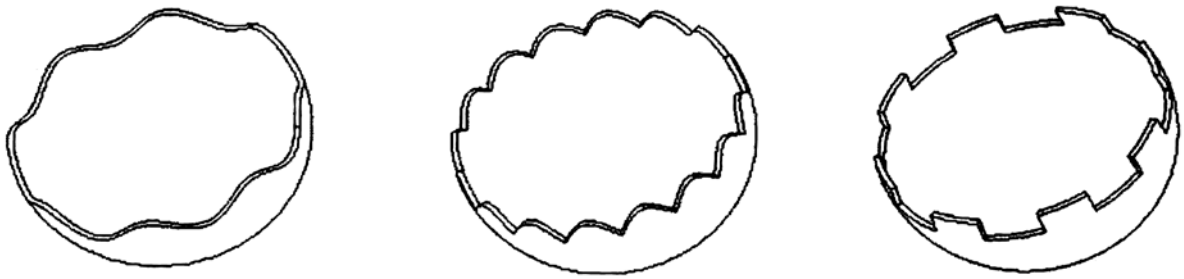


FIG. 28 Scalloped Edge Pattern

4.38.3 Magnetic/electrical experimental sets intended for children eight years of age and over that contain a loose as-received hazardous magnet or a loose as-received hazardous magnetic component, or both, are exempt from the requirements of 4.38.1 and 4.38.2 provided they comply with the requirements for safety labeling described in 5.17.

4.39 *Jaw Entrapment in Handles and Steering Wheels:*

4.39.1 These requirements are intended to address potential jaw entrapment in handles and steering wheels that are located such that they are accessible for teething in the following categories of toys intended for children under 18 months of age: activity tables intended to be played with by a standing child, large bulky toys, stationary floor toys, push toys intended to be pushed by a child walking upright, and ride-on toys.

4.39.2 Handles that are connected to the toy with a hinge and handles made from a pliable material (for example, straps and ropes) are exempt from this requirement.

4.39.3 Openings in handles and steering wheels that allow a 0.75 by 0.75 by 1 in. (1.9 by 1.9 cm by 2.5 cm) test fixture to pass completely through shall also allow a 1.5 by 2.5 by 1 in. (3.8 by 6.35 by 2.5 cm) test fixture to pass completely through (see Fig. 29). Test fixtures can be made of any rigid material. The test fixture shall be oriented such that the 0.75-in. (1.9-cm) dimension and the 2.5-in. (6.35-cm) dimension is parallel with the major dimension of the handle or steering wheel opening.

4.40 *Expanding Materials*—Toys and components of toys which fit entirely inside the small parts cylinder (see Fig. 3) in any orientation (small parts test) and which are determined per 8.30.1 – 8.30.5 to contain or be composed of expanding materials shall completely pass through the gauge specified in Fig. 30 when tested as specified in 8.30.7 and 8.30.8.

4.41 *Toy Chests*—These requirements are intended to minimize the following:

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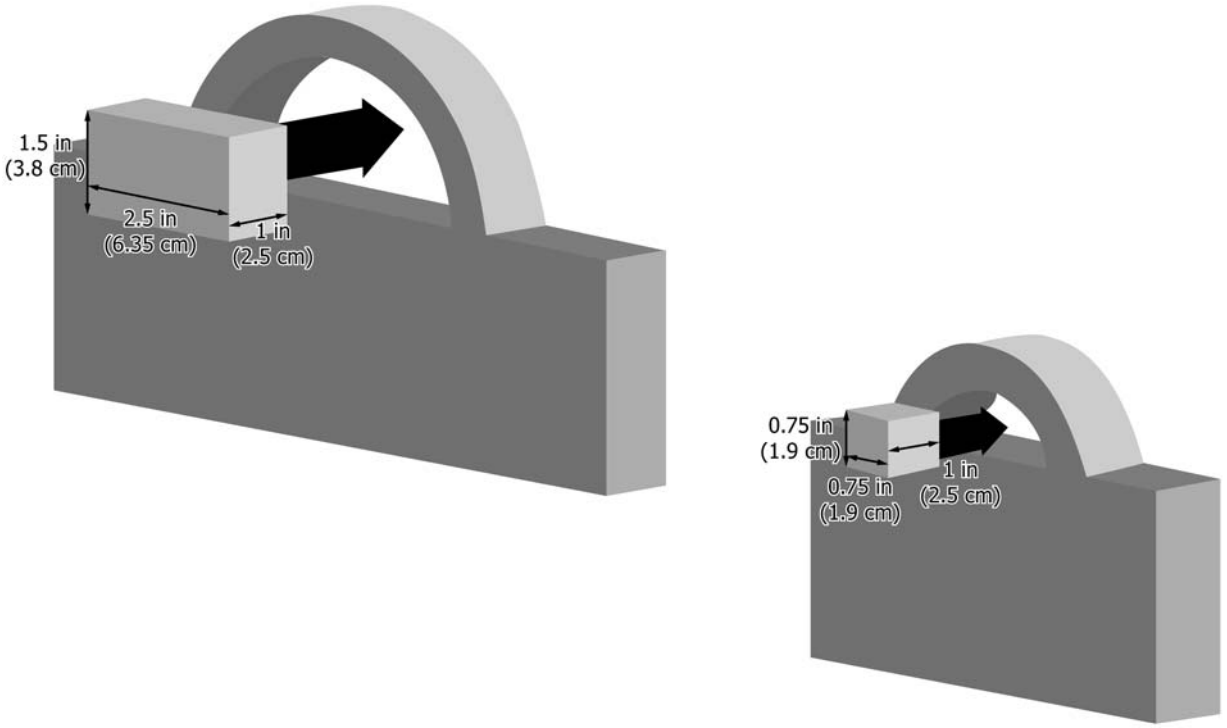


FIG. 29 Jaw Entrapment

(1) Possible entrapment and strangulation hazards associated with sudden lid closing or dropping;

(2) Possible crushing, pinching, and laceration hazards associated with folding mechanisms, hinges, and lid supports; and

(3) Possible suffocation hazards due to lack of adequate ventilation.

4.41.1 *Lid Support:*

4.41.1.1 Toy chests with vertically opening, hinged lids shall be provided with lid-support mechanisms to prevent sudden collapse or dropping of the lid. The lid-support mechanism shall support the lid so that at no position in the arc of travel of the lid from within 2 in. (50 mm) of the fully closed position, through an arc not to exceed 60° from the fully closed position, shall it drop more than 0.50 in. (13 mm) under the influence of its own weight, except in the last 2 in. (50 mm) of travel. The test shall be conducted in accordance with 8.27.1.

4.41.1.2 The toy chest lid shall comply with this requirement before and after being subjected to 7000 opening and closing cycles, in accordance with 8.27.1.2.

4.41.1.3 The lid-support mechanism shall not require adjustment by the consumer to ensure adequate lid support; nor shall it require adjustment in order to comply with 4.41.1.1 after being cycled in accordance with 8.27.1.2.

4.41.1.4 Lid-support mechanisms shall be designed so as to prevent pinching, crushing, or laceration injuries to fingers. Clearances or gaps produced by the action of such mechanisms (between components of the mechanism or between the mechanism and the toy chest or its lid) shall be constructed so that if the gap admits a 0.19-in. (5-mm) diameter rod, it will also admit a 0.50-in. (13-mm) diameter rod at all positions of the arc of travel of the lid. This requirement does not apply to lid support mechanisms installed on the inside of the toy chest that are at least 12 in. (300 mm) from the front and side edges of the toy chest or its lid.

4.41.2 *Hinge Line Clearance*—Toy chests having a gap or clearance along a hinge line between a stationary portion and a moveable portion shall be constructed so that, if the gap admits a 0.19-in. (5-mm) diameter rod, it will also admit a 0.50-in. (13-mm) diameter rod at all positions of the arc of travel of the moveable portion.

4.41.3 *Closures*—Toy chest closures such as lids, covers, and doors shall not be fitted with automatic locking devices. Closures and lids shall be of a type that can be opened with a force of 10 lbf (45 N) or less when tested in accordance with 8.27.2.

4.41.4 *Ventilation:*

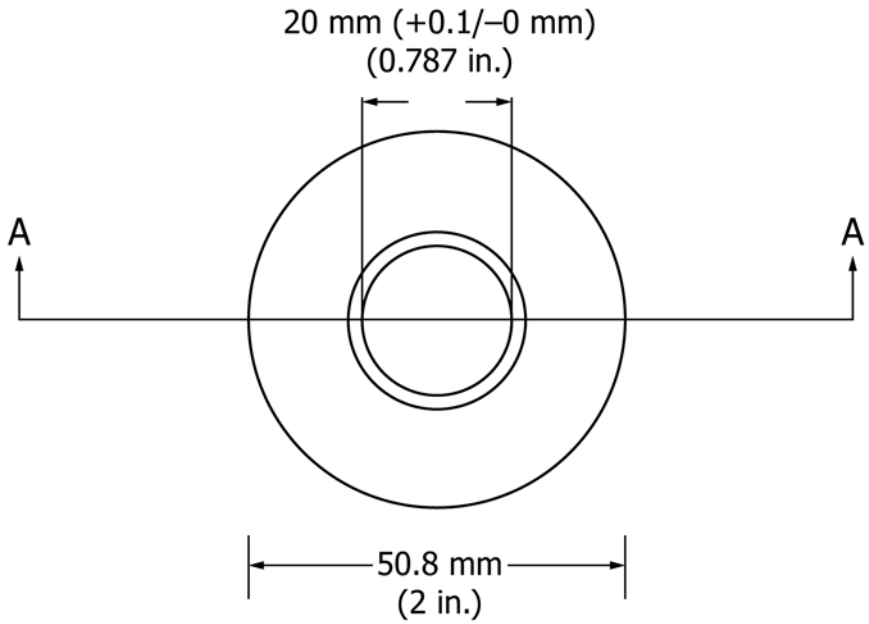
4.41.4.1 Any toy chest having a door or lid that encloses a continuous volume greater than 1.1 ft^3 (0.031 m^3) and in which all of the internal dimensions are 6 in. (150 mm) or more shall provide an unobstructed ventilation area of greater than a total of 2 $in.^2$ (1300 mm^2) over two or more separate openings situated at least 6 in. (150 mm) apart. The ventilation area shall remain unobstructed when the toy chest is placed on the floor in any position and adjacent to two vertical plane surfaces meeting at a 90° angle, so as to simulate the corner of a room.

4.41.4.2 If a permanent partition of bars (two or more) that limit the continuous space by making the largest internal dimension less than 6 in. (150 mm) (excluding diagonal measurements) are used to subdivide a continuous space, the ventilation area shall not be required.

4.41.5 Toy chests shall comply with the requirements listed in 6.8 for accompanying instructional literature and 7.3 for producer's markings.

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EXPANDING TOY TEST TEMPLATE



MATERIAL: 2 in. (50.8 mm) DIAMETER POLYTETRAFLUOROETHYLENE (PTFE) ROD STOCK

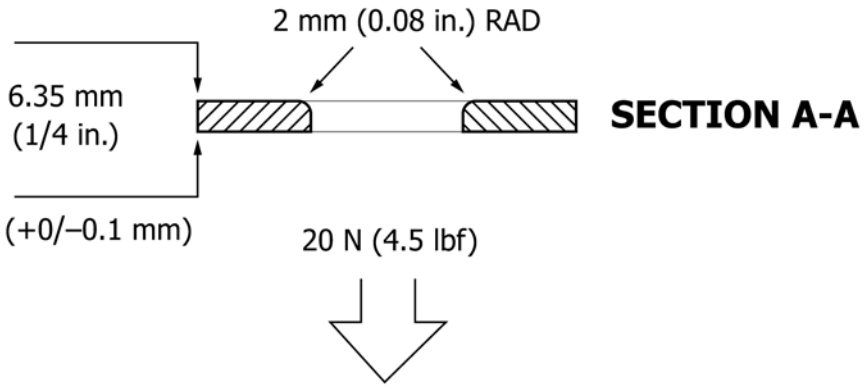


FIG. 30 Expanding Toy Test Template

5. Labeling Requirements

5.1 *Federal Government Requirements*—All toys that fall within the definitions and requirements of the U.S. FHSA shall conform to the labeling requirement of that act. For specific requirements, reference 16 CFR 1500.3, 1500.14, 1500.19, 1500.82, 1500.83, 1500.86, 1500.121, 1500.122, 1500.123, 1500.125, 1500.126, 1500.127, 1500.128, 1500.130, 1505.3, and 1511.7. In addition, state labeling requirements may exist.

5.2 *Age Grading Labeling*—Toys that are subject to any of the requirements of this specification should be labeled to

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indicate the minimum age for intended use or have such labeling on any retail packaging. If the toy or toy package is not age labeled in a clear and conspicuous manner or, based on such factors as marketing practices and the customary patterns of usage of the toy by children, is inappropriately age labeled, the toy shall be subjected to the most stringent applicable requirements within this specification. (Examples: (*1*) a tensile force of 15 lbf (67 N) shall be required instead of 10 lbf (45 N) when testing in accordance with 8.9 if no limiting age range is specified; (*2*) the "highest age of the age range" in 4.15 would be 14 years, the maximum age addressed in the scope of this specification.)

5.2.1 For certain toys, such as costumes and riding toys, it may also be appropriate to label the toy or its package, or both, in terms of height or weight limitations.

5.2.2 Guidelines for determining the appropriate age grade for toys are provided in Annex A1 of this specification.

5.3 *Safety Labeling Requirements*—Certain toys, and in some cases their packaging or their instructions, or both, are required to carry safety labeling to comply with this specification.

5.3.1 Required safety labeling shall consist of an alert symbol (an exclamation mark within an equilateral triangle), a signal word (CAUTION or WARNING), and text that describes the hazard that is present. Additionally, safety labeling may contain text about what to do or not to do to avoid injury (for example, "Keep out of baby's reach"). The signal word shall be in all upper case sans serif letters not less than ⅛ in. (3.2 mm) in height and shall be center or left aligned. The alert symbol shall directly precede the signal word. The height of the triangle shall be at least the same height as 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. Text describing the hazard(s) and hazard avoidance behavior(s) shall appear in sans serif lettering and shall be either left aligned or center justified. Capital letters shall be no less than 1/16 in. (1.6 mm). Recognizing space constraints, it is recommended, that where possible, such text begin on the next line below the signal word, and that a new line be used for each subsequent statement or separate thought.

5.3.2 Sections 5.4, 5.5, 5.6, 5.7, 5.11, and 5.15 require the signal word WARNING. When no signal word is specified for safety labeling in accordance with 5.3, it is recommended that the signal word CAUTION be used to indicate a potentially hazardous situation which could result in minor or moderate injury, and that the signal word WARNING be used to indicate a potentially hazardous situation which could result in death or serious injury.

5.3.3 Sections 5.11 and 5.15 specify required text describing the hazard(s) and hazard avoidance behavior(s). When no required text is specified for safety labeling in accordance with 5.3, the text is left to the discretion of the manufacturer. Sections 5.4, 5.5, 5.6, 5.7, and 5.15.1.1 provide recommended text to describe the hazard(s) and hazard avoidance behavior(s).

5.3.4 The required safety labeling described throughout Section 5 shall be on the principal display panel.

5.3.5 For toy items packed as premiums in or on a package containing other items, safety labeling shall be on the toy package, and similar labeling shall appear on the larger package.

5.3.6 All safety labeling shall be conspicuous and legible, shall be separated distinctively from any other wording or designs, and shall appear in the English language at a minimum. Such labeling shall be clearly visible to the intended audience and shall be in a color contrasting with the background on which it appears.

5.3.7 When safety labeling is printed onto the toy itself using a decoration process such as hot stamping, silk screening, or a similar process, it shall remain legible after normal use and reasonably foreseeable abuse when tested in accordance with 8.5 – 8.10.

5.3.8 When safety labeling is affixed to a toy in the form of an applied label, the label shall be applied so that it adheres firmly to the toy and none of its edges is lifted off the surface of the toy. Such label shall remain legible after normal use and reasonably foreseeable abuse when tested in accordance with 8.5 – 8.10.

5.4 *Aquatic Toys*—Aquatic toys and their packages shall carry safety labeling in accordance with 5.3, consisting of the signal word "WARNING" and contain, at a minimum, the following text or equivalent text which clearly conveys the same warning: *This is not a lifesaving device. Do not leave child unattended while device is in use.* In addition, no advertising copy or graphics shall state or imply that the child will be safe with such a toy if left unsupervised.

5.5 *Crib and Playpen Toys*—This requirement is applicable to toys intended to be strung across a crib or playpen by means of string, cord, elastic, or straps (including, but not limited to, crib exercisers, crib gyms, and activity toys).

5.5.1 *Age Grading*—Crib and playpen toys, as well as their packages, shall be labeled with the following text or equivalent information (text or graphic), which clearly conveys the age grade: *from birth to 5 months*.

5.5.2 *Safety Labeling*—Crib and playpen toys shall carry safety labeling, in accordance with 5.3, consisting of the signal word "WARNING" and contain, at a minimum, the following text or equivalent text which clearly conveys the same warning: *Possible entanglement or strangulation. Remove toy when baby begins to push up on hands and knees.*

5.6 *Mobiles*—This section addresses all mobiles intended to be attached to a crib, playpen, wall, or ceiling.

5.6.1 *Age Grading*—Mobiles intended to be attached to a crib or playpen, as well as their packages, shall be labeled with the following text or equivalent information (text or graphic), which clearly conveys the age grade: *from birth to 5 months*.

5.6.2 *Safety Labeling:*

5.6.2.1 Mobiles intended to be attached to a crib or playpen, and mobiles intended to be attached to a crib or playpen and later moved to a wall or ceiling, as well as their packages, shall carry safety labeling in accordance with 5.3. The labeling shall consist of the signal word "WARNING" and contain, at a minimum, the following text or equivalent text which clearly conveys the same warning: *Possible entanglement injury. Keep*

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out of baby's reach. Remove mobile from crib or playpen when baby begins to push up on hands and knees.

5.6.2.2 Mobiles intended to be attached only to a wall or ceiling, as well as their packages, shall carry safety labeling in accordance with 5.3. The labeling shall consist of the signal word "WARNING" and contain, at a minimum, the following text or equivalent text which clearly conveys the same warning: *Possible entanglement injury. Keep toy out of baby's reach.*

5.7 *Stroller and Carriage Toys*—Toys intended exclusively to be strung across strollers or carriages by means of string, cords, elastic, or straps shall carry safety labeling in accordance with 5.3. The labeling shall consist of the signal word "WARNING" and contain, at a minimum, the following text or equivalent text which clearly conveys the same warning: *Possible entanglement or strangulation injury when attached to crib or playpen. Do not attach to crib or playpen.*

5.8 *Toys Intended to be Assembled By an Adult*—Packages of toys that are intended to be assembled by an adult and that in their unassembled state contain potentially hazardous sharp edges or points, or small parts if the toy is intended for children under 3 years of age, shall carry safety labeling in accordance with 5.3 stating that the toy is to be assembled by an adult.

5.9 *Simulated Protective Devices*—Toys that simulate safety protective devices (examples include, but are not limited to, construction helmets and sports helmets), as well as their packages, shall carry safety labeling as defined in 5.3, stating that these toys are not safety protective devices.

5.10 *Toys with Functional Sharp Edges or Points*—Toys that are intended for use by children between the ages of 48 and 96 months, which contain accessible potentially hazardous sharp edges or sharp points that are a necessary part of the function of the toy, shall carry safety labeling on their packages as defined in 5.3, stating that a sharp edge or sharp point, or both, exists.

5.11 *Small Objects, Small Balls, Marbles, and Balloons:*

5.11.1 The packages of small balls, marbles, balloons, and certain toys and games, any descriptive material that accompanies them, and, if unpackaged and unlabeled, any retail display container provided by manufacturers or importers shall carry safety labeling in accordance with 16 CFR 1500.19(b).

5.11.1.1 In accordance with 16 CFR 1500.19(d), all labeling statements required by 5.11 shall appear at least in the English language on the principal display panel (except under 5.11.7) and shall be blocked together within a square or rectangular area, with or without a border. The label design, the use of vignettes, or the proximity of other labeling or lettering shall not obscure or render inconspicuous any labeling statement.

5.11.1.2 The statements required by 5.11 shall appear on at least two lines and appear on a solid background and be separated from all other graphic material by a space no smaller than the minimum allowable height of the type size for "other cautionary material" (for example the phrase "Not for children under 3 yrs."). If not separated by that distance, the labeling statements shall be surrounded by a border line.

5.11.1.3 All labeling statements required by 5.11 shall comply with the following type size requirements based on the computed area of the principal display panel. For these purposes, Signal Word means the word "Warning" and the words "Safety Warning"; Statement of Hazard means "Choking Hazard"; Other Material means all other remaining statements.

Area, in.^{2}	0–2	+2–5	+5–10	+10–15	+15–30	+30–100	+100–400	+400
Type Size—Signal Word	$^3/_{64}$ in.	$^1/_{16}$ in.	$^3/_{32}$ in.	$^7/_{64}$ in.	$^1/_8$ in.	$^5/_{32}$ in.	$^1/_4$ in.	$^1/_2$ in.
Type Size—Statement of Hazard	$^3/_{64}$ in.	$^3/_{64}$ in.	$^1/_{16}$ in.	$^3/_{32}$ in.	$^3/_{32}$ in.	$^7/_{64}$ in.	$^5/_{32}$ in.	$^1/_4$ in.
Type Size—Other Material	$^1/_{32}$ in.	$^3/_{64}$ in.	$^1/_{16}$ in.	$^1/_{16}$ in.	$^5/_{64}$ in.	$^3/_{32}$ in.	$^7/_{64}$ in.	$^5/_{32}$ in.

5.11.1.4 An equilateral triangle with an exclamation point (shown in 5.11.2) 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.

5.11.2 For toys and games intended for children at least 3 years old but less than 6 years of age, and which contain as-received small part(s), the labeling shall read:

⚠ WARNING:
CHOKING HAZARD—Small parts.
Not for children under 3 yrs.

5.11.3 For any small ball intended for children 3 years of age or older the labeling shall read:

⚠ WARNING:
CHOKING HAZARD—Toy contains a small ball.
Not for children under 3 yrs.

5.11.3.1 For any toy or game intended for children who are at least 3 years old but less than 8 years of age that contains a small ball the labeling shall read:

⚠ WARNING:
CHOKING HAZARD—Toy contains a small ball.
Not for children under 3 yrs.

5.11.4 For any marble intended for children 3 years of age or older the labeling shall read:

⚠ WARNING:
CHOKING HAZARD—This toy is a marble.
Not for children under 3 yrs.

5.11.4.1 For any toy or game intended for children who are at least 3 years of age but less than 8 years of age that contains a marble the labeling shall read:

⚠ WARNING:
CHOKING HAZARD—Toy contains a marble.
Not for children under 3 yrs.

5.11.5 For any latex balloon or any toy or game that contains a latex balloon, the labeling shall read:

⚠ WARNING:
CHOKING HAZARD—Children under 8 yrs. can choke or suffocate on uninflated or broken balloons.
Adult supervision required.

Keep uninflated balloons from children.
Discard broken balloons at once.

5.11.6 *Combination of Labeling Statements*—The labels of products that contain more than one item subject to the

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requirements of 5.11 may combine information, if the condensed statement contains all of the information necessary to describe the potential hazard associated with each product. For products that contain a balloon *and* a small ball, small object, or marble, only the signal word and statement of hazard may be combined.

5.11.7 *Alternative Labeling Statements for Items Subject to the Requirements of 5.11*—Labeling statements on small packages of toys or balloons that have a principal display panel of 15 $in.^2$ or less and that display cautionary statements in three or more languages may appear on a display panel other than the principal display panel if the principal display panel bears the appropriate statement below and bears an arrow or other indicator pointing toward or directing the purchaser's attention to the display panel on the package where the full labeling statement appears.

5.11.7.1 For a toy or game that is or contains a small object, small ball, or marble:

⚠ SAFETY WARNING

5.11.7.2 For a balloon or a toy or game that contains a balloon:

⚠ WARNING—Choking Hazard

5.12 *Toy Caps*—Refer to 16 CFR 1500.86 for required labeling.

5.13 *Art Materials*—Toys and components of toys that fall within the definition of art material as found in 16 CFR 1500.14(b)(8) shall be labeled in accordance with the provisions of that section and Practice D4236.

5.14 *Electric Toys*—Refer to 16 CFR 1505.3 for required labeling.

5.15 *Battery-Operated Toys*—Toys 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.

5.15.1 *Battery-Powered Ride-on Toys:*

5.15.1.1 Battery powered ride-on toys shall carry safety labeling in accordance with 5.3, consisting of the signal word "WARNING" and contain, at a minimum, text which clearly conveys the following:

(a) To reduce the risk of injury, adult supervision is required. Never use in roadways, near motor vehicles, on or near steep inclines or steps, swimming pools or other bodies of water; always wear shoes, and never allow more than ____ rider(s)

(b) RISK OF FIRE. Do not bypass. Replace only with ____.

NOTE 18—This warning shall be placed at the location of any user replaceable fuse or circuit protection device. Manufacturer should state the part number or equivalent.

5.15.1.2 The packaging or point-of-sale literature of battery-powered ride-on toys shall state the manufacturer's recommended user age or weight limitations for use of the toy, or both.

5.15.1.3 The packaging or point-of-sale literature of battery-powered ride-on toys shall bear the warnings as specified in 5.15.1.

5.15.2 *Button or Coin Cell Batteries:*

5.15.2.1 The following requirements are applicable to consumer replaceable button or coin cell batteries that are 1.5 volts or greater, regardless of the chemistry, and are greater than 15 mm in diameter and fit within the small parts cylinder. The packaging and instructions of toys that operate from such button or coin cell batteries shall carry safety labeling in accordance with 5.3.

(1) The packaging of toys that operate from such button or coin cell batteries shall indicate on the package the following: ⚠Warning: Contains button or coin cell battery. Hazardous if swallowed—see instructions.

NOTE 19—Graphical icons conveying the same information can be substituted.

(2) The instructions of toys that operate from such button or coin cell batteries shall carry safety labeling in accordance with 5.3. The language shall be placed along with any other battery information that is included in the instructions (that is, how to change battery, etc.). If there are no instructions included with the product then the required labeling shall appear either on the package or in an insert packed with the product.

The labeling shall consist of the alert symbol followed by the signal word "WARNING" and contain, at a minimum, the following text or equivalent text which clearly conveys the same information: "This product contains a Button or Coin Cell Battery. A swallowed Button or Coin Cell Battery can cause internal chemical burns in as little as two hours and lead to death. Dispose of used batteries immediately. Keep new and used batteries away from children. If you think batteries might have been swallowed or placed inside any part of the body, seek immediate medical attention."

5.16 *Promotional Materials*—Packaging, literature accompanying toys, and point-of-sale presentations shall not use words, statements, or graphics that are inconsistent in any way with the safety labeling instructions for use or assembly or age grading of the toy.

5.17 *Magnets*—The packaging and instructions of magnetic/electrical experimental sets identified in 4.38 shall carry safety labeling in accordance with 5.3. The labeling shall consist of the safety alert symbol followed by the signal word "WARNING" and contain, at a minimum, the following text or equivalent text which clearly conveys the same hazard alerting message: *"This product contains (a) small magnet(s). Swallowed magnets can stick together across intestines causing serious infections and death. Seek immediate medical attention if magnet(s) are swallowed or inhaled"*

6. Instructional Literature

6.1 *Definition and Description*—Information and instructions that are provided for the safe use or assembly, or both, of a toy, whether on the package or in leaflet form, shall be easy to read and understand by persons of the age level for whom the instructions and information are intended, including, if

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appropriate, children for whom the toy is intended. All such literature shall be shown in the English language at a minimum.

6.2 *Crib and Playpen Toys*—Toys intended to be strung across a crib or playpen by means of string, cords, elastic, or straps (including, but not limited to, crib exercisers, crib gyms, and activity toys) shall be provided with instructions for proper assembly, installation, and use to insure that the product does not present an entanglement or strangulation hazard. The instructions shall include at least the following information:

6.2.1 This toy is not intended to be "mouthed" by the baby and should be positioned clearly out of reach of the baby's face and mouth.

6.2.2 On cribs with adjustable mattress levels, the highest position may allow the toy to be too close to the baby. The second or lower position is more appropriate.

6.2.3 The drop side of the crib should never be lowered with the toy in place and the baby left unattended.

6.2.4 Always attach all provided fasteners (strings, straps, clamps, etc.) tightly to a crib or playpen according to the instructions. Check frequently.

6.2.5 Do not add additional strings or straps to attach to a crib or playpen.

6.3 *Mobiles*—Mobiles intended to be mounted on a crib, playpen, or wall or ceiling nearby shall be provided with instructions for proper assembly, installation, and use to insure that the product does not present an entanglement hazard. The instructions shall include at least the following information:

6.3.1 A crib mobile is intended for visual stimulation and is not intended to be grasped by the child.

6.3.2 If attached to the crib or playpen, remove when baby begins to push up on hands and knees. If so designed, mount on wall or ceiling clearly out of a standing baby's reach.

6.3.3 If mounted on a wall or ceiling, install the mobile clearly out of a standing baby's reach.

6.3.4 Always attach all provided fasteners (strings, straps, clamps, etc.) tightly to a crib or playpen according to the instructions. Check frequently.

6.3.5 Do not add additional strings or straps to attach to a crib or playpen.

6.4 *Toys Intended to be Assembled By an Adult*—Assembly instructions that accompany toys that are intended to be assembled by an adult and that in their unassembled state contain potentially hazardous sharp edges or sharp points, or small parts if the toy is intended for children under 3 years of age, shall carry safety labeling as defined in 5.3 and also state that the toy is to be assembled by an adult.

6.5 *Battery-Operated Toys*—For toys that use more than one battery per circuit, the instructions or the toy shall be marked with the following (or equivalent) information.

6.5.1 Do not mix old and new batteries.

6.5.2 Do not mix alkaline, standard (carbon-zinc), or rechargeable batteries.

6.6 *Battery Powered Ride-on Toys*—Instructions supplied with battery-powered ride-on toys shall contain guidance for safe use and maintenance of the toy. The instructions shall include at least the following:

6.6.1 Maximum weight or age limitations, or both, for safe use of the toy,

6.6.2 The kinds of surfaces which are appropriate for safe use of the toy,

6.6.3 The warning statements contained in 5.15.1.1,

6.6.4 Only use the battery(ies) specified by the manufacturer, and

6.6.5 Only use the charger(s) specified by the manufacturer.

6.7 *Toys in Contact with Food*—The packages or instructions, or both, for toys and their components intended to be used in contact with food shall be labeled to alert caregivers to wash the product thoroughly before use.

6.8 *Toy Chests*—Instructions for proper assembly and maintenance shall be provided in sufficient detail to describe the correct assembly of components, the resulting hazard if the lid support device is not installed, and a description of how to determine whether the support is working properly.

7. Producer's Markings

7.1 Either a principal component of a toy or the package of a toy shall be marked with the name and address of the producer or the distributor. In the case of toys sold in bulk, such as jacks or marbles, only the container need be marked. All of these markings shall be legible and so positioned as to be seen easily by the customer and shall resist normal use conditions. Toys may carry a code that will enable the producer to identify model changes except for toys comprising many loose components, in which case the container may be so coded.

7.2 *Battery-Powered Ride-on Toys*—Battery-powered ride-on toys shall bear a permanent label or marking identifying the manufacturer or distributor, place of business, the model numbers, and a date of manufacture or date code that will allow determination of, at a minimum, the month and year of manufacture.

7.3 *Toy Chests:*

7.3.1 Each toy chest shall be labeled permanently and conspicuously to identify the name and address (city, state, and zip code) of either the manufacturer, distributor, or seller.

7.3.2 A code mark or other mark shall be provided on the toy chest and either the packaging or shipping container that will identify the date (month and year) of manufacture and permit future identification of any given model.

7.3.3 The manufacturer shall change the model number whenever the toy chest undergoes a significant structural design, or material modification, or a change that affects its conformance with this consumer safety specification.

8. Test Methods

8.1 *General*—The inspection and test procedures contained herein are to be used to determine the conformance of products to the requirements of this specification. All types of toys covered by this specification shall undergo the normal use and abuse tests in accordance with 8.5 – 8.10. The remaining tests in this section apply to types of toys as specified within the requirements of Section 4. The relevant tests for a type of toy can be performed in any order except where specified. Each test may be conducted on a different toy unless otherwise

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specified. The tests can be considered as qualification tests and not necessarily as quality control tests. These tests shall also be conducted when there is a design or material change in the toy. Each producer or distributor who represents his products as conforming to this specification may use statistically based sampling plans that are appropriate, but he shall keep such essential records as are necessary to document with a high degree of assurance his claim that all of the requirements of this specification have been met. Any test methods that are made mandatory by the CPSC shall supersede any applicable test methods in this section.

8.2 *Testing for Hazardous Substance Content*—The applicable sections of 16 CFR, issued under the FHSA to be used for determining the presence of hazardous substances, are given in Table 4. The references in Table 4 refer to the regulations issued on Sept. 27, 1973.

NOTE 20—The latest issue of the regulation shall be used to determine compliance of the toy with the requirements of this specification. The requirements of the FHSA are mandatory by law.

8.3 *Test Methods for Determination of Heavy Element Content in Toys, Toy Components and Materials:*

8.3.1 *Total Element Content Screening:*

8.3.1.1 Toy material under test is to be digested per the appropriate CPSC Method:

(1) CPSC-CH-E1001-08.3 (metal substrates)

(2) CPSC-CH-E1002-08.3 (non-metal substrates)

(3) CPSC-CH-E1003-09.1 (paint and similar surface-coating materials)

8.3.1.2 With the following modification: Concentrated HNO_3 digestant is to be replaced with aqua regia (three parts concentrated HCl to one part concentrated HNO_3). Glass and ceramic components shall be digested using three parts HF to one part HNO_3. Certain polymeric materials such as PVC and CPVC may require use of three parts concentrated HNO_3 to one part 30 % H_2O_2 for complete digestion; in all cases, knowledge-based adjustments to the above digestant mixtures on a case-by-case basis may be necessary for products made from certain materials, and are allowable so long as complete digestion is achieved and avoidance of formation of insoluble metal salts is taken into consideration. In all cases, the use of concentrated H_2SO_4 is to be avoided to reduce the possibility of the formation of insoluble metal sulfates.

8.3.1.3 *Total Screen Method*—Resulting digested material is to be filtered and diluted as prescribed, then analyzed by atomic spectroscopy or other appropriate validated method for total content of all eight elements listed in Table 1 and Table 2; if results are below soluble limits for each element as prescribed in the appropriate table, the material can be considered to conform to requirements of 4.3.5.1 or 4.3.5.2, or both, without further testing. If soluble limits in the appropriate table are exceeded, additional testing per 8.3.2 (for paint and similar surface-coating materials) or 8.3.5 (substrate materials) will be required to confirm compliance. In addition, if the toy or toy component is a metallic small part and total cadmium concentration exceeds 75 ppm, it is to be tested per 8.3.5.5(*3*). Composite samples of up to three like materials (for example, three colors of plastic) are acceptable (if performed in accordance with Annex A7) for total element screening, but not for soluble element testing if such is required.

8.3.1.4 *Alternative Total Screen Method*—As an alternative to the method described in 8.3.1.3, Energy Dispersive X-Ray Fluorescence Spectrometry Using Multiple Monochromatic Excitation Beams may be employed to perform a total screen of element content, in accordance with the provisions of CPSC-CH-E1002-08.3 that reference ASTM F2853 – $10^{\varepsilon 1}$. If this alternative method is chosen, its application is limited to homogeneous polymeric materials.

NOTE 21—With the exception of required total lead content testing (see 4.3.5.1), it may be elected to omit total element screening and perform only soluble element testing per 8.3.2 – 8.3.6.

NOTE 22—The methods and exclusions given in 8.3.3 do not apply to surface coatings being tested for total lead content as required by 16 CFR 1303. Total lead determination under CPSC requirements at 16 CFR 1303 applies to any coating that can be scraped off, regardless of the amount, with results calculated based on the actual sample weight.

8.3.2 *Method to Dissolve Soluble Matter for Surface Coatings*—Soluble elements are extracted from toys under conditions that simulate the situation in which the materials stay 4 h in the alimentary tract after swallowing. The content of soluble elements in the extract is determined.

8.3.2.1 *Apparatus*—Normal laboratory apparatus and the following:

(1) Metal Sieve, plain weave wire mesh stainless steel metal sieve with a nominal opening of 0.5 mm and the following specifications: *(a)* Nominal wire diameter: 0.315 µm; *(b)* Maximum size deviation for an individual opening: ±0.090 µm; *(c)* Tolerance for average opening: ±0.018 mm; and *(d)* 6 % or fewer of the openings to exceed the nominal plus 0.054 mm.

(2) pH, a means of measuring pH with a minimum accuracy of 0.2 pH units.

(3) Membrane Filter, with a pore size of 0.45 µm.

(4) Centrifuge, capable of centrifuging at 5000 ± 500 × *g* RCF (g = 9.80665 m/s^2)

(5) A means to constantly agitate the mixture at a temperature of 37 ± 2°C.

TABLE 4 Determination of Hazardous Substance Content

Hazardous Substance	Regulation (Title 16 CFR)
Toxic substance	1500.3(b)5, 1500.3(c)2, and 1500.40
Corrosive substance	1500.3(b)7, 1500.3(c)3, and 1500.41
Irritant substance	1500.3(b)8, 1500.3(c)4, 1500.41, and 1500.42
Strong sensitizer	1500.3(b)9, 1500.3(c)5, and 1500.13
Pressure-generating substance	1500.3(c)7
Radioactive substance	1500.3(b)11 and 1500.3(c)8
Flammability	1500.3(b)10, 1500.3(c)6, 1500.43, and 1610.

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(6) Container, of gross volume between 1.6 and 5.0 times that of the volume of HCL extractant.

8.3.2.2 *Reagents*—Use only reagents of recognized analytical grade during the analysis.

(1) Hydrochloric acid (HCl) solution; concentration = (0.07 ± 0.005) mol/l.

(2) Hydrochloric acid (HCl) solution; concentration = (0.14 ± 0.010) mol/l.

(3) Hydrochloric acid (HCl) solution; concentration = approximately 1 mol/l.

(4) Hydrochloric acid (HCl) solution; concentration = 2 mol/l.

(5) Hydrochloric acid (HCl) solution; concentration = approximately 6 mol/l.

(6) n-heptane, (C_7H_{16}); 99 %.

(7) Water, of at least grade 3 purity in accordance with Specification D1193 or ISO 3696.

8.3.3 *Preparation of Test Samples*—A laboratory sample for testing shall consist of a toy in the form in which it is marketed, excluding the package and packaging components.

8.3.3.1 The test sample shall be taken from the accessible portions of a single toy sample.

8.3.3.2 Identical materials in the sample may be combined and treated as a single sample. A single sample may not consist of more than one material or color (that is, composite testing is not allowed).

8.3.3.3 The test sample can alternatively be taken from materials in a form such that they are representative of the relevant material specified above.

8.3.3.4 When a toy is intended to be taken apart or can be taken apart without the use of tools, each piece shall be considered separately.

8.3.3.5 For reference purposes, the sample may be taken from the raw material rather than scraped from the sample.

8.3.3.6 Scrape the coating off the test sample, and grind it through the sieve. Obtain a portion of not less than 100 mg of the resulting material.

(1) Where there is only between 10 and 100 mg of uniformly ground material available, test that quantity and calculate the results as if 100 mg of the sample had been available. The report should note this procedure and the actual sample amount.

(2) If there is less than 10 mg of sample available, the test is not performed.

(3) In the case of coatings that by their nature cannot be ground (for example, elastic, rubber, or plastic paint), test the sample as it was removed from the toy.

NOTE 23—The methods and exclusions given in 8.3.3.1 do not apply to surface coatings being tested for total lead content as required by 16 CFR 1303. Total lead determination under CPSC requirements at 16 CFR 1303 applies to any coating that can be scraped off, regardless of the amount, with results calculated based on the actual sample weight.

8.3.4 *Test Procedures:*

8.3.4.1 Prepare a test portion in accordance with 8.3.3.

8.3.4.2 Mix the test portion so prepared with 50 times its mass of an aqueous solution of 0.07 mol/L hydrochloric acid at 37 ± 2°C. In the case of a test portion of less than 100 mg, mix the test portion with 5.0 mL of this solution at the given temperature. Shake for 1 min.

(1) Check the acidity of the mixture. If the pH is greater than 1.5, add dropwise while shaking an aqueous solution of 2 mol/L (7.3 % m/m) hydrochloric acid until the pH is between 1.0 and 1.5. Protect the mixture from light. Shake the mixture efficiently for 1 h continuously, and then allow the mixture to stand for 1 h at 37 ± 2°C.

(2) Without delay, separate the solids from the mixture by filtration through a membrane filter with a pore size of 0.45 µm. If necessary, centrifuge at 5000 g for no longer than 10 min. Analyze the solution by atomic spectroscopy or other appropriate validated method to determine the concentration of the elements identified in 4.3.5.1. If it is not possible to examine the sample within one working day, stabilize by the addition of hydrochloric acid so that the resulting solution HCl concentration is approximately 1 mol/L.

NOTE 24—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.

8.3.4.3 The analytical results as determined in 8.3.4.2 (as well as those determined in 8.3.5.4, 8.3.5.5, 8.3.5.6, and 8.3.5.7) shall be adjusted by subtracting the analytical correction factor in the following table using the following method. This is necessary to make statistical correction for interlaboratory error.

	Analytical Correction							
Element	Sb	As	Ba	Cd	Cr	Pb	Hg	Se
Analytical correction, %	60	60	30	30	30	30	50	60

(1) Example of Calculations Using the Table:

Example 1—The analytical result for lead is 120 mg/kg; the correction factor from the table is 30 % (0.30).
Adjusted analytical results = 120 – (120 × 0.30) = 120 – 36 = 84 mg/kg.
The result does not exceed the allowed value for lead in the table and is therefore acceptable.

Example 2—The analytical result for chromium is 90 ug/kg: the correction factor from the table is 30 % (0.30).
Adjusted analytical results = 90 – (90 × 0.30) = 90 – 27 = 63 mg/kg.
The result exceeds the allowed value for chromium in the table and is therefore not acceptable.

8.3.5 *Soluble Element Test Method for Substrate Materials*—Soluble elements are extracted from toy materials under conditions which simulate the material remaining in contact with stomach acid for a period of time after swallowing. The concentrations of the soluble elements are determined quantitatively.

NOTE 25—Optional, alternate test methods are permitted, as described in 8.3.6.

8.3.5.1 *Apparatus*—As described in 8.3.2.1.

8.3.5.2 *Reagents*—As described in 8.3.2.2.

8.3.5.3 *Selection of Test Portions:*

(1) A laboratory sample for testing shall consist of a toy either in the form in which it is marketed, or in the form in which it is intended to be marketed. Test portions shall be taken

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from accessible parts of a single toy sample, that is, identical materials in the toy may be combined and treated as a single test portion but additional toy samples shall not be used. Test portions are only permitted to be composed of more than one material or color where physical separation (for example, dot printing), patterned textiles or mass limitation reasons, precludes the formation of discrete specimens.

(2) Test portions where less than 10 mg of material available are not tested.

NOTE 26—The requirement does not preclude that test portions can be taken from materials in a form such that they are representative of the relevant material specified above and the substrate upon which they are deposited.

8.3.5.4 Polymeric and similar materials including laminates (whether reinforced textile or not), other textiles, and similar materials.

(1) Sample Removal/Preparation Procedure:

(a) Obtain a test portion of not less than 100 mg of the polymeric or similar materials, avoiding heating of the materials, according to the following directions.

(b) Cut out test portions from the areas having the thinnest material cross section in order to ensure a surface area of the test pieces as large as possible in proportion to their mass. Each test piece shall in the uncompressed condition have no dimension greater than 6 mm.

(c) If the laboratory sample is not uniform in its material, a test portion shall be obtained from each different material present in a mass greater than 10 mg. In the case where there is between 10 and 100 mg of uniform material the mass of the test portion shall be reported in the test report and the quantity of the appropriate elements shall be calculated and reported as if 100 mg of the test portion had been used.

(2) Test Procedure—As described in 8.3.4.2 and 8.3.4.3.

8.3.5.5 *Glass/Ceramic/Metallic Materials:*

(1) Sample Removal/Preparation Procedure—Toys and components shall be first subjected to the relevant tests in accordance with Section 8. If any accessible glass, ceramic or metallic materials of the toy fits entirely within the small parts cylinder (see Fig. 3) before or after use and abuse testing, it shall be tested in accordance with 8.3.5.5(*2*) after removal of any coating in accordance with CPSC method CPSC-CH-E1003-09; metallic materials are also to be tested in accordance with 8.3.5.5(*3*) after removal of any coating in accordance with CPSC method CPSC-CH-E1003-09.

NOTE 27—Toys and components that have no accessible glass, ceramic or metallic materials are not tested according to 8.3.5.5. If a toy or component that is subject to testing per 8.3.5.5 consists of a combination of metallic and non-metallic materials (for example, a steel nut with a nylon locking insert), the non-metallic material is to be mechanically separated from the metallic material prior to the test, and only the metallic component is subjected to testing per 8.3.5.5; the non-metallic component is to be tested per the section of this standard applicable to the material type.

(2) Test Procedure – Standard Soluble Elements:

(a) Place the toy or component in a 50 mL glass container with nominal dimensions: height 60 mm, diameter 40 mm. Add a sufficient volume of an aqueous solution of 0.07 M HCl at 37 ± 2°C to just cover the toy or component. Cover the container, protect the contents from light and allow the contents to stand for 2 h at 37 ± 2°C. See Note 28.

(b) Without delay, efficiently separate the solids from the solution, firstly by decantation followed by filtration using a membrane filter, and if necessary, by centrifuging at up to 5000 g.

(c) Separation shall be completed as soon as possible after the completion of the standing time; centrifuging shall take no longer than 10 min and shall be reported in the test report. If the resulting solutions are to kept for more than 24 h prior to analysis they shall be stabilized by addition of hydrochloric acid so that the HCl concentration of the stored solution is approximately 1.0 M.

(d) Analyze the solution for element content using atomic spectroscopy or other validated test methods.

(3) Test Procedure-Special Soluble Cadmium (apply to metallic small parts only):

(a) Metal toys and toy components which, either before or after use-and-abuse testing per Section 8, fit entirely within the small parts cylinder (see Fig. 3) shall be tested per CPSC test method CPSC-CH-E1004-11. At the conclusion of the prescribed 24-h extraction test, efficiently separate, without delay, the solids from the solution, firstly by decantation followed by filtration using a membrane filter, and if necessary, by centrifuging at up to 5000 g. Separation shall be completed as soon as possible after the completion of the extraction time; centrifuging shall take no longer than 10 min and shall be reported in the test report. If the resulting solutions are to be kept for more than 24 h prior to analysis they shall be stabilized by addition of hydrochloric acid so that the HCl concentration of the stored solution is approximately 1.0 M. Stored solutions shall be protected from light to the extent practicable.

(b) Analyze the solution for cadmium content using atomic spectroscopy or other validated test methods.

NOTE 28—This type of container will accommodate all components/toys that fit inside the small parts cylinder. *(a)*

8.3.5.6 *Other Materials, Whether Mass Colored or Not:*

(1) Sample Removal/Preparation Procedures:

(a) Obtain a test portion of not less than 100 mg of the material according to 8.3.5.4.

(b) If the laboratory sample is not uniform in its material, a test portion shall be obtained from each different material present in a mass greater than 10 mg. Where there is between 10 and 100 mg of uniform material, the mass of the test portion shall be reported in the test report, and the quantity of the appropriate elements shall be calculated and reported as if 100 mg of the test portion had been used.

(c) If the material to be tested is coated with paint, varnish, lacquer, printing ink or similar material, remove this material per in accordance with CPSC method CPSC-CH-E1003-09 prior to testing per 8.3.5.6(*2*).

(d) Test Procedures—The materials shall be tested by the most appropriate method under 8.3. The method used shall be reported in the test report.

8.3.5.7 *Materials Intended to Leave a Trace:*

(1) Sample Removal/Preparation Procedure for Materials in Solid Form:

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(a) Obtain a test portion of not less than 100 mg of the material by cutting into test pieces, which in the uncompressed condition shall have no dimensions greater than 6 mm.

(b) A test portion shall be obtained from each different material intended to leave a trace, present in the laboratory sample in a mass greater than 10 mg. Where there is between 10 and 100 mg of material, the mass of the test portion shall be reported in the test report and the quantity of the appropriate elements shall be calculated and reported as if 100 mg of the test portion had been used. If the material contains any grease, oil, wax or similar material, the test portion shall be enclosed in hardened filter-paper and these ingredients shall be removed with n-heptane using solvent extraction.

(2) Sample Removal/Preparation Procedure for Materials in Liquid Form:

(a) Obtain a test portion of not less than 100 mg of the material from the laboratory sample. The use of an appropriate solvent to facilitate the obtaining of a test portion is permitted.

(b) A test portion shall be obtained from each different material intended to leave a trace, present in the laboratory sample in a mass greater than 10 mg. Where there is between 10 and 100 mg of material, the mass of the test portion shall be reported in the test report and the quantity of the appropriate elements shall be calculated and reported as if 100 mg of the test portion had been used. If the material is intended to solidify in normal use and contains grease, oil, wax or similar material, the test portion shall be allowed to solidify under normal use conditions and the resulting material shall be enclosed in hardened filter-paper and the grease, oil, wax or similar material shall be removed with n-heptane by using solvent extraction.

(3) Test Procedure for Samples not Containing Grease, Oil, Wax or Similar Material:

(a) Using the appropriately sized container, mix the test portion so prepared with 50 times its mass of an aqueous solution at 37 ± 2°C of 0.07 M HCl (see 8.3.2.2). For a test portion mass of between 10 and 100 mg, mix the test portion with 5.0 mL of this solution at 37 ± 2°C. Shake for 1 min. Check the acidity of the mixture.

(b) If the pH of the resulting solution is greater than 1.5, adjust the pH to between 1.0 and 1.5. If the pH is 2.5 or less, add dropwise, while shaking the mixture, 2 M HCl until the pH is between 1.0 and 1.5; if the pH is greater than 2.5, add dropwise, while shaking the mixture, 6 M HCl until the pH is between 2.50 and 1.5, then add dropwise, while shaking the mixture, 2 M HCl until the pH is between 1.0 and 1.5. The amount of hydrochloric acid used in relation to the amount of solution shall be reported in the test report.

(c) Protect the mixture from light. Agitate the mixture at 37 ± 2°C (see 8.3.4.2) for 1 h continuously and then allow to stand for 1 h at 37 ± 2°C.

(d) Without delay, efficiently separate the solids from the solution, firstly by filtration using a membrane filter and, if necessary, by centrifuging at up to 5000 g. Separation shall be completed as soon as possible after the completion of the standing time; centrifuging shall take no longer than 10 min and shall be noted in the test report.

(e) If the resulting solutions are to be kept for more than the working day prior to analysis they shall be stabilized by addition of hydrochloric acid so that the concentration of the stored solution is approximately 1.0 M HCl.

(f) Analyze the solution for element content using atomic spectroscopy or other validated test methods.

(4) Test Procedure for Samples Containing Grease, Oil, Wax or Similar Material:

(a) With the test portion remaining in the hardened filter-paper, macerate the test portion so prepared with 25 times the mass of the original material with water at 37 ± 2°C so that the resulting mixture is homogeneous. Quantitatively transfer the mixture to the appropriate sized container. Add to the mixture an aqueous solution of 0.14 M HCl at 37 ± 2°C in the proportion of 25 times the mass of the original test portion. In the case of a test portion mass between 10 and 100 mg macerate the test portion with 2.5 mL of water. Quantitatively transfer the mixture to the appropriate sized container. Add 2.5 ml of 0.14 M HCl at 37 ± 2°C to the mixture. Shake for 1 min.

(b) Check the acidity of the mixture. The amount of hydrochloric acid used in relation to the amount of solution shall be reported in the test report. Protect the mixture from light. Agitate the mixture at 37 ± 2°C for 1 h continuously and then allow to stand for 1 h at 37 ± 2°C. See Note 29.

(c) Without delay, efficiently separate the solids from the solution, firstly by filtration using a membrane filter and, if necessary, by centrifuging at up to 5000 g. Separation shall be completed as soon as possible after the completion of the standing time; centrifuging shall take no longer than 10 min and shall be noted in the test report.

(d) If the resulting solutions are to be kept for more than the working day prior to analysis they shall be stabilized by addition of hydrochloric acid so that the concentration of the stored solution is approximately 1.0 M HCl.

(e) Analyze the solution for element content using atomic spectroscopy or other validated test methods.

NOTE 29—The volume of the solution 0.07 M HCl or 0.14 M HCl, as the case may be, is calculated based on the mass of the test portion prior to de-waxing.

8.3.6 *Alternative Methods*—For purposes of determining compliance with the requirements contained in 4.3.5, "reasonable and representative tests" shall be used. Reasonable and representative tests could be either the tests contained in 8.3.1, 8.3.2, or 8.3.3, or alternate tests which utilize apparatus or procedures, or both, other than those in 8.3. The following paragraphs set forth the conditions under which alternate tests with apparatus or procedures other than those described in 8.3, inclusive, will be considered reasonable and representative.

8.3.6.1 Persons and firms determining the compliance of materials subject to the requirements contained in 4.3.5 may base those determinations on any alternate test utilizing apparatus or procedures other than those in 8.3, inclusive, if such alternate test is as stringent as, or more stringent than, the tests in 8.3, inclusive. An alternate test is considered to be "as stringent as, or more stringent than" a test in 8.3 if, when testing identical specimens, the alternate test yields failing results as often as, or more often than, the test in 8.3, inclusive. Any person using such an alternate test shall have data or

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information to demonstrate that the alternate test is as stringent as, or more stringent than, the test in 8.3, inclusive. For example XRF screening in accordance with Test Method F2853 protocol could be used if determined to be a more stringent test method to the extent applicable for the material tested.

8.3.6.2 The data or information required by paragraph 8.3.6.1 to demonstrate equivalent or greater stringency of any alternate test using apparatus or procedures other than those in 8.3, inclusive, shall 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 4.3.5.

8.3.6.3 The data or information required by paragraph 8.3.6.1 to demonstrate equivalent or greater stringency of any alternate test using apparatus or procedures other than those in 8.3, inclusive, shall be retained for as long as that alternate test is used to support determinations of compliance against the requirements contained in 4.3.5, and for one year thereafter.

(1) Alternate method acceptability requires rigorous statistical analysis of limits of acceptability to show consistency of results of alternate methods to prescribed method results. This analysis shall be performed separately for each substrate type and heavy element (for example, results for cadmium in metal may not be automatically assumed to apply to barium in plastic, etc.). Alternate methods, once validated, should be submitted to ASTM for inclusion in the standard to avoid inconsistency of results.

8.4 *Tests for Cleanliness and Preservative Effectiveness:*

8.4.1 *Cleanliness of Materials*—The cleanliness of cosmetics, liquids, pastes, putties, gels, powders, and avian feather products used in toys (excluding art materials) shall be determined using the methods in USP 35 <61> and <62> Microbial Limits and Pathogen Identification Tests (or optionally, the corresponding methods in the most current edition of the U.S. Pharmacopeia) or the CTFA Microbiology Guidelines, test methods M-1 and M-2.[20] The limits for determining the cleanliness of materials are as follows: infant products, 1×10^2 colony forming units per milliliter or per gram (cfu/mL or cfu/gm); products such as face paints or cosmetics intended for use by a child or on a doll or similar product (excluding lip balms, lip glosses, lipsticks, and the like items) which have a high likelihood of being used in the area of the eye, 1×10^2 cfu/mL or cfu/gm; avian feather products, 5×10^3 cfu/mL or cfu/gm; all other products, 1×10^3 cfu/mL or cfu/gm (due to the variability introduced by the dilution process, up to 5×10^2 cfu/mL or cfu/gm for infant or face products, and up to 5×10^3 cfu/mL or cfu/gm for all other products can be considered to be an acceptable result). In addition, Pseudomonas sp., Escherichia coli, coagulase positive Staphylococcus sp., and Salmonella sp. (plus Shigella sp. for avian feather products – this organism to be isolated using methods outlined in the latest edition of the FDA Bacteriological Analytical Manual) shall not be detected.

8.4.2 *Preservative Effectiveness*—The formulations of cosmetics, liquids, pastes, putties, gels, and powders used in toys shall first be evaluated for their potential for microbiological degradation using the methods outlined in the "Microbiological Risk Factor Assessment of Atypical Cosmetic Products" within the CTFA Microbiology Guidelines. In general, products with a low likelihood of supporting microbial growth are anhydrous or have a water activity below 0.5, or have some other characteristic which serves to inhibit microbial growth, and include but are not limited to the following:

NOTE 30—Avian feather products are not subjected to microbial challenge testing.

Wax-based products,
Siloxane and siloxane derivative-based products,
Lip balms,
Pomades,
Ointments,
Powders (anhydrous or nearly so, and non-hygroscopic),
Products with an alcohol content equal to or greater than 20 % (vol/vol), and
Products with a pH of less than 3 or greater than 10.

8.4.2.1 Products which are determined not to be susceptible after evaluation need not be subjected to microbial challenge testing.

8.4.2.2 Products which are judged to be susceptible to microbial degradation or to have the potential to support growth are to be tested for microbial control and preservative effectiveness using the methods in USP 35 <51> (or the corresponding method in the most current edition of the US Pharmacopeia) or using the methods in the CTFA Microbiology Guidelines, methods M-3 or M-6 as appropriate. The following organisms, at a minimum, as defined by the American Type Culture Collection[21] (ATCC), are to be used to challenge the product: Staphylococcus aureus, ATCC 6538; Escherichia coli, ATCC 8739; Pseudomonas aeruginosa, ATCC 9027; Candida albicans, ATCC 10231; and Aspergillus brasiliensis, ATCC 16404.

8.4.2.3 Preservative effectiveness/microbial control is to be evaluated using the following criteria:

(1) Sampling is to be performed (at a minimum) at the following intervals: at inoculation plus 14 days and 28 days after inoculation.

(2) Evaluation criteria: (*a*) bacteria shall exhibit a log reduction of >2 (that is, population shall be less than 1 % of initial inoculum) at 14 days, and show no increase from the 14-day result at 28 days; (*b*) fungi, yeast, and molds shall exhibit no increase from the initial inoculum at either 14 or 28 days.

8.5 *Normal Use Testing*—These tests are intended to simulate normal use conditions so as to ensure that hazards are not

[20] *Reagent Chemicals, American Chemical Society Specifications*, American Chemical Society, Washington, DC. For Suggestions on the testing of reagents not listed by the American Chemical Society, see *Analar Standards for Laboratory Chemicals,* BDH Ltd., Poole, Dorset, U.K., and the *United States Pharmacopeia and National Formulary,* U.S. Pharmacopeial Convention, Inc. (USPC), Rockville, MD. CTFA Microbiology Guidelines can be obtained from Personal Care Products Council, 1620 L St., NW, Suite 1200, Washington, DC 20036, www.personalcarecouncil.org.

[21] Organisms available from American Type Culture Collection (ATCC), 10801 University Boulevard, Manassas, VA 20110, https://www.atcc.org.

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generated through normal wear and deterioration. The object of these tests shall be to simulate the normal play mode of the toy, and the tests are therefore unrelated to the reasonably foreseeable abuse tests of 8.6 – 8.13. The tests are intended to uncover hazards rather than to demonstrate the reliability of the toy. The fact that a mechanism or material of a toy fails during testing is relevant only if the failure creates a potential hazard. Toys shall be subject to appropriate tests to simulate the expected mode of use of the particular toy. For example, levers, wheels, catches, triggers, strings, wires, chains, and so on, that are intended to be actuated by a child shall be operated repeatedly. Spring or power-operated devices shall be tested similarly. The tests shall be conducted in an expected use environment. For example, toys intended for use in the bathtub shall be tested in soapy water, and toys intended for use in the sandbox shall be exposed to sand during testing. It is recognized that no specific requirements are defined here; it would not be possible in view of the wide range of toys covered by this specification. However, the manufacturer or distributor shall do enough testing to satisfy himself that normal use during the estimated lifetime of the toy is being simulated. The toy shall be inspected after such tests, and hazards such as points, sharp edges, and release of small parts shall be evaluated in accordance with the relevant requirements listed in Section 4.

8.5.1 *Washable Toys*—Toys described as machine washable on the toy, package, or instructions shall be subjected to six machine washing and tumble drying cycles, as described in 8.5.1.1, unless a different drying method is specified by the toy manufacturer by means of a permanent label. They shall then be inspected for compliance with this specification.

8.5.1.1 *Conditions for Machine Washing and Tumble Drying*—Any commercially available top-loading washer, dryer, or laundry detergent intended for use in the home may be used for this test. The weight of each toy is determined prior to the beginning of the test. The toys, plus a dummy load of clothes sufficient to bring the total dry weight to a minimum 4 lb (1.8 kg), are washed in an automatic washing machine using the warm water setting and a 12-min wash cycle at the normal setting. The toys and dummy load shall then be tumble dried in an automatic clothes dryer using the warm setting, or air dried, until the load is dried. The toy shall be deemed dry when the final weight does not exceed the original dry weight by more than 10 %.

8.6 *Abuse Testing*—The tests described in 8.7 – 8.13 are to simulate the exposure of a toy to mechanical damage through dropping, throwing, and other actions likely to be performed by a child, which are characterized as reasonably foreseeable abuse. After testing, the toy shall be examined for mechanical hazards, such as hazardous sharp edges and points, and ingestion hazards, such as small liberated components, chips, or fragments. The severity of the abuse tests described in 8.7, 8.8, 8.9, 8.10, and 8.12 shall be determined according to the age group for which the toy is intended. If the toy is intended for an age group that spans more than one age group according to Table 5, the toy shall be subjected to the most severe test. Unless otherwise specified, none of the abuse testing described in 8.7 – 8.12 applies to toys intended for children over 96 months of age. Toys reasonably intended to be assembled by an adult, and not intended to be taken apart by a child, shall be tested only in the assembled state if the shelf package and assembly instructions indicate prominently that the article is to be assembled by an adult. Individual parts of toys that are intended to be assembled by children shall be tested as well as the fully assembled toy; however, the assembled toy shall be made of components that have not been subjected to the abuse testing.

8.7 *Impact Tests*—These tests are intended to simulate situations in which possible damage can occur to a toy by reason of its falling from a crib, table, or counter top, or other impact situations that may occur as a result of reasonably foreseeable abuse. After undergoing the appropriate test, the toy shall be examined for possible hazards, such as points, edges, or ingestible objects, in accordance with the relevant requirement of Section 4.

8.7.1 *Drop Test*—Except for toys covered in 8.7.2, toys falling below the weight limit given below shall be dropped onto a specified impact area. The number of times the toy will be dropped, and the height from which it is dropped, is to be determined from Table 5. The toy shall be dropped in random

TABLE 5 Test Parameters for Use and Abuse Tests

Test	Age Category of Intended User, months	Numerical Value	
		Stated by the Voluntary Standard	Recommended for Toy Manufacturers
Drop test	0 to 18	10 × 4.5 ft ± 0.5 in. (137 cm)	4 ft, 6.5 in. (1.38 m)
	over 18 to 36	4 × 3.0 ft ± 0.5 in. (91 cm)	3 ft, 0.5 in. (0.93 m)
	over 36 to 96	4 × 3.0 ft ± 0.5 in. (91 cm)	3 ft, 0.5 in. (0.93 m)
Torque test	0 to 18	2 ± 0.2 in.·lbf (0.23 N·m)	2.2 in.·lbf (0.25 N·m)
	over 18 to 36	3 ± 0.2 in.·lbf (0.34 N·m)	3.2 in.·lbf (0.36 N·m)
	over 36 to 96	4 ± 0.2 in.·lbf (0.45 N·m)	4.2 in.·lbf (0.47 N·m)
Tension test	0 to 18	10 ± 0.5 lbf (44.5 N)	10.5 lbf (46.7 N)
	over 18 to 36	15 ± 0.5 lbf (66.8 N)	15.5 lbf (69.0 N)
	over 36 to 96	15 ± 0.5 lbf (66.8 N)	15.5 lbf (69.0 N)
Compression test	0 to 18	20 ± 0.5 lbf (89.0 N)	20.5 lbf (91.2 N)
	over 18 to 36	25 ± 0.5 lbf (111.3 N)	25.5 lbf (113.5 N)
	over 36 to 96	30 ± 0.5 lbf (133.5 N)	30.5 lbf (135.7 N)
Flexure test	0 to 18	10 ± 0.5 lbf (44.5 N)	10.5 lbf (46.7 N)
	over 18 to 36	15 ± 0.5 lbf (66.8 N)	15.5 lbf (69.0 N)
	over 36 to 96	15 ± 0.5 lbf (66.8 N)	15.5 lbf (69.0 N)

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orientation. The test sample shall be allowed to come to rest after each drop and shall be examined and evaluated before continuing. The impact medium shall consist of a ⅛-in. (3-mm) nominal thickness of Type IV vinyl composition tile, composition 1-asbestos free, as specified in Federal Specification SS-T-312B over at least a 2.5-in. (64-mm) thickness of concrete. The impact area shall be at least 3 ft^2 (0.3 m^2). The recommended batteries shall be in place during the drop test for battery-operated toys. If no specific type of battery is recommended, the heaviest battery that is generally available shall be used.

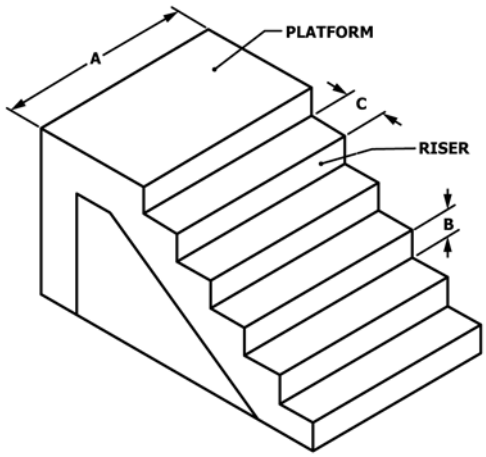
Age Group	Weight Criteria, lb (kg)
18 months or less	less than 3 ± 0.01 (1.4)
over 18 months, not over 36 months	less than 4 ± 0.01 (1.8)
over 36 months, not over 96 months	less than 10 ± 0.01 (4.5)

8.7.2 *Tipover Test for Large, Bulky Toys*—Large, bulky toys shall not be subjected to the drop test of 8.7.1, but they shall be tipped over according to the following procedure:

8.7.2.1 *Tipover Test for Large, Bulky Toys*—Large, bulky toys shall be tested for impact by tipping over three times, one of which is in the worst attitude by pushing the sample slowly past its center of balance onto the impact medium described in 8.7.1.

8.7.3 *Tumble Test for Wheeled Toys*—Wheeled toys weighing more than 3 lb (1.4 kg) but not more than 10 lb (4.5 kg) shall be tumbled down a flight of six steps with risers not less than 7 in. (180 mm) high (see Fig. 31). The treads may be wood, cement, or metal. The toy, including accessories, where applicable, shall be caused to fall down the steps two times in each of four attitudes: tumbling forwardly end-over-end and tumbling rearwardly end-over-end from each side. The toy shall be pushed slowly over the edge of the top step in the appropriate attitude and released as soon as it begins to fall of its own weight. The test shall be considered complete for an attitude even if the toy does not reach the bottom of the flight of steps.

8.7.4 *Impact Test for Toys that Cover the Face*—The toy shall be held firmly in a suitable clamp with that portion that covers or surrounds the eyes (in the case of cutout eye holes) in a horizontal plane. Drop a ⅝-in. (16-mm) diameter steel ball weighing 0.56 oz. (15.8 g) (with a tolerance of +0.03 (0.8 g, –0 oz) from a height of 50 in. (1.3 m) upon the horizontal upper surface of the toy in the area that would cover the eyes in normal use. In the case of toys with cutout eye holes, impact the area that would be directly adjacent to the eyes in normal use. The ball may be guided, but not restricted, in its fall by being dropped through a perforated tube extending to within approximately 4 in. (100 mm) of the toy.



Dimensions
"A" shall be not less than 3 ft (914 mm)
"B" shall be not less than 7 in. (180 mm)
"C" shall be not more than 9 in. (230 mm)

FIG. 31 Illustration of Step Construction

8.8 *Torque Tests for Removal of Components*—Any toy with a projection, part, or assembly that a child can grasp with at least the thumb and forefinger or the teeth shall be subject to this test. The amount of torque shall be determined from Table 5, according to the age group for which the toy is intended. The loading device used in the test shall be a torque gauge, torque wrench, or other appropriate device having an accuracy of ±0.2 in.·lbf (±0.02 N·m). A clamp capable of holding the test component firmly and transmitting a torsional force shall be used. The clamp is fastened to the test object or component with the toy fastened rigidly in any reasonable test position. The torque shall be applied evenly within a period of 5 s in a clockwise direction until either (*1*) a rotation of 180° from the original position has been attained, or (*2*) the required torque is exceeded. The maximum rotation or required torque shall be maintained for an additional 10 s. The torque shall then be removed and the test component permitted to return to a relaxed condition. This procedure shall then be repeated in a counterclockwise direction. Projections, parts, or assemblies that are mounted rigidly on an accessible rod or shaft designed to rotate along with the projections, parts, or assemblies shall be tested with the rod or shaft clamped to prevent rotation. If a component that is attached by a screw thread that has been assembled by the manufacturer, or that has been assembled to the manufacturer's instructions, becomes loosened during application of the required torque, continue to apply the torque until either (*1*) the required torque is exceeded, or (*2*) the part disassembles. The test should be terminated if it becomes obvious that the part under test will continue to rotate at less than the required torque limit and will not disassemble.

8.8.1 If the part disassembles, evaluate it for compliance with the appropriate requirements. If the disassembly exposes an accessible component that can be grasped as noted above, repeat the torque test on that component.

8.9 *Tension Test for Removal of Components*—Any projection of a toy that a child can grasp with at least the thumb and forefinger or the teeth shall be subjected to this test. The tension test shall be performed on the same components of the toy subjected to the torque test described in 8.8. The amount of force used shall be determined from Table 5, according to the age group for which the toy is intended. A clamp capable of applying a tension load to the test component shall be applied in a manner that will not affect the structural integrity of the attachment between the component and the toy. The loading device shall be a self-indicating gauge or other appropriate means having an accuracy of ±0.5 lb (±2 N). With the test sample fastened in a convenient position, an appropriate clamp shall be attached to the test object or component. The required

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tensile force shall be applied evenly, within a period of 5 s, parallel to the major axis of the test component, and maintained for an additional 10 s. The tension clamp shall then be removed, and a second clamp suitable for applying a tension load perpendicularly to the major axis of the test component shall be attached to the test object component. The required tensile force shall be applied evenly, within a period of 5 s, perpendicularly to the major axis of the test component and maintained for an additional 10 s.

8.9.1 *Tension Test for Seams in Stuffed Toys and Beanbag-Type Toys*—A stuffed toy or beanbag constructed of pliable material having seams (including, but not limited to, seams that are stitched, glued, heat sealed, or ultrasonic welded) shall have the seams subjected to a separate tension test in any direction using the forces specified in 8.9 and determined from Table 5 according to the age group for which the toy is intended.

8.9.1.1 The clamps used to grip the material on either side of the seam to be tested shall have jaws to which are attached ¾-in. (19-mm) diameter washers (see Fig. 32). The clamps shall be attached to the cover material of a completely assembled stuffed toy in a manner such that the outside diameter of the ¾-in. (19-mm) washers at a point nearest the seam shall be close to, but no closer than, ½ in. (13 mm) from the edge of the seam stitching thread. This seam test shall not be performed if the material adjacent to the seam cannot be grasped between the thumb and forefinger of the test personnel sufficient for full clamping by the ¾-in. (19-mm) diameter washer jaws. If such is the case, a torque and tension test shall be performed on an arm, leg, or other appendage of the toy instead of the seam test.

8.9.1.2 In performing a seam test, the force appropriate for the age category into which the toy falls (see Table 5) shall be applied evenly within 5 s and maintained for an additional 10 s.

8.9.2 *Tension Test for Suction Cups on Projectiles:*

8.9.2.1 For projectiles with a suction cup as the leading edge, place a clamp on the shaft such that the edge of the clamp is at a point 57 ± 1 mm from the tip of the projectile. Determine this distance in accordance with the procedure contained in 8.14.2. If, due to the length of the projectile, it is not possible to achieve 57 mm between the clamp and the tip of the projectile, place the clamp such that the distance between the clamp and the tip of the projectile is maximized. Place a second clamp around the suction cup such that it is held securely against a flat surface as shown in Fig. 33.

8.9.2.2 If either clamp causes any damage to the projectile, it is allowable to use alternative methods to secure the projectile.

NOTE 31—If glue is used to fasten the suction cup to a flat surface care shall then be taken that the solvents in the glue do not influence the material properties of the suction cup or its fastening to the shaft.

8.9.2.3 Apply forces in accordance with the methods contained in 8.9.

8.10 *Compression Test*—Any area on the surface of a toy that is accessible to a child and inaccessible to flat surface contact during the impact test shall be subject to this test. The compression force shall be determined from Table 5 according to the age group for which the toy is intended.

8.10.1 The loading device shall be a rigid metal disk 1.125 ± 0.015 in. (0.380 mm) in diameter and 0.375 in. (9.52 mm) in thickness. The perimeter of the disk shall be rounded to a radius of 1/32 in. (0.8 mm) to eliminate irregular edge. The disk shall be attached to an appropriate compression scale having an accuracy of ±0.5 lb (2 N). The disk shall be positioned so that the flat contact surface is parallel to the surface under test. The required force shall be applied evenly within 5 s through the disk. This load shall be maintained for an additional 10 s. The toy is to rest on a flat, hard surface in any convenient position during the test.

8.11 *Tests for Tire Removal and Snap-in Wheel and Axle Assembly Removal*—These tests relate to the requirements of 4.17.

8.11.1 *Removal of Tires*—The toy shall be clamped so that the wheel axle is vertical. A wire hook shaped as shown in Fig. 34 shall be positioned on the lower tire and attached to a dead weight of 10 ± 0.5 lb (4.5 kg) if the tire is on a toy intended for children aged 18 months or less, or to a dead weight of 15 ± 0.5 lb (6.8 kg) if the tire is on a toy intended for children aged over 18 months but not over 36 months. The load shall be applied gradually over a period of 5 s and maintained for 10 s.

8.11.2 *Toys Assembled With Snap-in Axles*—A 15 ± 0.5-lb (6.8-kg) dead weight shall be applied perpendicularly to the axle and in the least favorable direction, adjacent to a bearing (but between the two bearings), for 10 s, using a hook and string for attachment to the toy. The toy shall be held

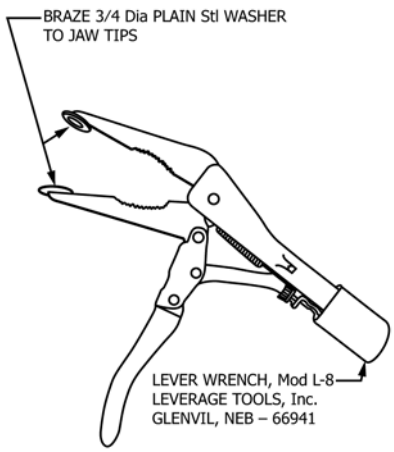


FIG. 32 Seam Clamp

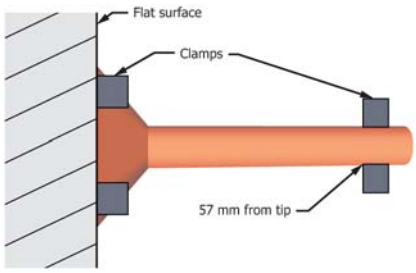


FIG. 33 Attachment of Clamps when Testing Projectiles with Suction Cup

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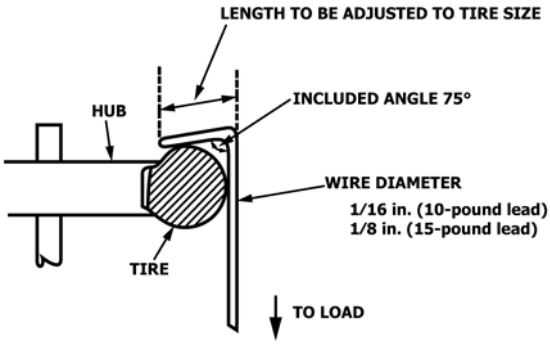


FIG. 34 Hook for Tire Removal

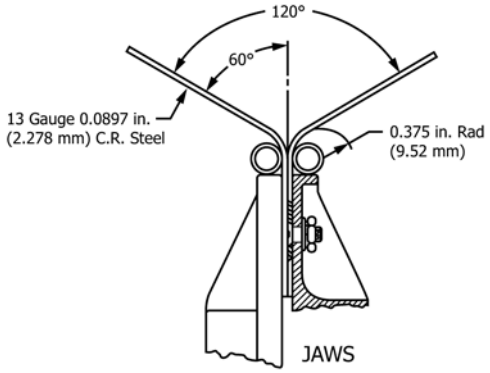


FIG. 36 Flexure Tester

horizontally in a test-convenient fixture, and the load shall be applied gradually over a 5-s period and then shall be maintained for 10 s. The toy shall be held horizontally if the axle cannot be hooked as described above, and a 10 ± 0.5-lb (4.5-kg) dead weight shall be attached to one wheel by means of a hook or clamp that acts perpendicular to the axle in the least favorable direction. The load shall be applied gradually over a 5-s period and then be maintained for 10 s.

8.11.3 *Compression Test for Snap-in Wheel and Axle Assemblies*—This test is for determining compliance with 4.17 if the axle and wheel are removed by the procedure described in 8.11.2. The wheel and axle assembly shall be positioned with the axle vertical over a hole in a rigid plate, as shown in Fig. 35. The hole shall be large enough in diameter to permit the axle to pass through. A load of 20 ± 0.5 lb (89 N) is applied to the upper wheel, using a suitable circular adaptor to prevent interference with the axle. The load shall be applied gradually over a 5-s period and then shall be maintained for 10 s. When applying the load, the upper wheel shall be guided, if necessary, in order to maintain the axle in a vertical position, but it shall not be restrained from moving downward. The axle shall not form a hazardous point or projection in those cases in which it is forced through either wheel.

8.12 *Flexure Test*—This test is for determining compliance with 4.10, for wires or rods used as flexible skeletons. The toy shall be secured in a vise equipped with vise shields that are fabricated from 13-gauge thick cold-rolled steel or other similar material and that have a 0.375-in. (9.5-mm) inside radius as shown in Fig. 36. The component shall then be bent through a 60° arc by a force applied perpendicularly to the major axis of the component at a point 2 ± 0.05 in. (50 mm) from the intersection of the component with the main body of the toy or applied at the end of the component if the component is less than 2 in. (50 mm) long. The force shall be determined from Table 5. The component shall then be bent in the reverse direction through a 120° arc. This process shall be repeated for 30 cycles at a rate of 1 cycle/2 s, with a 60-s rest period occurring after each 10 cycles. Two 120° arc bends shall constitute one cycle.

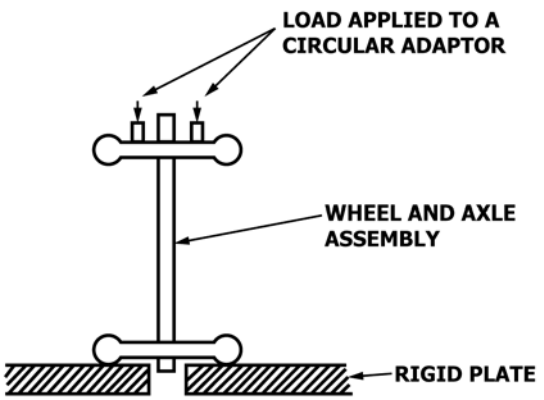


FIG. 35 Compression Test for Wheel Assemblies

8.13 *Test Methods for Mouth-Actuated Toys and Mouth-Actuated Projectile Toys:*

8.13.1 *Mouth-Actuated Toys:*

8.13.1.1 *Equipment*—A piston pump capable of discharging and taking in more than 18.3 ± 0.6 in.^{3} (300 ± 10 cm^3) of air in less than 3 s and capable of being connected to the mouthpiece of the toy. A relief valve shall be so arranged that the pump will not generate a positive or negative pressure of more than 2 psig ± 5 % (13.8 kPA ± 5 %).

8.13.1.2 *Test for Mouth-Actuated Toys*—The equipment described in 8.13.1.1 shall be attached to the mouthpiece of the toy. The toy shall be subjected to ten alternating intake-and-discharge cycles of at least 18 in.^{3} (295 cm^3) of air, including any volume that may be discharged through the relief valve. Any objects released as a result of this test shall be inspected for conformance with 4.6. The above procedure shall also be applied to the outlet if the air outlet of the toy is accessible as described in 4.6.2.1.

8.13.2 *Mouth-Actuated Projectile Toys:*

8.13.2.1 *Equipment*—A system capable of generating and maintaining an air pressure of 2 psig ± 5 % (13.8 kPA ± 5 %).

NOTE 32—An example of a system suitable for performing this test is an air compressor and pressure regulator.

8.13.2.2 *Test for Mouth-Actuated Projectile Toys*—The toy shall be loaded with the intended projectile. The equipment described in 8.13.2.1, shall be attached to the toy such that the direction of the airflow is towards the mouthpiece. The pressure shall be applied and maintained for 5 s. Repeat the test for a total of ten times. The projectile shall not be capable of passing completely through the mouthpiece.

8.14 *Projectiles:*

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8.14.1 *Tip Assessment of Projectiles with a Rigid Leading Edge*—Attempt to insert the leading edge of the projectile into the gauge shown in Fig. 15. The force applied shall be limited to the weight of the projectile. Determine whether the projectile protrudes through the gauge.

8.14.2 *Length of Suction Cup Projectiles*—Rest the suction cup on a flat surface subjected only to its own weight. Support the projectile if necessary to prevent it from falling over. Measure the length of the projectile as shown in Fig. 37.

8.14.3 *Impact Test for Projectiles*—Both projectile toys with stored energy and arrows fired without stored energy shall be subjected to the following impact test:

(1) If the discharge mechanism has multiple speed settings, set it to discharge at maximum speed.

(2) Position the toy such that the projectile will launch in a direction perpendicular to a concrete block or similar impact surface. The distance between the toy and the impact surface shall be such that at the point the projectile enters free flight (disengaged from the discharge mechanism), the leading edge of the projectile shall be 300 ± 5 mm from the impact surface.

(3) For arrows, position the bow such that the forward-most part of the bow is 300 ± 5 mm plus the length of the arrow from the impact surface. Stretch the bow until one of the following occurs:

(a) a 150 N pull force is reached; or

(b) the arrow cannot be pulled back further due to its length; or

(c) a 70 cm pull back distance has been reached.

(4) Launch the projectile into the impact surface. Repeat for a total of three impacts.

8.14.4 *Projectile Launch Distance*—Discharge the projectile in any normally foreseeable manner. Use a discharge angle that will maximize the distance travelled (for example, a projectile intended to be discharged vertically would also be fired at lower angles if it is possible to do so). The projectile shall be disengaged from the discharge mechanism and in free flight at the origin. Determine the maximum distance the projectile travels while in the air measured from the point of discharge to the initial point of contact with the horizontal plane. (See Fig. 38.)

8.14.4.1 For toys without stored energy, operate the toy as intended by applying a force such that the launch distance is maximized.

8.14.5 *Test Method for Kinetic Energy*—The kinetic energy (KE) of a projectile shall be determined from the following equation:

$$KE = 1/2\ mv^2 \qquad (1)$$

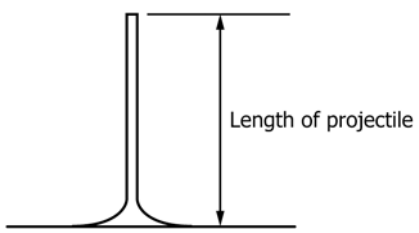


FIG. 37 Length of Projectiles with Suction Cups

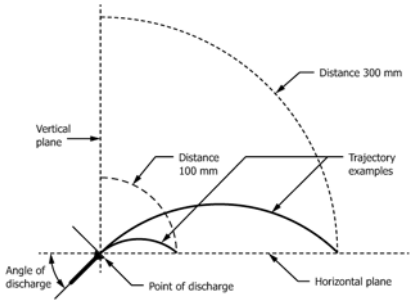


FIG. 38 Determination of Projectile Range

where:

m = mass of projectile, in kilograms (kg), and
v = velocity of the projectile, in meters per second (m/s).

The accuracy of the equipment used to determine the mass and velocity shall be such that the calculated kinetic energy is accurate to ±0.005 J.

8.14.5.1 The mass of a projectile, m, shall be determined by weighing the projectile on a laboratory balance.

8.14.5.2 The velocity of a projectile, v, shall be determined by firing it through ballistic screens. The screens shall be placed a known distance (d, meters) apart. The time (t, seconds) to travel this distance shall be recorded. The velocity of the projectile shall be calculated from the expression $v = d/t$ (m/s).

8.14.5.3 When performing the test to measure the velocity of a projectile, position the discharge mechanism so that the projectile is fired horizontally through the device. The distance between the discharge mechanism and the first screen shall be such that at the point the projectile enters free flight (disengaged from the discharge mechanism), the leading edge of the projectile has reached the first screen. The second screen shall be placed a distance no more than 300 mm from the first screen. See Fig. 39.

8.14.5.4 Alternative means of measuring the velocity (for example, radar guns, etc.) that meet the specified accuracy above are acceptable.

8.14.5.5 Due to the flight characteristics of certain projectiles and other factors that have the potential to influence the accuracy of the measurement of projectile velocity the value of v in the equation for kinetic energy shall be the maximum of five measurements.

8.14.6 *Test Method for Kinetic Energy Density (KED):*

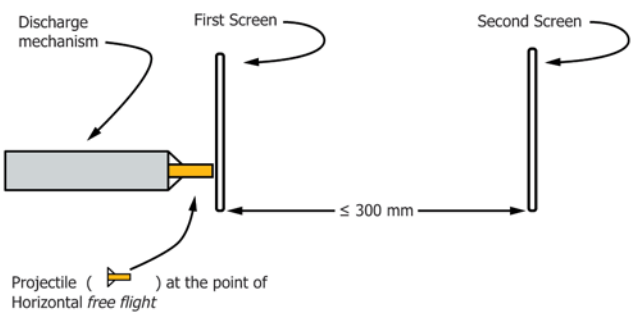


FIG. 39 Example of Determination of Velocity Using Ballistic Screens

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8.14.6.1 Determine the maximum KED, $E_{k,\ area}$, using the following equation:

$$E_{k,\ area} = mv^2/(2\ A) \quad (2)$$

where:

m = is the mass of the projectile, in kilograms;
v = is the maximum velocity of the projectile, in meters per second measured according to 8.14.5.2;
A = is the contact area of the projectile, in square meters; and
$E_{k,\ area}$ = is the maximum kinetic energy per area of contact, in J/m^2.

8.14.6.2 For the measurement of contact area of a resilient-tipped projectile, one acceptable method is to apply a suitable staining or inking agent (for example, Prussian blue) to the projectile, firing it at a suitable perpendicular hard flat surface from a distance of 300 ± 5 mm, and measuring the area of residual impression. An alternative method suitable for some projectiles is the use of an impressionable contact surface (for example, covered with a carbon paper system) rather than inking the projectile. Determine the contact area as follows:

(1) Apply a suitable staining or inking agent to the contact surface of the projectile. Place a sheet of clean white paper on a hard flat surface. Support the block so that it will not move when impacted; or, hold the sheet flat against the block and place a sheet of carbon paper (carbon side facing the white paper). Hold the sheets flat against the block.

(2) Load the projectile to be tested into the discharge mechanism. Orientate the loaded discharge mechanism perpendicular to the hard flat surface, with the contact surface of the projectile from a distance of 300 ± 5 mm from the block.

(3) If the discharge mechanism has more than one speed setting, set to the maximum speed.

For bows, use an arrow intended for the bow, and stretch the bow string until one of the following occurs:

(a) A 150 N pull force is reached, or

(b) The arrow cannot be pulled back further due to its length, or

(c) A 70 cm pull back distance has been reached.

(4) Propel the projectile into the paper.

(5) Measure the contact image area on the white paper; subtracting out any non-contact area. The contact area is the average of a minimum of ten measurements.

NOTE 33—Examine the projectile after each trial. If there is any damage to the tip of the projectile that would affect the outcome of the test or if the projectile itself can no longer be fired by the discharge mechanism, the projectile shall be replaced with a new projectile.

8.14.6.3 Calculate the maximum KED in J/m^2.

NOTE 34—The two methods of measuring the impact area described above with or without slight modification, have proven suitable for many projectiles, but the descriptions are not intended to imply that these two methods are the only acceptable means of deriving impact area. Any method which allows measurement or calculation of impact area with acceptable accuracy, precision, and repeatability is considered adequate for confirmation of compliance with this standard.

8.14.7 *Improvised Projectiles*—Refer to Fig. 40 and to Table 6 for the description and dimensions of the improvised projectiles.

NOTE 35—Due to possible dimensional changes caused by heat or humidity, or both, the improvised projectiles should be stored in a controlled environment of 21 ± 1°C and 65 ± 5 % relative humidity.

8.15 *Test for Stability of Ride-On Toys or Toy Seats*—These tests relate to the requirements of 4.15.

8.15.1 Place the ride-on toy or toy seat across the slope of a smooth surface inclined 10° to the horizontal plane. (Some tests require a 15° slope; refer to 4.15.2.2 and 4.15.3.)

8.15.2 Turn the steering mechanism, if any, to a position at which the ride-on toy or toy seat is most likely to tip.

8.15.3 Chock any wheels to restrict rolling, but allow casters to assume their natural position before chocks are applied.

8.15.4 Apply to the seat a static load equal to the weight indicated in Table 7 at the highest age of the age range for which the ride-on toy or toy seat is intended, but not exceeding 60 months. When the highest age of the intended age range falls between two ages listed in Table 7, the higher of the two shall be chosen.

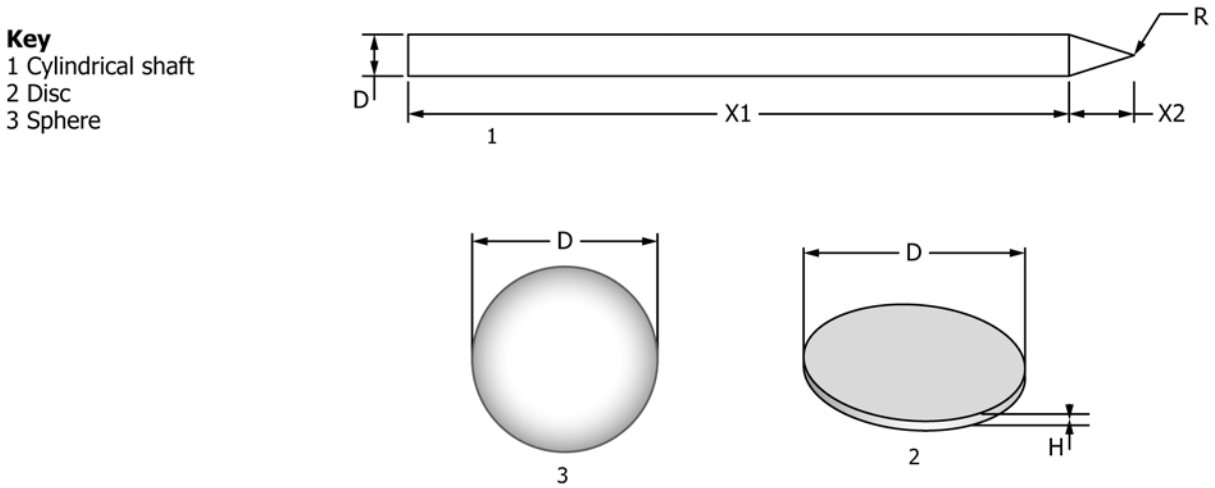


FIG. 40 Improvised Projectile Shapes

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TABLE 6 Description and Dimensions of the Improvised Projectiles

NOTE 1—All dimensions shown are in millimeters (mm).[A]

Designation	Name	Material	D	X1	X2	R	H
Shafts							
A	Pencil	Hardwood	7	155	15	0.5	
B	Long nail / pen refill	Aluminum	3	100	5	0.1	
C	Short nail / toothpick	Aluminum	1.5	50	2.3	0.05	
D	Toothpick	Aluminum	1.5	25	2.3	0.05	
Spheres							
E	Steel ball	Steel	8				
F	Marble 1	Glass	16				
G	Marble 2	Glass	25				
Discs							
H	Small coin	Steel	15				1.5
I	Medium coin	Steel	20				2
J	Large coin	Steel	25				3
K	X-Large Coin	Steel	30				3

[A]Tolerances: Shaft A (wood): (X1 + X2) = ± 2 mm; D = ± 0.5 mm. Shafts B, C, & D (metal): (X1 + X2) = ± 1 mm; D = ± 0.2 mm. Spheres E, F & G: D = ± 1 mm. Discs H, I, J & K: D = ± 0.5 mm; H = ± 0.2 mm. Radius on shaft tips are not critical dimensions thus no tolerances are specified.

TABLE 7 Weight of 95th Percentile Children (Values Given for Boys or Girls, Whichever is Higher)

Age, years	Weight, lb (kg)
1	28 (12.6)
2	29 (13.2)
3	42 (18.9)
4	43 (19.7)
5	50 (22.6)
6	59 (26.6)
7	69 (31.2)
8	81 (37.0)
9	89 (40.4)
10	105 (47.9)
11	121 (55.0)
12	120 (54.7)
13	140 (63.6)
14	153 (69.6)

8.15.5 The load shall be applied so that the major axis is perpendicular to the true horizontal while the ride-on toy or toy seat is on the incline specified.

8.15.6 The load shall be designed so that the height of its center of gravity is 8.7 ± 0.5 in. (220 ± 13 mm).

8.15.7 The center of gravity of the load for the sideways stability test shall be secured to the geometric center of the designated seating area.

NOTE 36—Separate tests for each side.

8.15.8 If there is no designated seating area or if there is no designated sideways orientation, the load shall be placed 1.7 in. (43 mm) inward towards the geometric center of the ride-on toy or toy seat from the least favorable position that it is reasonable to anticipate that the child will choose to sit.

NOTE 37—Separate tests for each side.

8.15.9 The center of gravity of the load for the fore and aft stability test shall be secured both 1.7 in. (43 mm) rearward of the front-most portion of the designated seating area and 1.7 in. (43 mm) forward of the rear-most portion of the designated seating area.

NOTE 38—Two separate tests.

8.15.10 If there is no designated seating area or if there is no designated fore and aft orientation, the load shall be placed 1.7 in. (43 mm) inward towards the geometric center of the ride-on toy or toy seat from the least favorable position that it is reasonable to anticipate that the child will choose to sit.

NOTE 39—Two separate tests.

8.16 Pompoms are subjected to the torque test as described in 8.8 and 8.8.1 and the tension test as described herein. The clamps used to grip the material to be tested shall have jaws to which ¾-in. (19-mm) diameter washers are attached (see Fig. 32). One clamp shall be attached to the pompom and a second clamp used to grip the base material. A force of 15 lbf (67 N) shall be applied evenly within 5 s and maintained for an additional 10 s.

8.17 *Stalled Motor Test for Battery-Operated Toys:*

8.17.1 The test shall be conducted using a new toy. Each motor shall be tested separately using fresh alkaline batteries. If different battery chemistry is specifically recommended for use in the toy by the manufacturer, repeat the test using the batteries specified by the manufacturer. If the toy will not operate using alkaline batteries, test with the type of battery recommended by the manufacturer at the specified voltage. The test is to be carried out in a draft-free location at an ambient temperature of 20 ± 5°C.

8.17.2 Operate the toy with moving parts that are mechanically linked to a motor locked in a fixed position. Only lock moving parts which can be stalled external to the toy. Do not disable any mechanical or electrical protective device such as clutches or fuses. Monitor the temperatures with the toy fully assembled. If normal use allows the motor to run unattended or if the toy has a non-recessed switch allowing it to be kept in the "on" position, operate the toy continuously and record the maximum temperatures. The test may be discontinued 60 min after the peak temperature of each component being tested is recorded. If the toy shuts off automatically or shall be kept "on" by hand or foot, monitor temperatures for 30 s, resetting the toy as many times as necessary to complete the 30 s of operation. If the toy shuts off automatically after an operating time of greater than 30 s, continue the test until the toy shuts off. At the conclusion of the test, the stalled motor condition shall not cause temperatures to exceed the limits of 4.25.7, or cause battery leakage, an explosion, or a fire.

8.18 *Tests for Battery-Powered Ride-on Toys:*

8.18.1 Components tested in accordance with the following sections are to be installed and operated in the toy, as they would be during normal use unless otherwise specified. Testing

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is to be conducted using fully charged batteries. Cheesecloth referenced in the following tests in #60 cotton gauze with a thread count of 32 by 28 threads per inch.[22]

8.18.2 *Low Power Circuit Determination:*

8.18.2.1 Adjust a variable resistor to its maximum resistance and connect it between the point to be investigated and the opposite pole of the supply source. The toy is supplied at rated voltage.

8.18.2.2 The resistance is then adjusted until the power consumed by the resistor reaches a maximum. Points closest to the supply, at which the maximum power is delivered to this resistor, where the current does not exceed 8 amps for a minimum of one minute, are considered low power points. The part of the circuit farther from the supply source than a low-power point is considered to be a low-power point.

8.18.3 *Maximum Temperature Test:*

8.18.3.1 Mechanically precondition all electrical pressure connections used for charging or discharging the battery(ies). If a main harness connector is provided, the main harness connection shall be connected and disconnected 600 times before the Maximum Temperature Test is performed. If a user replaceable fuse is provided, remove and insert the fuse 25 times before the Maximum Temperature test is performed.

8.18.3.2 Power the test sample using a fully charged battery as specified by the manufacturer. Operate the vehicle in the mode that results in the maximum continuous current draw. Determine the maximum continuous current draw by testing the vehicle on any intended surface as specified by the manufacturer, and by adjusting the weight, up to the manufacturer specified maximum. Several trials on different surfaces and with different weights may be necessary to determine the maximum continuous current draw.

8.18.3.3 Physically load the vehicle in any way necessary to obtain the maximum continuous current draw. Operate the vehicle continuously until the battery is exhausted or until thermal equilibrium is reached. If thermal equilibrium is not reached, replace the battery with a fully charged battery and continue the test.

8.18.4 *Stalled Motor Test for Battery-Powered Ride-on Toys*—Mechanically lock any accessible motor driven parts. For toys having more than one motor, each motor shall be tested individually. For toys having more than one operating mode, a different toy shall be tested in each mode. The toy shall be entirely draped with a double layer of cheesecloth during the test. For motors or other electrical components that are accessible, the cheesecloth shall also be draped over the component.

8.18.4.1 Operate the toy, under the stalled condition, until a circuit protection device interrupts the current or until the battery is depleted.

8.18.4.2 If the circuit protection device interrupts the circuit, immediately reset the circuit protection device or replace it in the case of a fuse and repeat the test three more times. If the circuit protection device automatically resets, continue the stalled motor test until the battery is exhausted.

8.18.4.3 The test shall not result in ignition of the cheesecloth.

8.18.5 *Nuisance Tripping Test*—Conduct the tests on a level surface as specified in 8.18.1, loading the vehicle with the maximum weight specified by the manufacturer.

8.18.5.1 *Start/Stop Condition*—Start and stop the toy in 1-s cycles for 30 repetitions (0.5 s start followed by 0.5 s stop) in the mode that draws the greatest current.

8.18.5.2 *Forward/Reverse*—If the toy has a reverse direction feature, cycle the toy in the forward and reverse directions in 1-s cycles for 30 repetitions (0.5 s forward followed by 0.5 s reverse) in the mode that draws the greatest current.

8.18.6 *Switch Endurance and Overload Tests*—Precondition switches at 95 % relative humidity between 20°C and 32°C for 48 h. Conduct the Switch Endurance and Overload Tests at 40°C. A switch is to be operated by means of its actuating member either manually or by mechanical means making and breaking the test current. If a fuse or protective device operates (opens or trips) the device shall be replaced or reset as many times as necessary to complete the required number of cycles. The test may be concluded at less than the prescribed number of cycles if the switch fails safe (switch stuck in the "off" position and no short-circuit condition results). Test 3 samples. All samples shall pass.

8.18.6.1 *Switch Endurance Test*—If a switch is relied upon for starting and stopping of the vehicle, conduct the endurance test for 100 000 cycles. Cycle (minimum 1 s on time and at least 6 cycles per minute) a switch in the toy using the maximum continuous current load as determined in the Maximum Temperature Test or in an equivalent simulated motor load circuit including the inrush and inductive characteristics. All other switches are to be subjected to 6000 cycles of endurance testing. Cycle (minimum 1 s on time and at least 6 cycles per minute) a switch in the toy using the maximum continuous current load as determined in the Maximum Temperature Test or in an equivalent simulated motor load circuit including the inrush and inductive characteristics.

8.18.6.2 *Switch Overload Test*—The overload test is to be conducted on a switch that is relied upon for starting and stopping of the vehicle. Stall the motor(s) of the toy. Operate the switch for 50 cycles of operation at a rate of 6 cycles per minute with 1 s on and 9 s off.

8.18.7 *Battery Overcharge Test*—Each battery shall be charged with its intended charger continuously for 336 h. The test shall not result in the release of electrolyte, or cause explosion or fire.

8.18.7.1 If the battery can be charged in the vehicle, place the battery in the vehicle and connect it to the charging circuit. Drape the charger, cable, and battery with a double layer of cheesecloth. The test shall not result in ignition of the cheesecloth or in the release of electrolyte.

8.18.8 *Short-Circuit Protection Test*—Entirely drape the toy with a double layer of cheesecloth. Short-circuit parts of opposite polarity. Any possible short-circuit condition shall not result in ignition of the cheesecloth.

[22] Testing is to be conducted while the vehicle is operated on a hard level surface covered with 3M #610 General Purpose Safety Walk tape or equivalent surface with a coefficient of friction between 1.27 and 1.32 when measured in accordance with MIL-D-17951.

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8.18.9 *Strain Relief Test*—The electrical connections of the cord or harness are to be disconnected. Apply a 20 lbf (90 N) to the cord so that the strain relief will be stressed from any angle permitted by the construction of the toy. Maintain the specified force for 1 min. There shall be no movement of the cord to indicate stress on the connections.

8.19 *Test for Toys that Contain Secondary Cells or Batteries:*

8.19.1 *Pre-Conditioning*—Each secondary battery shall be pre-conditioned by cycling the battery three times. A cycle consists of fully charging the secondary battery with the provided charger to the maximum capacity of the secondary battery and discharging the secondary battery using the toy until the toy stops functioning. Optionally, discharge may be accomplished by use of a circuit creating a consistent discharge at normal discharge current.

NOTE 40—Higher-than-normal discharge current may be utilized with agreement of the toy manufacturer.

8.19.2 *Battery Overcharge Test*—For AC to DC wall plug-in chargers, each battery shall be charged with its intended charger continuously for 336 h.

8.19.3 *Repetitive Overcharge Test*—Initiate charging by switching or connecting to the charging circuit for the recommended charging period. The device shall then be switched off or disconnected and allowed to rest one hour. The charge cycle shall be repeated ten times without discharge of the battery. For chargers that use batteries as the energy source, fresh batteries shall be used as needed.

8.19.4 *Single Fault Charging Test*—A discharged battery is connected to the charger with a single fault in the charging circuitry that results in the maximum charging voltage to the battery, and allowed to charge for 7 hours.

8.19.5 *Short Circuit Protection Test*—Each short circuit test shall be conducted with a fully charged battery. During the tests, monitor the toy for the conditions listed in 4.25.11.8. Continue the test until the battery has reached a completely discharged state or the toy has returned to +10°C of ambient temperature, or both. 8.19.5.1 is only applicable to toys with batteries intended to be removed. 8.19.5.2 and 8.19.5.3 are applicable to both toys with removable batteries and those without removable batteries. During the tests of these sections, it may be necessary to partially disassemble the toy to gain access to the circuitry. After applying the prescribed test condition, the toy should be reassembled to the greatest extent practical to minimize any effects on temperature rise.

8.19.5.1 *Removable Batteries*—Toys with removable batteries shall be tested by removing the battery and placing any accessible surface of the battery against a large, flat conductive surface under its own weight. If it is possible to create a short circuit, remove the battery from the conductive surface and recreate the short circuit with a 16 AWG bare copper wire.

8.19.5.2 *Toys Using Lithium Batteries*—Apply a short circuit to the battery terminals using a 16 AWG bare copper wire. If the battery is removable, attach it to the toy as intended before the short circuit test is applied.

8.19.5.3 *Toys Using Nickel Metal Hydride Batteries*—Compliance for toys using nickel metal hydride batteries can be demonstrated by testing to either 8.19.5.3(*1*) or 8.19.5.3(*2*).

(1) Simulated Fault Conditions—Simulate component failure by applying the fault conditions listed below. Fault conditions are applied one at a time. It is allowable to apply simultaneous fault conditions at the manufacturers request. If the battery is removable, attach it to the toy as intended.

Open circuit at the terminals of any component

Short circuit capacitor unless they comply with IEC 60384–14

Short circuit any two terminals of an electronic component (for example, diodes, transistors, etc.) except integrated circuits

Failure of triacs in the diode mode

Failure of integrated circuits. All possible output signals are considered under fault conditions within the integrated circuit. If it can be shown that a particular output signal is unlikely to occur, then the relevant fault is not considered.

NOTE 41—An examination of the schematic of the toy can be performed to establish which components are likely to produce excessive current if fault conditions were to be applied.

PTC resistors are not short-circuited if they are used within manufacturer's specifications. PTC-S thermistors are short-circuited unless they comply with IEC 60738–1, UL 62133, or CAN/CSA E62133.

After the application of a fault condition, the toy is operated as intended until steady-state conditions are achieved.

If the fault condition renders features of the toy non-functional, actuate those controls as follows. If the control shall be kept "on" by hand or foot (for example, a momentary switch) actuate the control for 30 seconds. Actuate all other controls as they are intended to be used.

(2) Alternative Test for Toys Using Nickel Metal Hydride Batteries—If the first component connected to the nickel metal hydride battery is a protective element (for example, a PTC) connected in series with the battery, a short can be placed such that the short only contains the protective element and the battery. This would mean the circuit contains both the protective element and the battery.

To qualify, PTC resistors shall be used within manufacturer's specifications and PTC-S thermistors shall comply with IEC 60738–1.

NOTE 42—If all current flows through a protective circuit element in series with the battery, then simulating fault conditions on other components would be unnecessary if the protective element is effective at limiting current and therefore preventing any hazardous conditions.

8.20 *Tests for Toys Which Produce Noise:*

8.20.1 *General Test Conditions*—This section contains general test conditions. The specific methods for particular toy categories are given in section 8.20.2. If there are differences between 8.20.1 and those in 8.20.2, the direction given in 8.20.2 shall be followed. Unless contradicted by this procedure, the measurement procedures in either ISO 11201 or ISO 11202 shall be used.

8.20.1.1 *Test Environment*—An environment that meets the qualification requirements of either ISO 11201 or ISO 11202 shall be used. If using ISO 11201, the value of the correction factor K_{2A} shall be ≤2.0 dB. If using ISO 11202, the value of K_{3A} shall be ≤4.0 dB. When EN ISO 11202 is used the local environmental correction K3 shall be calculated using the actual distance between source and microphone, *d*, and not the minimum distance of 1 m as stated in Annex A of the standard.

NOTE 43—Caution shall be used when selecting a testing environment. Typical furnished rooms may not meet the requirements of the above

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standards and therefore could produce inaccurate results.

8.20.1.2 *Mounting*—Sound reflections caused by test rigs used for the mounting of toys and/or the operator of the toy shall be minimized. No correction needs to be applied to measurements taken where the background noise is 15 dB or more below the sound being measured. Measurement taken where the background noise is between 15 and 6 dB below the sound being measured shall be corrected by the method contained in ISO 11201 or equivalent. Environments with a higher background noise shall not be used.

8.20.1.3 *Instrumentation*—The instrumentation system, including the microphone and cable, shall meet the requirements of a class 1 instrument as specified in IEC 61672-1. When measuring high peak sound pressure levels, for example, from toys using percussion caps, the microphone and the entire instrumentation system shall have the capability of handling linear peak levels exceeding the C-weighted peak levels by at least 10 dB.

8.20.1.4 *Microphone Positions*—Microphone positions are prescribed in 8.20.2. They shall all be evaluated with respect to finding the position with highest sound pressure levels but complete measurements are only required for the position yielding the highest levels. In practice, this often means that one microphone is moved from position to position. Whenever it is practicable, it is always an alternative to rotate the test object instead. Attention shall be paid to maintaining the correct measuring distance. The sound pressure level shall be measured with the microphone reference direction oriented towards the dominant sound source. Generally, for free-field response microphones (calibrated for "normal incidence" to the microphone diaphragm), the axis of the microphone-preamplifier body should be oriented towards the dominant sound source.

8.20.1.5 *Toy Operation:*

(1) Carry out the measurements on a new toy not already subjected to testing. Test battery toys using new primary batteries or fully charged secondary batteries. Test transformer toys with the transformer supplied with the toy. If the toy is supplied without a transformer, it shall be tested with the transformer recommended in the instructions. Normal operating mode(s) shall be reached before the tests are performed.

(2) Operate the toy under test in that mode of its intended or foreseeable use that produces the highest sound pressure level to the microphone position, where the maximum noise level is observed. For toys that have a volume control, the volume shall be set at the maximum level. If the toy has features that allow it to fit into multiple categories in 8.20.2, it shall be tested per all applicable methods. For example, a push/pull toy that also has a button intended to be pushed by the child that activates an electronic sound shall be tested to both the sections for push/pull toys and floor toys.

(3) If the toy under test has a clearly defined operating cycle, measure the A-weighted equivalent sound pressure level, L_{Aeq}, and the C-weighted peak sound pressure level, L_{Cpeak}, during at least one whole cycle. The completion of a whole cycle is intended to mean that all actions have been taken such that the toy is immediately ready to undergo another cycle. This may include acts such as winding, pumping, resetting, etc. Cycles shall be completed as quickly as practical. If the operating cycle lasts less than 15 seconds the cycle shall be repeated as quickly as possible and the measurement time shall be adapted to an integer number of operating cycles with a total duration of at least 15 seconds. If a toy has more than one clearly defined cycle, the cycle yielding the highest sound pressure level shall be used.

(4) If the toy under test does not have a clearly defined operating cycle, measure the A-weighted equivalent sound pressure level, L_{Aeq}, and the C-weighted peak sound pressure level, L_{Cpeak}, for at least 15 s during the operational mode where the sound pressure level is highest. For pass-by tests, measure the C-weighted peak sound pressure level, L_{Cpeak}, as the toy passes the microphone.

(5) Floor and tabletop toys that move, where the sound is caused as a result of the movement imparted on the toy (for example, a noise making mechanism attached to an axle of a toy vehicle) shall be tested using the method for push and pull toys. In addition to the C-weighted peak measurement a maximum A-weighted sound pressure level, L_{AFmax}, shall be made and compared to the requirements of 4.5.1.2. The toys described in this section do not include push/pull toys as defined in 3.1.68. The scope of requirements for push/pull toys are given in 4.5 (*7*).

(6) Toys that do not clearly fit in any of the categories listed in 8.20.2 shall be tested in the most appropriate way using the principles described in this section and those in 8.20.2.

8.20.2 *Specific Test Methods:*

8.20.2.1 *Close-to-the-ear Toys:*

(1) Mount close to the ear toys in a proper test rig at least 100 cm above the reflecting plane or have them operated by an adult operator with the arm outstretched.

(2) A-weighted equivalent sound pressure level, L_{Aeq}, measurements are to be made with the earpiece of the toy facing the microphone. The microphone shall be 50 ± 1 cm from the earpiece. For toys without earpieces, locate the microphone 50 ± 1 cm from the surface of the toy where the main sound source exists such that the sound pressure level at the microphone is maximized.

(3) C-weighted peak sound pressure level measurements, L_{Cpeak}, are to be made with the microphone 50 ± 1 cm from the surface of the toy where the main sound source exists such that the sound pressure level at the microphone is maximized.

(4) The toy is operated as described in 8.20.1. Conduct three trials. The highest observation for each respective measurement type (L_{Aeq}, L_{Cpeak}) is the measurement result.

8.20.2.2 *Floor, Tabletop, or Crib Toys:*

(1) Place stationary floor, tabletop, and crib toys on a standard test table as described in ISO 11202. A table with a wooden top with a thickness of 4 cm or larger and leg construction providing a stable test surface is considered sufficient. The tabletop should be large enough such that, with the toy resting on a fully over the tabletop, the side of the measurement box from which the measurement is being made is also above the tabletop.

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(2) Mount self-propelled table top and floor toys on the standard test table described above in a test rig so that they can be operated with full power, but preventing them from moving around. It is allowable to raise the toy up to 5 mm above the test table to allow for unrestricted movement (for example, wheel rotation).

(3) Microphone positions are on a hypothetical box-shaped measurement surface. The sides of the measurement surface are separated by 50 ± 1 cm from the nearest side of the reference box with the exception of the bottoms of both the measurement and reference boxes which lie in the same plane as the table top. For toys where all dimensions are ≤100 cm, there are five microphone locations, one at the center of each side of the measurement surface, not including the bottom side. For toys with a dimension >100 cm, there are four additional microphone locations at the upper corners of the measurement surface (see Fig. 41).

(4) The toy is operated as described in 8.20.1. Conduct three trials. The highest observation for each respective measurement type (L_{Aeq}, L_{Cpeak}) is the measurement result.

8.20.2.3 *Hand-held Toys:*

(1) Mount hand-held toys in a suitable test fixture at least 100 cm above the reflecting plane or have them operated by an adult operator with the arm outstretched.

(2) Microphone positions are on a hypothetical box-shaped measurement surface (see Fig. 42). The sides of the measurement surface are separated by 50 ± 1 cm from the nearest side of the reference box. There are six microphone locations, one at the center of each side of the measurement surface.

(3) The toy is operated as described in 8.20.1. Conduct the test three times. The highest observation for each respective measurement type (L_{Aeq}, L_{Cpeak}) is the measurement result.

8.20.2.4 *Rattles:*

(1) Mount the microphone 100 cm above the floor.

(2) Operate a rattle by grasping it where it is meant to be held or, if in doubt, where the longest lever between the hand and the sound emitting part of the rattle can be obtained. Make sure that the radiated sound is not affected by the grip of the hand. Stand side-face with the microphone with the rattle 50 cm from the microphone. The forearm of the operator shall be essentially horizontal and at the same height as the microphone. Strike downwards ten times with hard lashes in a slow tempo with a movement of approximately 15 cm. Use the wrist and keep the forearm essentially horizontal. Endeavor to achieve the highest possible sound level. Avoid moving the rattle towards or away from the microphone.

(3) Conduct the test three times. The highest observation for the C-weighted peak sound pressure level, L_{Cpeak}, is the measurement result.

8.20.2.5 *Pull and Push Toys:*

(1) Place pull and push toys on the reflecting plane (for example, concrete, tile, or other hard surface) and fix them in a test rig which enables them to be moved with varying speed along a direct line which passes the measuring microphones. Make sure that the friction of the reflection plane prevents wheels from skidding.

(2) Use two microphones 30 cm above the reflecting plane at distances (*d*) 40 cm plus half the width of the toy from the *x*-axis (40 + *w*/2) as shown in Fig. 43.

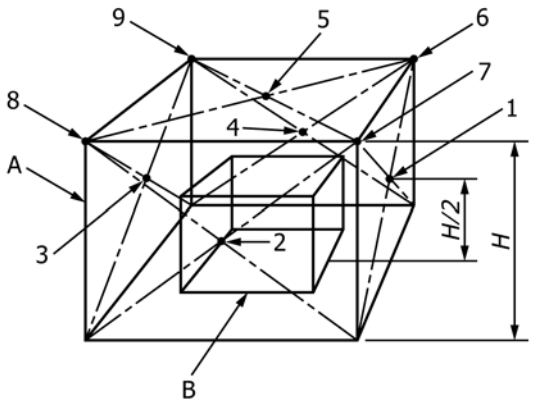
(3) Operate the pull or push toy at a speed that yields the maximum sound pressure level. Do not exceed 1 m/s.

(4) Conduct the test twice. The highest observation for the C-weighted peak sound pressure level, L_{Cpeak}, is the measurement result.

8.20.2.6 *Cap Firing Toys:*

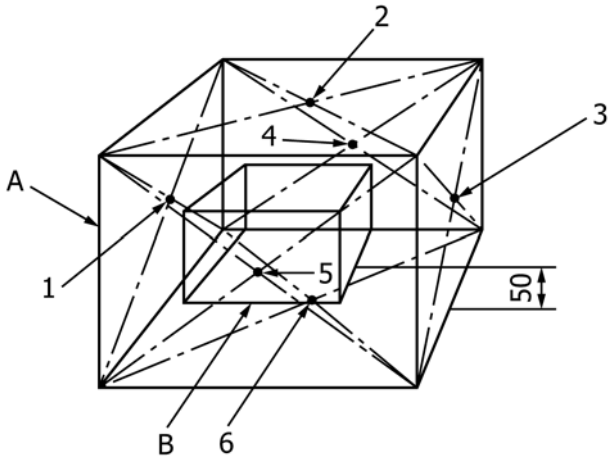
(1) Mount the toy in a proper test rig at least 100 cm above the reflecting plane or have them operated by an adult operator with the arm outstretched.

(2) For cap guns, use six microphone positions around the toy. Place the main sound emitting part of the toy at the origin of the measuring coordinate system in its normal operating orientation in such a way that the main axes of the toy coincide with the axes of the measuring coordinate system (see Fig. 44). If the length of the toy exceeds 50 cm, rotate the toy in the



Key:
A Measurement Surface
B Reference Box
1–5 Basic Microphone Positions
6–9 Additional Microphone Positions for Large Toys
H Height of the Box-shaped Measurement Surface

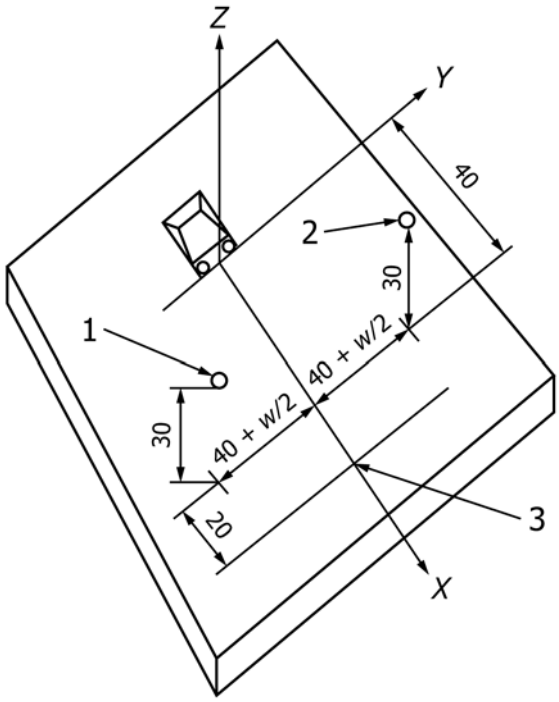
FIG. 41 Microphone Positions for Measurements of Stationary and Self-Propelled Floor Tabletop, and Crib Toys



Key:
A Measurement Surface
B Reference Box
1–6 Microphone Positions

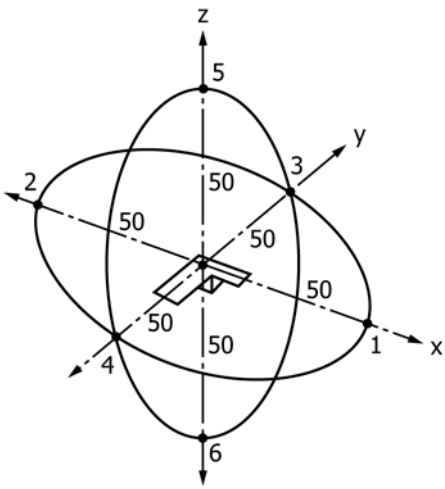
FIG. 42 Microphone Positions for Hand-Held Toys

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Key:
1–2 Microphones
3 End of measurement
w Width of toy

FIG. 43 Microphone Positions for Measurements of Pull and Push Toys



Key:
1–6 Microphone positions

FIG. 44 Microphone Positions for Measurement of Sound Pressure Levels of Cap Firing Toys

xy-plane 45° around the *z*-axis without changing the microphone positions. Select two microphone positions along each axis at a distance of 50 ± 1 cm to both directions from the origin as shown in Fig. 44.

(3) For other types of cap firing toys, select the most appropriate mounting and microphone positions from the categories of toys described previously.

(4) Operate a cap-firing toy using percussion caps recommended by the manufacturer and which are available on the market. Fire the toy at least three times in each microphone position to find the position with the highest peak sound pressure level, L_{Cpeak}. Fire the toy six additional times in the position with the highest peak sound pressure level, L_{Cpeak}.

(5) The highest observation for the C-weighted peak sound pressure level, L_{Cpeak}, is the measurement result.

8.21 *Dynamic Strength Test for Wheeled Ride-on Toys*—Load the toy for 5 min in the most onerous position with the appropriate mass in accordance with Table 7 on its standing or sitting surface. Secure the load to the toy in a position corresponding to the normal use of the toy. Drive the toy three times at a speed of 6.6 ft/s (2 m/s) ± 0.7 ft/s (0.2 m/s) into a nonresilient step with a height of 2 in. (50 mm). If the toy is intended to bear the mass of more than one child at a time, test each sitting or standing area simultaneously. Determine whether the toy continues to conform to the relevant requirements of this specification.

8.22 *Plastic Film Thickness*—Use a measuring device (dial-type thickness gauge or equivalent) capable of measuring thickness to an accuracy of 4 µm. Measurements shall be taken at 10 equidistant points across the diagonal of any 3.94 by 3.94-in. (100 by 100-mm) area. For plastic bags, prepare by cutting the sides, without stretching, into two single sheets.

8.23 *Test for Loops and Cords:*

8.23.1 Anchor or secure the toy. Place the head probe (Fig. 10) in the loop/opening formed by the cord/s, tapered end first, with the plane of its base parallel to the plane of the opening. Rotate the probe to any orientation about its own axis while keeping its base parallel to the plane of the opening; apply 10 lbf (45 N) while attempting to push the probe through the opening.

8.23.2 Elastic materials or loops that are smaller than the tapered diameter of the head probe shall be stretched before applying the head probe test fixture using the hook test fixture illustrated in Fig. 45. To begin the evaluation, the elastic material is first looped around the left bottom hook, then hooking the elastic material with the hook attachment of the force gauge, pull the elastic material to the right bottom hook without exceeding a force of 5.0 lbf (22.2 N). The elastic material is then pulled to the left upper hook without exceeding a force of 5.0 lbf (22.2 N). Pull the elastic material to the right side so that the hook of the force gauge is adjacent to the left upper hook and parallel to the right bottom hook without exceeding a force of 5.0 lbf (22.2 N). The hook of the force gauge should remain in this position during testing. If the elastic material cannot be stretched and held in this position or if the force needed to stretch the elastic material exceeds 5.0 lbf (22.2 N), the elastic material complies with this requirement. The testing sequence is illustrated in Fig. 45 (a) through (e). If the body of the toy forms part of the loop, position the body of the toy so that it is on the open, right-hand side of the hook test fixture. Apply the head probe in accordance with 8.23.1.

8.23.3 For cords, straps, and elastics that form loops and have a perimeter larger than the base diameter of the head probe and contain a breakaway feature, the following test is applied to determine release force. With the cord secured in a vertical fashion so that the breakaway feature is essentially in

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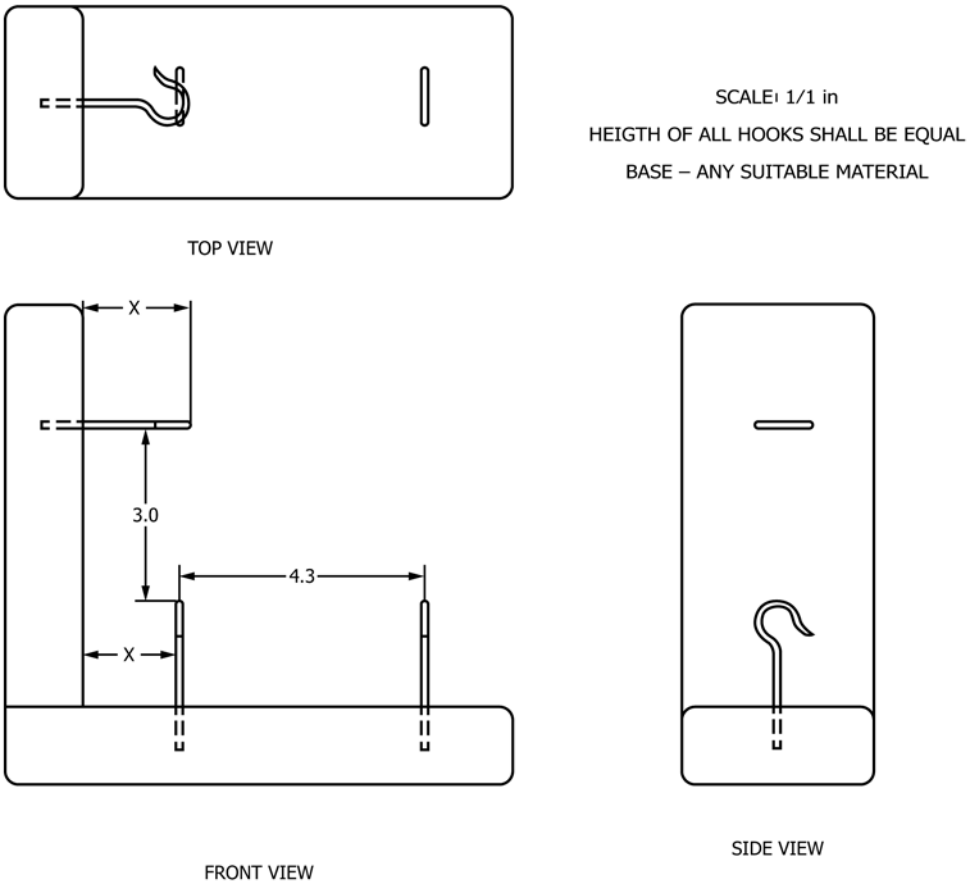


FIG. 45 Hook Test Fixture for Cords and Loops

the center of the two clamping devices, apply a downward force and determine if the breakaway feature releases at a force less than 5.0 lbf (22.2 N).

8.24 *Yo Yo Elastic Tether Toy Test Methods:*

8.24.1 The yo yo elastic tether toy is tested in its most onerous foreseeable use configuration. Hold the yo yo elastic tether toy by whatever holding means is supplied, typically a small loop. Rotate the toy in a horizontal or near-horizontal plane using any convenient means to achieve a constant rotational speed of 80 r/min or the maximum achievable speed up to 80 r/min.

NOTE 44—The plane of rotation may not be horizontal given the physical characteristics of the toy, for example the size and mass of the object at the end of the tether.

NOTE 45—Where a tether has no distinct holding means, such as a finger loop, the unloaded length of the tether that is held should be the minimal length required to prevent release of the tether during rotation.

8.24.1.1 A variable speed drill is one method of achieving a constant rotational speed. If such a drill is used, attach the holding means to a rigid cam as shown in Fig. 46. Use a cam of 3 cm (1.18 in.) in length as measured from the center of rotation to the edge of the clamping mechanism furthest from the center of rotation (see Fig. 47). If necessary, manually start the product rotating. A typical test set up is shown in Fig. 46.

8.24.2 Measure the length of the tether when the tether is fully extended during rotation. There is no requirement to measure the exact length of a tether if its fully extended length during rotation is well below or well beyond 50 cm (20 in.) (for example, less than 40 cm (16 in.) or greater than 60 cm (24 in.)). The tether length does not include the length of the mass at the end, the holding means (if present), or the cam (if used).

8.24.2.1 To facilitate length measurement of the tether during rotation, if helpful, mark two points along its length when it is under no load: (*1*) the point where it joins the mass at the end and (*2*) the point where it joins the holding means, as shown in Fig. 48.

8.25 *Magnet Test Methods:*

8.25.1 *Flux Density Measurement:*

8.25.1.1 *Test Equipment*—direct current (dc) field gauss meter with a resolution of 5 gauss (G) capable of determining the field with an accuracy of 1.5 % or better. The meter shall have an axial type probe with:

(1) An active area diameter of 0.76 ± 0.13 mm.

(2) A distance between the active area and probe tip of 0.38 ± 0.13 mm.

8.25.1.2 *Test Method:*

(1) Place the probe's tip in contact with the pole surface of the magnet. For a magnetic component (where the magnet is fully or partially imbedded in part of the toy), place the probe's tip in contact with the surface of the component.

(2) Keep the gauss meter's probe perpendicular to the surface.

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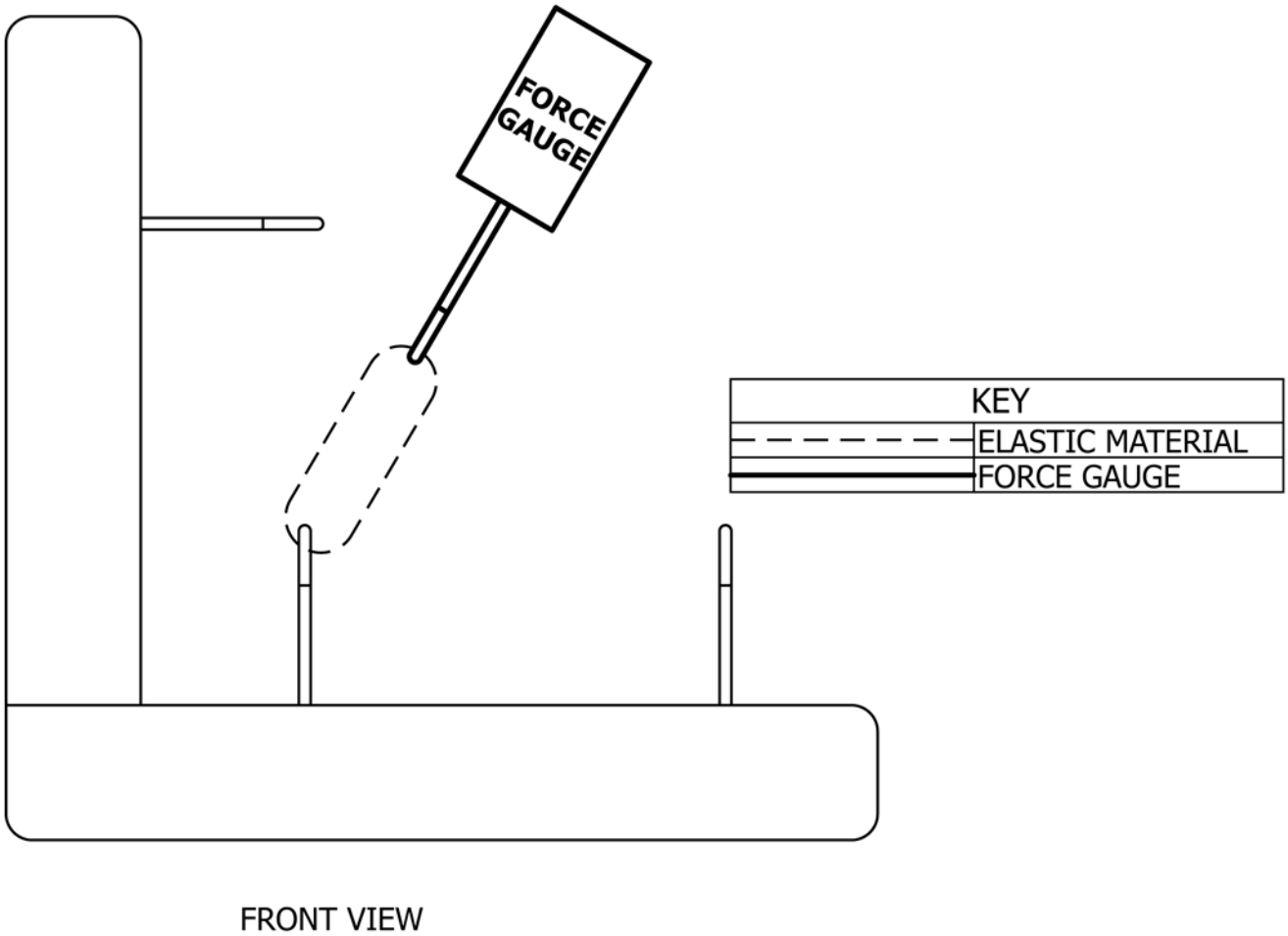


FIG. 45 (a) Test Procedure for Cords and Loops, Step 1 *(continued)*

(3) Move the probe across the surface to locate the maximum absolute flux density.

(4) Record the maximum absolute flux density measurement.

8.25.2 *Area Measurement of the Pole Surface:*

8.25.2.1 *Test Equipment*—Calipers or similar device with a resolution of 0.1 mm.

8.25.2.2 *Test Method*—If the magnet is imbedded/attached as part of a magnetic component, extract the magnet from the component. If the pole surface of the magnet is flat, calculate the area using the appropriate geometric formula. If the pole is not flat (for example, hemispherical), the pole surface area is the maximum cross section of the magnet perpendicular to an axis through the magnet poles (see Fig. 49).

NOTE 46—On multi-pole magnets use the area of the largest single pole, which can be determined using magnetic field viewing film or equivalent.

8.25.3 *Calculation*—The flux index ($kG^2\ mm^2$) is calculated by multiplying the area of the pole surface (mm^2) of the magnet by the square of the maximum flux density (kG^2).

8.25.4 *Magnet Use and Abuse Testing*—Each unique component shall be tested per this section. A new component shall be used that has not been subjected to other use and abuse testing. All the testing in this section shall be performed in series on each unique component (that is, testing shall follow 8.25.4.1 – 8.25.4.8 in sequential order). However, only wooden toys, toys intended to be used in water, and mouth pieces of mouth-actuated toys with magnets or magnetic component(s) shall be tested in accordance with 8.25.4.1.

NOTE 47—For products intended for children 8 years and older, where applicable, use the test parameters for children over 36 months to 96 months as listed in Table 5.

NOTE 48—Examples of unique magnetic components are rods of different sizes or shapes containing magnets. If the toy contains one magnet, then the component holding the magnet is considered to be a unique component.

8.25.4.1 *Soaking Test for Magnets*—Submerge the toy or toy component completely in a container of demineralised water at a temperature of 21.0 ± 5.0°C for 4 minutes, remove the toy, shake off the excess water, and keep the toy at room temperature for 10 minutes. Perform the soaking test for a total of four cycles.

8.25.4.2 *Cycling as Received*—These tests are designed to simulate a reasonably foreseeable play pattern. It is possible for toys to contain a single magnet or a combination of magnets, magnetic components, or metal mating parts, or combinations thereof. Without damaging the toy, the magnetic parts shall be brought together to a distance that initiates magnetic attraction, released, and then pulled apart to the distance where magnetic attraction ceases. Each attachment and detachment shall count

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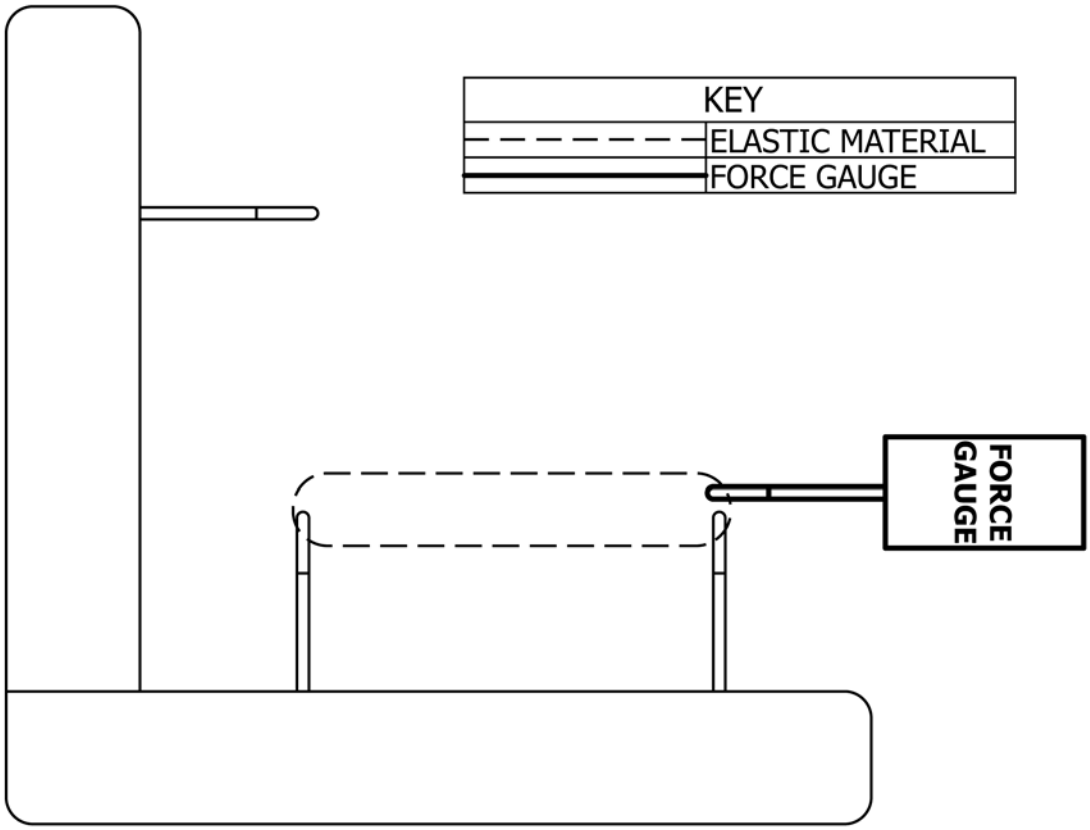


FIG. 45 (b) Test Procedure for Cords and Loops, Step 2 *(continued)*

as one cycle. Perform the test one thousand (1000) cycles or until the magnet under test detaches from the toy, whichever occurs first. It is acceptable for the testing to be automated or to be performed manually.

(1) Toys that Contain One Magnet Only and a Mating Metal Part—If no other magnets or magnetic parts are provided with the toy, then the mating metal part or surface, according to the toy's intended play pattern, should be used for cycling purposes.

(2) Toys that Contain One Magnet Only and No Mating Metal Part—If no other metal parts or surfaces are provided with the toy, the following shall be used for cycling purposes: A nickel disk with a minimum nickel content of 99 % and having the following dimensions: Diameter: 30 ± 0.5 mm; Thickness: 10 ± 0.5 mm.

8.25.4.3 *Drop Test*—Test according to 8.7.1 or if applicable, 8.7.2.

8.25.4.4 *Torque Test*—Test according to 8.8.

8.25.4.5 *Tension Test*—Test according to 8.9.

8.25.4.6 *Impact Test*—Place the magnetic part or magnetic component in an orientation that is most likely to result in breakage on a plane horizontal steel surface and drop a metallic weight with a mass of 1.0 ± 0.02 kg distributed over an area with a diameter of 80 ± 2 mm through a distance of 100 ± 2 mm on to it. Determine if a hazardous magnet or a hazardous magnetic component is generated.

8.25.4.7 *Compression Test*—Test according to 8.10 (for magnets that are accessible but cannot be grasped as defined in 8.9; an example of a magnet that is accessible but cannot be grasped is a magnet that is recessed.

8.25.4.8 *Cycling – After Abuse Testing*—Repeat the testing described in 8.25.4.2.

8.26 *Test Methods for Locking Mechanisms or Other Means:*

8.26.1 *Locking Mechanisms or Other Means:*

8.26.1.1 Erect the product in accordance with the manufacturer's instructions.

8.26.1.2 Secure the product so that the normal folding motion is not impeded.

8.26.1.3 Apply a force of 45 lbf (200 N) to the product, but not to the mechanism itself, in the direction normally associated with folding. Apply the force gradually over a 5 s period and maintain for an additional 10 s before releasing the force.

8.26.1.4 Perform this procedure five times within a 2 min period.

8.26.2 *Locking Test Method*—With the product in the manufacturer's recommended use position, gradually apply a force

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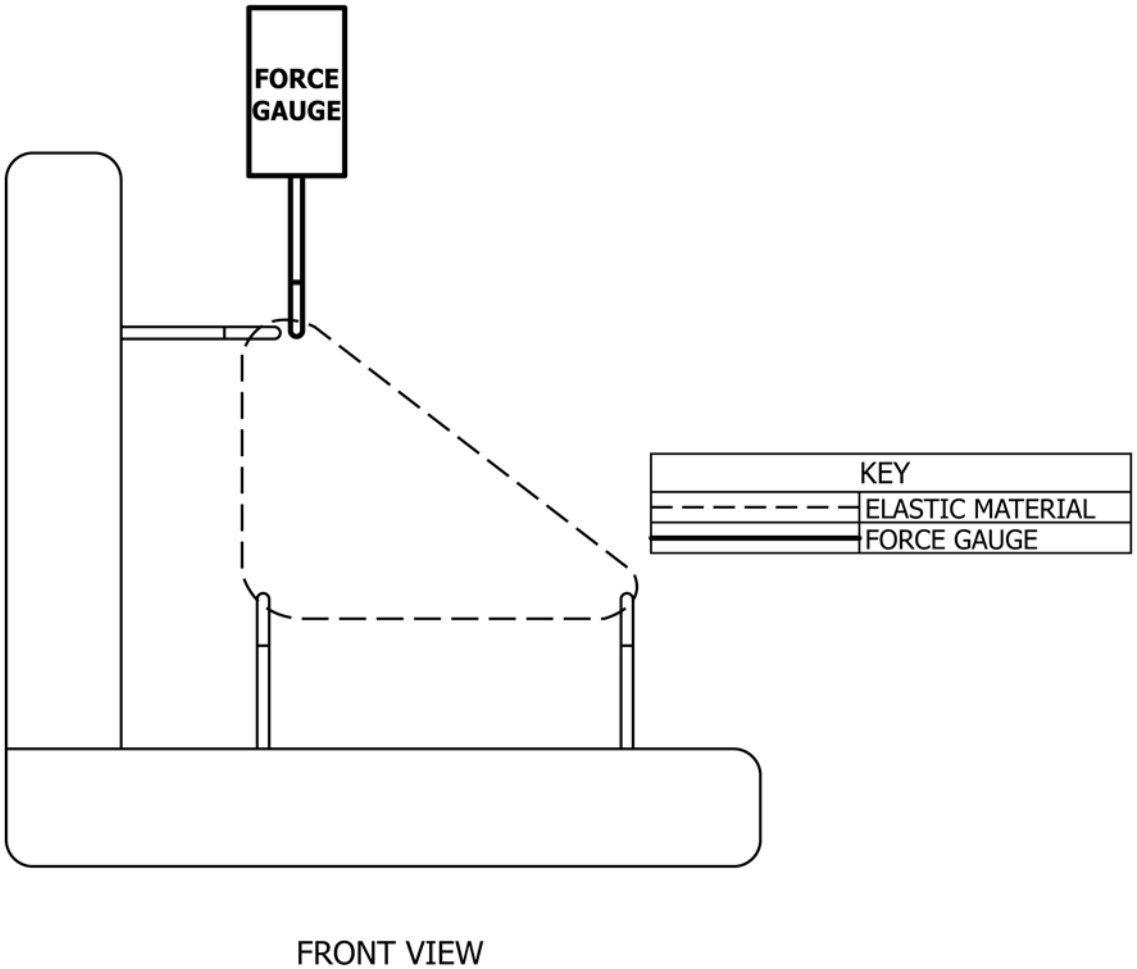


FIG. 45 (c) Test Procedure for Cords and Loops, Step 3 *(continued)*

of 10 lbf (45 N) to the locking mechanism in the direction tending to unlock it. The locking mechanism shall not unlock until a minimum force of 10 lbf (45 N) has been achieved.

8.27 *Tests for Toy Chest Lids and Closures*—The toy chests shall be assembled in accordance with the manufacturer's instructions before testing.

8.27.1 *Lid Support Mechanisms:*

8.27.1.1 Lift the lid to any position in its arc of travel to a distance greater than 2 in. (50 mm) but not to cause the lid to move through an arc of more than 60° from the lid's fully closed position measured at the outermost edge of the lid. Release the lid, and observe any dropping motion of a point in the approximate center of the outermost edge of the lid.

(a) Check the complete arc of travel of the lid from the 2 in. (50 mm) opened position to the 60° position at 5° increments. Repeat the evaluation starting at the 60° opened position to within 2 in. (50 mm) from closed position at 5° increments.

8.27.1.2 Subject the lid to 7000 opening and closing cycles. One cycle consists of raising the lid from its fully closed position to fully open and returning it to fully closed.

8.27.1.3 Take care not to force the lid beyond its normal arc of travel to prevent undue stress on screws or other fasteners used to attach lid support mechanisms.

8.27.1.4 The time to complete one cycle shall be approximately 15 s. The 7000 cycles shall be completed within a time period of 72 h, after which the test described in 8.27.1.1 should be repeated.

8.27.2 *Closures/Lids:*

8.27.2.1 *Vertically Hinged Lids*—With the lid in a closed position, apply a gradually increasing force in an upward direction perpendicular to the plane of the lid at a point within 1 in. (25 mm) from its geometric center. Record the maximum force to cause the lid to begin to open.

8.27.2.2 *Other Lids, Covers, and Doors*—For all other closures, apply a gradually increasing force in the direction required to open a completely closed toy chest. Record the maximum force to cause the closure to begin to open.

8.28 *Test for Overload of Ride-On Toys and Toy Seats:*

8.28.1 Place the toy on a horizontal plane.

8.28.2 If the toy is intended to accommodate only one child, the test load shall be three times the weight indicated in Table 7 at the highest age of the age range for which the toy is intended, or three times the manufacturer's stated weight capacity, whichever is greater. When the highest age of the intended age range falls between two ages listed in Table 7, the higher of the two shall be used to calculate the test load.

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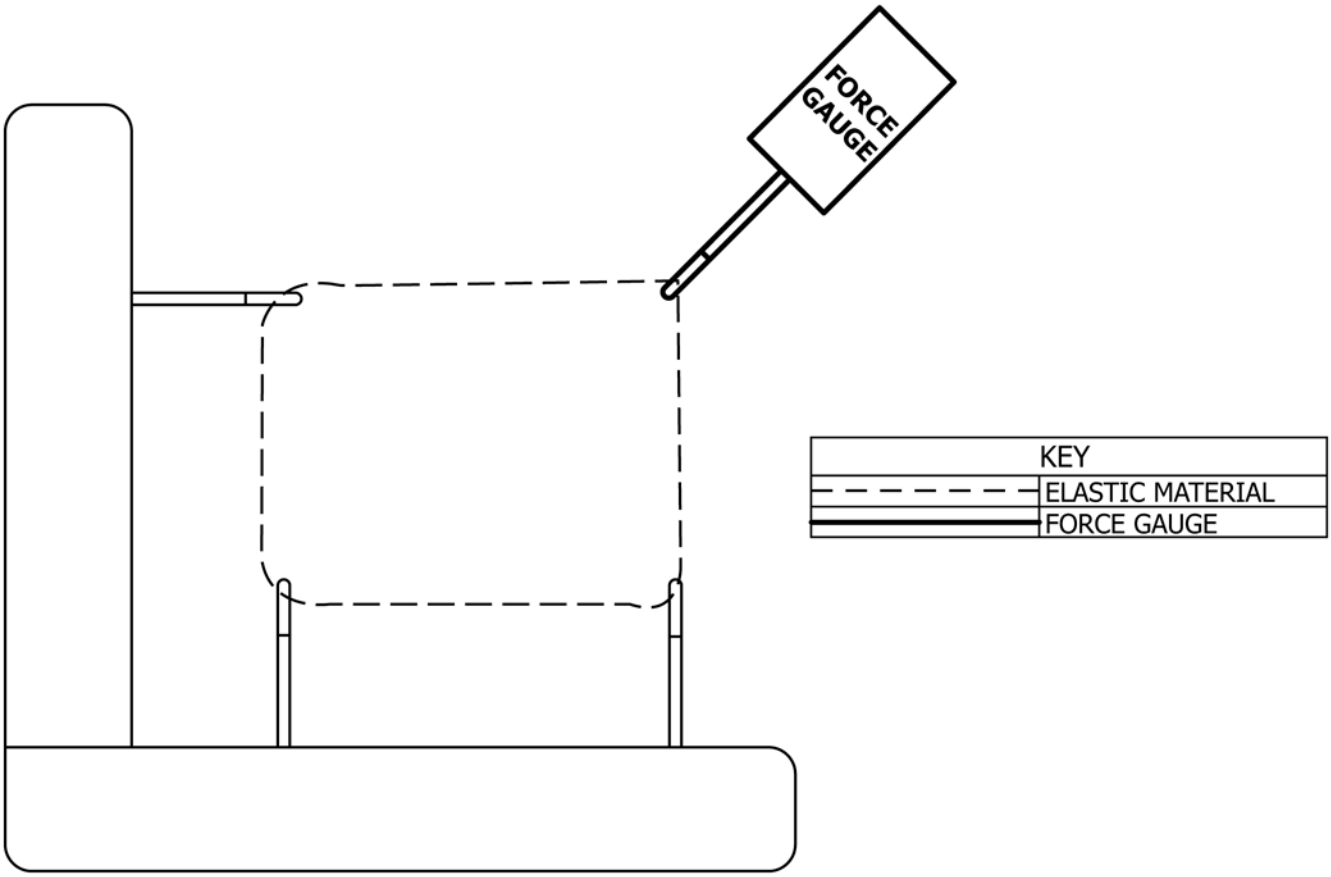


FIG. 45 (d) Test Procedure for Cords and Loops, Step 4 *(continued)*

8.28.3 If the toy is intended to accommodate more than one child, the test load shall be two times the weight indicated in Table 7 at the highest age of the age range for which the toy is intended, or two times the manufacturer's stated weight capacity after it is divided by the number of seating or standing areas, whichever is greater. The test loads shall be applied simultaneously to every sitting or standing area.

8.28.3.1 *Example*—Product age grade—1 to 4 years, from Table 7 the 95th percentile weight of a 4 year old is 43 lb. Stated weight capacity is 150 lb, number of seating/standing areas is 3; 150 lb/3 = 50 lb. 50 lb > 43 lb. Therefore the test load is, 2 × 50 lb = 100 lb which would be placed on each of the three seating/standing areas simultaneously—total weight 300 lb.

8.28.4 Apply a static load(s) that is equal to the weight as determined by the criteria above. The load(s) shall be applied so that it is as close as possible to the geometric center of the designated seating or standing area(s). If there is no designated seating or standing area(s), the load(s) shall be placed at the least favorable position that it is reasonable to anticipate that the child will choose to sit or stand.

8.28.5 Observe whether the toy collapses within 1 min after application of the static load(s).

8.29 *Stuffing Materials Evaluation*—A visual inspection shall be performed on a representative sample of the stuffing material using a stereo widefield microscope, or equivalent, at 10× magnification and adequate illumination.

8.30 *Expanding Materials – Test Method:*

8.30.1 Condition the toy or component at 20 ± 5°C (68 ± 9°F) and at a relative humidity of 40 to 65 % for a minimum of seven hours prior to the test.

8.30.2 Measure and record all dimensions of the toy or component, using calipers or other suitable measurement tool, to the nearest 0.1 mm (0.004 in.); these dimensions represent the "as-received" state.

8.30.3 Submerge the toy or component under test in a bath of deionized water maintained at 37 ± 2°C (98.6 ± 3.6°F) for the duration of immersion, without agitation. For toys or components that exhibit positive buoyancy, place weight(s) (with mass just sufficient to achieve complete submersion) atop

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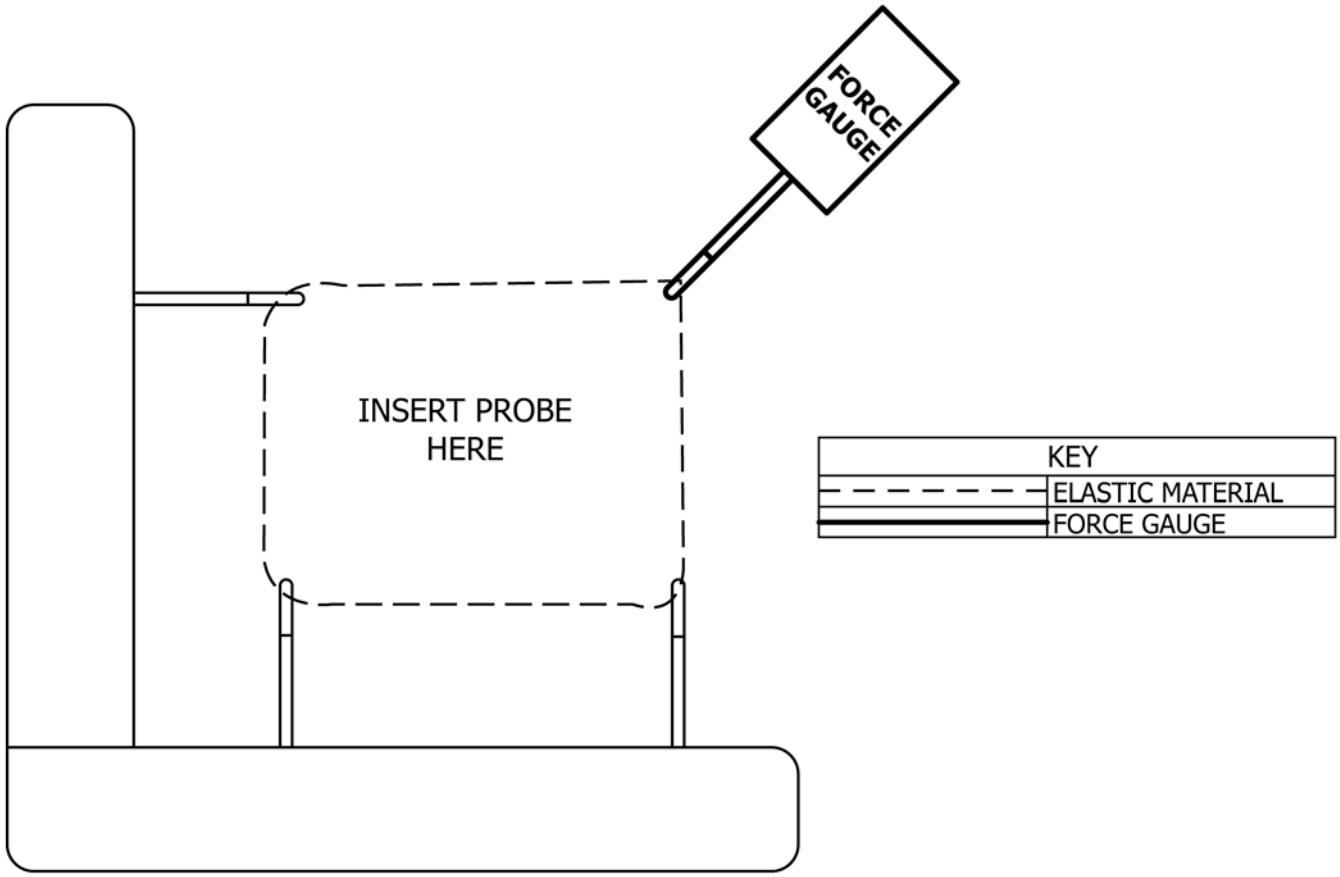


FIG. 45 (e) Test Procedure for Cords and Loops, Step 5 *(continued)*



FIG. 46 Example of Typical Test Set-Up

the toys or components. Care should be taken to minimize contact of the test toy or component with the sides or bottom of the container.

8.30.4 Maintain submersion for 72 hours, measuring the sample dimensions as in 8.30.2 at 6, 24, 48, and 72 hours duration.

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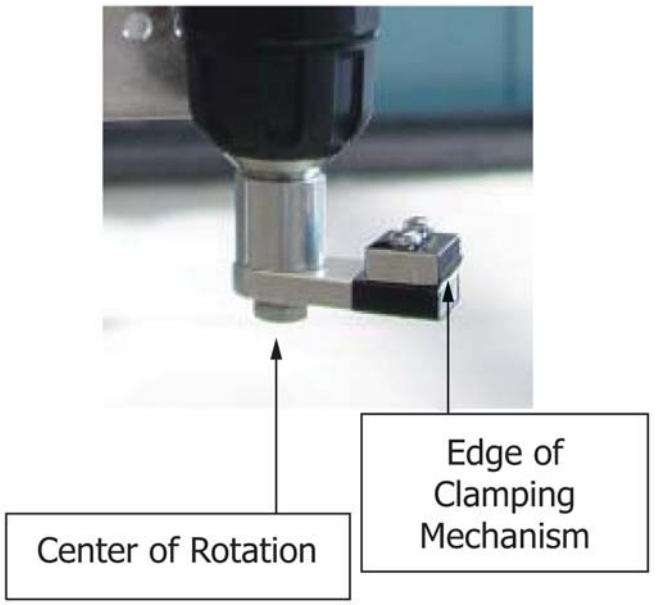


FIG. 47 Close-Up of Clamp

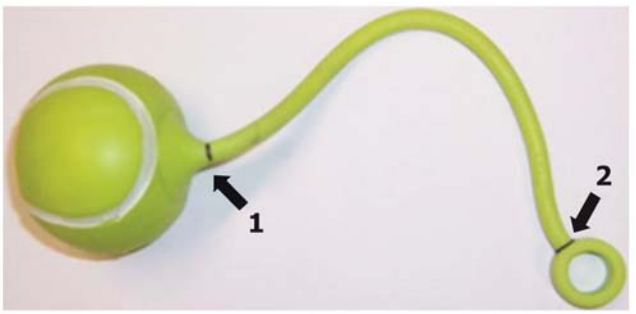


FIG. 48 Marking Unloaded Tether

8.30.5 If the toy or component exhibits expansion greater than 50 % in any dimension from its as-received state (see 8.30.2), at any time interval, the toy or component is classified as containing or being composed of an expanding material and shall be tested per 8.30.7 and 8.30.8.

8.30.6 If the toy or component exhibits expansion equal to or less than 50 % in all dimensions from its as-received state (see 8.30.2), at all measurement time intervals, the toy or component is classified as not containing or being composed of an expanding material and no further testing per this section 8.30 is required.

8.30.7 If the greatest expansion was observed at 72 hours of immersion, proceed to immediately test the toy or component per 8.30.8; if the greatest expansion was observed at another time interval, condition a new sample per 8.30.1 and submerge this new sample per 8.30.3 for the time interval at which the greatest expansion was observed, then immediately test the toy or component per 8.30.8 at the conclusion of that interval.

8.30.8 While the toy or component is submerged in deionized water at 37 ± 2°C (98.6 ± 3.6°F), attempt to push the object through the gauge pictured in Fig. 30 (starting from the radiused side) with a force perpendicular to the flat surface of the gauge of up to 20 N (4.5 lbf) using a 10 mm (0.394-in.) diameter rod with a hemispherical end, with the rod roughly centered within the hole in the gauge. Position the toy or component in the orientation least likely to pass through the gauge opening.

9. Identification

9.1 So that purchasers may identify products conforming to all of the requirements of this specification on toy safety, producers, importers, and distributors may include a statement of compliance in conjunction with their name and address on product labels, invoices, and sales literature.

9.1.1 The following statements are suggested:

(1) Conforms to the requirements of ASTM Standard Consumer Safety Specification on Toy Safety, F963 (name and address of producer, importer, or distributor).

(2) Conforms to the safety requirements of Specification F963 (name and address of producer, importer, or distributor).

10. Keywords

10.1 battery-operated toys; children; safety labeling; safety testing; toy safety requirements

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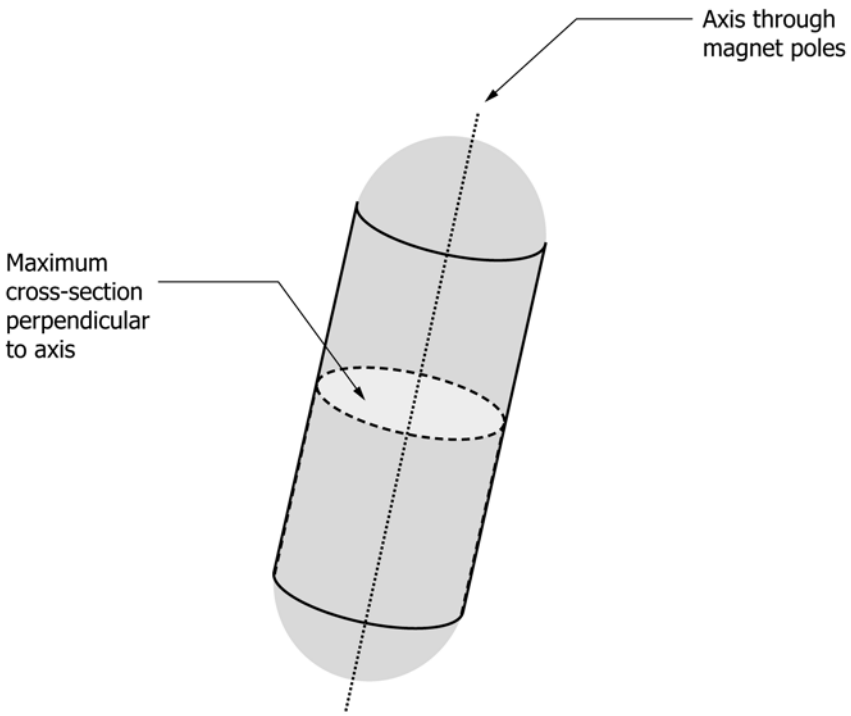


FIG. 49 Illustration of Pole Surface on a Magnet with Rounded Ends

ANNEXES

(Mandatory Information)

A1. AGE GRADING GUIDELINES +

A1.1 Purpose and Scope

A1.1.1 Good age-grading practices are important to ensure that a toy is appropriate and safe at particular stages of physical and mental development.

A1.1.2 Age labeling is intended to provide point-of-sale guidance to consumers for the selection of appropriate toys for children with respect to average abilities, interests of various age groups, and safety aspects of the toys themselves.

A1.1.3 This guideline is intended to provide thoughts and considerations necessary to establish meaningful age recommendations for toy products.

A1.1.4 "Guidelines for Relating Children's Ages to Toy Characteristics (1985)" is available from the Consumer Product Safety Commission, Washington, DC 20207.

A1.2 Criteria for Establishing Age Grades

A1.2.1 The following criteria should be considered when establishing age grading for a toy. While all of these should be considered in total, each one may be weighted individually to arrive at the appropriate age grading.

A1.2.1.1 The physical ability of a child to manipulate and play with the specific features of a toy. This necessitates an understanding of the physical coordination, fine and gross motor capabilities, size, and strength generally available at a given age.

A1.2.1.2 The mental ability of a child to understand how to use the toy (that is, understand instructions, sequences of operations, objective of the toy). Consideration of the mental skills at a given age is important in order to provide a concept that will challenge abilities and stimulate further development, yet not frustrate. Accomplishment should be neither too easy nor too difficult to be satisfying to the child.

A1.2.1.3 The toy shall meet play needs and interests at different levels of development. Understanding developmental levels and identifying play materials and play environments to enhance each developmental stage is important for assigning appropriate age grades. Play interests and toy preferences change rapidly; there should be careful attention to a child's preference or aversion to specific toy subjects at certain stages. In order for a toy to enhance play, it obviously shall be appealing to its user. In short, it shall be fun.

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A1.3 Tools

A1.3.1 Use of the following tools can help guide the establishment of meaningful age grading for a toy. These tools are not arranged in a particular order of importance; all of them should be considered during the age grading process.

A1.3.1.1 Prior experience with the toy or a similar toy in the marketplace indicating suitability for a specific age group.

A1.3.1.2 Reference materials on comparative body measurements and human factors elements.

A1.3.1.3 Reference resources on child development norms to establish developmental mileposts.

A1.3.1.4 Identification of developmental features to be enhanced/stimulated within certain age spans.

A1.3.1.5 Expertise of outside consultants, child development specialists, physicians, and psychologists.

A1.3.1.6 Testing of models or prototypes with children.

A1.3.1.7 Observing skill levels in children at play.

A1.3.1.8 Seeking opinions of parents.

A1.3.1.9 Interacting with children and asking questions.

A1.4 Safety Considerations of Age Grading

A1.4.1 The toy shall be safe for the intended user. Once the skill level has been determined, the design shall be tailored to satisfy the requirements of this specification associated with that age level.

A1.4.2 Age grades are indicators of average development, which does not necessarily reflect suitability for the exceptional child. A parent remains the best judge of whether the child is at the appropriate development stage for safe play with a particular toy.

A1.4.3 A primary consideration should be potential choking and aspiration hazards associated with small parts. Children under the age of three are more prone to placing objects in their mouths. However, the propensity to put nonfood objects in the mouth does not disappear at the chronological age of three years. The following toys are appropriate for children under three years of age and are cited specifically as subject to the safety requirements of 16 CFR 1501 for small parts regulations:

A1.4.3.1 Squeeze toys, teethers, crib exercisers, crib gyms, crib mobiles, toys intended to be affixed to a crib, stroller, playpen, or baby carriage, pull and push toys, pounding toys, blocks and stacking sets, bathtub, wading pool and sand toys, rocking, spring, and stick horses and other figures, chime and musical balls and carousels, jack-in-the-boxes, stuffed, plush, and flocked animals and other figures, and those preschool toys, games and puzzles, riding toys, dolls and animal figures, cars, trucks, and other vehicles that are intended for use by children under the age of three years.

A1.4.4 Some of the characteristics of toys that describe those preschool toys that are appropriate for children under the age of three years are listed below by class of toy:

A1.4.4.1 *Dolls*—Soft-bodied baby dolls or character dolls that are for holding or cuddling, stuffed or "bean bag" dolls, rag or cloth dolls with simple features (including accessories), and lightweight plastic dolls with simple features and limited articulation at the limb joints.

A1.4.4.2 *Infant Toys*—Toys intended to be used in a crib or playpen, to be held easily by small hands, shaken, grasped, rattled, or cuddled.

A1.4.4.3 *Toy Vehicles*—Cars, trucks, boats, and trains of simple chunky shape, decorated in primary colors without extensive descriptive detail or representation of a particular make or model of vehicle and that require simple actions such as rolling, dumping, pushing, and releasing.

A1.4.4.4 *Action Toys*—Simple action toys for the identification of sounds or pictures and surprise action toys.

A1.4.4.5 *Early Learning Toys*—Toys, books, and puzzles for learning basics such as letters or numbers or shapes, and simple physical motions such as turning wheels or knobs, pulling and letting go, or sorting by size, etc.

A1.4.4.6 *Blocks and Stacking Toys*—Toys that do not require finger dexterity or fitting together of small intricate pieces.

A1.4.4.7 *Soft Balls and Similar Items*—Soft, lightweight balls or other shapes for squeezing, shaking, rolling, or tossing.

A1.4.5 Toys that should not be considered appropriate for very young children, and therefore not be age labeled as such, have the following characteristics:

A1.4.5.1 Toys that require intricate finger movements or controlled adjustments, fitting intricate pieces together.

A1.4.5.2 Toys, for example, games that require or incorporate elements of reading ability beyond the ABCs or 123s.

A1.4.5.3 Toys that simulate adult figures or characters and their associated accessories.

A1.4.5.4 Collecting sets (for example, figures and vehicles).

A1.4.5.5 Projectile-type toys, launched vehicles, planes, etc.

A1.4.5.6 Makeup sets.

A1.4.6 Another major development cutoff has been cited at approximately eight years of age, at which time reading ability has progressed so that a child can, on his own, read, understand, and heed instructions, caution statements, etc. Because the instructions and caution statements are necessary for the safe use of the product in some cases, those products should be labeled for use by children over the age of eight. Products that fall into this category include the following:

A1.4.6.1 Science and environmental kits or sets containing breakable glass components and complex instructions.

A1.4.6.2 Complex model and craft sets requiring precision assembly and finger dexterity or incorporating sharp tools or components.

A1.4.6.3 Electrically operated toys incorporating heating elements.

A1.4.6.4 Certain chemistry sets, fueled model vehicles, and rockets, etc. that contain chemicals that may be hazardous, cannot generally be handled safely by children unable to read and understand instructions and cautionary statements. The minimum age for which any such product should be recommended is eight years and then *only* with adult supervision.

A1.5 Descriptive Age Labeling

A1.5.1 Manufacturers can assist parents and other purchasers in the appropriate selection of toys by incorporating

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descriptive labeling to identify potential safety concerns if the toy is accessible to children outside the recommended age group.

A1.5.2 For example, if a toy contains small play pieces and is labeled for older children, such as an action figure set, the manufacturer should consider including a statement on the retail packaging that the toy contains small pieces.

A1.5.3 Factors to consider would include the appeal of the toy to young children, market experience, the design or construction of the toy, and whether the packaging provides visual indication of any small play pieces. In addition, a manufacturer should consider the probability that a purchaser may overestimate a child's physical or mental abilities and the child's understanding of a potential hazard related to the toy.

A2. PACKAGING AND SHIPPING

A2.1 Packaging

A2.1.1 Packages that are intended to be opened by adult purchasers should be constructed as to avoid hazards during the opening process from metal fasteners, particularly staples, and should not contain common pins used to position the toy within the package.

A2.2 Shipping

A2.2.1 Packaged and unpackaged toys can be subjected to a wide variety of tests designed to test the ability of toys to withstand the destructive forces encountered in the distribution cycle. The tests used most widely include drop, vibration, compression, and incline impact. Limited testing may be sufficient for many toys, especially those that are of light weight and constructed of resilient materials, such as dolls and stuffed toys. Others, however, such as large plastic or heavy metal toys, may be damaged during shipment and should be subjected to appropriate tests. Guidance for useful tests can be obtained from the following ASTM sources: Test Methods D642, D5276, D880, and D999.

A3. DESIGN GUIDELINES FOR TOYS ATTACHED TO CRIBS OR PLAYPENS

A3.1 Purpose and Scope

A3.1.1 This annex provides guidance for design practices intended to encourage the careful examination of product characteristics and configurations with respect to safety. As there are no objective means for determining conformance with these design guidelines, they are not to be used to judge compliance with this specification.

A3.2 Guidelines

A3.2.1 Designs for all products intended to be attached to cribs or playpens should be accomplished in a manner that minimizes the potential for strings, ribbons, elastic, or parts of clothing to become caught on the product, such that an infant is placed in a dangerous predicament in which possible strangulation could occur.

A3.2.2 Examples of the implementation of good design practices for crib and playpen environments include the following:

(1) Rounded corners with the use of generous radii wherever possible.

(2) Smooth contours that minimize abrupt changes in shape that could easily become a catch point for strings, ribbons, elastic, or loose clothing.

(3) Isolation of fastening hardware using recesses, counterbores, or other similar methods.

(4) Reduction of the potential for any mismatch of surfaces where a catch point could develop.

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A4. DESIGN GUIDELINES FOR BATH TOY PROJECTIONS

A4.1 Purpose and Scope

A4.1.1 This annex provides guidance for design practices intended to result in bath toy projection characteristics and configurations that will minimize the risk of injury to the genital and anorectal area if a child were to sit or fall onto the bath toy projection while in an unclothed or minimally clothed state. Some examples of these potentially hazardous projections include but are not limited to rigid fins of fish, rigid hulls, funnels, and masts of boats.

A4.2 Guidelines

A4.2.1 It is important that the design of a bath toy be developed with consideration of the shapes, dimensions and materials of any projections on the toy such that penetration and impalement hazards are minimized.

A4.2.2 Examples of good design practices include:

A4.2.2.1 *Non-Vertical Projections*—It is preferable to have projections designed such that they are always non-vertical when the toy is evaluated in all stable positions including consideration of the potential positions the toy can rest on the bottom of a bath tub, with or without water present in the bath tub, to produce a vertical or nearly vertical projection.

A4.2.2.2 *Stability*—If a toy topples over when force is applied to the end of the vertical projection, both when the bath toy is empty and filled with water, then the vertical projection is unlikely to be hazardous.

A4.2.2.3 *Accessibility*—Vertical projections can be protected by suitable means to minimize possible injury. A protected projection is one that has adequate adjacent structure (ribs, housings, or other permanent components) to render the projection unlikely to cause penetration or impalement hazards.

A4.2.2.4 *Flexibility*—Vertical projections can be designed to be flexible to minimize possible injury. This can be done through the choice of materials, a design which bends or compresses or the dimensions of the projection.

A4.2.2.5 *Diameter*—The diameter (or cross-sectional projected area) of a vertical projection can be sized large enough to minimize possible injury.

A5. FLAMMABILITY TESTING PROCEDURE FOR SOLIDS AND SOFT TOYS

A5.1 Purpose

A5.1.1 This annex establishes the protocol and general criteria for flammability testing of solids, and soft toys in conformance with the requirements of 16 CFR 1500.3(c)(6)(vi).

A5.2 Definitions

A5.2.1 *major axis*—a straight line through the longest dimension of the product connecting the most distant parts or ends of the product. A product can have more than one major axis (see Fig. A5.1), but they shall be equal in length. For toys that pose or transform, position the product so that its major axis is the longest possible dimension.

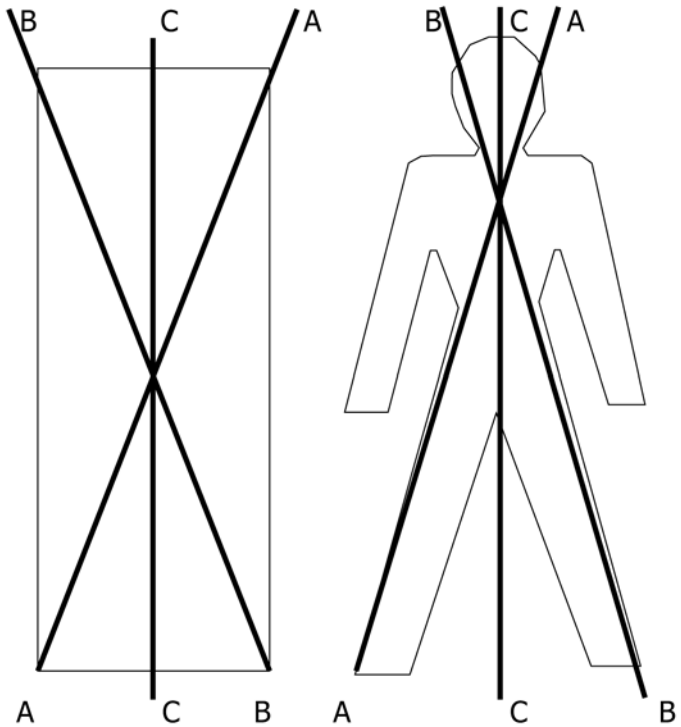
A5.2.2 *soft toy*—any stuffed or plush toy, that may or may not be parts or components of other toys.

A5.2.3 *solids*—toys or toy parts constructed of rigid, flexible, or pliable solids.

A5.2.4 *accessories*—an item intended to be removed to enhance the play pattern.

A5.2.5 *strings*—long slender flexible material usually consisting of several strands (as of thread or yarn) woven or twisted together, usually used to bind, fasten, tether, or tie. This does not include string when used, for example, for hair on a doll.

A5.2.6 *paper*—a thin, flat, single layer of material produced by the compression of fibers. The fibers are usually composed



NOTE 1—Lines A-A and B-B are both major axes. Line C-C is *not* a major axis.

FIG. A5.1 Illustration for Determining Major Axis

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of cellulose. Examples of paper products are traditional playing cards, newspaper, magazines, and construction paper. Examples of products that are not paper are cardboard, and paperboard (multiple layers of paper bonded together).

A5.3 Exemptions

A5.3.1 Strings, paper, and ping-pong balls.

A5.3.2 Accessible components having a major dimension of 1 in. (25 mm) or less.

A5.3.3 Textile fabrics intended to be removed shall be tested separately and meet the requirements of A6.1. Fabrics not intended to be removed shall become subject to the test to the extent that it becomes a part of the test surface.

A5.3.4 Sleeping bags.

A5.3.5 Packaging materials intended to be discarded by the consumer. Components of packaging that are likely to be incorporated into the play pattern of the toy are not exempt.

A5.4 Sample Preparation for Solids and Soft Toys

A5.4.1 Test product completely assembled as per manufacturer's instructions. If disassembly is required for storage purposes only, test when fully assembled as per manufacturer's instructions. If assembly or disassembly, or both, is part of the play pattern (that is, accessories, puzzles, construction toys, etc.) test each component separately.

A5.4.2 Remove all string or paper from the product as deemed necessary.

A5.5 Procedure for Solids and Soft Toys

A5.5.1 Place the prepared sample in a draft-free area that can be ventilated and cleared after each test. The temperature of the sample at the time of testing shall be between 68 and 86°F (20 and 30°C) at a relative humidity of 20 to 70 %.

A5.5.2 The test fixture shall be corrected to a clean condition prior to the start of each test.

A5.5.3 Measure the dimensions of the sample, and support it by means of the test fixture (see Fig. A5.2) or equivalent, so that the ends of the major axis are oriented horizontally. Placing a scale along the major axis is a sufficient means for gauging the burn distance.

A5.5.3.1 *Orientation and Locations for Ignition of Specimens*—When orienting specimens, provide support over the entire length of the major axis without sagging, making sure the supporting device does not retard the spread of flame materially. Optional: for samples with long hair, it may be necessary to add fine wire (24 AWG or higher) between some nails to provide sufficient support for the hair. The addition of support for hair is not necessary unless the hair hangs down vertically while lying on the test fixture.

NOTE A5.1—The CPSC does not test hair separately but rather tests hair as a normal part of the toy. The toy might be tested in a face-down position, with the hair in a horizontal position on top of the toy. The toy could also be tested lying on its back, with the hair lying beneath the toy. Hair that hangs vertically would not be used to calculate the burn rate.

(1) A sample that is so large that it becomes impractical to support its entire length shall be arranged in such a manner that support at the end of a major axis is provided by the test fixture.

(2) One or more specimens shall be ignited at one end of the major axis, and when practical, one or more specimens shall be ignited at the opposite end of the major axis. Specimens shall be positioned in the worst case position, as dictated by experience.

A5.5.4 Trim the candle and wick as necessary to maintain a flame height of ⅝ to 1 in. (16 to 25 mm).

A5.5.4.1 Hold a burning paraffin candle whose diameter is at least 1 in. (25 mm) so that the flame is a minimum of ⅝ in. (16 mm) high, with the tip of the inner cone of the flame in contact with the surface of the sample at the end of the major axis for 5 s. Maintain contact of the candle with the sample for 5 s or until ignition occurs. If the sample melts away from the flame, move the candle and maintain contact for the full 5 s or until the sample ignites. If the ignition occurs immediately, hold the candle steady and allow the ignited flame to move away.

A5.5.5 Remove the candle and allow the sample to burn for an additional 55 s (total burn time including ignition time is 60 s) or until the flames reach the opposite end of the major axis. Determine the time of combustion by means of a stop watch. Do not allow the total test time to exceed 60 s with a self-sustaining flame.

A5.5.6 Extinguish the flame with a CO_2 or similar nondestructive extinguisher, if necessary, after the 60 s. The experienced application of water is an acceptable method for extinguishing the flame.

NOTE A5.2—Extinguishing the flame shall be accomplished in a manner that preserves the accuracy of the burned distance.

A5.5.7 Measure the length of the burned area, and calculate the rate of burning along the major axis of the sample.

A5.5.8 Products that do not ignite are considered acceptable. No burn rate is calculated for these samples. The burn rate for products that self-extinguish in less than 60 s shall be computed by using the actual burning time as the denominator when calculating the burn rate. For example, ignited product burns 3 in. (76 mm) in 20 s and self-extinguishes. The burn rate is calculated as follows:

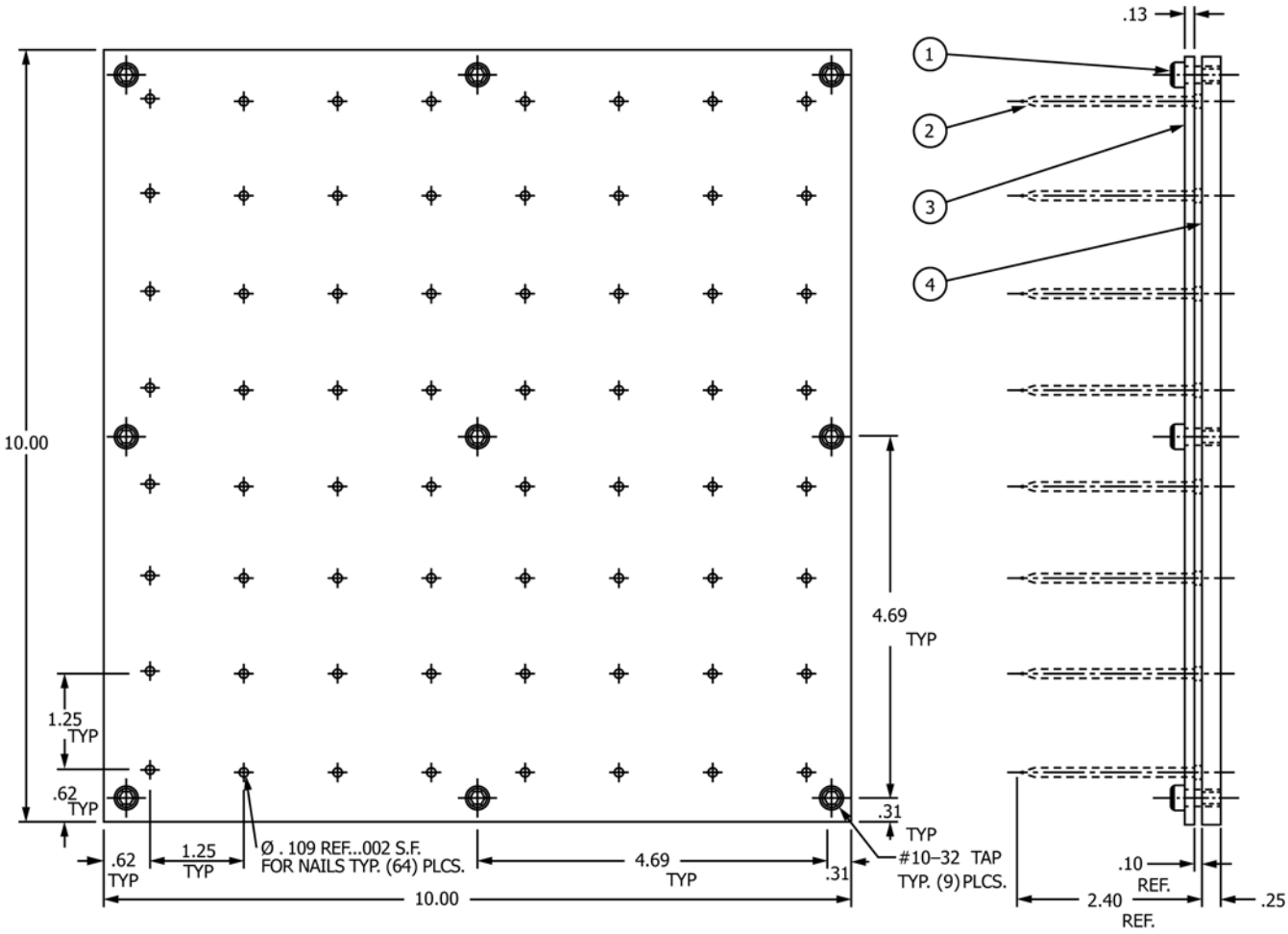
$$\frac{3\text{ in.}}{20\text{ s}} = 0.15\text{ in./s} \qquad \text{(A5.1)}$$

A5.5.8.1 Burn-rate calculations for a product that self-extinguishes shall be approached cautiously to avoid the introduction of measurement error since small measurement errors can become a significant portion of final calculations when the burn distance is short.

NOTE A5.3—It is unlikely that the CPSC would pursue an enforcement action that includes a burn rate calculation higher than 0.10 in. per second and yet consistently self-extinguishes during the test. However, the CPSC reserves the right to proceed with an action if such a burn rate may result in the product's causing substantial personal injury or substantial illness.

(1) When the product does not self-extinguish, the flame shall be allowed to continue for a total time of 60 s. Calculate the rate of burning using the actual distance of flame spread during the full 60 s. For example, the product ignites and burns 9 in. (229 mm) in 60 s. The burn rate is calculated as follows:

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Item	Required	Description	Material
1	9	# 10–32 × 0.38 LG.	S.H.C.S.
2	64	# 8d × 2.50 LG.	Common Nail
3	1	0.13 × 10.00 × 10.00 LG.	Stainless Steel
4	1	0.25 × 10.00 × 10.00 LG.	Stainless Steel

NOTE 1—Tolerances (unless otherwise specified):
3 Place DIMS ± 0.005
2 Place DIMS ± 0.015
Angles ± 1°

NOTE 2—Break all sharp edges and screw to suit unless otherwise specified.

FIG. A5.2 Suggested Flammability Test Fixture

$$\frac{9\ in.}{60\ s} = 0.15\ in./s\ (a\ flammable\ solid) \qquad (A5.2)$$

NOTE A5.4—While testing, samples shall not be extinguished prematurely if such action will affect the burn rate. For example, if a stuffed rabbit is ignited at the tip of one ear and the flame is extinguished when the flame reaches the base of the ear, this may produce an inflated burn rate if the ear material burns at a faster rate than the rest of the product. Therefore, allow the sample to burn the full 60 s taking into account both the ear and the rest of the product.

(2) There may be scenarios where the flame may need to be extinguished prematurely prior to reaching the full 60 s. For example, the major axis of a product is 6 in. in length. The product ignites and burns the total length of the major axis (6 in.) in 40 s but continues to flame. Once the flame travels the full length of the major axis, extinguish the flame immediately regardless of whether or not the full 60 s has been reached. The burn rate is calculated as follows:

$$\frac{6\ in.}{40\ s} = 0.15\ in./s \qquad (A5.3)$$

A5.6 Requirements

A5.6.1 A toy shall be considered a flammable solid if it ignites and burns with a self-sustaining flame at a rate greater than 0.1 in./s (2.5 mm/s) along its major axis.

A5.6.2 If the burn rate of a composite product (that is, solid/fabric combined) exceeds 0.10 in./s in part due to the

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presence of a permanently attached fabric, then a secondary test shall be performed to determine compliance. The secondary test shall consist of removing the permanently attached fabric from the solid and retesting the solid component separately. When sold as part of a toy such that the permanently attached fabric cannot be removed without causing damage to the toy and the fabric (that is, fabric covered book, stuffed dolls/animals, etc.) or if the toy is an enclosure that a child can enter, the fabric shall become subject to the solids test to the extent that it becomes a part of the major axis.

NOTE A5.5—The permanently attached fabric that was removed from the sample shall now be subject to meeting the requirements of Annex A6.

A5.6.3 *Criteria for Acceptance:*

A5.6.3.1 Sample size = four, whenever practical.

A5.6.3.2 A burn rate is not calculated for samples that do not ignite.

A5.6.3.3 Calculate the burn rate to two significant figures (to the nearest hundredth using conventional rounding rules, that is, for 5 or higher, round up).

A5.6.3.4 Round the burn rate to the nearest tenth (that is, round 0.15 up to 0.2).

A5.6.3.5 Level of acceptance = 0.1 in./s (2.5 mm/s), maximum, along the major axis.

A5.6.3.6 *Additional Guidance for Manufacturers*—Manufacturers' decisions on the performance of an item should be based on a minimum of four samples. This provides a reasonable opportunity for detecting undesirable variations in the product. Proceed as follows:

(1) If the burn rate of all samples is less than 0.1 in./s (2.5 mm/s), accept.

(2) If the burn rate of all samples is greater than 0.1 in./s (2.5 mm/s) but less than 0.15 in./s (3.75 mm/s), accept and consider further investigation for action to improve performance.

(3) If the burn rate of one of the samples is 0.15 in./s (3.75 mm/s) or greater, reject and repeat the test with four additional samples (one time only). If the burn rate of any of the retested samples is 0.15 in./s. or greater, reject.

(4) If the burn rate of more than one of the initial 4 samples is 0.15 in./s (3.75 mm/s) or greater, reject.

NOTE A5.6—CPSC makes its decision on whether a product is a flammable solid based on the burn rate of each individual sample. It then determines whether the product may cause substantial personal injury or substantial illness during or as a proximate result of any customary or reasonably foreseeable handling or use. CPSC has no objection to other laboratories rounding off to the nearest 0.1 in./s. It will calculate burn rates to two decimal places but does not envision enforcement action where the burn rate is greater than 0.10 in./s and less than 0.15 in./s. However, CPSC reserves the right to proceed if such burn rate may result in the product's causing substantial personal injury or substantial illness.

A6. FLAMMABILITY TESTING PROCEDURE FOR FABRICS

A6.1 Purpose

A6.1.1 This annex establishes the protocol and general criteria for flammability testing of fabrics in conformance with the requirements of 16 CFR 1500.3 (c)(6)(vi).

A6.2 Definitions

A6.2.1 *fabric*—any coated or uncoated material (except film and fabrics having a nitro-cellulose fiber, finish or coating) that is woven, knitted, felted, or otherwise produced from any natural or manmade fiber, or substitute therefore, or combination thereof.

A6.2.2 *plain surface fabric*—any textile fabric which does not have an intentionally raised fiber or yarn surface such as pile, nap, or tuft, but shall include those fabrics having fancy woven, knitted or flock printed surfaces.

A6.2.3 *raised surface fabric*—any textile fabric which has an intentionally raised fiber or yarn surface such as a pile, nap or tufting.

A6.3 Exemptions

A6.3.1 Fabrics where a contiguous 2 by 6 in. piece cannot be extracted.

NOTE A6.1—If a contiguous 2 by 6 in. piece of fabric cannot be obtained, but due to the existence of other fabrics adjacent to it a composite 2 by 6 in. sample can be obtained, and the fabrics in question are permanently attached to a common substrate, then it shall be tested. An example of this would be a doll's hula skirt made of thin strips of fabric 6 in. in length. Each individual strip is joined at the top by a common substrate (that is, plastic waistband) and when combined with the other strips immediately adjacent to it, a 2 by 6 in. sample can be extracted.

A6.3.2 Fabrics that are permanently attached to a solid shall initially be tested with the solid per Annex A5.

A6.4 Sample Preparation

A6.4.1 Precondition all fabrics in a horizontal position for a minimum of 30 min at a temperature of 221 ± 10°F.

A6.4.2 Fabrics intended to be washed shall be subjected to AATCC Home Laundering Fabrics Prior to Flammability Testing to Differentiate Between Durable and Non-Durable Finishes - 2007.

A6.4.3 A total of 5 samples, whenever practical, shall be cut for each location. Samples may be obtained from more than one toy.

A6.4.4 Samples shall be tested in the manner in which they appear on the toy (that is, exposed side face-up).

A6.4.5 Use the most onerous orientation (for example, warp or fill).

A6.4.6 If it is necessary to use a sample that consists of more than one type of fabric, then take the sample from the most onerous location.

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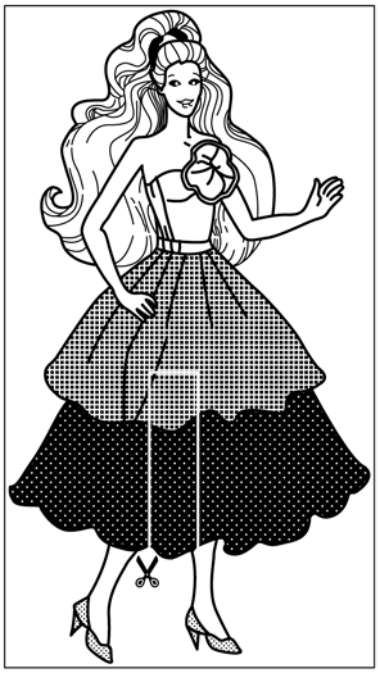


FIG. A6.1 Layered Fabric Sample

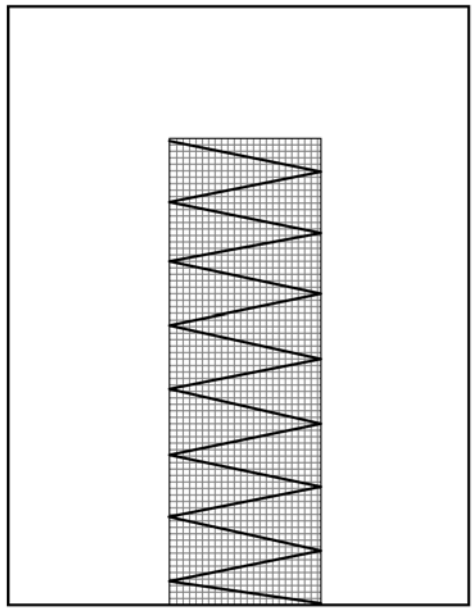


FIG. A6.2 Fabric Requiring Support

A6.4.7 If fabric is layered and the layers are permanently secured to one another (for example, stitched together) at any point, cut through as many materials necessary to obtain the sample and include all layers in a single sample. Orient layers in the sample holder in the same manner they appear on the toy. (See Fig. A6.1.)

A6.4.8 For fabrics with finished ends made of a different material (that is, lace, ribbons, etc.) test the finished ends separately.

A6.4.9 If the finished ends consist of the same material as the sample being tested (that is, hemmed, folded, etc.) then attempt to exclude this from the 2 by 6 sample. In addition, if the fabric contains any seams or stitching, attempt to exclude them from the sample. If a sample cannot be extracted by excluding the finished ends or seams/stitching, then include them in the sample during testing; however, orient the sample in the fixture so that the finished ends or seams/stitching are at the top or side of the fixture to minimize any effect it may have on the burn rate.

A6.4.10 If the fabric requires support in order to be held in the fixture, then the use of thin gauge wire (24 AWG or higher) strung across the plate opening at equidistant points from each other is acceptable. (See Fig. A6.2.)

A6.4.11 Regardless of sample size, if the fabric has non-fabric components permanently attached to it (that is, buttons, sequins, beads, etc.) remove these components only if removal will not cause permanent damage to the fabric or to the non-fabric component. Then test each component separately as applicable. If permanent damage cannot be avoided during removal, then test with non-fabric components attached.

A6.5 Test Procedure

A6.5.1 Test fabrics per the test method specified in 16 CFR 1610.4(g).

A6.5.2 Use the equipment as specified in 16 CFR 1610.4(b).

A6.6 Requirements

A6.6.1 *Plain Surface Fabrics:*

A6.6.1.1 Specimens are acceptable if:

(1) All specimens either did not ignite, ignited but self-extinguished, or any combination thereof.

(2) Average burn time is 3.5 s or greater.

A6.6.1.2 If only 1 of 5 specimens ignites and burns the stop cord with a time of 3.5 s or more, samples are acceptable.

A6.6.1.3 If only 1 of 5 specimens ignites and burns the stop cord in less than 3.5 seconds, test another set of 5 specimens. Compute the average time of flame spread for all 10 specimens. If 2 or more of these specimens ignite and burn the stop cord, average the results from those specimens. If only 1 of the 10 specimens ignites and burns the stop cord, samples are acceptable.

A6.6.2 *Raised Surface Fabrics:*

A6.6.2.1 Specimens are acceptable if:

(1) All specimens either did not ignite, ignited but self-extinguished, or any combination thereof.

(2) Average burn time is 4 s or greater.

(3) Average burn time is less than 4 s and all specimens burn with a surface flash where the intensity of the surface flame is insufficient to ignite, char, or melt the base fabric.

(4) Only 1 of 5 specimens ignites and burns in less than 4 s and the base fabric does not ignite or fuse, the sample is acceptable.

(5) Only 1 of 5 specimens ignites or burns in more than 4 s, regardless of whether the base fabric ignites or fuses, the sample is acceptable.

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A6.6.2.2 To compute the average time of flame spread for each set of 5 specimens, at least 2 of the specimens shall ignite and burn the stop cord.

A6.6.2.3 If only 1 of 5 specimens ignites and burns in less than 4 s where the base fabric ignites or fuses, test another set of 5 specimens. Compute the average time of flame spread for all 10 specimens. If 2 or more of the 10 specimens ignite and burn the stop cord, average the results from those specimens. If only 1 of the 10 specimens ignites and burns the stop cord, samples are acceptable.

A7. COMPOSITING PROCEDURE FOR TOTAL HEAVY METAL ANALYSIS

A7.1 Purpose

A7.1.1 Composite testing for a total digestion analysis may be conducted to potentially reduce the number of tests conducted. Combining different but like materials into a composite analysis shall be done with adequate care and understanding of the limitations and potential propagations of error in measurement or the test may fail to detect excessive metals in one of the individual materials.

A7.2 Definitions

A7.2.1 *Composite Testing – Different Materials*—Combining different but similar materials to reduce the number of digestions and instrumental metal analyses performed.

A7.2.2 *Similar or Like Materials*—Materials that have similar characteristics may be combined into one composite sample. Glass may be composited together; and plastics composited together; however glass and plastic may not be composited together as they require different digestant mixtures to achieve complete digestion. Coatings on metal substrates should not be composited with coatings on non-metal substrates.

A7.3 Exclusions

A7.3.1 Metal substrates with different compositions should not be composited together as one may interfere in the digestion process and cause re-precipitation or incomplete digestion, therefore affecting the actual result.

A7.4 Sample Preparation

A7.4.1 Each individual component shall be weighed individually with sufficient precision and sufficient safety factors to assure that no false negatives are reported.

A7.4.2 Sufficient materials shall be used for each of the components giving proper consideration for the weighing capabilities of the balance used and the detection limits and necessary dilution for the subsequent instrumental analysis.

A7.4.3 The combined materials are digested according to the appropriate procedure, depending on the material, before analysis by atomic spectroscopy or other appropriate validated method.

A7.4.4 Appropriate weights of each of the individual materials composited depend on final dilution volumes, weighing accuracy, and detection limits.

A7.4.5 Equal weights (to the extent achievable by good laboratory practice) of each of the similar or like materials shall be used in the composite sample.

A7.5 Calculation

A7.5.1 As an example, results for the Arsenic (As) content are calculated and reported as follows:

$$\textit{Total As concentration}: \%As\ (wt./wt.) = 0.10cd/w \qquad (A7.1)$$

where:

c = concentration of arsenic detected (µg/ml)
d = dilution volume (mL)
w = weight of aliquot digested (mg)

A7.5.1.1 One example of composite testing of different plastics would be as follows, and considers the case of weighing to the nearest 0.01 mg, digesting in acid, diluting to a final volume of 10 or 20 mL, and testing on an ICP-OES with an MDL of 0.04 µg/mL. A sample comprising red, green, and orange plastics is tested as a composite using 15.0 mg of red plastic, 16.0 mg of green plastic, and 17.0 mg of orange plastic. The resulting 48.0 mg of composite plastic from this example is digested in acid and diluted to 10 mL, and then the diluted digest is found to contain 0.0008 % arsenic. The combined 3 aliquots of plastic would have contributed to a total of 0.40 µg of arsenic for the composite sample. Although the average concentration in this case would be 8 ppm, the individual contributions are not known, and one shall calculate the arsenic concentration of each plastic as if all of the arsenic originated from it. Thus, the red plastic could contain up to 0.4 µg / 0.0015 g = 27 ppm (µg/g), with similarly calculated results of 25 ppm and 24 ppm for the green and orange plastics. See Table A7.1.

A7.5.2 As another similar example, results for the arsenic (As) content are calculated and reported in Table A7.2. All of individual plastics (11 ppm, 11 ppm, 12 ppm) in the above composite do not exceed 0.0020 % (20 ppm) for arsenic (80 % of 0.0025 % arsenic limit). The composite passes and so do the individual plastics. Therefore the plastics do not need to be tested individually.

A7.5.3 Composite analysis by ICP-MS or another validated method of equivalent sensitivity or the use of a larger sample weight may be necessary when an element has a low regulatory limit and high detection limit (reporting limit), such as with arsenic.

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TABLE A7.1 Total Arsenic (As) Analysis – Composite Testing

Item Analytical	(c) Results As (µg/mL)	(d) Dilution Volume (mL)	Total As (µg)	(w) Sample wt (mg)	Potential As (%) per Component	As (%) Composite
Red Plastic	0.04[A]	10	0.4[A]	15.0	0.0027	
Green Plastic	0.04[A]	10	0.4[A]	16.0	0.0025	
Orange Plastic	0.04[A]	10	0.4[A]	17.0	0.0024	
Total Composite	0.04[A]	10	0.4[A]	48.0		0.0008[B]

[A] In a composite of different plastics, the analytical result for the total composite would be applied to each component part as if all the arsenic was in that component plastic.
[B] In this example, the arsenic concentration of the combined plastics is 0.0008 %, which is below the 0.002 % arsenic acceptable limit (80 % of the 0.0025 % arsenic limit); however any individual component having a result based on it's sample weight that is greater than 80 % of the heavy metal limit should be retested individually. For example, all of individual plastics in the above composite exceed 0.0020 % for arsenic (80 % of 0.0025 % arsenic limit) so all of the plastics should be tested individually. This calculation and data interpretation would be applied to the remaining heavy metals.

TABLE A7.2 Total Arsenic (As) Analysis – Composite Testing

Item Analytical	(c) Results As (µg/mL)	(d) Dilution Volume (mL)	Total As (µg)	(w) Sample wt (mg)	Potential As (%) per Component	As (%) Composite
Red Plastic	0.04	20	0.8	72.0	0.0011	
Green Plastic	0.04	20	0.8	70.0	0.0011	
Orange Plastic	0.04	20	0.8	66.0	0.0012	
Total Composite	0.04	20	0.8	208.0		0.0004

A7.6 Rationale

A7.6.1 Composite heavy element testing of several samples of slightly differing but essentially similar materials (for example, several colors of polyethylene plastic) is desirable to reduce testing cost if this can be accomplished without compromising in any way the achievement of the same attribute (that is, pass/fail) result which would have been reached had the samples been tested individually. Annex A7 outlines detailed procedures for accomplishing this end by specifying the conditions under which compositing is allowable, when a composite result may be relied upon without further testing, and when testing of individual samples shall subsequently be performed. Composite testing has been limited to total digestion (vis-a-vis soluble) analyses primarily in order to align with the European Union harmonized standard EN 71-3, which specifically forbids compositing for its required (soluble) analyses.

A8. DESIGN GUIDELINES FOR BATTERY OPERATED TOYS

A8.1 Purpose and Scope

A8.1.1 This annex provides guidance for design practices intended to encourage the careful examination of product characteristics and configurations with respect to safety. As there are no objective means for determining conformance with these design guidelines, they are not to be used to judge compliance with this specification.

A8.2 Guidelines

A8.2.1 The design of battery operated toys shall be such that an explosion, combustion or overpressure hazard is not generated during normal use, reasonably foreseeable abuse where applicable, and under stalled motor conditions (see 4.25.7.2). If explosion, ignition of flammable gases or the toy itself, or pressure sufficient to visibly distort the sealed portion of the toy or cause any part of the toy to be unintentionally ejected by a distance greater than 100 mm during testing per 8.19.3, 8.19.4, 8.19.5, or 8.17, this shall be considered a hazardous condition.

A8.2.2 Examples of the implementation of good design practices for battery operated toys include the following:

(1) The design of airtight products shall allow the gas emitted by the battery to be absorbed or to escape if the amount of gas emitted is significant enough to present an explosion, combustion or overpressure hazard.

(2) Designers of any battery operated toys incorporating a water or air-tight device should be aware of the normal emission of flammable gas from batteries of certain chemistries. This gas shall be either absorbed or allowed to escape. Otherwise, certain conditions could trigger the ignition of the entrapped gas/air mixture.

(3) It is recommended that the design of such products be discussed with a battery company representative.

NOTE A8.1—Additional guidance can be found in ANSI C18.1M-2 Annex A Guidance for Device Designers.

A8.2.3 Manufacturers of toys which include button or coin cell batteries are encouraged to consider the use of technologies which eliminate or further ameliorate the risks of ingestion from these batteries as these technologies become commercially available and economically viable.

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A9. RATIONALE FOR 2007 REVISIONS

A9.1 Definitions[23]

A9.1.1 *Section 3*—New definitions for terms used in this version of Consumer Safety Specification F963:

hazardous magnet
hazardous magnetic component
impulsive sound
maximum A-weighted sound pressure level
rattle
reference
strap
tangle or form a loop
yo-yo elastic tether toy

A9.2 Sound Producing Toys

A9.2.1 *Sections 4.5 and 8.20*—These sections have been totally replaced by a new set of requirements and a new test procedure.

A9.2.1.1 These requirements have been developed after extensive review of known research on noise-related injury to hearing and existing published recommendations for noise limits. They are intended to reduce the risk of damage to hearing due to high continuous and impulse noise levels. They apply only to toys that are designed to emit sound, i.e., toys that have sound producing features such as electric or electronic devices, percussion caps, rattling components, etc.

A9.2.1.2 The requirements in 4.5.1.1 and 4.5.1.3 are intended to address those hazards presented by continuous sounds (e.g., speech, music). These hazards are chronic and typically manifest themselves after years of exposure. The Occupational Safety and Health Administration (OSHA) has set acceptable limits at 85 dB(A) for 8 h of exposure. An independent audiologist consulted by the ASTM work group recommended a similar exposure level. His recommendations for an 8 h exposure level, Leq, 8h, were 85 dB(A) for continuous sound, and 82 dB(A) for the continuous sound emitted from toys that produce both continuous and impulsive sound.

A9.2.1.3 Exposure to noise from toys is intermittent and integrated with other daily noises. It is unlikely that a toy would present 8 h continuous exposure to sound. These assumptions are consistent with the findings of European research conducted by ISVR Consultancy Services in Southampton U.K. and published as "Noise from Toys and its Effect on Hearing." Based on that study, the probable duration of play with a sound producing toy was determined by the ISVR to be 1.5 h per day.

A9.2.1.4 Using the recommended exposure levels from the audiologist, the ISVR study's conclusion on the duration of play, and a 3 dB exchange rate, the equivalent recommended values are 92.3 dB(A) and 89.3 dB(A), respectively. Rounding each value to the nearest 5 dB(A) yields 90 dB(A) for both. The ISVR study referenced above also concluded that 25 cm was an average use distance for toys. However, a 50 cm distance is superior for measurement purposes. Therefore, the 25 cm, 90 dB(A) requirement was converted to its 50 cm equivalent. The 50 cm free-field equivalent of 90 dB(A) at 25 cm is 84 dB(A). This was rounded to 85 dB(A) to arrive at the final requirement.

A9.2.1.5 The ISVR study uses a distance for close-to-the-ear toys of 2.5 cm. Using the same reasoning applied above, the 50 cm free-field equivalent of 2.5 cm, 90 dB(A) is 64 dB(A). This was rounded to 65 dB(A) to arrive at the final close-to-the-ear-toy requirement.

A9.2.1.6 The requirements in 4.5.1.4 – 4.5.1.6 are intended to address those hazards presented by impulsive sounds (e.g., percussion caps), which can be especially hazardous. Permanent damage to hearing may occur after only one exposure to high impulsive sound levels.

A9.2.1.7 A technically accurate impulsive sound requirement would involve a combination of decibel levels and number of repetitions per day of the sound and also determining the potential for misuse (actuating close to the ear). This alternative would result in some subjective determinations regarding repetitions/day and the likelihood for actuating close to the ear. Therefore, a conservative approach was adopted that limits impulsive sounds to 120 dB (C-weighted peak). This requirement protects against misuse and allows up to 10 000 repetitions per day according to OHSA guidelines. The 50 cm free-field equivalent of 25 cm, 120 dB(C) is 114 dB(C). This was rounded to 115 dB(C) to arrive at the final requirement. This requirement only applies to impulsive sounds created by non-explosive means (e.g., two masses colliding).

A9.2.1.8 Impulsive sound level requirements for toys that produce sound from explosion (e.g., caps) have been treated separately. A higher decibel level (125 dB(C)) is allowed for these types of toys because of the human ear's inability to respond to waveforms with such rapid rise-times such as these.

A9.3 Yo Yo Elastic Tether Toys

A9.3.1 *Sections 4.37 and 8.24*—The task group concluded that the mass on the end of the tether was significant in creating the strangulation potential of a yo yo elastic tether toy. That is why these yo yo products have been associated with near strangulations, and similar products with little mass on the end such as a "sticky" hand have no similar data. The mass was determined by weighing product known to be associated with wrapping around neck. Yo yo elastic tether samples evaluated weighed 0.1 kg (0.2 lb), 0.07 kg (0.15 lb), and 0.07 kg (0.15 lb). Estimated weight of sticky hand (hand portion only) is 0.0045 kg (0.01 lb). The appropriate value for the mass at the end of the tether was chosen to be between these two values, 0.02 kg (0.04 lb).

[23] This rationale pertains only to those changes made in the 2007 edition of Consumer Safety Specification F963. Rationales for previous editions may be obtained from ASTM International Headquarters by requesting Research Report RR:F15-1000.

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A9.3.1.1 The cord length is based on two times the neck circumference of a 5th-percentile 3-year-old from Childata, or 2 × 24.0 cm = 48 cm (18.9 in.). The age of 3 years was chosen based on the age of children involved in the incident data.

A9.3.1.2 The rotational speed of 80 RPM was determined by testing adults and determining the maximum RPM they can achieve rotating a product above their heads. The range of adult speed was 80 – 108 RPM, the average was 90 RPM and the standard deviation was 7 based on a sample size of 14. This was reduced to 80 RPM as an estimate for the speed children 3 to 6 years old can achieve. The incident data indicated that children 3 to 6 years old are most often involved in yo yo elastic tether incidents.

A9.4 Magnets in Toys

A9.4.1 *Section 4.38*—These requirements address the recent incidents of magnet ingestion resulting in serious injury or death by identifying magnets or magnetic components that can be readily swallowed. It requires these hazardous magnets and hazardous magnetic components to be reliably contained in a product, or carry a warning. Hazardous magnets and hazardous magnetic components are identified by describing both a magnetic strength of concern, along with a size and shape that can be swallowed.

A9.4.1.1 The following areas were considered:

(a) Data indicate that powerful magnets have been involved in all known ingestion incidents to date. The data also suggest that magnet ingestion was not a problem in toys until powerful magnets (such as NIB magnets) became cost effective and commonplace several years ago. Ceramic, rubberized, and ferrite magnets have substantially lower attractive forces and therefore shall be made larger to provide sufficient magnetism, which makes them less likely to be swallowed.

(b) The magnets/magnetic components involved in the ingestion incidents were small objects (see 4.6 and Fig. 3). Therefore, the requirements have indicated that hazardous magnets or hazardous magnetic components shall not be small objects.

(c) The exemptions represent magnets which are used in applications that are not obvious to the consumer. These are very common magnet uses and there are no data associated with these magnets.

(d) Products intended for children under three are already subject to the small parts requirement which would include these magnets or magnetic components.

A9.4.2 *Section 5.17*—The warning specifically explains the hazard as "sticking across intestines." Studies of warnings show that when the audience can "picture it," even when there is no picture, then compliance with the warning increases. In the final analysis, the "intestines" statement makes this warning more effective than it would be without it.

A9.4.3 *Section 8.25*—If the play pattern of the toy includes repeated attaching and detaching of the magnet(s), the magnet(s) shall be subjected to repeated attachment and detachment that is expected over the life of the toy. Furthermore, if it is likely that other components included in the toy can attach to the magnet(s), then the magnet(s) and the other components shall be dropped/impacted together during use/abuse testing.

A9.5 Hemispheric Shaped Objects

A9.5.1 *Section 4.36*—Data analysis of the "cupped" shaped objects involved in the fatal and non-fatal incidents, indicated that the wall thickness of the objects involved in the incidents ranged from approximately 0.04 in. (1 mm) to 0.12 in. (3 mm). Based on this data, it was believed that wall thickness was not a concern. It is also important to note that wall thickness is not a relevant factor for objects with diameters at the upper end of the requirements as these sized objects may fit around/under the chin.

A9.5.1.1 However, since publication of this requirement, questions have been raised in the United States and Europe regarding objects with "thick" walls or rims—what is the appropriate measurement for these objects, inner or outer diameter? The work group has discussed the intent of the requirement and has concluded that the inner diameter measurement is the critical element in determining whether or not a "cupped" shaped object has the potential to fit a child's face and create a vacuum. Therefore, a change from outer diameter to inner diameter is recommended.

A9.5.2 *Section 4.36.6(e)*—The new option for a single large opening in the base includes the area that is defined by the original two small opening minimum dimensions (0.080 in./2 mm) and the minimum space in between these openings (0.5 in./13 mm). The 0.66 in./17 mm dimension is calculated as 0.080/2 mm + 0.080/2 mm + 0.5/13 mm. This approach is consistent with the option for ventilation in 4.16.1.1. Similarly, placement of this opening at least 0.5 in. (13 mm) from the rim of the object should ensure that facial features such as the nose or chin, or flesh, will not completely block the opening.

A9.6 Miscellaneous Technical Issues

A9.6.1 *Section 4.12*—The purpose of this section is to minimize the potential of asphyxiation hazards that may be caused by thin packaging film, including sheets and bags. Plastic sheeting/bags may adhere to a child's mouth and nose making it impossible to breathe. Since the most frequent pattern of death is the covering of the face, the exemption is based on the size of the face and not whether the plastic is a bag or a sheet. CPSC anthropometry data for the face of a 4 to 6-month-old indicates a minimum head height of 125 mm (4.9 in.) and minimum face width of 85 mm (3.3 in.). This is the basis for the exemption, which is a minor dimension of <3.9 in. (100 mm). Plastic sheets or bags with a minor dimension less than 3.9 in. (100 mm) will not entirely cover the face of a 4 to 6-month-old infant.

A9.6.1.1 Both ISO 8124 and EN 71 allow for perforations of the sheeting if it does not meet the thickness requirements. There is no injury data from the EU to indicate that perforated film presents a hazard. The 1 % area for perforations is considered to be sufficient to sustain an air flow and prevent the adhering of the film to the face.

A9.6.2 *Section 4.14:*

A9.6.2.1 *Section 3.1.85*—Definition of strap added to clarify and expound test method verbiage in 4.14. Children under the age of 18 months have developed certain gross motor skills (e.g., can grasp and pick up objects). However, they lack

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fine motor skills such as those required to insert the end of cords/straps/elastics though a small opening or to wrap a cord/elastic multiple times around a wheel.

A9.6.2.2 *Section 4.14.1.1*—Details requirements for breakaway features on cords, straps, and elastics.

A9.6.2.3 *Section 4.14.2*—Clarifies scope of test method by adding "strap" as an additional type of cord/elastic covered by the requirement.

A9.6.2.4 *Section 8.23.2*—This section provides an additional testing method and supplemental diagrams (with details for additional equipment) that should be used for materials that have a loop perimeter smaller than the tapered end of the head probe.

A9.6.2.5 *Section 8.23.3*—Details testing method for determining the release force required for breakaway features on cords, straps, and elastics.

A9.7 Miscellaneous Editorial Changes

A9.7.1 *Section 4.6*—The word "choking" has been added to the test to be consistent with the language of 16 CFR 1501.

A9.7.2 *Section 4.15.6*—This section references the dynamic strength test in 8.21. This reference had been omitted in the previous version of Consumer Safety Specification F963.

A9.7.3 *Section 4.17*—Reference to the wrong definition has been corrected to 3.1.65.

A9.7.4 *Section 4.25*—Abuse testing in 8.6 – 8.10 of the standard is not applied to toys intended for children over 96 months (this is laid out in Table 5). Therefore, it is redundant and unnecessary to break down the age group in this way in the requirement section.

A9.7.4.1 *Section 4.25.10.6(2)*—Corrected reference to test procedure to 8.18.8.

A9.7.5 *Section 8.6*—Explicitly states the age requirements as they pertain to abuse testing (for clarification). Also, the word "test" has been corrected to "toy" in the third sentence.

A9.7.6 *Section 8.18.7.1*—The text has been changed to correct errors in the procedure contained in the previous version of this section.

A10. RATIONALE FOR 2008 REVISIONS

A10.1 Jaw Entrapment

A10.1.1 *Section 4.39*—There have been product recalls in past years to address incidents of jaw entrapment. There have been additional incidents of jaw entrapment in toy products that did not rise to the level of a recall. All but one incident involved entrapment in a handle or steering wheel. When a child's jaw becomes entrapped in a product, there is potential for damage to teeth and gums, long term orthodontic consequences and impairment of normal speech development. Most cases of jaw entrapment involve children less than 18 months of age. (See Fig. A10.1 and Table A10.1, and Table A10.2.) There is no incident data indicating handles that are connected to the toy with a hinge and handles made from a pliable material (for example, straps and ropes) pose a risk of jaw entrapment.

A10.1.2 *Anthropometric Data*—The April 1966 study titled "Selected Facial Measurements of Children for Oxygen-Mask Design"[24] provides very useful anthropometric data.

A10.1.2.1 To provide protection for children up to the age of 18 months:

Width—Using the maximum estimated stomion-menton dimension and rounding up, indicates the gauge should be 3.8 cm (1.5 in.) in width.

Length—The 95th percentile mouth breadth for 2 to 3.5 year olds (the youngest age available) is 3.8 cm (1.5 in.) from Childata (see Table A10.3 and Table A10.4). One inch was added resulting in the 2.5 in. length. A safety factor of 2.54 cm (1 in.) was used for mouth breath since the anthropometric data is based on a mouth at rest, and a mouth can be expected to stretch significantly from this position. Alternately, the lip length dimensions above can be used to arrive at the same estimate, rounding up, of 6.35 cm (2.5 in.).

A10.1.2.2 To provide protection against the youngest user becoming entrapped:

Width—A gauge width of 1.9 cm (0.75 in.) was chosen based on the minimum stomion menton distance for a 1 month old.

Length—The small jaw breadth of 1.9 cm (0.75 in.) is based on the 5th percentile 2 year old mouth breadth which is 2.54 cm (1.0 in.), so to be conservative 75 % of that was used.

A10.1.2.3 The task group considered adding a requirement as suggested at the meeting that the scope only cover handles and steering wheels that are able to be placed in the mouth, or would be teethable. The task group considered this suggestion and determined that this modification would not be made since incident data demonstrated that some products created jaw entrapment without the need for the child to place the product in his/her mouth (for example, the child's jaw was entrapped without the need for the child to introduce the handle end of the push toy into the mouth).

A10.1.2.4 The task group considered adding simulated teeth to the gauge. The task group concluded that the addition of teeth was not advisable because the incidents being addressed involved entrapment of the child's jaw. The teeth of the child may have influenced the resulting entrapment; however, the proposed requirement accounts for the presence of the teeth. Also, for a very young child the dimensions of the teeth are variable, since the teeth are just erupting.

A10.1.2.5 The task group added a depth of greater than 1.3 cm (½ in.) to both gauges to clarify that this is a three

[24] Young, J. W., "Selected facial measurements of children for oxygen-mask design," AM 66-9, AM Rep., 1966, Apr: 1-11.

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dimensional test. The depth of 1.3 cm (½ in.) was chosen based on dimensions of products known to be associated with jaw entrapment and the need for only a small portion of the child's jaw to be introduced into the space of the incident products.

A10.2 Folding Mechanisms and Hinges

A10.2.1 *Section 4.13*—The scope of this section has been modified such that the requirement is not limited to toys intended to support the weight of a child. Hinges can present potential pinch hazards regardless of whether the toy is intended to support the weight of a child. Examples and exclusions were reinstated from the previous version of this standard.

A10.3 Locking Mechanisms

A10.3.1 *Sections 8.26.1 and 8.26.2*—The requirements for single- or double-action locking mechanisms are based on Consumer Safety Specification F406. This requirement is intended to ensure that children will not be able to unlock a locking device on their own—a caregiver will be required to unlock the locking device. The requirement for a 45-lbf test on the locking mechanism is based on Consumer Safety Specification F404. An exemption for the 45-lbf test was added for products where the direction of the sitting load works against the direction of collapse of the folding mechanism. The requirement has also been modified to require that locking mechanisms or other means engage automatically to protect children who set up the product on their own. Reference to safety stops has been deleted because safety stop was not defined.

A10.4 Yo Yo Elastic Tether Toys

A10.4.1 *Section 4.37.2*—Sports balls are exempt from the Yo Yo Ball requirements, since these requirements were not intended to address this type of product. The work group agreed it will clarify the standard if we specifically exempt them.

A10.5 Impaction Hazards

A10.5.1 *Section 4.32.2:*

A10.5.1.1 This section has been developed to address products intended for children under 48 months of age that meet specific dimension criteria such that they produce a fall-on impaction hazard. This revision is based on incident data provided by the CPSC involving objects that are long enough to be pushed into the mouth, probably past the uvula in a fall-on incident, and large enough to prevent or inhibit removal, even by an adult caregiver. Products less than 2.25 in. (the length of the small parts cylinder) in length are excluded as are products less than 15 mm in diameter. These exemptions are based on the dimensions of products in the incident data. Flexible items are exempt because the flexible end assures they will not create a fall-on impaction hazard.

A10.5.1.2 The impaction hazard addressed by 4.32.2 is different from the hazard associated with preschool play figures addressed in 4.32.3. The preschool play figures were associated with seven deaths by choking and one incident resulting in serious injury. The incidents involved children under the age of 2 with one exception which involved a developmentally delayed child. In addition there were other choking incidents with the preschool play figures that did not result in significant injury.

A10.5.1.3 The distance to the undercut is based on the dimensions of the small ball test fixture.

A10.5.1.4 The age grade of the product associated with the 2 most recent fatalities was 3+, so this requirement applies to products intended for children under 48 months of age to address the known incident data (ages of victims: 7 mo., 9 mo., 13 mo., 13 mo., 19 mo., 22 mo., 2 yr., 2 yr., 4 yr with severe developmental delay).

A10.5.1.5 There is no force associated with this test because the test is not intended to simulate an actual impaction incident. Rather, it is designed to identify the size and shape of products associated with these incidents.

A10.5.1.6 The supplemental gauge is used to identify the size and shape of objects associated with incident data and is not related to the size of the child for these incidents. Similarly, the 1.1 lb exemption is related to the weight of objects associated with this type of hazard, not the strength capabilities of children.

A10.6 Sound Producing Toys

A10.6.1 *Section 4.5.1.3*—This section contains acoustic requirements that are being interpreted by some laboratories is such a way to fail safe push/pull toys. The requirement needs to be changed for the following reasons:

(1) The standard states in 4.5 that the requirements apply to "toys that are designed to produce sound." Further to this, the intent of the section is to apply the sound pressure level requirements to those features of the toy designed to produce sound. During the pass-by test for push/pull toys, the contact between the wheels of the product and the test surface will produce a continuous sound that will significantly contribute to the overall sound pressure measurement. The tester will be unable to distinguish between the contributions to the overall sound level made by the wheels versus those made by the mechanism designed to produce sound. Therefore, a true measurement of the intended continuous sound producing mechanism cannot be achieved by the methodology given in the standard.

(2) Among other factors, the levels in the standard are based on a use distance of 25 cm (do not confuse this with the measurement distances specified in the standard). The distance from the noise producing mechanism to the ear of the child on the push/pull toys discussed here would be much greater than 25 cm. Because the relationship between sound pressure level and distance follows the inverse square law, an increase in the distance from the sound mechanism to the ear of the child would reduce the sound pressure level at the ear of the child dramatically. The risk of hearing loss would be reduced to such an extent as to make it insignificant.

(3) It is implausible that a child could sustain the maximum speed at which the push/pull toy is tested (2 m/s). The speed represents a "worst-case" condition that would only be achievable momentarily at best. This supports regulating against immediate, acute hazards such as impulsive sounds versus

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chronic hazards that are presented by exposure to long-term, excessively loud continuous sounds.

A10.6.2 In addition, the proposed change would further harmonization between this standard and the European toy standard EN 71-1.

A10.7 Magnets

A10.7.1 *Sections 4.38, 5.17, and 8.25*—These sections were revised to account for the incidents (ingestions) due to magnetic components that were small parts and to reflect the age of the children involved with the incidents. It also introduces the special use and abuse requirements to avoid magnets from detaching from magnetic components during play.

A10.8 Toy Chests

A10.8.1 *Deletion of Sections 4.27, 6.2, 7.2, and 8.14*—Toy chests are considered as children's furniture and have their own set of safety requirements that are already covered in Consumer Safety Specification F834.

NOTE A10.1—The section numbers above refer to the previous version of the standard; the subsequent sections have been renumbered in the current version.

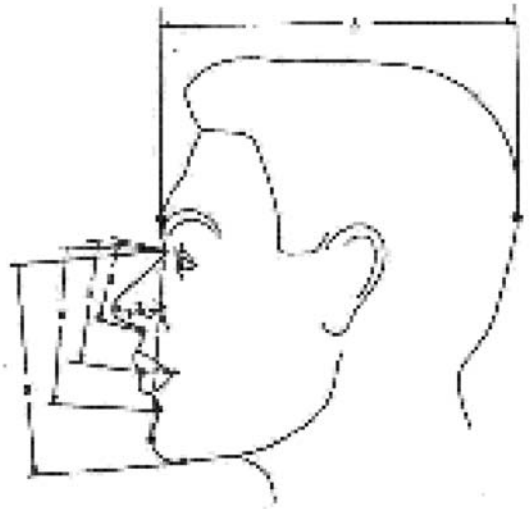


Figure 1. Locations of head and face measurements established by anatomical landmarks (side view).

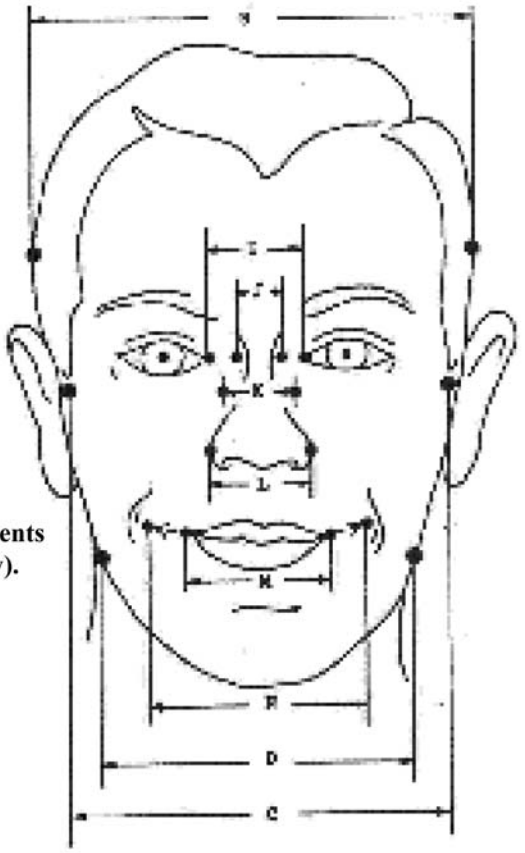


Figure 2. Locations of head and face measurements established by anatomical landmarks (front view).

NOTE 1—
F. Nasion-Stomion Distance: The distance between the nasal root depression and the point of upper and lower lip intersection.
H: Nasion-Menton: This measurement, taken from the nasal root depression to the lower point on the chin, defines total face height.
M: Lip length, normal: A bilateral measurement (bichelion diameter) of distance between the external corners of the mouth. This measurement is taken with all facial muscles relaxed.
N: Lip length, extended: A bilateral measurement (bichelion diameter) of maximum distance between the corners of the mouth in a condition of voluntary extension using muscles of facial expression.

FIG. A10.1 Facial Measurements

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TABLE A10.1 Facial Measurements (in Inches)

Age	# children[A]	Mean Nasion-menton distance[B]	Range Nasion-menton distance	Mean Nasion-stomion distance[C]	Range Nasion-stomion distance	Estimated mean stomion-menton distance	Estimated minimum stomion -menton distance	Estimated maximum stomion -menton distance
1 mo	20	2.36	2.28-2.72	1.58	1.46-1.69	0.78	0.82	1.03
6 mo	20	2.77	2.56-2.95	1.61	1.54-1.73	1.16	1.02	1.22
1 yr	20	2.85	2.68-3.03	1.76	1.69-2.13	1.09	0.99	0.90
2 yr	20	3.14	3.03-3.27	1.98	1.81-2.17	1.16	1.22	1.10
3 yr	20	3.37	3.15-3.66	2.05	1.89-2.20	1.32	1.26	1.46
4 yr	20	3.41	3.19-3.58	2.08	1.57-2.20	1.33	1.62	1.38
5 yr	31	3.49	3.23-3.78	2.16	2.05-2.40	1.33	1.18	1.38
6 yr	91	3.6	3.11-3.98	2.23	2.01-2.56	1.37	1.10	1.42

[A] Per the author, sex distribution was reasonably constant across age groups; no sex distinction was made in groups 1 month through 4 years.
[B] From nasal root depression to the lower point on the chin (a measure of face height).
[C] From nasal root depression to the intersection of the lips.

TABLE A10.2 Lip Length, in Inches

Age	# children[A]	Lip Length, Normal		Lip Length, Extended, extrapolated base on percentage increase in lip length for older children, or 50 % increase over largest normal lip length
		Mean	Range	Maximum
1 mo	20	1.08	0.98-1.26	1.89
6 mo	20	1.09	0.95-1.34	2.01
1 yr	20	1.28	1.14-1.5	2.25
2 yr	20	1.18	0.98-1.5	2.25
3 yr	20	1.38	1.22-1.57	2.35
4 yr	20	1.49	1.26-1.69	2.54

[A] Per the author, sex distribution was reasonably constant across age groups; no sex distinction was made in groups 1 month through 4 years.

TABLE A10.3 Mouth Breadth[A]

Age	Sex	N	Mean (cm)	Sd	5th%ile cm (inch)	95th%ile cm (inch)
2-3.5	Mf	75	3.30	.40	2.70 (1.0)	3.80 (1.5)
3.5-4.5		71	3.40	.40	2.80 (1.1)	3.90 (1.5)

[A]From Appendix B, Childata, The Handbook of Child Measurements and Capabilities Data for Design Safety Department of Trade and Industry.

TABLE A10.4 Mouth Opening[A]

Age	Sex	N	Mean (mm)	Sd	Min	max
3	M	49	36.0	5.39	22	47
4	M	67	37.3	5.47	22	52
5	M	56	39.9	4.02	27	47

[A]From Appendix B, Childata, The Handbook of Child Measurements and Capabilities Data for Design Safety Department of Trade and Industry.

A11. RATIONALE FOR 2011 REVISIONS

A11.1 Certain Toys with Nearly Spherical Ends

A11.1.1 *Section* 4.32*:*

A11.1.1.1 The requirements of 4.32.2 do not apply to certain tethered components as specified in the exclusions because the weight of the product and the limited length of the tether make it highly unlikely for the fastener to pose an impaction hazard. Further, the absence of injury data associated with such tethered fasteners justifies this exclusion.

A11.1.1.2 Following are examples provided and suggested interpretation as to whether these shapes fall within the scope of 4.32.2 of Consumer Safety Specification F963. These interpretations assume that the dimensions of the part and age grade of the product are such that it falls within the scope of 4.32.2.

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Requirements of 4.32.2 apply to this domed peg, even if the very center of the head is flat or has a through hole.



Requirements of 4.32.2 do not apply to this mallet since it is not a nail, screw, peg, or bolt.



The requirements of 4.32.2 do apply to this item because the end is domed.



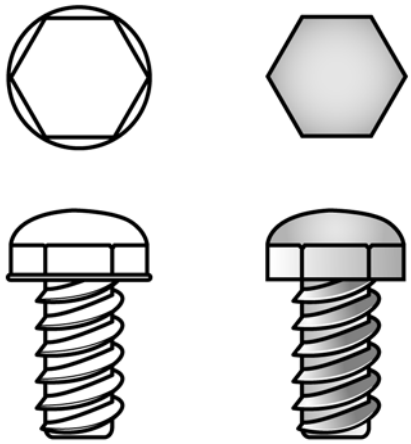
Requirements of 4.32.2 do not apply to these toy fasteners because the end is not spherical, hemispherical or domed. The end is flat across the top.



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The requirements of 4.32.2 do apply. These are toy bolts with domed tops.



A11.2 Test for Stability of Ride-On Toys or Toy Seats

A11.2.1 *Subsection 8.15.4*—To distinguish between the load placement for fore and aft stability and sideways stability. With the current test methodology, some laboratories and auditors have mistakenly taken the requirements in this subsection to mean both fore and aft stability and also sideways stability. Subsection 8.15.4 states, "The center of gravity of the load for all ride-ons shall be secured both 1.7 in. (43 mm) rearward of the front-most portion of the designated seating area and 1.7 in. (43 mm) forward of the rearmost portion of the designated seating area (note: two separate tests). If there is no designated seating area, the load shall be placed at the least favorable position that it is reasonable to anticipate that the child will choose to sit."

A11.2.1.1 As you can see, 8.15.4 only addresses fore and aft stability. Additional rationale can be found in the original test methods from the Voluntary Product Standard PS 72-76. In Section 4.15.1.1 (d) it states, "The load shall be applied so that its center of gravity lies in a true vertical 6 inches above the center of the seat." In Section 4.15.2 it states, "The load shall be applied in the least favorable position on the seat for each direction."

A11.3 Abuse Testing

A11.3.1 Table 5—Table 5 is specifically written to address the drop test, which is a subsection of impact testing. Table 5 is written to address the drop test. This is a technical correction to the table.

A11.4 Test for Overload of Ride-On Toys and Toy Seats

A11.4.1 *Section 8.28*—There is no test method currently specified for overload therefore this test method is being proposed and it is consistent with the way independent test labs have been performing the test.

A11.5 Stability and Over-Load Requirements

A11.5.1 *Section 4.15*—Wherever "seat" appears in this section, it has been changed to "toy seat" and a definition for toy seats has been developed. The issue is that furniture is exempt from Consumer Safety Specification F963, however, toys that are their counterparts are covered. It can be difficult to discern between a toy seat and a piece of children's furniture. Therefore, these changes are proposed to clarify that the scope of this standard only applies to toy counterparts of furniture and juvenile products.

A11.6 Plastic Film

A11.6.1 *Section 4.12*—This section applies to "flexible plastic film bags and flexible plastic sheets used as packaging materials for shelf packages or used with toys." The title refers to packaging film but the requirement refers to plastic film used with toys. The wording was changed to clarify the scope of the requirement. Also deleted part of the test method section, which is already covered by the requirement section.

A11.7 Teethers and Teething Toys, Rattles, and Squeeze Toys

A11.7.1 *Sections 4.22, 4.23, and 4.24*—The change to exempt soft-filled (stuffed) toys from the rattles, squeeze toys and teethers sections is being made to be consistent with exemptions found in: 16 CFR 1510, Rattles; EN-71, Clause 5.8, Shape and Size of Certain Toys; and with Consumer Safety Specification F963, Section 4.32, Certain Toys with Nearly Spherical Ends. However, if a stuffed toy contains an internal rigid component (rigid is defined in Consumer Safety Specification F963 as material with a hardness >70 Shore A scale durometer) then the gauges would be applied. If the rigid internal component does not penetrate the full depth of the gauge(s), the toy would PASS. If the rigid internal component does penetrate the full depth of the gauge(s) the toy would FAIL if the major dimension of the rigid component is >1.2 in. (30 mm) or would PASS if the major dimension of the rigid component is <1.2 in. (30 mm). The rigid internal component requirements harmonize with the requirements of EN-71, Clause 5.8.

A11.8 Jaw Entrapment in Handles and Steering Wheels

A11.8.1 *Section 4.39*—There have been product recalls in past years to address incidents of jaw entrapment. There have been additional incidents of jaw entrapment in toy products that did not rise to the level of a recall. All but one incident involved entrapment in a handle or steering wheel. When a

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child's jaw becomes entrapped in a product, there is potential for damage to teeth and gums, long term orthodontic consequences and impairment of normal speech development. Most cases of jaw entrapment involve children less than 18 months of age. (See Fig. A10.1, Table A10.1, and Table A10.2.) There is no incident data indicating handles that are connected to the toy with a hinge and handles made from a pliable material (for example, straps and ropes) pose a risk of jaw entrapment.

A11.8.2 *Anthropometric Data*—The April 1966 study titled "Selected Facial Measurements of Children for Oxygen-Mask Design"[24] provides very useful anthropometric data.

A11.8.2.1 To provide protection for children up to the age of 18 months:

Width—Using the maximum estimated stomion-menton dimension and rounding up, indicates the gauge should be 3.8 cm (1.5 in.) in width.

Length—The 95th percentile mouth breadth for 2 to 3.5 year olds (the youngest age available) is 3.8 cm (1.5 in.) from Childata (see Table A10.3 and Table A10.4). One inch was added resulting in the 2.5 in. length. A safety factor of 2.54 cm (1 in.) was used for mouth breath since the anthropometric data is based on a mouth at rest, and a mouth can be expected to stretch significantly from this position. Alternately, the lip length dimensions above can be used to arrive at the same estimate, rounding up, of 6.35 cm (2.5 in.).

A11.8.2.2 To provide protection against the youngest user becoming entrapped:

Width—A gauge width of 1.9 cm (0.75 in.) was chosen based on the minimum stomion menton distance for a 1 month old.

Length—The small jaw breadth of 1.9 cm (0.75 in.) is based on the 5th percentile 2 year old mouth breadth which is 2.54 cm (1.0 in.), so to be conservative 75 % of that was used.

A11.8.2.3 The task group considered adding a requirement as suggested at the meeting that the scope only cover handles and steering wheels that are able to be placed in the mouth, or would be teethable. The task group considered this suggestion and determined that this modification would not be made since incident data demonstrated that some products created jaw entrapment without the need for the child to place the product in his/her mouth (for example, the child's jaw was entrapped without the need for the child to introduce the handle end of the push toy into the mouth).

A11.8.2.4 The task group considered adding simulated teeth to the gauge. The task group concluded that the addition of teeth was not advisable because the incidents being addressed involved entrapment of the child's jaw. The teeth of the child may have influenced the resulting entrapment; however, the proposed requirement accounts for the presence of the teeth. Also, for a very young child the dimensions of the teeth are variable, since the teeth are just erupting.

A11.8.2.5 The requirement was modified to clarify the gauges shall pass completely through the opening. The gauge depth was modified from the original requirement of greater than ½ in. to the present requirement of 1 in. When passing the gauge through the opening, a depth shall be specified to assure the test results are consistent.

A11.9 Strings and Lines for Flying Devices

A11.9.1 *Subsection 4.14.4*—EN 71-1 (Clause 4.13) and ISO 8124-1 (Clause 4.11.7) both use "resistance" instead of "resistivity." Resistance = resistivity × length/area, therefore, this change is being made for consistency. Also, the units have been corrected to ohms per centimeter (Ω/cm).

A11.10 Heavy Elements

A11.10.1 *Subsections 4.3.5 and 8.3:*

A11.10.1.1 The soluble approach for determination of heavy elements in toys and toy components has been selected over total element limits as this has been demonstrated to be more closely correlated with the amount of element which is bioavailable, and therefore with risk of toxicity. These requirements (and test methods) and this rationale have been based on requirements from the European Union toy safety standard EN 71-3:1994/AC:2002 (and International Organisation for Standardisation standard ISO 8124-3:2010). The option of a total element screening method has been provided as a means of reducing testing cost burdens, but is not to be interpreted as an endorsement of a total element limit over a soluble limit. It is simply faster and more cost-effective in most situations to measure total element content (since total lead content shall be measured, the other elements can often be measured in the same instrument run, and as soluble element content can never exceed the total amount present, this frequently provides a more convenient method for confirmation of compliance). The determination that a metallic small part exhibiting a total cadmium content less than the soluble limit of 75 ppm can be considered to also be compliant with the 200 µg soluble cadmium requirement in the 24-hour extraction test is based on data and other information on the solubility of cadmium from cadmium-containing materials and products, such as the CPSC's Staff Report on Toy Standard Test Methods with Data from Testing Metal Jewelry and Other Materials, August 2010 (available online at page 45: http://www.cpsc.gov/PageFiles/96192/cadmiumtoy.pdf).

A11.10.1.2 The scope is intended to indicate an approach to the decision of what toys, or toy components are excluded from the standard because of characteristics that render them unlikely to present a risk of injury by the ingestion of materials containing the toxic elements.

A11.10.1.3 Toys and toy components that are accessible to the child during play are subject to these requirements unless otherwise indicated. Some materials such as metal, glass, and ceramic are exempted if they are not small parts.

A11.10.1.4 Unless included in a toy, modeling clays, which are covered in the EN 71-3 requirements for heavy metals are not covered in these heavy metals requirements because they are already exempt from Consumer Safety Specification F963 as indicated in 1.4 and subject to the federal requirements of LHAMA.

A11.10.1.5 The list of excluded materials is based on the regulatory exclusions provided by the U.S. Consumer Product Safety Commission (CPSC), specified at 16 CFR 1500.91, in implementation of the requirements for lead in substrates and lead in paint under Section 101 of the Consumer Product Safety Improvement Act (CPSIA) of 2008. In addition, while

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EN 71-3:1994 + AC:2002 includes test methods for paper and paperboard, given the exemption for paper and paperboard, test methods specific to these materials have not been included here. It is the intention that ASTM F963 – 11 (except for the additions of the CPSIA-mandated total lead limits and the 24-hour migration test for metallic small parts) not require additional testing beyond that required by EN 71-3:1994 + AC:2002. It is also intended that ASTM F963 – 11 mirror regulatory exemptions from testing provided by the US CPSC to the full extent that such are applicable, and to have any future expansions of CPSC exemptions automatically incorporated into ASTM F963.

A11.10.1.6 Sections 8.3.2 – 8.3.6 provide a test procedure and manner of interpretation of results for solubility testing.

A11.10.1.7 As in EN 71, solubility testing is called for in the proposed ASTM standard. However, note that as described in 8.3.6, an alternative approach may be used if validated per specified requirements.

A11.10.1.8 Component parts and materials may be separately tested and certified.

A11.11 Yo Yo Elastic Tether Toys

A11.11.1 *Sections 4.37 and 8.24*—The task group concluded that the mass on the end of the tether was significant in creating the strangulation potential of a yo yo elastic tether toy. The risk of strangulation appears much lower for products with very light ends compared to the yo-yo type balls as seen on the market in 2003 with end weights of 65 to 85 g (0.14 to 0.19 lb). The lightweight end results in very slow rotational speed when swung overhead and there is much less recoil capacity of the tether due to significantly lower loading during rotation. Additionally, the lightweight "sticky hand" variety of yo-yo elastic tether toy had market presence, prior to 2003, with no reports of near-miss strangulation or other similar incident. The mass was determined by weighing product known to be associated with wrapping around the neck incidents. Yo yo elastic tether toy samples evaluated weighed 0.10 kg (0.2 lb), 0.07 kg (0.15 lb), and 0.07 kg (0.15 lb). The weight of four "sticky hand" variety of yo-yo elastic tether toys (hand portion only) was 0.005 kg (0.01 lb) 0.008 kg (0.02 lb), 0.009 kg (0.02 lb) and 0.012 kg (0.03 lb). The appropriate value for the mass at the end of the tether was chosen to be between these values, 0.02 kg (0.04 lb).

A11.11.1.1 The cord length is based on two times the neck circumference of a 5th-percentile 3-year-old from Childata, or 2 × 24.0 cm = 48 cm (18.9 in.). The age of 36 months and over was chosen based on the age of children involved in the incident data.

A11.11.1.2 The rotational speed of 80 RPM was determined by testing adults and determining the maximum RPM they can achieve rotating a product above their heads. The range of adult speed was 80 – 108 RPM, the average was 90 RPM and the standard deviation was 7 based on a sample size of 14. This was reduced to 80 RPM as an estimate for the speed children 36 months and over but under 72 months of age can achieve. The incident data indicated that children 36 months and over but under 72 months of age are most often involved in yo yo elastic tether toy incidents.

A11.11.1.3 The use of a cam with a variable speed drill assists in spinning the toy in the air. Specification of a cam length is required in order to achieve consistent results across laboratories, given that the length affects the load on the tether during rotation. The objective was to employ as short a length as possible, but one that would facilitate clamping and rotation of the toy. A 3 cm (1.18 in.) cam length was identified as one that adequately met both objectives.

A11.12 Miscellaneous

A11.12.1 *Sections 1.4 and 3*—For clarification, juvenile products, constant air inflatables, powered and no-powered scooters have been added to the list of products which are not covered by the toy standard. Definitions for juvenile products and constant air inflatables have been added to the terminology section.

A12. RATIONALE FOR 2016 REVISIONS

A12.1 Microbiological Safety

A12.1.1 The purposes of changes to 3.1.20, 4.3.6, and 8.4 are as follows:

A12.1.1.1 To more clearly specify which products are subject to microbiological cleanliness testing.

A12.1.1.2 To provide additional test protocol options for microbiological cleanliness testing; the CTFA Microbiology Guidelines were chosen as an additional test protocol because they are designed specifically for cosmetic products, which are more similar to most of the relevant materials found in toys than are pharmaceuticals, for which the USP protocols were developed.

A12.1.1.3 To extend cleanliness testing to feather products, as they may potentially exhibit high microbial loads or the presence of pathogens, or both.

A12.1.1.4 To clarify the microbiological requirements for process water.

A12.1.1.5 To specify acceptable microbial loads for various product categories.

A12.1.1.6 To specify pathogens which shall be found to be absent for various product categories.

A12.1.1.7 To clarify how and specify a method by which formulations are to be evaluated to determine the need for microbial challenge testing and thus which products shall be tested.

A12.1.1.8 To provide additional test protocol options for microbial challenge testing; the CTFA Microbiology Guidelines were chosen as an additional test protocol because they are designed specifically for cosmetic products, which are

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more similar to most of the relevant materials found in toys than are pharmaceuticals, for which the USP protocols were developed.

A12.1.1.9 To specify a minimum standard set of organisms to be utilized for microbial challenge testing.

A12.1.1.10 To more clearly specify sampling intervals and evaluation criteria for microbial challenge testing.

A12.2 Projectile Toys

A12.2.1 *3.1.62 Projectile*—Apart from the types of toys excluded in the definition discussion, this definition includes any object that has the capacity for self-propulsion from a self-contained compressed gas or liquid, or both, (for example rockets) or other device (for example, a spring) embedded within the projectile that provides propulsion regardless of the duration.

A12.2.2 Historically, the two primary potential hazards associated with projectile type toys have been projectiles discharged into the mouth creating a choking hazard and eye injuries caused by projectiles striking the eye. Both of these hazards can exist with launch mechanisms with stored energy due to the potential for an unexpected discharge of the projectile. In contrast, only eye injury potential is the primary concern with non-stored energy/user dependent discharge mechanisms even though they may incorporate a mechanism or design feature that imparts kinetic energy to the projectile but only after a user initiated action. It is this inability of non-stored energy/user dependent mechanisms to fire unexpectedly that exempts them from requirements such as small parts or improvised projectiles. When evaluating a discharge mechanism to determine whether or not it can store energy, the test criteria is if energy can be put into the mechanism and will remain for a period of time. For example, an action figure that utilizes a spring in compression to fire a spear would be considered a launch mechanism with stored energy if the spring remained in compression after the force to compress the spring is removed. In contrast, it would be considered a launch mechanism without stored energy if the spring returned to its relaxed/natural state as soon as the compressive force is removed. Furthermore, projectile travel distance is not a factor that should be considered when distinguishing between stored energy and user dependent/non-stored energy launching mechanisms.

A12.2.2.1 A toy can be both the projectile and the discharge mechanism at the same time. For these type of toys, the discharge mechanism is a function of the materials (that is, polymer compounds, metals, etc.) used to construct the projectile. The user manipulates (twists, stretches, bends, squeezes, folds, etc.) the projectile to introduce potential energy into the projectile. After some period of time has elapsed, the projectile enters free flight without further action by the user when the potential energy is converted into kinetic energy by the action of the material returning to its original state. For purposes of this standard, these toys shall be considered as projectiles launched by a stored energy discharge mechanism. (Refer to Fig. A12.1.)

A12.2.3 Where the projectile is propelled by the user or by means of a discharge mechanism incapable of storing energy independent of the user, the kinetic energy of the projectile can be determined by the discharge mechanism and still be considered non-stored energy. Examples of non-stored energy discharge mechanisms include, but are not limited to, spring powered pump to fire mechanisms (with no trigger), bellows powered air systems (non-pressurized) and certain friction type launchers where the user forces the projectile through a constricted opening either manually or with mechanical assistance (that is, using a lever). Friction type launchers (commonly known as c-clip launchers) are a unique mechanism in that by their very design and material type can store energy. However, for purposes of this standard, friction type launchers that cannot launch a projectile without an input force provided by the user are considered launch mechanisms without stored energy. For example, this can be determined by observing the seated position of the projectile and the action required by the user to launch the projectile in the following examples of a friction type launchers shown in Fig. A12.2 and Fig. A12.3.

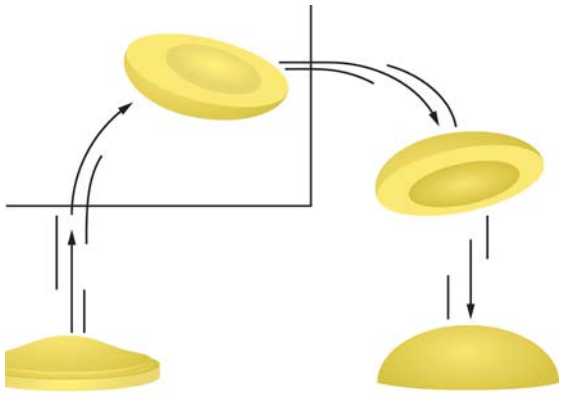


FIG. A12.1 Toy that is Both a Projectile and Stored Energy Discharge Mechanism

A12.2.4 *4.21 Projectiles*—The reference to “not applicable to sling shots and sharp pointed darts” that has appeared in previous versions of 4.21 of this standard has been intentionally deleted since this text is redundant. These products are specifically excluded under the Scope (1.4) of this standard.

A12.2.5 *Section 4.21 Exemption for Ground-Based Types of Toys*—By definition, projectiles are intended to be launched into free flight; this exemption is intended to address those toys or components of toys that may travel through the air as part of the intended play pattern, but are not considered projectile toys and do not present the same hazard. Additional text added to the examples to provide further clarification. The change in the wording from “projectiles” to “toys or toy components” will align this exemption with the corresponding one in ISO 8124-1:2014.

A12.2.6 *4.21 Exemptions for Projectiles that Travel Less than 300 mm*—To facilitate efficient and accurate testing, many laboratories have created timing devices consisting of two gates or “screens” constructed with a fixed separation distance of 300 mm. These devices are used to measure the speed of the projectile. Measuring the speed of projectiles with a launch distance less than 300 mm can be time consuming and difficult. In general, projectiles having a launch distance less than 300

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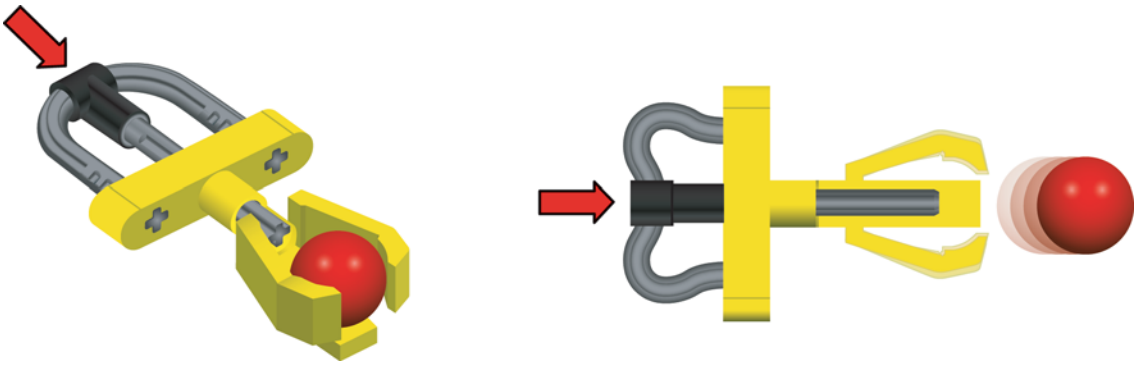


FIG. A12.2 Manually (push) Activated Non-stored Energy Launcher Showing Projectile Seated in C-Clip and After Release

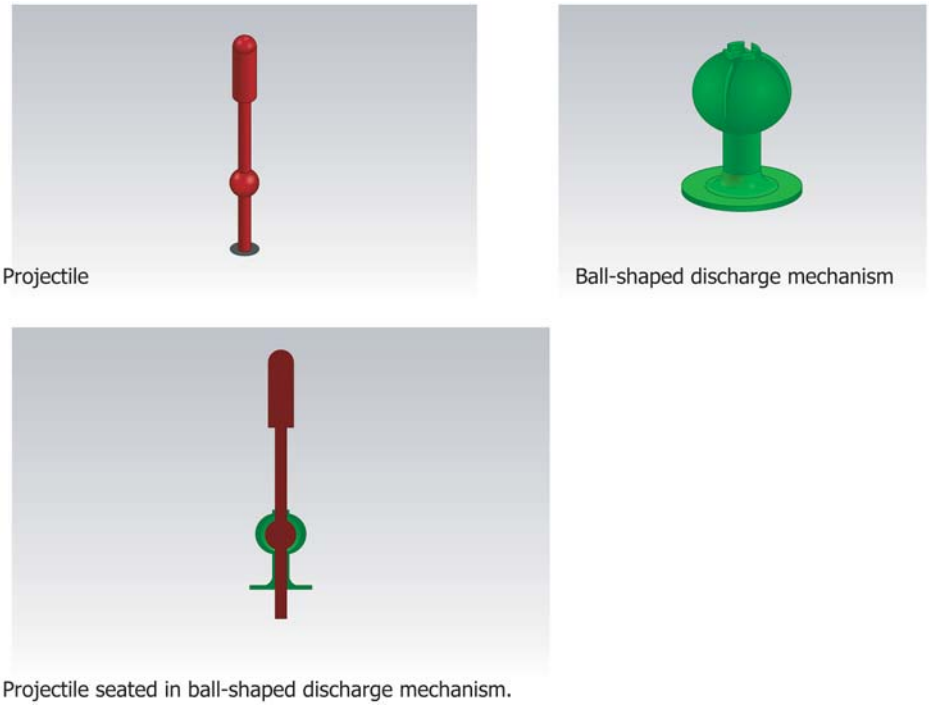


FIG. A12.3 Manually Activated Non-stored Energy Launcher

mm are not considered to possess sufficient energy to pose a risk of injury and are therefore exempt with exceptions as noted below.

A12.2.6.1 One exception to this exemption addresses small part projectiles discharged by stored energy launch mechanism. A more conservative approach was taken which limits the travel distance of these projectiles to a maximum of 100 mm (approximately 4 in.). These projectiles would most commonly be seen on play sets where an initial action triggers the release of projectile(s) (for example, boulders, car parts, etc.) that travel relatively minor distances. Play sets such as these have been sold without history of injury.

A12.2.6.2 A second exception to the 300 mm exemption was made for projectiles with suction cup tips. As discussed below in 4.21.1.2 and 4.21.1.3, the fatal incidents involving projectiles with suction cups were not related to the launch distance. Therefore, the length requirement always applies regardless of travel distance and launch mechanism – stored energy or non-stored energy.

A12.2.6.3 Other than as noted above, projectiles that travel 300 mm or less are exempt from the requirements of 4.21.1.1 regardless of the type of launch mechanism. The decision to create this exemption is based on the available data that indicates that there have been no known injuries related to projectiles that travel this distance or less when used in their intended manner.

A12.2.7 *4.21.1.1 Leading Edge Assessment of Projectiles*— Under the requirements of F963 – 11, Section 4.21.1.2 all rigid tip projectiles fired by stored energy launch mechanisms are subject to the 2 mm tip radius requirement; this provision was introduced in the F963 – 86$^{\varepsilon 1}$ version of the standard. The general nature of the radius requirement resulted in varying interpretations along with difficulty in performing the actual measurement. This revision to the standard requires that all projectiles regardless of the type of launch mechanism, that have rigid leading edges be assessed using the Tip Assessment gauge. The dimensions of the gauge are based on the 2 mm

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requirement and are intended to simplify the pass/fail determination. The rigid leading edges of projectiles on the market have radii ranging from 2 mm to flat. For those that have flat leading edges, it was determined that the corners adjacent to the flat leading edge that could reasonably be expected to strike the eye shall be smooth as well. In addition, for rigid tipped projectiles fired by stored energy launchers it was determined that the corner adjacent to the leading edge shall have a radius of at least 0.25 mm to "break" the edge.

A12.2.7.1 Fig. 15—The changes to the tolerances will result in a more conservative gauge at the extremes of the tolerances; that is, the shorter height and increased width which will remove the likelihood that potentially unacceptable/hazardous tips will not be identified due to the tolerance range. The original tolerances were selected to align with the projectile requirements in ISO 8124. The ISO Technical Committee is aware of the error and is taking steps to amend the tolerances in that standard.

A12.2.7.2 Corners on rigid tipped projectiles fired by non-stored energy launchers are not required to meet this requirement. This decision was based on experiences with certain brands of construction toys have used levered catapults and other non-stored energy launchers to fire millions of various building elements with "knob" designs as the leading edge without known injuries.

A12.2.8 *4.21.1.2 and 4.21.1.3 Projectiles with Suction Cups*—A search of the CPSC data on deaths associated with projectile toys revealed incidents where children choked to death on small, flexible, plastic darts with suction cup tips. From the description in the reports and the orientation of the dart when extracted, it appears that the majority of children were chewing on the dart when the incident occurred rather than firing the dart into their mouths. Based on the dimensional data provided on the darts, the vast majority appeared to be small parts and therefore would not meet the existing requirements. However, in at least one incident, the tip of the dart was nearly even with the top of the small parts cylinder. It was clear that none of the darts in question would have met the existing EN 71-1 length requirement of 57 mm. Therefore, the EN 71 requirement has been adopted in this standard. There were no similar incidents in the data involving darts with foam shafts. Darts with foam shafts have been sold in great numbers. Therefore, an exemption has been included for this type of construction.

A12.2.9 *4.21.1.1 Exemption for Small Parts of Foam Projectiles*—Foam used in projectiles is a lightweight material that lacks mechanical strength but is required for performance reasons. Due to this inherent weakness, foam will not consistently pass the torque and tension test requirements without creating small parts that may still be fired by the discharge mechanism. Failures are typically clamp induced. The available historical data does not indicate that there have been any fatalities or serious injuries associated with small parts from foam projectiles considering the billions that are with consumers.

A12.2.10 *4.21.2.2 Kinetic Energy (KE)*—For calculation purposes, the velocity measurement is being changed from the average of five trials to the maximum of five trials. This is to align the requirement in F963 with the calculation methods for projectiles in ISO 8124 Part 1:2014 and in EN 71 Part 1:2014.

A12.2.11 *4.21.2.3 Kinetic Energy Density (KED):*

A12.2.11.1 As noted previously, one of the primary concerns with projectiles is the potential for serious eye injury. For purposes of this standard, serious eye injuries are defined in order of increasing severity as hyphema, lens dislocation, retinal damage and globe rupture. These injuries usually require medical treatment. This standard is not intended to protect against corneal abrasion, which is the most common type of eye injury. Corneal abrasion injuries can be caused by incidental contact of the cornea by any object, including, for example, by being poked in the eye by a fingernail; foreign matter blowing into the eye; or even aggressively rubbing the eye. While medical treatment may be sought, the "injury" typically heals within a few days.

A12.2.11.2 The concept of kinetic energy density ("KED") was first introduced in a report published by the National Bureau of Standards in 1972. The purpose of the study was to determine if there was a parameter associated with projectile toys which may be used to evaluate their eye injury potential for hyphema. Twenty-two projectiles (mostly-rigid tipped) were fired at a human eye or a 25 Shore "A" rubber ball, or both, to determine the impact area. Key conclusions were:

(1) Kinetic energy density ("KED") is a predictor of whether or not a projectile will damage the eye.

(2) A value of KED that would not be expected to cause damage was calculated at 8000 J/m^2 based on the data from a study conducted by D. Weidenthal published in 1964.

(3) Based on the data analysis, the lowest value of KED for the toys deemed to be "unsafe" was slightly above 3000 J/m^2 based on the impact surface being a 25 Shore A rubber ball. Since the rubber ball absorbs energy on impact, converting the impact area to a hard wood surface would yield an equivalent KED value of 10200 J/m^2 for the actual projectile.[25]

A12.2.11.3 In 1975 this was followed by three studies performed by Bio-Technics Laboratories of Los Angeles, CA. The projectiles were a variety of foam tips attached to steel weights and steel weights alone dropped down a tube from different heights (49.4 cm and 59.4 cm) onto rabbit eyes. After impact the rabbits were checked at 5 minute, 1, 4, 16, 24, 48, and 72 hour intervals and graded for ocular reaction (conjunctivae, corneal injury, etc.). Key findings from all three studies were:

(1) At a KED of 5000 J/m^2 there were no observable reactions at after 72 hours (sample size 100 impacts).

(2) At a KED of 6012 J/m^2 there were two noticeable reactions (hematoma) remaining after 72 hours (sample size 100 impacts). In both instances the projectiles were the foam covered steel balls.

[25] Experiments were conducted by dropping a marble from different heights onto a 25 Shore A soft rubber ball and an oak board to compare impact areas. Since the KE was constant for each test height (0.05 J, 0.08 J, and 0.12 J), only the size of impact area varied. At 0.05 J the impact area of the ball on the oak board was 30 % of the impact area of the rubber ball; at 0.08 J, the impact area was 28 % of the impact area of the rubber ball, and at 0.12 J, the impact area was 30 % of the impact area of the rubber ball. Using an average of 29 %, KED of the impacts onto the oak board was approximately 3.4 times greater than onto the rubber ball (100/29=3.44).

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A12.2.11.4 When the concept of KED was introduced into EN 71 Part 1 it was only applied to arrows whose maximum kinetic energy exceeded 0.08 J. Arrows exceeding this KE value shall have their impact surface protected by a resilient material and their KED shall not exceed 1600 J/m^2 when tested according to the prescribed method.

A12.2.11.5 No formal rationale exists for why this value was selected. Members of CEN TC 52 provided the following as their recollections regarding how this value was arrived at: "It was derived by dividing the kinetic energy limit of 0.5 J for resilient tipped projectiles by the area of a resilient tip (typically a suction cup) of 3 cm^2 which gives a KED value of 0.16 J/cm^2 or 1600 J/m^2."

A12.2.11.6 Subsequently, ISO 8124 Part 1 adopted this same provision for arrows and also extended it to include projectiles. Note: The final draft of the revised projectiles requirements was approved in the Spring 2014, the KED limit will increase from 1600 to 2500 J/m^2 when it becomes effective. The rationale for recommending this change is based on the studies of individuals as outlined below.

A12.2.11.7 Beginning in 2005 through 2010, Stephan Duma, PhD, and various colleagues at the Virginia Tech-Wake Forest Center for Injury Biomechanics and Bucknell University published a series of research papers in various publications:

Determination of Significant Parameters for Eye Injury Risk from Projectiles, 2005 ("VT Study") Risk Functions for Human and Porcine Eye Rupture Based on Projectile Characteristics of Blunt Objects, 2006

Development and Validation of a Synthetic Eye and Orbit for Estimating the Potential for Globe Rupture Due to Specific Impact Conditions, 2007

Eye Injury Risk Functions for Human and Focus Eyes: Hyphema, Lens Dislocation and Retinal Damage, 2010: update July 2011 ("Army Study")

A12.2.11.8 Based on their statistical analysis of existing data from previous studies, literature searches and their own testing, the authors concluded that that mass and velocity individually are considered poor predictors of injury. However, their combination as kinetic energy ("KE") served as the most significant predictor of corneal abrasion and also an effective injury predictor for the internal structures of the eye. The drawback of KE as an injury predictor is that is does not factor in the projected contact area of the projectile. Their analyses confirmed the conclusions of the NBS Study and the Bio-Technics research that normalized energy or KED is the best predictor for the probability of eye injury caused by the impact of blunt objects. KED would not be an effective measure if the objects were sharp or threatened penetration or perforation of the eye. (Therefore, to prohibit projectile tips that are not sufficiently rounded, a cylindrical gauge test has been introduced that is based upon the 2 mm tip radius previously discussed in this rationale, 4.21.1.1 Leading Edge Assessment of Projectiles.)

A12.2.11.9 The 2010 publication by Doctors Stephan Duma and Eric Kennedy was the result of a study conducted for the US Army that included an expanded literature search as well as data gathered by firing various sized steel projectiles at an "eye"—an anthropometric head form with eyes that are instrumented with load cells to measure impact loads through the eye and surrounding tissue. Based on their data and analysis, the lowest KED value where injury (hyphema) occurred was 7000 J/m^2. This was the same value arrived at in the 2005 VT Study. Table A12.1 outlines the key findings from the Army Study and the VT Study.

A12.2.11.10 Based on the data from the Army Study, Dr. Duma has created a risk function for hyphema (see Fig. A12.4). The risk function was developed using survival analysis with a weibull distribution. The scale and shape parameter estimates were obtained using the maximum likelihood method. As noted in the table above, the projectiles were various rigid tipped metal shapes and there were no hyphemas observed at a value less than 7000 J/m^2. Since there was no injury data below a KED of 7000 J/m^2, the curve below this value is just an estimator of theoretical best fit.

A12.2.11.11 Dr. Duma was contacted by Hasbro to discuss KED values and their associated injury probabilities based on the findings of the Army Study. In Dr. Duma's opinion since the toys standard requires projectiles with a kinetic energy greater than 0.08 J to have a resilient tip:

(1) the probability of an injury (hyphema) at a KED value of 3000 J/m^2 is "extremely small."

(2) the probability of an injury (hyphema) at a KED value of 2500 J/m^2 is "effectively zero."

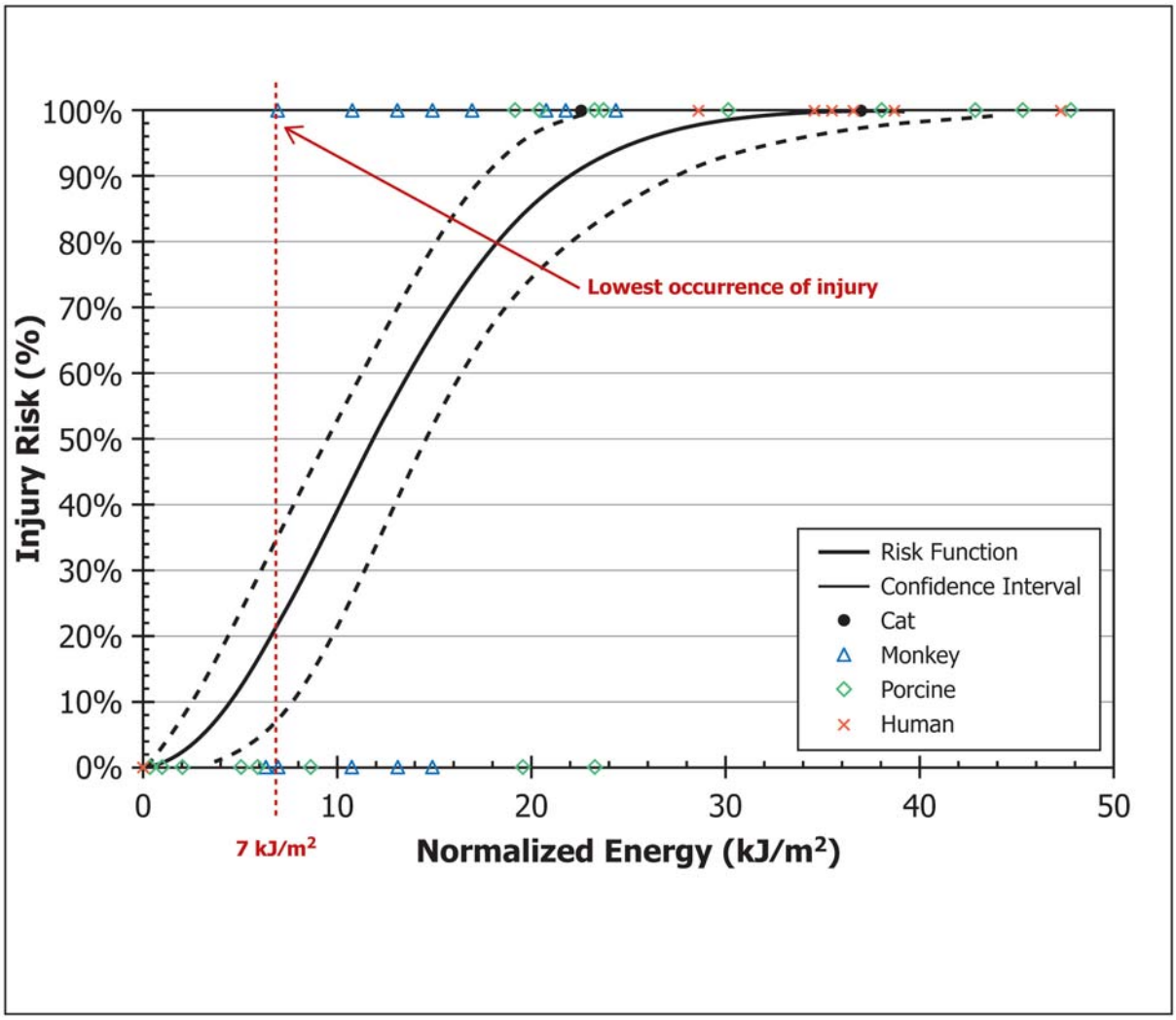
A12.2.11.12 Consequently, this more conservative value of 2500 J/m^2 has been selected for this standard.

A12.2.11.13 *Section 4.21.3.3*—Language added to be consistent with 4.21.2.3 which requires projectiles with a kinetic

TABLE A12.1

	Army Study – 2010/2011	VT Study – 2005
Source(s) of Data	Literature Search and Eye Impact Testing on FOCUS headform	Literature Search
Number of Data Points	251 – Literature Search plus data from impact testing with 4.5 mm diameter 296 – Impacts on FOCUS headform	104 – from 9 different studies
Data Analysis Technique	Logistical Regression & Survival Analysis	Logistical Regression
Type of Impact	Direct hit on open eye Rigid tipped	Direct hit on open eye Rigid tipped
Type of Projectile	Various including BB's, metal rods, other metal projectiles Steel spheres ranging in diameter from 3.2 mm to 17.5 mm (Impacts on Focus Head form)	Various including BB's, metal rods, other metal projectiles
Lowest value for KED where injury (hyphema) occurred	7000 J/m^2	7000 J/m^2

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NOTE 1—The vertical red dashed line at 7 kJ/m^2 has been added to the original graph to indicate that there is no hyphema injury data for rigid tipped projectiles below this value.

FIG. A12.4 Source: Eye Injury Risk Functions for Human and Focus Eyes: Hyphema, Lens Dislocation and Retinal Damage, 2010; Update July 2011 ("Army Study")

energy greater than 0.08 J that are launched by stored energy discharge mechanisms have a subsequent KED evaluation, with maximum KED of 2500 J/m^2. Without this change, the requirements for arrows discharged by bows will be more onerous. Typically, arrows with a low kinetic energy, will have a smaller impact surface, thus could potentially result in a technical failure of the 2500 J/m^2 requirement even though the kinetic energy is below 0.08 J threshold after which KED evaluation becomes applicable. Without this change, it will also require measurement of KED regardless of the kinetic energy. The original text was selected to align with the projectile requirements in ISO 8124. The ISO Technical Committee is aware of the omission and is taking steps to amend the requirements in that standard.

A12.2.12 *4.21.2.6 Improvised Projectiles:*

A12.2.12.1 Discharge mechanisms should be designed to minimize the ability to discharge any potentially hazardous improvised projectiles (for example, pencils, nails, stones) without modification by the user. If possible, the discharge mechanism and the intended projectile should be designed such that the loading interface is specifically designed to only accept the intended projectiles. This can be achieved by adding keyways peculiar to the projectile and matching the discharge mechanism or by specific design of the locking mechanism to hold the projectile in place prior to firing.

A12.2.12.2 It is recognized that manufacturers cannot determine every possible way in which a child may improvise a projectile from commonly available products but in order to facilitate the consistent interpretation of this requirement, a standard set of typical improvised projectiles has been specified. The standardized set of improvised projectiles is intended to represent such articles as pencils, nails, marbles, and coins and is based on (*1*) existing improvised projectile kits used by major laboratories (*2*) coin dimensions from numerous countries and (*3*) commonly available marbles/spheres. This set of improvised projectiles will also align F963 with the same requirements currently being balloted for inclusion in ISO 8124 Part 1.

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A12.2.12.3 Improvised projectiles that travel relatively minor distances would likely have little appeal to children. Therefore, discharge mechanisms that are unable to fire any of the specified improvised projectiles more than 300 mm are exempt from the requirement. This distance was considered to be very conservative in this application but was selected to align this exemption with the one mentioned above for trivial projectiles. It is not intended to imply that improvised projectiles with a launch distance greater than 300 mm should automatically be considered appealing to children or hazardous. In general, launch distance is one of numerous factors which should be considered in evaluating the ability of a discharge mechanism to fire an improvised projectile in a hazardous manner; typically the distance traveled by the improvised projectile will be less than the distance traveled by the intended projectile. Conversely, the time to load and the ease of loading the improvised projectile will be equal to or greater than the time and ease respectively, of the intended projectile.

A12.2.13 *4.21.3.3 Bow and Arrow Sets:*

A12.2.13.1 The requirements relating to arrows that are longer than 150 mm and are intended to be discharged by children, for example, in role play. For bows and arrows, the 150 N pull force is based on the 95th percentile pull force a 13 year old male child can apply, pulling from a standing position with one hand, on a door knob at a height of 1300 mm (reference: McClelland 1976, UK and Childata, UK Department of Trade and Industry, datasheet 151). The 70 cm maximum distance is based on the length of an arm (to grip) of a 13 year old male (reference: Childata, UK Department of Trade and Industry, datasheet 54).

A12.2.13.2 The specific requirements for bows and arrows in 4.21.3.3 are not intended to apply to bows and arrows that are miniature representations, for example those supplied with action figurines.

A12.2.14 *4.21.4 Rotors*—These design requirements are intended to address potential injuries from horizontally spinning rotors. Toys with unprotected rotors have been involved in injuries and product recalls. Toys that are designed to fly horizontally (for example, a rubber band powered airplane and remote controlled helicopters), do not present the same degree of hazard and are not within the scope of the projectile requirements. These same requirements are currently being balloted for inclusion in the projectile requirements for ISO 8124 Part 1.

A12.3 Expanding Materials

A12.3.1 This requirement is intended to reduce the risks related to certain toys which may expand significantly after being swallowed by a child, creating a gastrointestinal blockage or other serious condition. Fatal and potentially fatal incidents are reported to have occurred when children have swallowed such toys and other expanding household items such as beads used to retain water in flowerpots and floral arrangements.

A12.3.2 Consultations with medical experts yielded a consensus on two salient points:

A12.3.2.1 The pyloric sphincter at the lower end of the stomach, where it connects to the duodenum, is the limiting dimension of the gastrointestinal tract; that is, if objects small enough to be swallowed can pass through the pyloric sphincter after reaching maximal size, they are unlikely to create a blockage or other condition requiring medical or surgical intervention at any other point in the GI tract.

A12.3.2.2 The approximate maximum dimension of an object which will pass through the pyloric sphincter of an 18-month-old child is 20 mm; that is, the pyloric sphincter of a child of that age is able to expand to accommodate this dimension as well as to move it into the duodenum by peristaltic (muscular) action (the sphincter is a ring of muscular tissue).

A12.3.3 Consideration was given to aligning with the expanding toys requirements of EN 71-1 and ISO 8124-1, which fundamentally prohibit items that fit entirely within the small parts cylinder and which expand more than 50 % in any dimension in response to submersion in deionized water for 72 hours. While such a requirement would prohibit items (such as superabsorbent acrylic polymer spheres) known from incident data to be potential issues, it would also eliminate from the marketplace items (such as expanding sponges) which have been sold for many years without incident and do not appear to present the same risk of injury. The Working Group within ASTM Subcommittee F15.22 thus began consideration of an alternative requirement based on the known characteristics and dimensions of the human anatomy.

A12.3.4 The final requirement utilizes a gauge reflecting the 20 mm dimensions of the pyloric sphincter, and the test requirement incorporates a minimal force value to simulate the muscular action of the sphincter; the gauge is constructed of PTFE and the test is conducted while submerged to simulate the "wet" environment of the stomach. Consideration was also given to utilizing a dilute hydrochloric acid solution simulating the stomach environment, but testing determined that for a wide variety of expanding materials, the results either did not differ significantly from those obtained using deionized water, or in some cases (such as superabsorbent acrylic polymers), expansion was greater in deionized water than in dilute hydrochloric acid, and that deionized water thus would represent a more severe test.

A12.4 Magnets

A12.4.1 *New Definition: 3.1.48 – magnetic/electrical experimental sets*—There is no incident data to indicate that the exemption for "hobby & craft items" as defined in 4.38.3 (F963 – 11) had increased the risk associated with hazardous magnets or magnetic components. However, the introduction of a new definition for magnetic/electrical experimental sets would narrow the scope of products that could use the labeling exemption to only those products that combine magnetism and electricity such as electrical motors, loudspeakers, doorbells, etc. In addition, this change would more closely align the requirements in F963 with the requirements in ISO 8124 and EN 71.

A12.4.2 *Section 8.25.4:*

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A12.4.2.1 The magnet requirements apply to toys age graded to 14 years of age. Included within section 8.25.4 are a series of special magnet only tests. A number of these tests are the normal use and abuse tests referenced in the standard (8.7 – 8.10). However, the table that lists the various parameters for these tests only covers children up to 96 months of age. The purpose of Note 47 is to advise that the test parameters for the children from 36 months to 96 months shall be used when testing products for children over 8 years of age.

A12.4.2.2 The magnet use and abuse requirements have been expanded in order to further align F963 with the requirements of other standards such as ISO 8124 and EN 71. This includes the addition of:

(1) A Soaking Test for wooden toys and mouth pieces of mouth actuated toys that become wet as part of their normal play pattern is intended to ensure glued magnets do not become loose. Wooden toys are also subjected to this test because the properties of wood, such as the size of holes, can change with humidity levels.

(2) A specific metal disk for Cycle Testing of toys that contain only a single magnet or magnetic component and no mating metal part.

(3) Subjecting parts to the Drop Test.

(4) Subjecting parts to the Compression Test when the magnets are not accessible and cannot be tested per the Tension Test since the magnets cannot be grasped.

A12.4.3 *Section 8.25.4.1:*

A12.4.3.1 The soaking test was introduced in EN 71 in 1998. The soaking test was a response to a concern that small parts of wooden toys could be liberated as a result of adhesive breakdown due to repeated saliva contact. The test method considers that children often suck a toy for a period of time and then turn their attention to another toy, the first toy often drying out before it is sucked again and again; thus, the repeated soaking. It was known that toddlers of 2 to 3 years of age seldom spend more than 2 to 3 minutes on a single activity, so 4 minutes was felt to be a reasonable length of time to soak the toy for. Mouth activated toys for older children are also unlikely to be held in the mouth continuously for long periods of time and these are repeatedly wetted and dried. The test method was verified through inter-laboratory testing.

A12.5 Toy Chests

A12.5.1 The rationale for this change is that toy chests are still covered under F963 – $07^{\varepsilon 1}$ standard that is now mandatory under Federal law. On May 11, 2009, the U.S. Consumer Product Safety Commission unanimously voted to adopt the newest revision of the toy safety standard F963 – 08, except the revision to section 4.27 regarding toy chests.

A12.5.2 In order for ASTM to be consistent with the mandatory toy safety requirements, it is necessary for a new revision to F963:

A12.5.2.1 Eliminate the exemption for toy chests,

A12.5.2.2 Incorporate the requirements for toy chests back into F963,

A12.5.2.3 For the withdrawal of F834, and

A12.5.2.4 Clarify the test method for the lid support.

A12.6 Ride-On Toys

A12.6.1 *Section 8.28:*

A12.6.1.1 Revision to 8.28.2 is to provide clarification—no technical change. Revision to 8.28.3 proposes a more stringent test because the existing overload test did not sufficiently address testing for toys intended to accommodate multiple children. Only one seating/standing surface would be tested at a time in the current test. This new test requires that all seating/standing areas be tested simultaneously, which is more representative of actual product usage. The two times weight factor provides for a margin of safety without being unnecessarily onerous.

A12.6.2 *Section 4.15.1:*

A12.6.2.1 This change is intended to exclude certain products which are not inherently designed for stability. This change is commensurate with an exemption under EN 71, Clause 4.15.1.4. Products with wheels 150 mm or less apart are inherently unstable; the waist breadth of a 3-year-old is approximately 150 mm.

A12.6.3 The cords, straps, and elastics requirement was intended to address potential entanglement and strangulation hazards presented by toys where a cord or loop is accessible to be placed around the neck. Ride-on toys have a unique play pattern; they will not typically be picked up by a child and the waist restraints are not readily accessible to be placed around the neck. Role-play waist restrain belts/straps have been incorporated into ride-on toys for children ages 12 months and over for many years. There is no incident data to indicate that a strangulation or entanglement hazards is presented by these restraints. In addition, the use of waist restraints on ride-on toys encourages children to use restraints at an early age, which is a benefit.

A12.7 Heavy Metals

A12.7.1 This revision of ASTM F963 is intended to allow the use of the ASTM F2853 – $10^{\varepsilon 1}$ (X-ray Fluorescence Spectrometry Using Multiple Monochromatic Excitation Beams, commonly known as HDXRF) for Total Element Content Screening, which may obviate the need for additional "wet chemistry" testing of homogenous plastic (polymeric) substrate materials for all eight listed heavy metal elements. The ASTM F2853 – $10^{\varepsilon 1}$ test method was previously approved by the CPSC (via test method CPSC-CH-E1002-08.3) for final testing for lead in homogenous non-metal and metal substrate materials of children's products, with specified conditions, to determine compliance with and certify products to the 100 ppm lead substrate limit imposed by Section 101 of the Consumer Product Safety Improvement Act. Data supplied by the CPSC as well as independent labs and the relative advantages of HDXRF over wet chemistry support this expanded allowance of HDXRF for the other seven heavy metals, in addition to lead.

A12.8 Battery Operated Toys

A12.8.1 New definitions have been added to define batteries and cells. New testing requirements have been added to address toys that contain rechargeable cells and batteries. A

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new warning label has been added for certain button and coin cell batteries of nominal 1.5 volts or greater to address hazards that have been identified with these cells. Added four new test methods for toys that contain rechargeable cells and batteries; these include battery overcharging test, repetitive overcharging test, single fault charging test and short circuit protection test.

A12.8.2 Compliance with referenced battery standards may be established by appropriate documentation rather than third party laboratory testing.

A12.8.3 The requirements of 4.25.11 do not apply to the main drive circuit of battery-powered ride-on toys powered by batteries of any chemistry other than lithium (covered in 4.25.10). This reduces redundant testing for secondary cells other than lithium.

A12.8.4 Since November 2007, CPSC has received dozens of reports of remote-controlled helicopters igniting while being charged and one incident of a helicopter that ignited while flying. Numerous other incidents have resulted in overheating, smoke, and thermal burn hazards. These reports involve minor burns and minor property damage. Since November 2006, there have been involved in incidents have been powered by nickel metal hydride, lithium-ion, and lithium polymer battery(ies). Some of these toys did not have any integral protection against overcharging, short-circuiting, or overheating. The toys also included chargers that do not have charge control circuitry to protect against overcharging. Protection circuitry incorporated into both the battery(ies) and charger is essential to provide a robust system to prevent short circuits, overcharging, and overheating that can result in battery venting, fire, and explosion.

A12.8.5 The National Capital Poison Center (NCPC) has seen a recent increase in incidents associated with coin/button cells resulting in serious injury or death. The work group reviewed the available data on the fatalities and injuries where there was data on the battery size and type. The vast majority of the incidents involved 20 mm, 3.0 V lithium coin cells which became lodged in the esophageal tract. Under certain conditions, where the tissue is in contact with the lodged cell, this lodging can cause hydrolysing of the saliva, which significantly raises the local pH, leading to chemical burns or possibly esophageal perforation. Children have obtained the cells directly from various household products (usually other than hand held games and toys, which require the use of a tool to access the battery compartment) or from loose batteries outside of the product or packaging. Information provided to the work group indicated that batteries above a minimum threshold of 1.5 V that are lodged in the esophagus can initiate an electrolytic reaction. The batteries most associated with the injuries are rated at 3 V since the electrolysis may be stimulated more easily where the battery voltage is greater than 2 V. While the battery technology associated with the injuries was predominantly lithium, other technologies may exceed the 1.5 V thresholds for electrolysis. Future technologies may also be able to provide similar or better performance than lithium; as such, battery technology was not specifically included in the statement. Batteries with a diameter less than 20 mm are generally passed through the digestive tract and were not seen to present the soft tissue damage perforation hazard. To provide a margin of safety, the work group decided that the labelling requirement would apply to batteries greater than 15 mm and 1.5 V.

A12.8.6 The existing requirement references the battery as the power source when determining a low power circuit. In situations where the same battery power source is used for a high power circuit in addition to a low power circuit there shall be a method to determine the low-power points from the high-power points, it cannot be based on the battery power source.

NOTE A12.1—The method used above is the same method used in IEC 62115 in determining a low power point. (Lower amps)

A12.9 Acoustics

A12.9.1 The format and sequence of the methods section was revised to clarify the method and present the procedure in a similar manner to how it is presented in EN 71-1:2014 which will assist test labs in determining compliance to both standards.

A12.9.2 The requirements and methods were revised to eliminate the phrases continuous sounds and impulsive sounds. These have been replaced with the measurement type (L_{Aeq}, L_{Cpeak} respectively). While the concepts of continuous and impulsive sounds are still critical in establishing the correct decibel limits, they aren't necessary to test the product. These changes eliminate the need for the tester to make a determination as to whether a sound is continuous or impulsive and brings this aspect into alignment with EN 71-1:2014.

A12.9.3 Toys that alter or reproduce a child's voice were added to the exemption list in 4.5. The sound output of these toys are dependent upon the input (the sound pressure level of the child's voice for example) and are very similar to the existing exemption for mouth-actuated toys.

A12.9.4 The C-weighted peak limit for close-to-the-ear toys was raised from 95 dB to 110 dB in 4.5.1.4. The previous revisions had mistakenly applied a safety factor twice which resulted in an unnecessarily low requirement. This change aligns the requirement with that in EN 71-1:2014.

A12.9.5 The definition of a cycle was elaborated upon in 8.20.1.4. Previous revisions left room for interpretation and inconsistency.

A12.9.6 Added definition for push/pull toy for clarification as this type of toy is cited in 4.5.1.3 under sound level requirements.

A12.9.7 Direction was added at 8.20.1.5 to address how to test toys such as toy vehicles that the child pushes and where the sound comes from the movement of the toy.

A12.9.8 The tolerance placed on the measurement distance was changed from 50 ± 0.5 cm to 50 ± 1 cm. This brings the tolerance into alignment with EN 71-1:2014.

A12.9.9 In section 8.20.2.4, the height of the microphone was changed from 120 cm to 100 cm. This brings the method into alignment with EN 71-1:2014.

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A12.9.10 In 8.20.2.5, the speed at which push/pull toy are operated was changed from 2 m/s to a speed that maximizes the sound output but does not exceed 1 m/s. 1 m/s is more sensible as children of a suitable age that play with push/pull toys would have difficulty achieving 2 m/s and many toys would not stay upright when moving at this speed.

A12.10 Miscellaneous

A12.10.1 *Stuffing Materials Evaluation*—The CPSC does not recognize the referenced test method in their Toy Laboratory Testing Manual and this test has not been typically applied in practice. A visual inspection of the material using optical microscopy is proposed as an alternative. Reference to the PA state law requirements should be deleted because state laws should not be referenced in ASTM standards which have been adopted as law by the CPSC.

A12.10.2 *Squeeze Toys*—This change is intended to address products where a squeeze toy is attached to a ring. The ring would not be subject to the squeeze toy requirements because it is not a squeeze toy.

A12.10.3 Section 4.6.2.2 was added to address the potential choking hazards of mouth actuated projectile toys (such as a pea shooter) that may be created by mouthpieces that are small parts or projectiles that could pass back through the mouthpiece if the user inhales rather than exhales while the projectile is in the launcher.

A12.10.4 Section 8.13.1, the specifications of the piston pump test equipment were revised to align with the test equipment referenced in corresponding requirements in EN 71 Part 1 and ISO 8124 Part 1. A survey of major laboratories was undertaken to confirm this change was acceptable and would not require the purchase of new equipment.

A12.10.5 Section 8.13.2, the test equipment and test procedure were selected from EN 71 Part 1 for alignment purposes.

A13. RATIONALE FOR 2017 REVISION

A13.1 New language is being added to 4.21.2.3 to indicate that the kinetic energy density measurement is only performed on projectiles when the kinetic energy of the projectile exceeds 0.08 J. Without this change, this testing would be performed on all projectiles whether or not they presented a risk of injury. This also aligns with ISO 8124–1 and EN71–1 requirements.

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