

UNITED STATES  
CONSUMER PRODUCT SAFETY COMMISSION



LABORATORY TEST MANUAL

FOR

TOY TESTING

Requirements for Testing of Toys and Other Articles Intended for Use by Children 12 Years and Under.

June 2010

*This test manual was prepared by CPSC staff and has not been reviewed or approved by, and may not necessarily represent the views of, the Commission.*

This laboratory test manual has been developed to provide guidance to U.S. Consumer Product Safety Commission (CPSC) staff members who test toys and children's products for compliance with the CPSC regulations listed in this manual. The test manual is not intended to supersede or limit these regulations. Should there be a discrepancy between the requirements in a regulation and the test methods outlined in this manual, the regulation shall supersede this manual.

Additional information regarding CPSC, its publications, and regulations may be accessed on the Internet at <http://www.cpsc.gov>.

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## 1. SCOPE

This U.S. Consumer Product Safety Commission (CPSC) staff laboratory test manual is a reference guide designed to assist CPSC staff with testing procedures for toys, rattles, and pacifiers as required in the Code of Federal Regulations, Title 16, Parts 1501, 1510, and 1511, respectively. Additional requirements for toys are contained in ASTM International (ASTM) F963-07e1, *Standard Consumer Safety Specification for Toy Safety*.

Specific details regarding test procedures for some products are not contained in every regulation. Therefore, to provide a uniform method of testing and reporting within CPSC, this manual was developed to describe the tests to be conducted and to outline the proper sequence of product testing. Additional guidelines have been incorporated into this document where clarification was determined to be necessary.

This manual identifies tools and equipment used by CPSC staff to perform testing in accordance with the regulations addressed in this manual. Descriptions and pictures of instrumentation are meant to serve as examples and are for clarification purposes only. Tools and equipment shown do not represent the sole models, brands, or types that can be used and should not be interpreted as an endorsement of any tool, fixture design, or equipment manufacturer.

This laboratory test manual does not contain the complete language of the CPSC regulations and is provided for advisory and guidance purposes. It is not intended to replace or supersede any sections of the regulations. In case of discrepancies between this manual and a regulation, the regulation shall supersede this manual.

## 2. SUMMARY OF REGULATIONS

This test manual covers seven CPSC safety regulations for toys and other articles intended for use by children. These regulations and their effective dates are as follows:

- 2.1 *16 CFR §1500.50, §1500.51, §1500.52 and §1500.53*  
*Test Methods for Simulating Use and Abuse of Toys and Other Articles Intended for Use by Children*  
Effective date February 6, 1975

The objective of §1500.51, §1500.52, and §1500.53 is to describe specific test methods for simulating normal use of toys and other articles intended for use by children (of different age categories) as well as the reasonably foreseeable damage or abuse to which the articles may be subjected. The test methods are for use in exposing potential hazards that would result from the normal use or the reasonably foreseeable damage or abuse of such articles intended for children.

- 2.2 *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*  
Effective date December 22, 1978

The sharp point test is used by the Commission in making a preliminary determination that points on toys and other articles intended for use by children under 8 years of age, and such points exposed in normal use or as a result of reasonably foreseeable damage or abuse of such toys and articles, present a potential risk of injury by puncture or laceration under section 2(s) of

the Federal Hazardous Substances Act (15 U.S.C. 1261(s)). The Commission will further evaluate points that are identified as presenting a potential risk of puncture or laceration injury to determine the need for individual product regulatory action.

A toy or other article intended for use by children will not automatically become a banned article if it fails to meet the technical requirements in the regulation for sharp points. The CPSC's Office of Compliance will make that determination based upon the results of the tests and the potential hazard.

2.3 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*

Effective date March 26, 1979

The sharp edge test method is used by the Commission in making a preliminary determination that metal or glass edges on toys and other articles intended for use by children under 8 years of age, and such edges exposed in normal use or as a result of reasonably foreseeable damage or abuse of such toys and articles, present a potential risk of injury by laceration or avulsion under section 2(s) of the Federal Hazardous Substances Act (15 U.S.C. 1261(s)). The Commission will further evaluate toys and other articles with edges that are identified as presenting a potential risk of laceration or avulsion injury to determine the need for individual product regulation.

The technical requirements in the regulation for sharp edges differ from self-executing banning regulations in that a toy or other article intended for use by children will not automatically become a banned article if it fails the test. The CPSC's Office of Compliance will make that determination based upon the results of the tests and the potential hazard.

2.4 16 CFR Part 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*

Effective date June 15, 1979

Section 1500.18(a)(9) of part 1500 classifies as a banned hazardous article any toy or other article intended for use by children under 3 years of age that presents a choking, aspiration, or ingestion hazard because of small parts. Part 1501 describes certain articles that are subject to §1500.18(a)(9); lists certain articles that are specifically exempted; and provides a test method for determining whether an article is hazardous to children under 3 because it, or one of its components that can be detached or broken off during normal or reasonably foreseeable use, is small enough to present a choking, aspiration, or ingestion hazard.

2.5 16 CFR Part 1510

*Requirements for Rattles*

Effective date May 23, 1978

A rattle is an infant's toy, intended to be hand held, usually containing pellets or other small objects and which produces sounds when shaken. Part 1510 sets forth the requirements whereby rattles are not banned articles under §1500.18(a)(15). The purpose of these requirements is to ensure that certain infant rattles which may cause choking and/or suffocation because their design or construction permits them to enter into an infant's mouth and become lodged in the throat are eliminated from interstate commerce.

2.6 16 CFR Part 1511  
*Requirements for Pacifiers*  
Effective date June 30, 1977

A pacifier is an article consisting of a nipple that is intended for a young child to suck upon but is not designed to facilitate a baby's obtaining fluid, and usually includes a guard or shield and a handle or ring. Part 1511 sets forth the requirements whereby pacifiers are not banned articles under §1500.18(a)(8).

2.7 ASTM F963-07e1  
General Toy Requirements  
Effective date February 10, 2009

The regulation includes all of the requirements of ASTM F963-e1, Standard Consumer Safety Specification for Toy Safety, with the exception of annex A4, Flammability Testing Procedure for Toys.

This regulation sets additional requirements for toys and toy components that are not covered in the preceding regulations through the incorporation of ASTM F963. The entire standard has been adopted with the exception of the flammability requirements included in annex A4. The requirements in the ASTM standard are intended to reduce the risk of injury or death from toy products such as magnets, ride-on toys, and other specific toys intended for children up to age 12 and include additional performance requirements for toys beyond the others listed above.

### **3. PERFORMANCE REQUIREMENTS**

The performance requirements for products intended for use by children 12 years of age and younger are described in the regulations summarized above. Generally, products do not meet the requirements of CPSC's regulations if any of the following occurs:

*Toys – Children 3 years and under*

- Contain small parts
- Contain parts with accessible sharp points
- Contain accessible sharp edges (glass and metal parts only)
- Fail to meet the pacifier or rattle requirements (where applicable)
- Contain accessible components with a lead content above 300 ppm

*Toys – Children over 3 years but not more than 96 months*

- Contain accessible sharp edges (glass and metal parts only)
- Contain hazardous projections
- Contain accessible components with a lead content above 300 ppm

*Toys – Children 12 years and younger*

- Contain accessible components with a lead content above 300 ppm

## 4. GENERAL EQUIPMENT LIST

### 4.1 USE AND ABUSE TESTING

- Accessibility Probe (0 – 3 years)
- Accessibility Probe (37 – 96 months)
- Small parts cylinder
- Sharp point tester
- Sharp edge tester
- Pressure sensitive polytetrafluoroethylene (TFE) high temperature electrical insulation tape (Military Specification MIL-I-23594B, 1971) with the following characteristics:
  - 1) TFE backing between 0.0026” - 0.0035” thick
  - 2) Pressure sensitive silicone polymer adhesive (0.003” thickness)
  - 3) Tape width no less than ¼”
- Impact medium, 1/8” nominal thickness, type IV vinyl tile (Federal Specification SS-T-312B, Interim Amendment-1 (YD), dated October 10, 1974) shall:
  - 1) Be installed over a 2.5” minimum concrete base
  - 2) Cover a minimum 3 ft<sup>2</sup> area
- Small ball test fixture
- 1.35 lb calibration weight (for use with the sharp edge tester)
- Force gauges (1.25” compression disk with 1.32” edge radius)
  - 1) 30 lbf or greater
  - 2) Accuracy of ± 0.5 lb
- Torque gauge/wrench (accuracy of ± 0.2 in-lb)
- Timer
- Clamps (for use in performing tension and flexure tests)
- Scale (10 lb capacity minimum and accuracy of ± 0.01 lb)

### 4.2 PACIFIER TESTING

- Pacifier test fixtures
- Small parts cylinder
- 2 lb (+0/-0.02) weight with clamp
- Vernier caliper (accuracy of 0.001”)
- 10 lb force gauge (1.25” compression disk with 1.32” edge radius and accuracy of ± 0.5 lb)
- 2 qt steel container (for heat cycle deterioration test)
- Hot plate
- Metal strainer
- Timer
- Tape measure (1/16” increments minimum)

### 4.3 RATTLE TESTING

- Rattle test fixtures
- Small parts cylinder

#### 4.4 SPECIFIED TESTING

- Unique fixtures: Some fixtures have been fabricated specifically to test particular products such as ride-on toys, and stuffed toys with seams. Information regarding the set up, operation, and fabrication of these fixtures can be found in the specific test section for that product type.

#### 4.5 BATTERY POWERED TOYS

- Dynamometer

#### 4.6 SOUND PRODUCING TOYS

- Bruel & Kjaer Type 2250 Sound Analyzer
- Microphone

#### 4.7 MAGNET TESTING

- DC field gauss meter (resolution of 5 gauss (G)) and an axial-type probe with the following characteristics:
  - 1) An active area diameter of  $0.76 \pm 0.13$  mm
  - 2) A distance between the active area and probe tip of  $0.38 \pm 0.13$  mm
- Calipers or similar device (with a resolution of 0.1 mm)

#### 4.8 CALIBRATION AND ACCURACY

##### 4.8.1 Force gauges/torque wrenches/gauges

4.8.1.1 All force gauges shall be calibrated annually to insure accuracy. Equipment calibrations are to be coordinated with CPSC laboratory calibration personnel.

4.8.1.2 Force gauges shall be checked for proper operation prior to each test session. The operational check shall consist of manually applying a force to the gauge (compression and/or tension, depending on the gauge type) and verifying that the gauge operates and returns to the original reading.

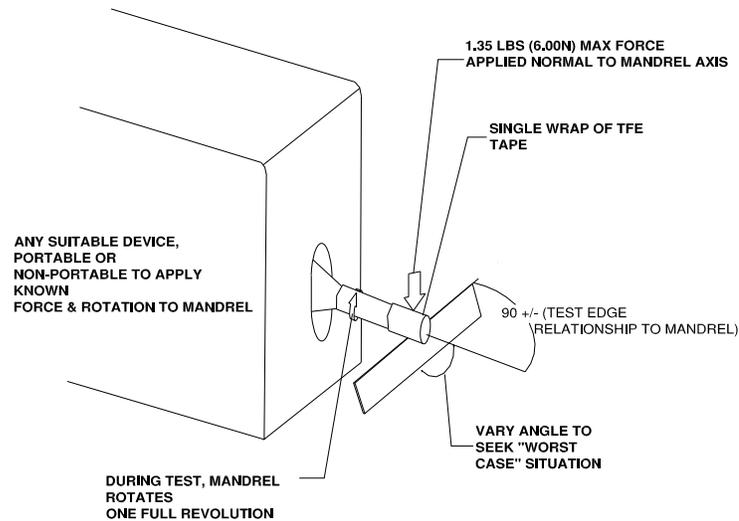
4.8.1.3 Test personnel shall ensure the force gauge is set to zero prior to the performance of any test.

4.8.1.4 Torque wrenches/gauges shall be calibrated annually. Staff should follow all of the operational procedures specified for force gauges above.

##### 4.8.2 Sharp Edge Tester



A sharp edge tester is a portable electronic device powered by a 120v household current electric motor attached to a rotating mandrel. This mandrel is wrapped with a single layer of polytetrafluoroethylene (TFE) tape and makes only one revolution for each test. The motor and mandrel assembly are both mounted in a cradle that pivots with a pair of tension springs that pull on the assembly producing a 1.35 lbf on the mandrel ¼” from the end. The mandrel is pressed against a potential sharp edge and rotated once. The edge is considered sharp if the tape is cut a minimum of ½ inch (13mm) after testing.



PRINCIPLE OF SHARP EDGE TEST

## Figure 1 – Sharp Edge Tester

4.8.2.1 The sharp edge tester does not require annual calibration but should be checked prior to each use to insure proper operation. This check shall be performed prior to each test session. A calibration shall be performed periodically in accordance with paragraph 4.8.2.2.

4.8.2.2 Calibration is checked by inverting the instrument and placing the top surface of its body on the edge of a tabletop or similar surface. Place masking tape around the free end of the mandrel and mark ¼” from the end. Using a wire loop, hang a 1.35 lb calibration weight at this mark. Application of the weight should cause the mandrel to slowly drop. If it drops rapidly, or bottoms out, the instrument is damaged or out of calibration and shall not be used for testing until the device has been repaired/calibrated.

4.8.2.3 The TFE tape for the sharp edge tester shall be kept in the same conditioning environment ( $73 \pm 3$  degrees F) as the samples to be tested. If large numbers of tests are performed in succession, it is possible to elevate the temperature (due to friction) of the mandrel and exceed the temperature requirements.

4.8.2.4 The tape used with the sharp edge tester is made from TFE tape. The regulation requires tape meeting MIL-I-23594B (1971) be used for testing. CPSC staff uses type “T” tape for compliance testing, which is commercially available.

### 4.8.3 Sharp Point Tester



The sharp point tester is a portable electrical device utilizing a small incandescent lamp with a battery and spring assembly to determine the geometry and rigidity of a potentially sharp pointed object. The potential sharp point is inserted into a small rectangular opening in the end of the tester, where it contacts a spring loaded plunger. Based on the geometry and rigidity of the point, if it is a sharp point, it will be able to penetrate the opening far enough to displace the plunger and so activate the incandescent lamp.

4.8.3.1 The sharp point tester does not require annual calibration but should be checked prior to each use to insure proper operation. The calibration procedure is detailed in paragraph 4.8.3.2.

4.8.3.2 To calibrate the sharp point tester, loosen the locking ring by rotating it clockwise (when viewed from the gauging slot end of the instrument). After a couple of rotations, a calibration reference mark scribed on the threaded portion of the barrel parallel to the axis will be revealed. Rotate the end cap clockwise until the indicator lamp lights, Figure 2. The gap between the electrical contacts has now been completely closed and must be opened to 0.005”. Slowly turn the end cap counterclockwise until the indicator lamp extinguishes. It may be necessary to turn the cap back and forth to establish the exact point at which the lamp lights. When this point is determined, note the position of the calibration reference mark with the micrometer divisions. Each mark on the cap is equivalent to 0.001”. Rotate the cap counterclockwise 5 divisions. Tighten the lock ring against the cap being careful not to turn the cap. The sharp point tester is now ready to test.



**Figure 2 – Sharp Point Test Setup**

## 5. SAMPLES

### 5.1 DEFINITION

A “sample” includes all items received with the same sample number. Additionally, it may consist of several subsamples (items of the same kind and manufacturer).

### 5.2 SAMPLE HANDLING

5.2.1 Upon receiving a sample and prior to testing, CPSC test personnel shall ensure each subsample is permanently marked with a subsample number if not already done so by the collecting official.

5.2.2 All official samples are sealed using a CPSC Form 164 sample seal. The seal must be signed and dated by the person opening the sample when the seal is broken. All official signed seals are kept with the sample as part of the chain of custody documentation.

5.2.3 After testing, the samples are resealed with a new sample seal and returned to the CPSC Sample Storage Facility. All small parts and parts that failed to meet the requirements for sharp points or edges are to be packaged in a sealed container from the sample and labeled appropriately. The broken subsample and container of parts shall be placed in a second sealed container and sealed with an official seal. The small parts, sharp points, or sharp edges and the subsample shall be sent to Health Sciences (through the sample tracking system) for hazard determination.

5.2.4 The remaining subsamples shall be packaged in a sealed container and affixed with an official seal and returned to the CPSC Sample Storage Facility.

### 5.3 SUBSAMPLES

5.3.1 A general toy sample for testing consists of at least 12 subsamples whenever possible. Subsamples for use and abuse testing are equally divided for each applicable test – for example, 6 subsamples for impact testing and 6 subsamples for torque and tension testing. (Note: torque and tension testing are performed on the same subsamples.)

5.3.2 A minimum of 2 subsamples shall be subjected to each applicable test.

5.3.3 If more than 2 violations result from any individual test, additional subsamples shall be saved for possible future testing, as directed by the Office of Compliance.

5.3.4 Single subsamples shall not be subjected to more than one test, except where specifically noted in this manual. For example, a single sample may be subjected to both a torque and tension test.

### 5.4 SAMPLE CONDITIONING

5.4.1 All samples, except where specific conditioning requirements are specified in this manual, shall be conditioned to a temperature of 73 ±3 degrees F at a relative humidity of 20-70% for a minimum period of 4 hours prior to testing.

5.4.2 The test environment should be maintained within the sample conditioning specifications. In the event that maintaining the environmental conditions is not possible, then:

- A preconditioning chamber capable of maintaining the environmental conditions of paragraph 5.4.1 should be used for maintaining samples.
- Subsamples should be tested within 5 minutes after being removed from the chamber.

## **6. SAFETY**

Testing personnel shall wear all personal protective equipment (including protective footwear, eyewear, and hearing protection) that is appropriate for the tests to be conducted.

## **7. TEST GUIDELINES**

### **7.1 APPLICABILITY**

The following guidelines shall be used in determining the required tests to be performed on toys and children's products subject to the regulations covered in this manual and that are not exempt as described in paragraphs 7.2 and 7.3 below.

7.1.1 Use and abuse tests apply to toys and other products intended for use by children in three age categories as follows: (a) children 18 months of age or less, (b) children over 18 months but not more than 3 years, and (c) children over 3 years but not more than 96 months. Each sample should be subjected to testing applicable for the age determination provided by CPSC's Division of Human Factors staff, regardless of how the product is marketed, labeled, advertised, or otherwise intended.

7.1.2 Toys reasonably intended to be assembled by an adult or not intended to be taken apart by a child should be tested fully assembled. The packaging and assembly instructions must prominently indicate that the article is to be assembled only by an adult.

7.1.3 Toys intended to be repeatedly assembled and disassembled by children should be subjected to testing in both the assembled and unassembled conditions.

7.1.4 Where a test may be performed in more than one way, toys should be tested in the orientation considered the most severe.

### **7.2 EXEMPTIONS – Toys Intended for Children Under 8 Years**

7.2.1 The following articles intended for children less than 8 years of age are exempted from the sharp point and sharp edge technical requirements:

- Bicycles
- Full-size and non-full-size cribs
- Toys and other children's articles that, by reason of their functional purpose, necessarily present the hazard of sharp points, sharp metal or glass edges (toy sewing machines with needles, ballpoint pens, toy scissors, ice skates), and do not have any nonfunctional sharp points or sharp edges.

*Note:* The articles listed above are exempt only from testing in accordance with the regulations listed in section 2 of this test manual. Any regulations regarding specific products listed above are still applicable.

7.2.2 This exemption applies only if functional points or edges are identified by a conspicuous, legible, and visible label and they do not present any hazards due to nonfunctional sharp points or sharp edges. Samples should be tested for sharp points and sharp edges in cases where the exemption of a product is unclear.

### 7.3 EXEMPTIONS – Toys Intended for Children Under 3 Years

7.3.1 The following articles intended for use by children less than 3 years of age are exempted from small parts testing to identify choking, aspiration, or ingestion hazards:

- Balloons
- Books and paper articles
- Writing materials (crayons, chalk, pencils, pens)
- Children’s clothing and accessories (shoe lace holders, buttons)
- Grooming, feeding, hygiene products (diaper pins and clips, barrettes, toothbrushes, drinking glasses, dishes, eating utensils)
- Phonograph records (CDs and DVDs)
- Modeling clay and similar products
- Finger paints, watercolors, and other paint sets
- Rattles (see section 10)
- Pacifiers (see section 11)
- Fabric (Velcro, frizz, yarn, elastic, string, and paper)

7.3.2 Samples should be tested for small parts in cases where the exemption of a product is unclear.

### 7.4 PERFORMANCE OF TESTS

7.4.1 Testing shall be based on the age determination of the product as determined by CPSC’s Division of Human Factors staff. Testing shall not be performed prior to receipt of the age determination.

7.4.2 Accessibility tests should be performed using the appropriate probes to determine access to any potential sharp edges and or sharp points for all samples with an age determination of 8 years or less.

7.4.3 Sharp point and sharp edge testing should be performed on accessible sample parts, as determined by CPSC test personnel.

7.4.4 If a sample is intended for use by children 3 years and under, it should be examined in the as-received condition for potential small parts.

7.4.5 Samples should be subjected to the use and abuse tests in section 9 of this manual, followed by repeating the sharp edge, sharp point, and small parts tests.

*Note:* If performing the use and abuse test on a subsample would jeopardize losing or destroying the evidence of a potential violation, do not conduct any use and abuse tests on that subsample.

Similarly, if a violation is discovered during a use and abuse test and continued testing would destroy the evidence, do not continue with the testing on that subsample.

## **8. MATERIALS**

### **8.1 QUALITY**

8.1.1 Toys may be made from new or reprocessed materials. Test personnel should perform a visual check of the subsamples' material to ensure it is clean and free from infestation.

8.1.2 If reprocessed materials are used, they should be tested in accordance with section 39 of this manual.

8.1.3 Cosmetics, liquids, pastes, putties, gels, and powders used in toys (excluding art materials) shall be visually checked for microbiological degradation. Upon any indication of degradation, cleanliness and preservative effectiveness testing shall be performed on the sample.

8.1.3.1 If cleanliness and preservative testing is required, test personnel shall have samples tested to the toxicology requirements of ASTM F963 (section 4.3) at a CPSC-approved third party testing laboratory. The test results from these tests shall be included as part of the official test report.

### **8.2 WASHABLE TOYS**

8.2.1 Any sample containing a label stating "machine washable" on the product, package, or instructions shall be subjected to six machine washing and tumble drying cycles prior to testing.

8.2.2 Any commercially available top-loading washer, dryer, or laundry detergent intended for use in the home may be used for preconditioning samples.

8.2.3 Each subsample shall be weighed prior to the beginning of the test. The subsample shall be combined with a dummy load of clothes with a total dry weight of 4 +0.5, -0 lb (1.8 + 0.23, - 0 kg), and washed in an automatic washing machine using the warm water setting and a 12-minute wash cycle at the normal setting.

*Note:* Use cotton sheeting material to make up the total dry weight of the load as called out in Table 1 of American Association of Textile Chemists and Colorists (AATCC) Test Method 124-2006, *Appearance of Fabrics after Repeated Home Laundering*.

8.2.4 The subsample 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 subsample shall be considered dry when the final weight does not exceed the original dry weight by more than 10%.

8.2.5 If a different drying method is specified by the sample manufacturer by means of a permanent label, the manufacturer's instructions shall supersede the requirements of paragraphs 8.2.1 through 8.2.4.

8.2.6 Upon completion of sample preconditioning, subsamples shall be subjected to the test requirements of section 9, Test Criteria and Procedures of this manual.

### 8.3 FLAMMABILITY OF TOYS

8.3.1 Toy samples or components constructed of textile fabrics shall be subjected to testing in accordance with 16 CFR 1610.

8.3.1.1 The toy sample shall not have a burn rate greater than 0.1 in/second along the major axis in accordance with 16 CFR 1500.3(c)(6)(vi).

8.3.2 Non-textile toy samples may be tested for flammability hazards using the methodology of ASTM F963, Annex A4. However, testing to annex A4 is not required.

## **9. TESTING PROCEDURES**

### 9.1 NORMAL USE

9.1.1 Toy samples shall be conditioned in the most detrimental environment in which the toy sample is intended to be used, at the discretion of the tester, based on the type of toy and information provided by the manufacturer in written directions, instructions, labeling, and packaging.

9.1.1.1 Samples shall be conditioned for a minimum of 4 hours to a maximum of 24 hours prior to testing.

9.1.1.2 Samples should be tested within 5 minutes of removal from the conditioned environment when the effects of the environment could be temporary (e.g., samples conditioned in water may dry prior to testing).

9.1.1.3 Liquid solutions (such as soap with water) should be mixed using the manufacturer's instructions. In the absence of manufacturer guidance, the tester shall rely on generally-accepted practices to determine proportions.

9.1.2 Toy samples primarily intended for use in abrasive environments shall be cyclically submerged and removed from the environment a minimum of 10 times. This would be applicable to samples primarily intended for use in environments such as sand, gravel, or mulch.

9.1.2.1 The environmental material shall be placed in a container large enough to allow the toy sample to be completely covered during testing.

9.1.2.2 The sample may be placed into the environment or the environmental material may be added to the container as necessary. In both cases, the environmental material must completely surround the sample.

9.1.3 Any residuals from the conditioning testing shall be left intact during subsequent testing.

9.1.4 All mechanical operating components intended for use during play with the sample shall be cyclically tested. This includes but is not limited to hinged components, spring-operated components, magnetic components, buttons, switch levers, cords, and wheels. Products covered in other sections of this manual, such as toy chests, shall be exempt from these requirements.

9.1.4.1 A minimum of 100 cycles shall be performed on each component. A component moving through the complete range of motion and returning to the original orientation shall be considered a complete cycle.

## 9.2 HAZARD DETERMINATION TESTS

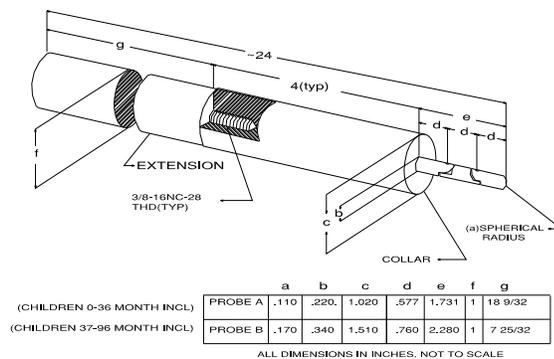
9.2.1 There are five different hazard determination tests that may be performed within this sequence of testing. Each sample submitted for testing shall be subjected to all applicable tests. Each subsample shall be subjected to only one test, except subs used for the torque test. It is acceptable to use a single subsample for the accomplishment of the torque and tension tests.

9.2.2 Lab test personnel shall determine the tests for which a sample is exempt and determine if the sample is to be tested in an assembled or unassembled condition. See section 7 for further information regarding age groups and exemptions. The sequence of tests is performed as follows:

- 1) Accessibility (9.2.3)
- 2) Sharp Points (9.2.4)
- 3) Sharp Edges (9.2.5)
- 4) Small Parts (9.2.6)
- 5) Use and Abuse (9.3)
- 6) Repeat 1-4.

### 9.2.3 Accessibility

9.2.3.1 Accessibility testing is done both prior to and after use and abuse testing using one of two accessibility probes (Probe A or Probe B, depending on the age for which the toy or other article is intended). The two probes are shown in Figure 3. A point or edge that can be contacted by any portion of the probe forward of the collar is deemed accessible.



ACCESSIBILITY PROBES

### Figure 3 – Accessibility Probes

9.2.3.2 Probe A or B is used according to the age determination of the sample. Probe A is used for toy samples with an age determination of 3 years or less. Probe B is used for toy samples with an age determination of greater than 3 years and less than 8 years.

9.2.3.3 If a toy or article contains a hole, recess, or opening, the probe shall be inserted in an attempt to contact possible sharp points or edges.

9.2.3.3.1 The depth to which the probe is inserted is determined by the size of the opening as measured by the minor dimension. The minor dimension of an opening is the diameter of the largest sphere that will pass through the opening. If the minor dimension of the opening is less than the diameter of the collar of the probe, then the insertion of the probe will be no greater than the length of the two-jointed “finger” of the probe.

9.2.3.3.2 An opening with a minor dimension greater than the collar diameter requires the probe to be inserted up to a depth as determined from Table 1.

**Table 1**

<b>AGE GROUP</b>	<b>MINOR DIMENSION OF OPENING</b>	<b>PROBE</b>	<b>INSERTION DEPTH</b>
<b>3 years or less</b>	<b>Equal to or less than 1.02 inch</b>	<b>A</b>	<b>Up to collar</b>
	<b>Between 1.02 and 7.36 inch</b>	<b>A (with extension)</b>	<b>2 1/4 times minor dimension</b>
	<b>Equal to or greater than 7.36 inch</b>	<b>A</b>	<b>Unrestricted</b>
<b>Over 3 years; up to 8 years</b>	<b>Equal to or less than 1.51 in</b>	<b>B</b>	<b>Up to collar</b>
	<b>Between 1.51 and 9.0 inches</b>	<b>B</b>	<b>2 1/4 times minor dimension</b>
	<b>Equal to or greater than 9.0 inches</b>	<b>B (with extension)</b>	<b>Unrestricted</b>

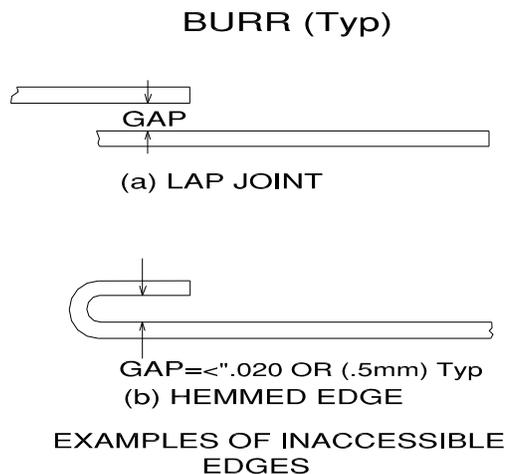
9.2.3.3.3 The insertion depth shall be measured from the “finger” tip of the correct size probe and marked on the extension with a pencil or tape. The probe may be inserted into the opening up to the marked depth, Figure 4. When inserting the probe, the mark must not pass into or beyond the plane of the opening.



**Figure 4 – Accessibility Probe Application**

9.2.3.4 The joints of the “finger” may be rotated as necessary, up to 90 degrees, when testing for the accessibility of a point or edge.

9.2.3.5 A point or edge can be determined to be inaccessible without testing if the distance between any point or edge and an adjacent surface is less than or equal to 0.020 inch (0.5 mm). If the gap is less than or equal to 0.020 inch (0.05 mm), then the point or edge is considered inaccessible, regardless of accessibility with a probe. Examples of metal edges that may be inaccessible due to the adjacent surface are lapped joints and hemmed edges, Figure 5.



**Figure 5 – Inaccessible Edge Examples**

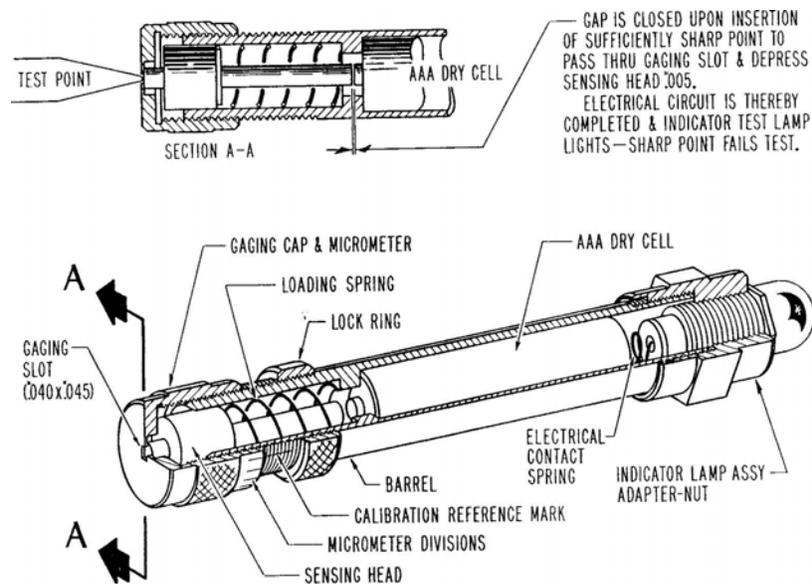
9.2.3.6 The gap between the point or edge and the adjacent surface is measured using a 0.020 thickness gauge. In cases where the gap is near 0.020 inch (0.05 mm), the gap size should be measured and the measurement recorded.

9.2.3.7 Any burr or feathered edge on the side closest to the protective parallel surface is considered inaccessible if the gap between the edge and the parallel surface is no greater than 0.020 inch. A hemmed edge is formed when a portion of sheet metal is folded 180 degrees back onto itself. Any burr or feathering on the inside edge (the side closest to the parallel surface) is inaccessible if the gap between the edge and the parallel surface does not exceed 0.020 inch (0.05 mm).

9.2.3.8 Once a point or edge has been determined to be accessible, it may be tested with the sharp point or sharp edge test fixture as described in sections 9.2.4 and 9.2.5, respectively.

## 9.2.4 Sharp Points

9.2.4.1 Toy samples intended for use by children aged 96 months or less may not contain sharp points before or after use and abuse testing. An illustration of a sharp point tester is shown in Figure 6.



**Figure 6 – Sharp Point Tester**

9.2.4.2 Testing shall be performed on all samples determined to have potentially hazardous sharp points as received such as:

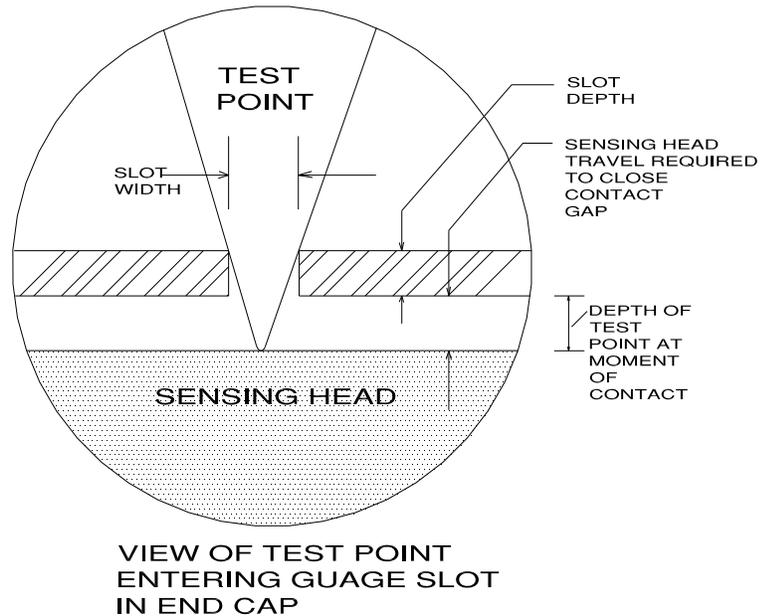
- Toys or assembly devices such as wires, pins, nails, and staples
- Sheared sheet metal, burrs on screws, and splintered wood
- Toys intended to be assembled by an adult containing hazardous sharp points in the unassembled state (testing is performed with the toy assembled)

9.2.4.3 Samples in which an accessible sharp point is determined to be a necessary function of the toy, such as a needle in a sewing kit, are not required to be tested. Samples with age determinations of less than 48 months shall not have accessible hazardous functional points.

### 9.2.4.4 Sharp Point Test

9.2.4.4.1 The sharp point tester shall be calibrated in accordance with section 4.6.3.2 prior to each test session or daily.

9.2.4.4.2 A potential sharp point shall be tested by inserting the point into the gauge slot. The thickness of the face of the end cap is 0.015 inch and the sharp point must penetrate 0.020 inch to activate the lamp, Figure 7.



**Figure 7 – Sharp Point Tester Gauging Slot**

9.2.4.4.3 Perform the test with added ballast to provide the required force on the test point when applied from above in a vertical orientation. This is the preferred method.

9.2.4.4.4 The potential sharp point shall be pointed up and the sharp point tester shall be lowered onto the point, Figure 8.

9.2.4.4.5 Allow the sharp point tester to rest on the potential sharp point (Figure 8). If the lamp lights, the point is considered to be a sharp point. If the tester is not ballasted, apply a force of 0.5 – 1.0 lb (2.2 – 4.4 N) in a downward axial direction along the length of the sharp point tester.



**Figure 8 – Sharp Point Test**

9.2.4.4.6 If the lamp lights under the weight of the sharp point tester with a force applied, it shall be considered a sharp point.

9.2.4.4.7 A recessed point may be made accessible to the test device by removing material surrounding the point or removing the point from the sample. In each case, the integrity of the point shall be maintained to ensure the accuracy of the testing.

9.2.4.4.8 Flexible materials with potential sharp points shall be tested in such a way as to ensure the structural rigidity of the material. The point to be tested shall be supported such that the test point is not made more rigid than in its original configuration. For example, a slender flexible piece of plastic shall not be held in such a way that would unfairly restrict the piece from bending or buckling.

## 9.2.5 Sharp Edges

9.2.5.1 Toy samples intended for use by children aged 96 months or less may not contain sharp edges before or after use and abuse testing. The sharp edge tester is shown in Figures 9 – 11.

9.2.5.2 Testing for sharp edges is required to be performed on metal and glass only. Testing of other materials is not required.

9.2.5.3 Toy samples containing sharp edges that are a necessary part of the function of a toy having an age determination of over 48 months are not required to be tested.

9.2.5.4 Any accessible edges, including holes and slots, are required to be free of sharp edges.

Note: Regardless of the manner in which edges are finished, they are subject to the sharp edge requirements. If a device is used to protect an edge, it shall not become detached after use and abuse testing.

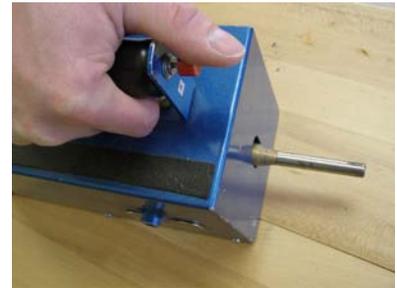
9.2.5.5 The ends of bolts or threaded rods are considered accessible and should be tested for sharp edges as required.

#### 9.2.5.6 Sharp Edge Test



**Figure 9 – Sharp Edge Tester (On/Off Switch)**

9.2.5.6.1 Turn on the tester, Figure 9.



9.2.5.6.2 Press and release the activation switch on the front of the handle. This causes the mandrel to rotate and positions it ready for a test, Figure 10.

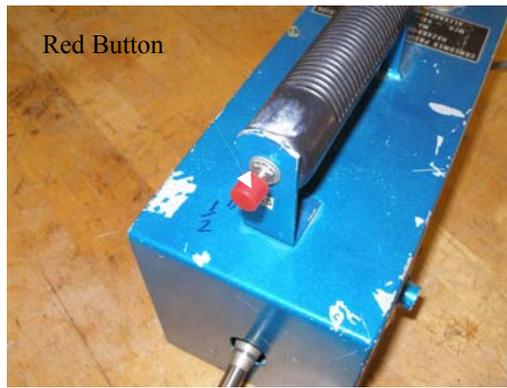
**Figure 10 - Sharp Edge Tester (Activation Switch)**

9.2.5.6.3 Wrap TFE tape on the mandrel starting at the bottom and without stretching the tape. Tape overlap shall be less than 0.1 inch (2.54 mm) and located at the bottom of the mandrel so it is the first section of tape to make contact with the edge being tested, Figure 11.



**Figure 11 - TFE Tape on Mandrel**

9.2.5.6.4 The edge shall contact the tape 0.25 inch (6.35 mm) from the end of the mandrel and at the midpoint of the tape, Figure 11.



**Figure 12 – Accessibility Test**

9.2.5.6.5 The tester can hold the test edge against the mandrel or hold the sharp edge test instrument/mandrel against the test edge. In either case, the mandrel shall not be allowed to come up against its stop limits when a maximum force of 1.35 lbf is applied.

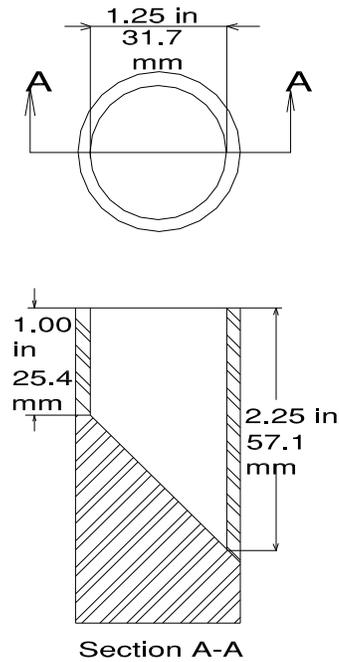
9.2.5.6.6 Push the activation switch on the front of the handle to start the mandrel. Do not allow the edge to move from its position. The mandrel will rotate once and stop.

9.2.5.6.7 Carefully remove the tape and inspect for cuts. If the tape is completely cut through  $\frac{1}{2}$  inch continuously, then this is considered a sharp edge.

## 9.2.6 Small Parts

9.2.6.1 Only toys intended for use by children aged 3 years or less are subject to the requirements of this section.

9.2.6.2 No toy (including removable parts, liberated components, or toy fragments) shall be small enough (without being compressed) to fit entirely within a cylinder of specified dimensions, as shown in Figure 13. Toy fragments include, but are not limited to, pieces of flash, slivers of plastic, pieces of foam, or fine bits or shavings. Certain components or parts are exempt from the small parts requirement. See section 7.3 of this manual for a list of the exemptions.



**Figure 13 – Small Parts Test Cylinder**

9.2.6.3 Toys that are intended to be assembled by an adult and contain potentially hazardous small objects in the unassembled state shall be assembled in accordance with the manufacturer’s instructions prior to testing.

9.2.6.4 Small parts testing shall be performed before and after use and abuse testing on all small objects such as small toys or components of toys including eyes, squeakers, or knobs, or pieces that break off or can be removed from toys.

9.2.6.5 Small Parts Test

9.2.6.5.1 Place the article or any detached or detachable parts into the small parts cylinder both before and after testing.

9.2.6.5.2 The article or any detached parts shall be inserted in any orientation and without compressing it. If the part fits entirely into the cylinder, then it is considered a small part, Figure 14.



**Figure 14 – Small Part Test**

9.3 USE and ABUSE TESTING

This section describes the six different use and abuse tests: **Impact** (9.3.5), **Flexure** (9.3.6), **Torque** (9.3.7), **Tension** (9.3.7), **Compression** (9.3.8), and **Seam Test** (9.3.9).

9.3.1 A minimum of 12 subsamples are preferred to perform all the use and abuse tests.

9.3.2 The severity of each test is a function of the age category for which the toy is intended (except the flexure test). Table 2 shows the testing requirements for each test based on the age determination of the sample.

**Table 2 – Abuse Tests**

<b>Age Category</b>	<b>Impact</b>	<b>Flexure</b>	<b>Torque</b>	<b>Tension</b>	<b>Compression</b>
0 -18 months	10 drops 4.5ft (- 0.5in)	120° arc 30 cycles	1.8 in-lb	9.5 lbf	19.5 lbf
19 – 3 years	4 drops 3ft (- 0.5in)		2.8 in-lb	14.5 lbf	24.5 lbf
37 – 96 months			3.8 in-lb		29.5 lbf

9.3.3 Toys age graded for more than one category are subjected to the most severe test category.

9.3.4 Each subsample shall be subjected to only one test with the exception of the torque and tension tests. These tests are to be performed on the same subsample when possible.

9.3.5 **Impact Test**

9.3.5.1 The two tests included in the impact test procedure are the drop test and the tip over test. Neither test is performed if a sample does not meet the weight and size criteria for each test, as described in paragraphs 9.3.5.2.1 and 9.3.5.3.1 of this manual.

### 9.3.5.2 Drop Test

9.3.5.2.1 The drop test is applied only to toys and children's articles that are below the weight limits specified in Table 3.

**Table 3 – Weight Limits for Drop Test**

Age Category	Weight Criteria
0 to 18 months	Less than 3 pounds
Over 18 to 3 years	Less than 4 pounds
Over 36 to 96 months	Less than 10 pounds

9.3.5.2.2 Each toy sample shall be weighed using a calibrated scale. A drop test is performed if the weight does not exceed the weight criteria based on the age determination of the toy sample. If the sample exceeds the weight criteria, it is not tested to this requirement. However, the tip over test may be applicable, depending on the sample dimensions.

9.3.5.2.3 To determine the test drop height and number of drops required, refer to Table 2 (page 28). Find the applicable age group for the sample based on the age determination. If the age determination spans more than one age group, use the age group that produces the more severe test and determine the number of the drops and the drop height.

9.3.5.2.4 Measure the correct drop height.



9.3.5.2.5 Hold the sample in a random orientation with the lowest part of the sample at the correct drop height, Figure 15.

9.3.5.2.6 Release the sample and allow it to drop onto the drop surface specified in 4.1.1. Let the sample come to rest unimpeded.

9.3.5.2.7 After each drop, examine the sample for possible sharp points, sharp edges (any accessible area), and small parts. The examination for small parts is applicable to samples intended for use by children aged 3 years or less.

**Figure 15 – Impact Test**

9.3.5.2.8 Discontinue testing of a subsample if a known sharp point or sharp edge could be dulled.

*Note:* A sample may be impacted on any surface of the subsample likely to fail if an impact to that surface is possible during normal use. “Random orientation” has been interpreted by CPSC staff to mean that a subsample may not be intentionally dropped from the same orientation.

### 9.3.5.3 Tip over Test

9.3.5.3.1 The tip over test is applied to any large toy that has a projected base area of 400 square inches or more or a volume of more than three cubic feet calculated by the major dimensions without regard to minor appendages.

9.3.5.3.2 The base area for toys with permanently attached legs is measured by calculating the area enclosed by straight lines connecting the outermost edge of each leg of the perimeter. There is no maximum weight for the tip-over test.

9.3.5.3.3 Place the sample toy so that it will completely contact the impact medium upon falling.

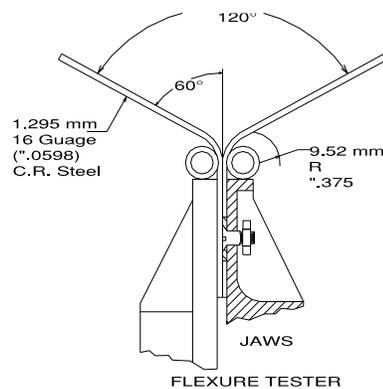
9.3.5.3.4 Slowly tip the sample over by pushing it past its center of balance. The tipping procedure can be performed in the direction most likely to occur in actual use or in the direction most likely to produce a failure.

9.3.5.3.5 Repeat the tip procedure for a total of three times, and re-examine the sample after each test for sharp points/edges (any accessible area) and small parts.

### 9.3.6 Flexure Test

9.3.6.1 This test is applied to any sample component containing metal wire(s) or other metal materials for the purpose of stiffening or for the retention of form in toys.

9.3.6.2 Secure the body of the toy in the flexure tester, Figure 16, with the component which is to be flexed pointing upwards.



**Figure 16 – Flexure Test Fixture (Vise Shields)**

9.3.6.3 Apply a force perpendicular to the major axis of the component two inches from the intersection of the component with the main body of the toy. Apply a force at the end of the component if the component is less than two inches long.

9.3.6.4 The applied force should be equal to the tension force specified in Table 2 (page 28) based on the age determination of the sample.

9.3.6.5 The component being tested shall be allowed to bend a maximum of 60 degrees in either direction. The vise shields shall be used as a guide to determine when 60 degrees has been obtained.

9.3.6.5 The force shall be measured with a force gauge. If the force required to bend the component was less than the maximum force, proceed with 9.3.6.6.

9.3.6.6 Bend the component in the reverse direction through a 120 degree arc until it touches the opposite vise shield. Return it to the center starting position. This is considered one complete cycle.

9.3.6.7 Repeat the process, at the rate of one cycle per two seconds, for a total of ten cycles. Complete a total of 30 cycles allowing the sample to rest for 60 seconds at the completion of each set of 10 cycles.

9.3.6.8 Examine the sample for broken wires and other accessible sharp points or edges as applicable that may have become exposed as a result of the flexure test.

### 9.3.7 Torque and Tension Tests

9.3.7.1 These tests apply a tensile force and/or torque (twisting force) to any component that is graspable by a child. The amount of force applied depends on the age determination for the sample.

9.3.7.2 There are no universal tools suitable to perform the tests of this section on all possible samples. General purpose clamps are used by CPSC laboratory staff, as shown in Figure 17. Any tools capable of securely holding the test component may be used provided the structural integrity of the component being tested is not compromised.

15 lb Max Tension

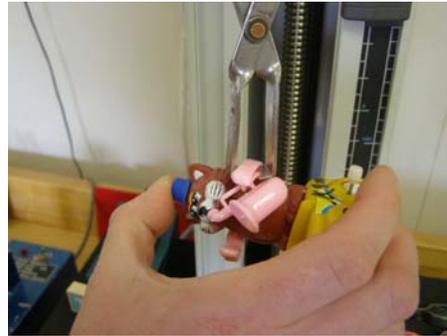


TENSION TEST ADAPTER/CLAMP

**Figure 17**

9.3.7.2.1 Sample components shall be tested, Figure 18, in both a plane perpendicular to and a plane parallel to the major axis of the sample.

9.3.7.3 If attaching a clamp could affect the structural integrity of a sample and if the tester has determined that a component could be grasped by the thumb and forefinger or by the teeth of a child, attachment of a test device may be achieved by gluing or other similar method that does not reduce structural integrity.



**Axial Direction**

**Perpendicular Direction**

**Figure 18 – Tension Test**

9.3.7.4 Hemispherical or tapered components should be subjected to the torque and tension tests if a 0.040 inch (1 mm) feeler gauge can freely be inserted between the component and the main body. This criterion is used for the eyes and noses that are segments of spheres on stuffed toys and for caps and plugs in tubing that are flush fitting or have no surface that would enable them to be grasped by gripping their outer diameter.

9.3.7.5 Protective caps shall be subjected to the compression test noted in section 9.3.8 regardless of whether the cap is accessible to flat-surface contact during the impact test in 9.3.5.

9.3.7.6 Torque Test

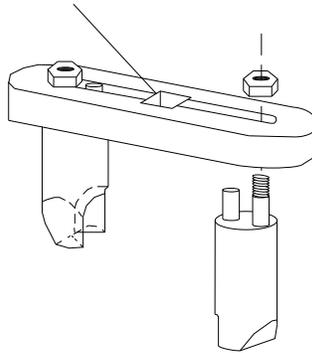
9.3.7.6.1 The main body of the test sample shall be secured to prevent its rotation, Figure 19.



**Figure 19 – Torque Test**

9.3.7.6.2 A torque test clamp which CPSC staff has found to be suitable for performing the torque test on many eyes, noses, and other round components is shown in Figure 20.

INSERT 1/4" Sq-drive of (1-5 in-lbs) TORQUE WRENCH



TORQUE TEST ADAPTER/CLAMP

**Figure 20 - Torque Tester**

9.3.7.6.3 Apply the required torque, as shown in Table 2 (page 28), in a clockwise direction over a period of 5 seconds. Stop when either the torque limit is reached or 180 degrees of rotation is achieved.

9.3.7.6.4 Maintain the torque for an additional 10 seconds.

9.3.7.6.5 Allow the component to return to a zero force state and then test in the counter-clockwise direction.

9.3.7.6.6 The body and any pieces that become detached during the test shall be examined for sharp points or edges.

9.3.7.6.7 Perform the small parts test on any separated pieces for samples with age determinations less than 3 years.

9.3.7.6.8 If the test does not result in a failure, perform the tension test on the subsample.

#### 9.3.7.7 Tension Test

9.3.7.7.1 Determine the correct tensile force from Table 2 (page 28) based on the age determination of the sample.

9.3.7.7.2 The tension test, Figure 18, shall be conducted on the same component of the same subsample that was subjected to the torque test.

9.3.7.7.3 The test sample should be secured in a manner that does not affect the test results or the integrity of the component being tested.

9.3.7.7.4 Apply a tensile force parallel to the major axis of the component being tested. The force shall be applied over a period of 5 seconds and maintained for an additional 10 seconds.

9.3.7.7.5 Allow the component to return to its original position.

9.3.7.7.6 Apply a tensile force perpendicular to the major axis, not to exceed 90 degrees from its initial test position. The force shall be applied over a period of 5 seconds and maintained for an additional 10 seconds.

9.3.7.7.7 Terminate testing in the event that a component separates from the main body. Note the force and amount of time when the separation occurred and record it.

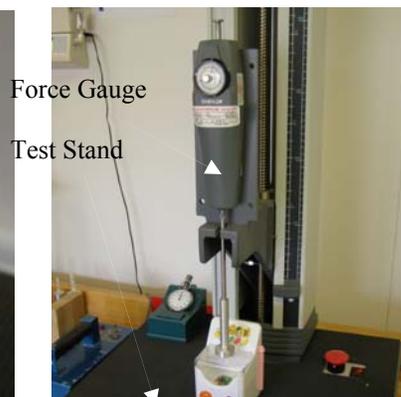
9.3.7.7.8 Perform the small parts test on any separated pieces for samples with age determinations of less than 3 years.

#### 9.3.8 Compression Test

9.3.8.1 Determine the correct compressive force from Table 2 (page 28) based on the age determination of the sample.

9.3.8.2 Place the toy in a stable position in the test apparatus, Figure 21.

9.3.8.3 Attach the compression disc to the spring force gauge and position the disc so that its contact surface is parallel to the surface being tested. The direction of the force is perpendicular to the surface being tested.



## Figure 21- Compression Test

9.3.8.4 Apply the required force over 5 seconds and maintain it for an additional 10 seconds.

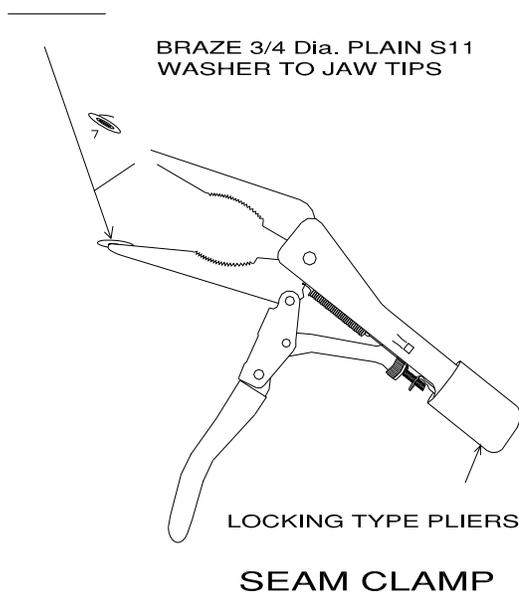
9.3.8.5 Examine for any sharp points or sharp edges after the test is completed. Perform the small parts test on any separated pieces for samples with age determinations of less than 3 years.

### 9.3.9 Seam Test for Stuffed Toys and Bean Bags

9.3.9.1 Determine the correct tensile force from Table 2 (page 28) based on the age determination of the sample.

9.3.9.2 A single tension test shall be applied to the weakest seam(s) in a direction perpendicular to that seam approximately 0.5 inch away from the seam. The weakest seam shall be determined by CPSC staff performing the test.

9.3.9.3 The clamps used for the seam test can be constructed by brazing/soldering two 0.75 inch diameter washers to a vise grip-type clamp, Figure 22.



**Figure 22 – Seam Clamp**

9.3.9.4 Attach the clamps to the covering material no closer than 0.5 inch from the seam. If the material adjacent to the seam cannot be grasped between the thumb and

forefinger of the test personnel sufficiently for full clamping, then this test will not be performed, Figure 23.



**Figure 23 – Seam Test**

9.3.9.5 Apply the appropriate force evenly over 5 seconds and hold for an additional 10 seconds.

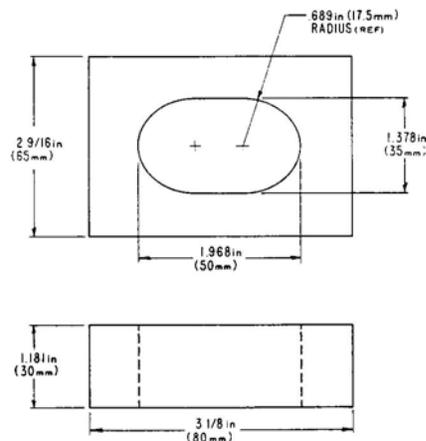
9.3.9.6 After the test, examine the seam for separation and accessibility to any sharp points or sharp edges with the 0-36 month probe. The stuffing material shall be screened for small parts. Typical stuffing materials identified as small parts are crushed nut shells, polystyrene foam, and polypropylene pellets.

## 10. RATTLES

### 10.1 REQUIREMENT

No portion of a rattle shall be capable of entering and penetrating to the full depth of a cavity in a test fixture with dimensions shown in Figure 24. Rattles shall meet this requirement both before and after performing the use and abuse tests of section 9 of this manual (excluding the flexure tests).

CAVITY CENTERED WITHIN FIXTURE



## Figure 24 – Rattle and Supplemental Rattle Test Fixtures

### 10.2 TEST PROCEDURE

10.2.1 Place the rattle test fixture shown in Figure 25 on an elevated horizontal plane surface. Allow enough vertical space to perform the test.



**Figure 25 – Rattle Test Setup**

10.2.2 Apply any portion of the test sample in the most adverse orientation to the opening in the test fixture under its own weight and in a non-compressed state, Figure 26.



**Figure 26 – Rattle Test**

10.2.3 Repeat this procedure after performing the abuse tests.

10.2.4 Rigid rattles incorporating nearly spherical, hemispherical, or circular flared ends shall be designed such that the ends are not capable of entering and penetrating to the full depth of the supplemental test fixture illustrated in Figure 24. A rattle shall meet this requirement when tested under the force only of its own weight and in a non-compressed state.

10.2.5 Repeat 10.2.4 after performing the use and abuse testing in accordance with Section 9, Test Criteria and Procedures of this manual.

## 11. PACIFIERS

## 11.1 VISUAL TESTS

11.1.1 A pacifier sample shall not have any ribbon, string, cord, chain, twine, leather, yarn, or similar attachments.

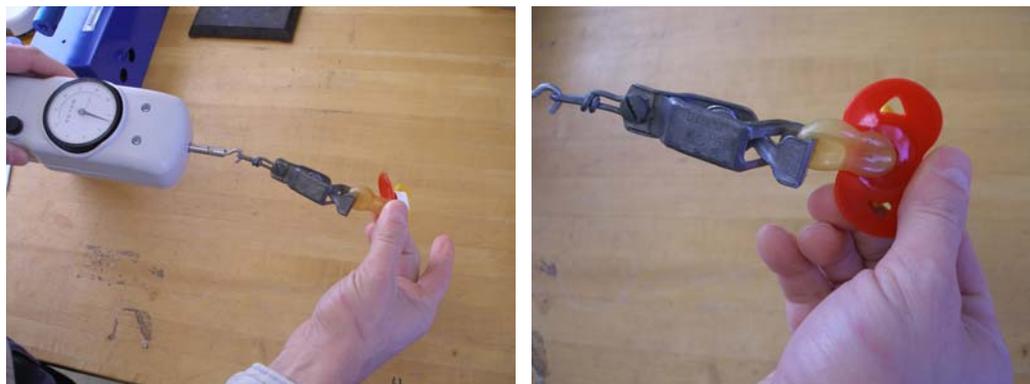
11.1.2 EXCEPTION - A seven inch lanyard that is not permanently attached to the pacifier and is packaged separately from the pacifier is allowed.

11.1.3 Pacifiers shall be labeled “Warning – Do Not Tie Pacifier Around Child’s Neck as it Presents a Strangulation Danger.” The label shall appear legibly and conspicuously.

## 11.2 STRUCTURAL INTEGRITY TEST

### 11.2.1 Nipple Test

11.2.1.1 Hold the pacifier by the shield or guard, grasp the nipple end of the pacifier, and gradually apply a tensile force to the pacifier nipple in any possible direction, Figure 27.



**Figure 27 – Pacifier Nipple Test**

11.2.1.2 The force of 10.0 lb (44.5 N) shall be applied evenly over a period of 5 seconds. Maintain the 10.0 lb force for an additional 10 seconds.

11.2.1.3 The subsample shall fail if the nipple becomes detached from the shield.

### 11.2.2 Handle/Ring Test

11.2.2.1 Hold the pacifier by the shield or guard or base of the nipple, and push or pull on the handle or ring in any possible direction, Figure 28.



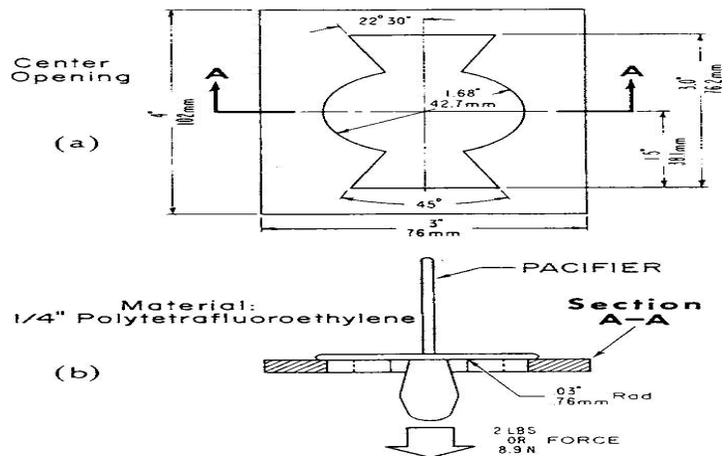
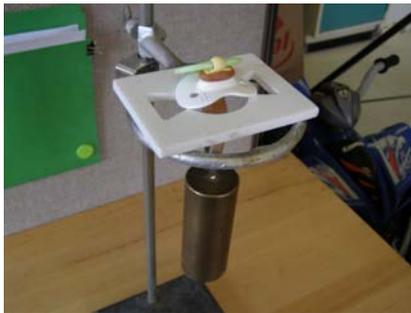
**Figure 28 – Pacifier Handle Test**

11.2.2.2 A force of 10.0 lb (44.5 N) shall be applied evenly over a period of 5 seconds. Maintain the 10.0 lb force for an additional 10 seconds.

11.2.2.3 The subsample shall fail if any small parts are generated from the pacifier during this test.

### 11.2.3 Guards and Shields

11.2.3.1 Place the pacifier in the opening of the pacifier test fixture so the nipple of the pacifier is centered in the opening and protrudes through the back of the fixture as shown in Figure 29.



**Figure 29 – Pacifier Shield and Shield Test**

11.2.3.2 For pacifiers with non-circular guards or shields, align the major axis of the guard or shield with the major axis of the opening in the fixture.

11.2.3.3 Apply a tensile force to the pacifier nipple in the direction shown. The force shall be applied gradually attaining but not exceeding 2.0 lb (8.9 N) over a period of 5 seconds and maintained for an additional 10 seconds.

11.2.3.4 Any pacifier which can be completely drawn through an opening with dimensions no greater than those of Figure 29 by such a force shall be considered to not meet this requirement.

#### 11.2.4 Ventilation Holes

11.2.4.1 The pacifier guard or shield shall contain at least two holes symmetrically located and each being at least 0.20 inches (5 mm) in minor dimension.

11.2.4.2 The edge of any hole shall be no closer than 0.20 inches (5 mm) to the perimeter of the pacifier guard or shield.

#### 11.2.5 Protrusions

11.2.5.1 Secure the pacifier by clamping the nipple with its axis horizontal. For pacifiers with hinged handles or rings, the orientation of the hinge axis shall be horizontal.

11.2.5.2 A plane surface shall be applied to any protrusion from the guard or shield with a force gradually attaining but not exceeding 2.0 lbf (8.9 N) applied in a direction along the axis of the nipple, Figure 30.



**Figure 30 – Pacifier Protrusion Test**

11.2.5.3 The normal of the plane surface shall be maintained parallel to the axis of the nipple. Any protrusion shall be allowed to flex or rotate about its hinge as the plane surface is applied to it.

11.2.5.4 Measure the distance from the plane surface to the guard or shield at the base of the nipple. No protrusion from the face of the guard or shield opposite from the nipple shall exceed 0.63 inches (16 mm).

#### 11.2.6 Heat Cycle Deterioration Test

11.2.6.1 All pacifier subsamples subjected to the testing prescribed in sections 11.2.1 through 11.2.5 shall be subjected to the heat cycle deterioration test.

11.2.6.2 Submerge the pacifier in boiling water for 5 minutes and then remove the pacifiers. Allow them to cool for 5 minutes in 60°F to 80°F room temperature air (16°C to 27°C).

11.2.6.3 Re-submerge the pacifiers in the boiling water for 5 minutes. Repeat the process for a total of 6 boiling/cooling cycles.

11.2.6.4 After the sixth cycle, the pacifier shall again be subjected to the structural tests in sections 11.2.1 and 11.2.2.

11.2.7 Any components or fragments which are released as a result of the tests in section 11.2 of this manual shall be tested for small parts. The subsample shall be considered to not meet this requirement if released components or fragments are determined to be small parts.

## **12. BATTERY-OPERATED TOYS**

### **12.1 REQUIREMENTS**

12.1.1 Toy samples utilizing batteries (either non-rechargeable or rechargeable batteries) are subject to these testing requirements.

12.1.2 All testing shall be accomplished using fresh batteries that meet the dimensional requirements of the latest revision of ANSI C18.1, *Portable Lithium Primary Cells and Batteries – General and Specifications*, or the latest revision of IEC 60086-2, *Primary Batteries – Part 2: Physical and electrical specifications*. Repeat the test using the batteries specified by the manufacturer (if other than alkaline), if possible.

12.1.3 Rechargeable batteries shall be fully charged prior to testing.

12.1.4 The battery compartment on all toy samples shall be permanently marked or marked in the area immediately adjacent to the battery compartment to show the correct placement/battery polarity using the polarity symbols “+” and “-”. Battery compartments for button cell batteries are not subject to this requirement. The battery compartment door is considered part of the battery compartment.

12.1.5 Additional markings located on the toy or in the instructions must indicate the correct battery size and voltage. These markings are not required for non-replaceable batteries or for rechargeable battery packs that, by design, can only be inserted in the correct orientation.

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

12.1.7 Battery-operated toys shall be designed so that it is not possible to charge any non-rechargeable battery either through physical design of the battery compartment or through circuit design. This applies to any sample in which batteries may be installed incorrectly (reversed) or in which a battery charger may be applied to a sample containing non-rechargeable batteries.

12.1.8 The toy shall not contain batteries of different types or capacities within any single electrical circuit.

12.1.9 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.

## 12.2 EXEMPTIONS

12.2.1 Section 12.1.7 does not apply to samples containing circuits with one or two non-rechargeable batteries as the only source of power.

12.2.2 Toys having a circuit powered only by button cell-type batteries are not subject to section 12.1.7.

## 12.3 BATTERY TESTING

12.3.1 All battery-operated toys shall be tested in accordance with the recommended batteries installed and in accordance with section 9.3, abuse testing. Testing shall be performed with manufacturer recommended batteries installed in the toy sample.

12.3.2 Batteries and battery compartments of toy samples with age determinations of under 3 years shall be tested in accordance with section 9, Test Criteria and Procedures, Test Criteria and Procedures.

12.3.2.1 Battery compartments shall not be accessible without the use of a coin, screwdriver, or other common tool in toy samples that are age graded for children less than 3 years old.

12.3.2.2 Batteries that fit completely within the small parts test cylinder shall not be accessible, before and after testing.

### 12.3.3 Normal Testing

12.3.3.1 Toy samples shall be operated in accordance with the manufacturer's instructions until the batteries have been fully depleted.

12.3.3.2 Monitor the temperature of the surfaces of the batteries during operation. The surfaces of the batteries shall not achieve temperatures exceeding 160°F (71°C) for all battery-operated toys during operation.

12.3.3.3 Perform abuse testing in accordance with section 9.3.

12.3.3.3.1 Samples with age determinations of less than 96 months shall be retested and must meet the temperature requirements of this section.

12.3.4 If the toy contains mechanical components that are externally linked to the motor and which can be stalled by the user, perform the stalled motor test in accordance with section 13.1 to determine conformance with the temperature limits.

12.3.5 CPSC test personnel may perform additional operational testing as required to ensure no condition can occur that would cause the toy sample to fail the temperature requirements.

## **13. BATTERY-POWERED TOYS**

### **13.1 STALLED MOTOR TEST FOR BATTERY-POWERED TOYS**

13.1.1 Each test shall be conducted using a new toy subsample and each motor shall be tested separately using new alkaline batteries. If batteries other than alkaline are specified by the manufacturer, repeat the test using the specified batteries, if possible.

13.1.2 All tests shall be carried out in a draft-free location at an ambient temperature of  $68 \pm 9^\circ\text{F}$  ( $20 \pm 5^\circ\text{C}$ ).

13.1.3 Operate the toy sample with the moving parts that are mechanically linked to a motor locked in a fixed position. Only parts which can be stalled external to the toy subsample shall be locked. Do not disable any mechanical or electrical protective device, such as clutches or fuses.

13.1.3.1 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 for 60 minutes.

13.1.3.2 If the toy shuts off automatically or must be kept “on” by hand or foot, monitor temperatures for 30 s and reset the component as many times as necessary to complete 30 s of operation.

13.1.3.3 If the toy shuts off automatically after an operating time of greater than 30 s, continue the test until the toy shuts off.

13.1.4 Monitor the battery temperatures with the toy fully assembled.

13.1.5 Record the temperature of each battery at 5-minute intervals until battery is depleted or the toy shuts off.

13.1.6 The stalled motor condition shall not cause temperatures to exceed the limits of section 12.3 ( $106^\circ\text{F}$  or  $71^\circ\text{C}$ ) or cause battery leakage, an explosion, or a fire.

13.1.7 The maximum temperature measured on the insulation of any conductor shall not exceed the temperature rating of the material.

### **13.2 TESTS FOR BATTERY-POWERED RIDE-ON TOYS**

13.2.1 Sample components tested in accordance with these requirements are to be installed and powered in the toy as practical.

13.2.2 Component testing may be accomplished with the component removed from the vehicle in cases where in-place testing is not practical, at the discretion of the tester. In cases where the component is removed, the component must be undamaged and intact and tested in a manner that simulates operation in the sample toy.

13.2.3 All testing is to be started using fully charged batteries or an equivalent power supply.

13.2.4 Testing requiring vehicle operation is to be conducted on a hard level surface covered with 3M #610 General Purpose Safety Walk Tape or equivalent (coefficient of friction between 1.27 and 1.32 in accordance with MIL-D-17951, Military Specification: Deck Covering, Lightweight, Nonslip, Abrasive Particle Coated Fabric, Film, Or Composite And Sealing Compound).

13.2.5 All user-replaceable circuit protection devices used in battery-powered ride-on toys shall be listed, recognized, or certified by an independent testing laboratory.

13.2.6 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 designed such that it does not easily allow tampering.

13.2.6.1 All replaceable circuit protection devices shall be subjected to the abuse tests of section 9.3.

13.2.7 Maximum Temperature Test (battery powered ride-on toys)

13.2.7.1 Mechanically precondition all electrical pressure connections used for charging or discharging the batteries.

13.2.7.1.1 The main harness connection shall be connected and disconnected 600 times before the maximum temperature test is performed.

13.2.7.1.2 If a user-replaceable fuse is provided, remove and insert the fuse 25 times before performing the maximum temperature test.

13.2.7.2 Operate the vehicle in the mode that results in the maximum continuous current draw using the manufacturer's recommended battery.

13.2.7.3 Determine the maximum continuous current draw by testing the vehicle on an adjustable friction roller dynamometer or any acceptable surface in accordance with the manufacturer's instructions.

13.2.7.4 Perform a minimum of 3 preliminary trials on different surfaces and with different weights to determine the conditions in which the maximum continuous current draw occurs.

13.2.7.5 Adjust the weight, up to the manufacturer's maximum allowable. Adjust the dynamometer to achieve the maximum current. Secure the sample prior to testing.

13.2.7.6 Operate the vehicle continuously for 60 minutes under the condition determined in 13.2.6.5, until the battery is exhausted or until thermal equilibrium is reached. The maximum temperature measured on the insulation of any conductor shall not exceed the temperature rating of the material (third party test laboratory rating).

13.2.7.7 If thermal equilibrium is not reached, replace the battery with a fully charged battery and continue the test.

13.2.8 Stalled Motor Test

13.2.8.1 Mechanically lock any accessible motor driven parts. For toy samples having more than one motor, each motor shall be tested individually. Begin testing with fully charged batteries.

13.2.8.2 For toy samples having more than one operating mode, a separate test shall be conducted in each mode.

13.2.8.3 Drape the toy sample entirely with a double layer of cheesecloth. For motors or other electrical components that are accessible, additional cheesecloth shall be draped over each component. # 60 cotton gauze cheesecloth with a thread count of 32 by 28 threads per inch shall be used.

13.2.8.4 Operate the toy under the stalled condition of 13.2.7.1 until a circuit protection device interrupts the current or until the battery is depleted.

13.2.8.5 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 additional times.

13.2.8.6 If the circuit protection device automatically resets, continue the stalled motor test until the battery is exhausted.

13.2.8.7 The test shall not result in ignition of the cheesecloth.

#### 13.2.9 Nuisance Tripping Test (battery-powered ride-on toys)

13.2.9.1 This test shall be conducted on any battery-powered ride-on toy designed with a wiring system that has a user-replaceable device (fuse) for the primary circuit protection or a wiring system with user-resettable primary circuit protection (manual reset fuse).

13.2.9.2 All tests shall be conducted on a level surface as specified in 13.2.4. The vehicle shall be loaded with the maximum weight specified by the manufacturer.

13.2.9.3 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.

13.2.9.4 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 0.5s reverse) in the mode that draws the greatest current.

13.2.9.5 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.

13.2.9.6 No component tested shall actuate (open or trip).

#### 13.2.10 Switch Endurance and Overload Tests (battery-powered ride-on toys)

13.2.10.1 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:* (1) 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 at least 8 amps into any variable resistor load for at least one minute.  
(2) UL-94 refers to Underwriters Laboratories Inc. Standard 94, Test for Flammability of Plastic Materials for Parts in Devices and Appliances.

13.2.10.2 Precondition switches at 95% relative humidity between 68°F and 90°F (20°C and 32°C) for 48 h.

13.2.10.3 Conduct the switch endurance and overload tests at 104±2°F (40±1°C).

*Note:* Switch assembly may be removed from the sample if it is not practical to test the component in place. Assembly must remain intact and be tested in such a way as to simulate the operation as originally installed.

13.2.10.4 The switch is to be operated by means of its actuating member either manually or by mechanical means, making or breaking the test current.

13.2.10.4.1 If a fuse or protective device operates (opens or trips), the device must be replaced or reset as many times as necessary to complete the required number of cycles.

13.2.10.4.2 The switch body shall not result in a short circuit condition when subjected to the switch endurance test and overload tests.

13.2.10.4.3 The switch shall not fail in a mode which could cause the vehicle to run continuously (switch stuck in the “on” position).

13.2.10.5 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).

13.2.10.6 A minimum of 3 subsamples shall be tested. All subsamples shall pass for the sample to meet the requirements of this section.

13.2.10.7 Switch Endurance Test (battery-powered ride-on toys)

13.2.10.7.1 Conduct the endurance test for 100,000 cycles on any switch used for starting and stopping of the vehicle.

13.2.10.7.2 Cycle the switch using the maximum continuous current load as determined in the Maximum Temperature Test, section 13.2.7, or in an equivalent simulated motor load circuit including the inrush and inductive characteristics (minimum 1 s “on” time and at least 6 cycles per minute).

13.2.10.7.3 All other switches are to be subjected to 6,000 cycles of endurance testing. Cycle switch using the maximum continuous current load as determined in the Maximum Temperature Test, section 13.2.7, or in an equivalent

simulated motor load circuit including the inrush and inductive characteristics (minimum 1 s “on” time and at least 6 cycles per minute).

#### 13.2.10.8 Switch Overload Test (battery-powered ride-on toys)

13.2.10.8.1 Conduct the overload test on switches that are relied upon for starting and stopping of the vehicle.

13.2.10.8.2 Stall the motor(s) of the toy.

13.2.10.8.3 Operate the switch for 50 cycles of operation at a rate of 6 cycles per minute with 1 s “on” and 9 s “off.”

#### 13.2.11 Battery Overcharge Test (battery-powered ride-on toys)

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

13.2.11.2 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.

13.2.11.3 If the battery can be charged in the vehicle, place the battery in the vehicle and connect it to the charging circuit.

13.2.11.3.1 Drape the charger, cable, and battery with a double layer of cheesecloth. Cheesecloth shall be #60 cotton gauze with a thread count of 32 by 28 threads per inch.

13.2.11.3.2 The test shall not result in ignition of the cheesecloth or in the release of electrolyte.

13.2.11.4 During charging, battery-charging voltages shall not exceed the manufacturer’s recommended charging voltages.

#### 13.2.12 Short-Circuit Protection Test (battery powered ride-on toys)

13.2.12.1 Wiring connected to the main/motor battery shall be short-circuit protected and shall not present a risk of fire when tested.

13.2.12.2 Entirely drape the toy with a double layer of cheesecloth.

13.2.12.3 Short circuit parts of opposite polarity.

13.2.12.4 Any applied short-circuit condition shall not result in ignition of the cheesecloth.

#### 13.2.13 Strain Relief Test (battery-powered ride-on toys)

13.2.13.1 The electrical connections of the cord or harness wires entering a connector block are to be disconnected.

13.2.13.2 Apply a maximum force of 20 lbf (90 N) to the cord from any angle permitted by the construction of the toy so that the strain relief will be stressed.

13.2.13.3 Maintain the specified force for 1 min. There shall be no movement of the cord relative to the connections.

## 14. SOUND-PRODUCING TOYS

### 14.1 REQUIREMENTS

14.1.1 Toys that are designed to emit sound shall conform to the following requirements:

14.1.1.1 The A-weighted equivalent sound pressure level,  $LA_{eq}$ , of continuous sounds produced by close-to-the-ear toys shall not exceed 65 dB.

14.1.1.2 The A-weighted equivalent sound pressure level,  $LA_{eq}$ , of continuous sounds produced by all other toys except close-to-the-ear toys and push/pull toys shall not exceed 85 dB.

14.1.1.3 The C-weighted peak sound pressure level,  $LC_{peak}$ , of impulsive sounds produced by close-to-the-ear toys shall not exceed 95 dB.

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

14.1.1.5 The C-weighted peak sound pressure level,  $LC_{peak}$ , of impulsive sounds produced by a toy using percussion caps or other explosive action shall not exceed 125 dB.

### 14.2 EXEMPTIONS

14.2.1 Mouth-actuated toys (section 15) where the sound pressure level is determined by the blowing action of the child.

14.2.2 Child-actuated 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.

14.2.2.1 The continuous sound pressure requirements do not apply to rattles; however, rattles are covered by impulsive sound pressure requirements.

14.2.3 Radios, tape players, CD players, and other similar electronic toys and toys where the sound output is dependent on the content of removable media (for example, game cartridges, flash cards, and so forth).

14.2.4 Toys that are connected to or interfaced with external devices (for example, televisions, computers) where the sound pressure level is determined by the external device; and sound emitted from earphones/headphones.

## 14.3 NOISE PRODUCING TOY TESTS

14.3.1 Testing shall be done on a new untested toy. Test battery powered toys using new or fully charged batteries. External power supplies should not be used as they may affect the performance of the toy.

14.3.2 Testing shall be performed in the CPSC Toy Lab. The doors and windows shall be closed prior to testing.

### 14.3.3 Microphone Positions

14.3.3.1 A minimum of 3 microphone positions shall be used for any individual test.

14.3.3.1.1 One microphone may be moved from position to position or the test sample may be rotated while maintaining a single microphone location.

14.3.3.1.2 Attention must be paid to maintaining the correct measuring distance.

### 14.3.3.2 Close-to-the-Ear Toys

14.3.3.2.1 The earpiece of the sample toy shall be aligned with the microphone at a distance of  $50 \pm 0.5$  cm ( $19.7 \pm 0.2$  in) from the earpiece.

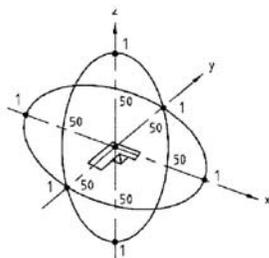
14.3.3.2.2 On samples without earpieces, locate the microphone  $50 \pm 0.5$  cm ( $19.7 \pm 0.2$  in) from the surface of the toy where the sound pressure level at the microphone is maximized.

14.3.3.2.3 To measure impulsive sounds, locate the microphone  $50 \pm 0.5$  cm ( $19.7 \pm 0.2$  in) from the surface of the toy where the sound pressure level at the microphone is maximized.

### 14.3.3.3 Cap-Firing Toys

14.3.3.3.1 Use six microphone positions around the toy.

14.3.3.3.2 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, Figure 32.

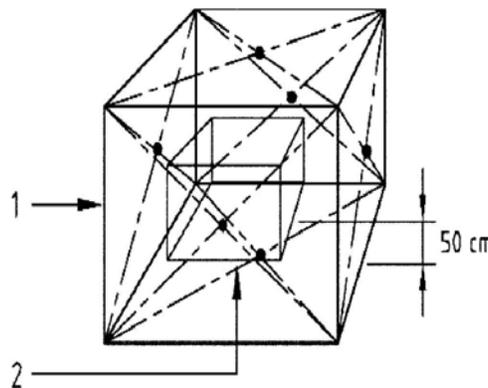


## Figure 32 - Sound Measurement Microphone Locations (Cap Firing Toys)

14.3.3.3.3 If the length of the toy exceeds 50 cm, rotate the toy in the  $xy$ -plane  $45^\circ$  around the  $z$ -axis without changing the microphone positions. Select two microphone positions along each axis at a distance of  $50 \pm 1$  cm ( $19.7 \pm 0.4$  in) from the origin.

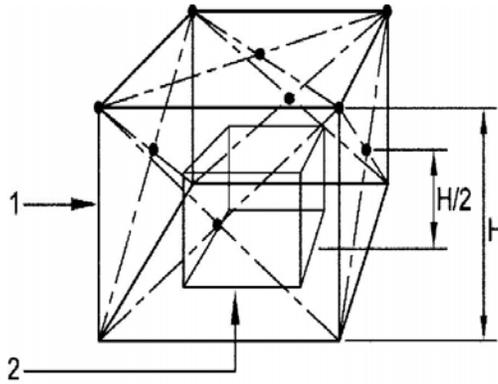
14.3.3.4 Rattles - mount the microphone 1.2 m above the floor and at a distance of 0.5 m from the sound source.

14.3.3.5 Other Hand-Held Toys - select six microphone positions on a box-shaped measurement surface at the measuring distance of 50 cm from the reference box of the toy, as shown in Figure 33. The positions are at the centers of the sides of the measurement surface at the distance 50 cm from the reference box, Figure 33.



## Figure 33 - Sound Measurement Microphone Locations (Miscellaneous Other Toys)

14.3.3.6 Stationary and Self-Propelled Table-Top, Floor, and Crib Toys - select 5 microphone positions (9 microphone positions if the length or width of the toy is larger than 100 cm) at the measuring distance of 50 cm on a box-shaped measurement surface. The sides of the measurement box with height  $H$  are always 50 cm from the sides of the reference box, except for the bottom of the boxes, which lie in the same plane, Figure 34. All microphone positions are on the measurement box, Figure 34.



- (1) Measurement Box  
 (2) Reference Box

**Figure 34 - Sound Measurement Microphone Locations (Stationary, and Self-Propelled, Floor, Table-Top, and Crib Toys)**

14.3.3.7 Pull and Push Toys and Hand-Activated Spring-Propelled Toys - for toys with a width ( $w$ ) of 25 cm or less, use 2 microphones at distances ( $d$ ) 50 cm from the  $x$ -axis of the measuring coordinate system. For toys with a width ( $w$ ) of more than 25 cm, use 2 microphone at distances ( $d$ ) 40 cm plus half the width of the toy from the  $x$ -axis ( $40 + w/2$ ). Place the toy on a test rig or on the reflecting plane in its normal operating orientation in such a way that movement of the toy is possible along the  $x$ -axis passing the microphone positions.

#### 14.3.4 Installation and Mounting Conditions

14.3.4.1 Test rigs used for the mounting of toys and/or the operator of the toy shall not affect the sound emission of the toy during the test or cause sound reflections that could increase the sound pressure levels at the measuring points.

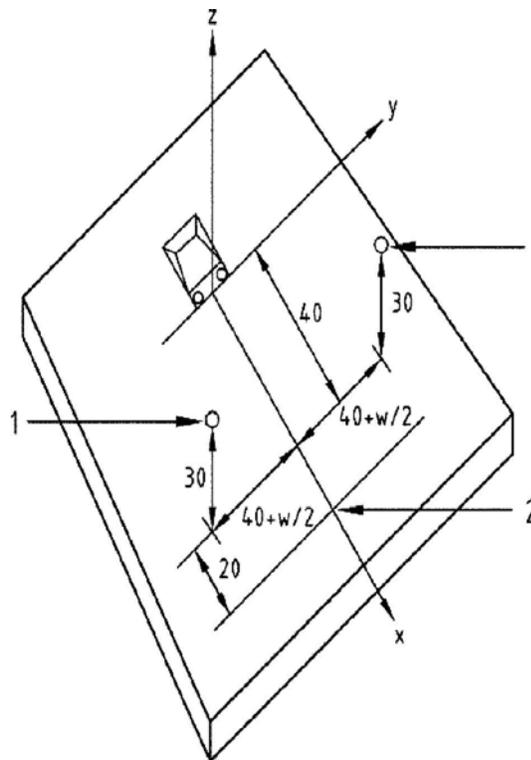
14.3.4.2 Mount close-to-the-ear toys and hand-held toys in a proper test rig at least 100 cm above the reflecting plane or have them operated by an adult operator with the arm outstretched.

14.3.4.3 Stationary table top, floor, and crib toys shall be tested on a stable wooden bench top with a thickness of 4 cm (1.5 in) or larger. The bench top should be large enough to accommodate microphone locations.

14.3.4.4 Mount self-propelled table top and floor toys on a bench top as described in section 14.3.4.3. The installation shall allow sample operation with full power, but prevents the sample from moving around.

14.3.4.5 Place pull and push toys on the reflecting plane (concrete, tile, or other hard surface) and fix them in a test rig which enables them to be moved at varying speeds along a line which passes the measuring microphones (“pass by” test). Ensure the friction of the reflecting plane prevents wheels from skidding.

14.3.4.6 Place hand-actuated wind-up toys, with the wind-up spring fully loaded, on the reflecting plane (concrete, tile, or other hard surface) so that the front of the toy is  $40 \pm 1$  cm ( $1.5 \pm 0.5$  inch) along the  $x$ -axis from the microphones of the “pass by” test, Figure 31.



**Figure 31- Sound Measurement Microphone Locations (Push/Pull Toys)**

14.3.4.7 All other types of toys shall be mounted in the most appropriate way similar to that described in sections 14.3.4.

#### 14.3.5 Operating Conditions

14.3.5.1 Sample shall be tested in its intended use as described by the manufacturer so that it produces the highest sound pressure level as measured by the microphone.

14.3.5.2 Operate all hand-actuated toy samples manually (excluding pull and push toys). A maximum applied force equal to the maximum tensile or compressive force defined in Table 2 (page 28), based on the age determination of the toy sample, for operation.

14.3.5.2.1 Shake toy samples intended to be shaken at a rate of three times per second. One cycle shall consist of an initial 15 cm (6 in) stroke followed by a return to the starting point.

14.3.5.3 Operate a rattle by grasping obvious hand holds or at the longest lever between the hand and the sound emitting part.

14.3.5.3.1 Ensure the radiated sound is not affected by the grip of the hand.

14.3.5.3.2 Strike downwards ten times in a slow tempo using the wrist while keeping the forearm essentially horizontal.

14.3.5.3.3 Stand perpendicular to the axis of the microphone keeping the rattle at the same height as the microphone with a distance of 50 cm (19.5 in) during testing.

14.3.5.4 Operate a pull and push toy at a speed that yields the maximum sound pressure level. Do not exceed 2 m/s (6.6 ft/s).

14.3.5.5 Operate a cap-firing toy using percussion caps recommended by the manufacturer and which are available on the market.

#### 14.3.6 Instrumentation

14.3.6.1 Testing shall be performed using the Bruel & Kjaer Type 2250 Sound Analyzer or an equivalent sound measuring instrumentation system.

14.3.6.2 An alternative instrumentation system, including the microphone and cable, which meets the requirements of a class 1 or class 2 instruments specified in IEC 61672-1, *Electroacoustics – Sound level meters Part 1: Specifications*, and IEC 61672-2, *Electroacoustics – Sound level meters Part 2: Pattern evaluation tests* may be used as necessary. The entire instrumentation system shall have the capability of handling linear peak levels exceeding the C-weighted peak levels by at least 10 dB.

#### 14.3.7 Measurements:

14.3.7.1 Toy samples shall be operated to achieve the peak operation before tests are performed.

14.3.7.2 If the toy sample has a clearly defined operating cycle, measure the equivalent sound pressure level in each microphone position during at least one whole cycle.

14.3.7.2.1 Quiet periods longer than 15 s shall be excluded from the measurement period. Perform a total of 3 measurements.

14.3.7.3 If the toy under test does not have a clearly defined operating cycle, measure the equivalent sound pressure level in each microphone position for at least 15 s during the operational mode where the noise level is highest. Record a minimum of 3 measurements.

14.3.7.4 Measure the C-weighted peak sound pressure level for pass-by tests. Record a minimum of 2 sound measurements on each side of the sample.

14.3.7.5 Measure the C-weighted peak sound pressure level, *LCpeak*, of impulsive sounds in each microphone position. Perform a minimum of 3 sound measurements.

14.3.7.6 Measure the C-weighted peak sound pressure level, *LCpeak*, for 10 cycles on all rattle samples. Perform a minimum of 3 measurements.

14.3.7.7 All sound measurement results shall be given as:

- (1) A-weighted equivalent sound pressure level at the specified position, LAeq, in decibels;
- (2) A-weighted maximum sound pressure level at the specified position, LAmax (pass-by tests), in decibels;
- (3) C-weighted peak sound pressure level at the specified position, LCpeak, in decibels.

14.3.7.8 The highest value of the applicable measurements (LAeq, LAmax, and LCpeak) at any of the microphone positions is the measurement result.

## **15. MOUTH-ACTUATED TOYS**

15.1 Testing of mouth-actuated toy samples is required if the outlet is capable of being inserted into or covered by the mouth.

15.2 Connect a piston pump capable of producing a minimum air volume of 18 in<sup>3</sup> (295 cm<sup>3</sup>) in less than 3s to the mouthpiece of the toy. Use the adapters provided with the piston pump test fixture to connect the test sample.

15.3 Install a relief valve so the pump will not generate a positive or negative pressure of more than 2 psig.

15.4 Toy samples shall be subjected to 10 alternating positive and negative pressure cycles of air, 18 in<sup>3</sup> (295 cm<sup>3</sup>) minimum, including the air volume discharged through the relief valve.

15.5 Any objects released as a result of this test shall be inspected for small parts, sharp points, and sharp edges, as appropriate. Small objects contained in an inflatable toy shall not be liberated during inflation or deflation.

15.6 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 not meet the small parts requirements when air is alternately blown and sucked rapidly through the mouthpiece.

15.7 The above procedure shall be applied to the outlet if the air outlet of the toy is accessible.

## **16. PROJECTIONS**

16.1 Inspect all projections which appear to present a potential skin puncture hazard to ensure each is protected by suitable means, such as by turning back the end of a wire or by affixing a smoothly finished protective cap or cover.

16.2 All toy samples shall meet this requirement both before and after testing in accordance section 9, Test Criteria and Procedures.

16.3 Toys intended to be repeatedly assembled and taken apart shall be tested separately and in the assembled condition.

16.4 The test requirement for assembled toys does not apply where the assembling makes up a significant part of the play value of the toy.

16.4 Only projections that are determined to be accessible by the tester are required to be evaluated as projection hazards.

16.5 The toy shall be tested in its most hazardous orientation. Corners of structures shall not be considered as projections.

## **17. WOOD**

17.1 The accessible surfaces and edges of wood used in toys shall be free of splinters, both before and after being tested in accordance with section 9, Test Criteria and Procedures.

17.2 Splinters shall be considered any part of the wood that has become separated or a piece or part that is partially attached and does not meet the sharp point or small parts (samples with age determinations less than 3 years) when tested to the requirements of section 9, Test Criteria and Procedures.

## **18. WIRES AND RODS**

18.1 Wires and rods used in the interior of sample toys shall be subjected to the abuse tests of section 9.

18.2 Wires or rods used in the interior of toys shall not have their ends unfinished or contain hazardous points or burrs if they become accessible after testing.

18.2 Metal wires or other metal materials used for stiffening or the retention of form in sample toys shall not fracture to produce a hazardous point, edge, or projection when the component is bent through a 60° arc by the applicable maximum force in accordance with section 9.2.

18.3 When applied perpendicularly to the major axis of the component at a point  $2 \pm 0.05$  in ( $50 \pm 1.3$  mm) from the intersection of the component with the main body of the toy or at the end of the component if the component is less than 2 in (50 mm) long, the maximum force shall be as follows (within a tolerance of  $\pm 0.5$  lb ( $\pm 0.02$  kg)):

- 10 lbf (44.5 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

18.4 Inspect umbrella spokes. The ends of spokes on toy umbrella samples shall be protected in accordance with section 16.

18.4.1 If the protection can be removed when tested in accordance with section 9.2, the ends of the spokes shall be free from sharp edges and sharp points.

18.4.2 If the protective components can be 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.

## 19. NAILS AND FASTENERS

19.1 All accessible nails and fasteners shall be tested in accordance with section 9.2 and section 16.

19.2 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 section 25.

## 20. PACKAGING FILM

20.1 Use the Starrett digital dial indicator for testing packaging film, Figure 35.



20.2 Remove a 3.94 in by 3.94 in (100 mm by 100 mm) area of the film included with or as part of the sample.

20.2.1 For plastic bags, prepare by cutting the sides, without stretching, into two single sheets.

### Figure 35 – Packaging Film Tester

20.3 Measure 10 equidistant points across the diagonal of any film sample.

20.3.1 Zero the dial indicator against the granite plate.

20.3.2 Lift dial indicator, position the sample, and carefully allow the dial indicator to contact the packaging surface at each of the 10 points measured in section 20.3.

20.4 The average thickness of the 10 measurements shall not be less than 0.00150 in. (0.03810 mm) for shelf packaging materials.

20.5 The actual thickness (any single measurement) shall never be less than 0.00125 in (0.03175 mm).

20.5.1 Sheeting with an average thickness of less than 0.00150 in (0.03810 mm) shall be perforated with holes (a minimum area of 1 % of the sample area) over any 1.18 in x 1.18 in (30 mm x 30 mm) sample of packaging material.

20.6 This requirement does not apply to the following:

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

- 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.

## **21. FOLDING MECHANISMS AND HINGES (except for toy chests)**

### **21.1 REQUIREMENTS**

21.1.1 Toy furniture and other toy samples which contain a folding mechanism, arm, or bracing intended to support a child (or weight of a child in normal use) shall have a safety stop or locking device to prevent unexpected or sudden movement or collapse of the article. These requirements do not apply to door edges or to toy pivot points on toys such as truck bodies, earth moving machinery, or similar toys.

21.1.2 If the folding mechanism does not contain a safety stop, the sample must 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 article.

### **21.2 HINGE-LINE CLEARANCE**

21.2.1 Measure the gap between the stationary and moveable hinge line components.

21.2.1 Remove and weigh the hinge line moveable component of the toy sample.

21.2.3 Toys having a gap or clearance along the hinge line between a stationary portion and a moveable portion that weighs more than 0.5 lb (0.2 kg) shall be constructed such that the accessible gap at the hinge line will admit a 3/16-in (5 mm) diameter rod; it will also admit a 1/2 in (13 mm) diameter rod at all positions of the hinge.

### **21.3 LID SUPPORT MECHANISM TESTING**

21.3.1 Assemble the sample in accordance with the manufacturer's instructions.

21.3.2 Lift the lid to any position in its arc of travel to a distance greater than 2 in. (50 mm).

21.3.2.1 Do not cause the lid to move through an arc of more than 60° from the lid's fully closed position. Measurement shall be taken at the outermost edge of the lid.

21.3.2.2 Release the lid. The lid shall not drop at the point where the measurement is taken.

21.3.3 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.

21.3.4 To prevent undue stress on screws or other fasteners used to attach lid support mechanisms, do not to force the lid beyond its normal arc of travel.

21.3.5 The time to complete one cycle shall be approximately 15 s. The 7000 cycles shall be completed within a time period of 72 h using the small scale cyclic test facility (ssctf).

21.3.6 Repeat 21.3.2 at the conclusion of cyclic testing.

## 21.4 CLOSURES/LIDS

### 21.4.1 Vertically Hinged Lids

21.4.1.1 Place the lid in a closed position.

21.4.1.2 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.

21.4.1.3 Record the maximum force to cause the lid to begin to open.

### 21.4.2 Other Lids, Covers, and Doors

21.4.2.1 For all other closures, apply a gradually increasing force in the direction required to open a completely closed lid, cover, or door.

21.4.2.2 Record the maximum force to cause the closure to begin to open.

## 21.5 LOCKING DEVICES

21.5.1 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, the unit shall remain in its recommended use position.

### 21.5.2 Test Requirements

21.5.2.1 Erect the product in accordance with the manufacturer's instructions.

21.5.2.2 Secure the product so that the normal folding motion is not impeded.

21.5.2.3 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.

21.5.2.4 Perform this procedure 5 times within a 2 min period.

21.5.2.5 With the product in the manufacturer's recommended use position, gradually apply a force 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.

21.5.2.5.1 Locking devices shall comply with either of the following:

(1) Each single action device release mechanism shall not unlock in accordance with 21.5.2.5.

(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.

## **22. CORDS, STRAPS, AND ELASTICS**

### **22.1 REQUIREMENTS**

22.1.1 Cords or elastics included with or attached to toys intended for children less than 18 months of age (excluding pull toys) 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).

22.1.2 Cords, straps, and elastics greater than 12 in. (300 mm) long for pull toys intended for children less than 3 years of age shall not be provided with beads or other attachments that could tangle to form a loop.

22.1.3 Toy bags made of impermeable material intended for children less than 18 months old and an opening perimeter greater than 14 in. (360 mm) shall not have a drawstring or cord as a means of closing.

22.1.4 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 resistivity of more than  $10^8 \Omega \cdot \text{cm}$  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.

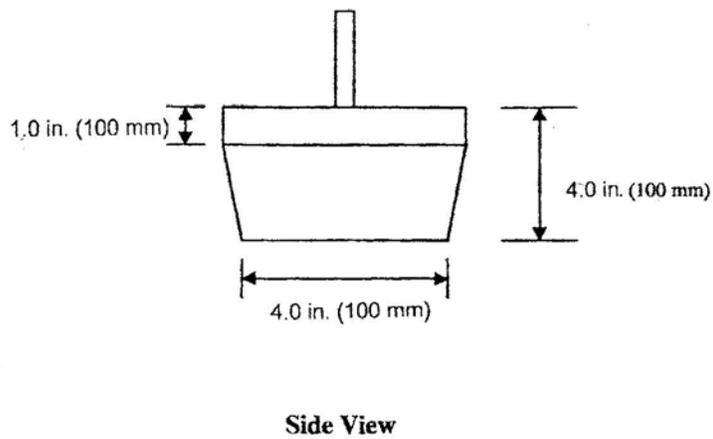
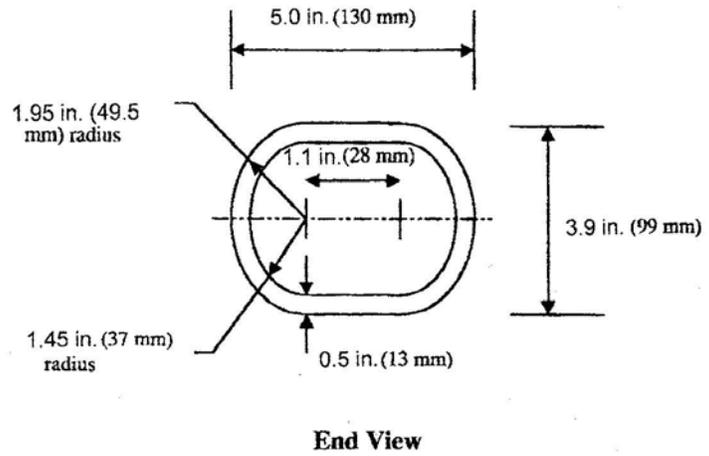
22.1.4.1 Condition samples for a minimum of 4 hours prior to testing. Samples shall be tested within 5 minutes of being removed from the condoning environment.

### **22.2 LOOPS AND CORDS TESTING**

22.2.1 Anchor or secure the toy. Place the head probe, Figure 36, in any loop formed by the cord, strap, or elastic. Insert the tapered end of the probe with the plane of its base parallel to the plane of the opening.

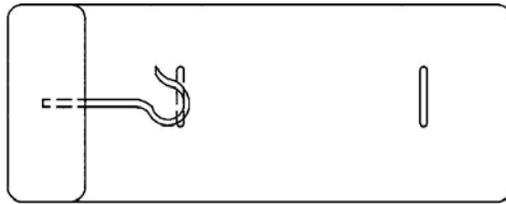
22.2.2 Rotate the probe to any orientation about its own axis while keeping its base parallel to the plane of the opening; apply a maximum force of 10 lbf (44.5 N) while attempting to push the probe through the opening.

22.2.3 The leading edge of the probe shall not be able to be completely inserted into a loop that does not contain a breakaway feature.



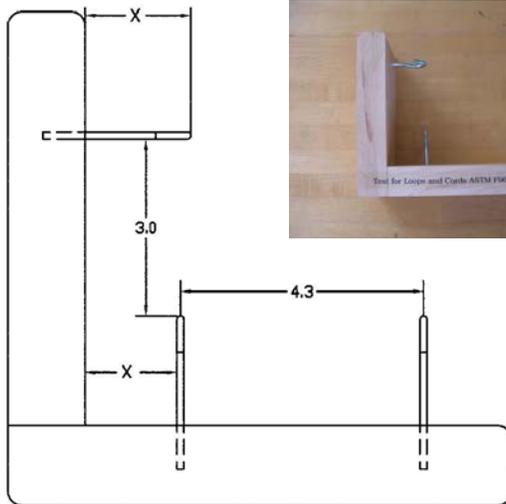
**Figure 36 Head Probe**

22.2.4 Cords, straps, and elastics with diameters smaller than the tapered end of the head probe shall be stretched using the hook test fixture, Figure 37.

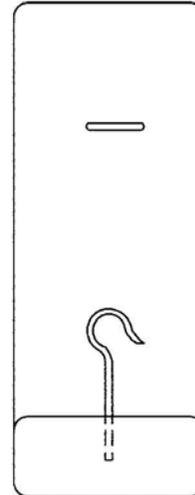


SCALE: 1/1 in  
 HEIGHT OF ALL HOOKS SHALL BE EQUAL  
 BASE - ANY SUITABLE MATERIAL

TOP VIEW



FRONT VIEW



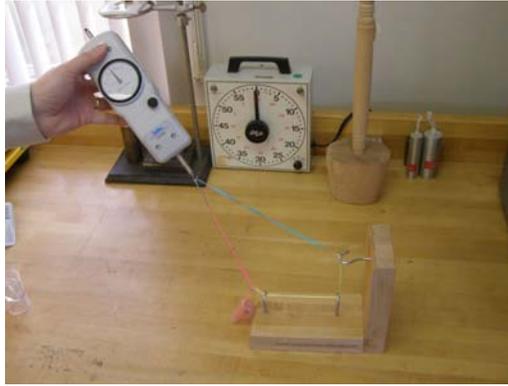
SIDE VIEW

### Figure 37 Cords, Straps, and Elastics Probe

22.2.4.1 Loop the elastic material around the left bottom hook. Hook 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).

22.2.4.2 Then pull the loop to the left upper hook without exceeding a force of 5.0 lbf (22.2 N).

22.2.4.3 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, Figure 38.



**Figure 38 Cord Test**

22.2.4.4 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, the elastic material shall be considered to be in compliance with the requirement.

22.2.4.5 Apply the head probe in accordance with 22.2.1 – 22.2.2.

#### 22.2.5 Cords, Straps, and Elastics Containing a Breakaway

22.2.5.1 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).

22.2.5.2 The breakaway feature on cords, straps, and elastics having a perimeter larger than the base diameter of the head probe shall be tested as follows:

22.2.5.2.1 Secure the cord with 2 clamping devices in a vertical fashion so the breakaway feature is centered.

22.2.5.2.2 Apply a maximum downward force of 5.0 lbf (22.2 N).

22.2.5.2.3 Determine if the breakaway feature releases.

22.2.5.3 The free length of the individual released cord, strap, or elastic should not exceed a maximum length of 12 in (300 mm).

22.2.5.4 The breakaway feature shall be capable of being reattached without altering the characteristics of the attachment.

#### 22.2.6 Self-Retracting Pull Cords

22.2.6.1 Hold the cord in the fully extended, vertical position that is most favorable for retraction.

22.2.6.2 Attach a weight of 2 lb (0.9 kg) to the end of the fully extended cord. And release.

22.2.6.3 Measure the distance the cord retracts.

22.2.6.4 Any accessible cord used in cord-activated mechanisms intended for use by children less than 18 months of age (except monofilament-type cords 1/16 in diameter (2 mm) or less) shall not retract more than 1/4 inch (6 mm).

22.2.6.5 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 accordance with 22.3.1 – 22.3.3.

## 23. STABILITY AND OVER-LOAD REQUIREMENTS

These requirements 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 (such as horses or cars); and stationary toys with seats, such as play furniture.
- Any toy intended for use as a seat or intended to support all or part of a child’s weight.

Ride-on toys of spherical, cylindrical, or other shape that do not normally have a stable base are not covered by these requirements.

### 23.1 SIDEWAYS STABILITY REQUIREMENTS

23.1.1 Toy samples subject to testing in this section shall be of one of the following categories:

- Ride-on toys or seats in which the child’s feet can provide stabilization, or
- Ride-on toys where the child’s feet are restricted by an enclosing structure.

#### 23.1.2 Sideways Stability, Feet Available For Stabilization

23.1.2.1 The sideways stability test is not required if the height of the seat from the ground is less than the height indicated in Table 4.

**TABLE 4**

Age Determination (years)	Height (in/cm)
1	9/23.3
2	9.7/24.8
3	11/28.4
4	12.3/31.3
5	13.3/33.5

23.1.2.2 For toy samples or seats in which the height of the seat from the ground is greater than the height indicated in Table 4, the toy shall not tip when tested as follows.

23.1.2.2.1 Attach the inclined plane two part test fixture to the baby walker test table. Place the sample across the slope of the 10° inclined surface perpendicular to the horizontal plane. Verify that the slope is 10° ± 0.1°.

23.1.2.2.2 Turn the steering mechanism, if any, to a position at which the toy is most likely to tip.

23.1.2.2.3 Chock the legs or wheels to restrict movement. Allow casters to assume their natural position before chocks are applied.

23.1.2.2.4 Apply a static load equal to the weight indicated in Table 5 based on the age determination (not to exceed 60 months). When the highest age of the intended age range falls between two ages listed, the older age shall be used.

**TABLE 5**

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

23.1.2.2.5 Apply the load such that the major axis is perpendicular to the true horizontal while the toy is on the incline. The load shall be designed so that the height of its center of gravity is  $9.7 \pm 0.5$  in ( $220 \pm 13$  mm).

23.1.2.2.6 The sample shall be tested with the center of gravity of the load secured 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: two separate tests).

23.1.2.2.7 If there is no designated seating area, the load shall be placed at the least favorable position at which it is reasonable to anticipate that a child will choose to sit and secured.

23.1.2.3 The ride-on toy sample or seat shall not tip during testing.

### 23.1.3 Sideways Stability, Feet Unavailable For Stabilization

23.1.3.1 Attach the inclined plane two part test fixture to the baby walker test table. Place the sample across the slope of the  $15^\circ$  inclined surface perpendicular to the horizontal plane. Verify that the slope is  $15^\circ \pm 0.1^\circ$ .

23.1.3.2 Turn the steering mechanism, if any, to a position at which the toy is most likely to tip.

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

23.1.3.4 Apply a static load equal to the weight indicated in Table 5 based on the age determination (not to exceed 60 months). When the highest age of the intended age range falls between two ages listed, the older age shall be used.

23.1.3.5 Apply the load such that the major axis is perpendicular to the true horizontal while the toy is on the incline. The load shall be designed so that the height of its center of gravity is  $9.7 \pm 0.5$  in ( $220 \pm 13$  mm).

23.1.3.6 The sample shall be tested with the center of gravity of the load secured 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: two separate tests).

23.1.3.7 If there is no designated seating area, the load shall be placed at the least favorable position at which it is reasonable to anticipate that a child will choose to sit.

23.1.3.8 The ride-on toy sample or seat shall not tip during testing.

## 23.2 FORE AND AFT STABILITY

23.2.1 The toy samples tested in this section shall not tip forward or backward when loaded with a simulated child's weight.

23.2.2 Place the toy perpendicular to the slope of a smooth inclined  $15^\circ$  surface.

23.2.3 Testing shall be performed with the toy both facing upward and downward on the sloped surface.

23.2.4 Turn the steering mechanism, if any, to a position at which the toy is most likely to tip.

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

23.2.6 Apply a static load equal to the weight indicated in Table 5 based on the age determination (not to exceed 60 months). When the highest age of the intended age range falls between two ages listed, the older age shall be used.

23.2.7 Apply the load such that the major axis is perpendicular to the true horizontal while the toy is on the incline. The load shall be designed so that the height of its center of gravity is  $9.7 \pm 0.5$  in. ( $220 \pm 13$  mm).

23.2.8 The sample shall be tested with the center of gravity of the load secured 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: two separate tests).

23.2.8 If there is no designated seating area, the load shall be placed at the least favorable position at which it is reasonable to anticipate that a child will choose to sit.

23.2.9 The stability test for a ride-on toy shall be repeated with the wheels turned at an angle of  $45^\circ$  to the left and to the right of the forward position.

23.2.10 The sample (ride-on toy or seat) shall not tip during testing.

### 23.3 STABILITY OF STATIONARY FLOOR TOYS

23.3.1 Stationary floor toys greater than 30 in (760 mm) in height and weighing more than 10 lb (4.5 kg) shall be placed on a 10° inclined surface with all movable portions of the toy fully extended and facing in the direction of the down slope side.

23.3.2 The toy sample shall not tip over.

23.3.3 The toy sample shall conform to the requirements of section 9, Test Criteria and Procedures.

### 23.4 OVERLOAD REQUIREMENTS FOR RIDE-ON TOYS AND SEATS

23.4.1 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 be loaded and tested with the weight indicated in Table 6.

23.4.2 Samples shall be tested in accordance with section 9, Test Criteria and Procedures.

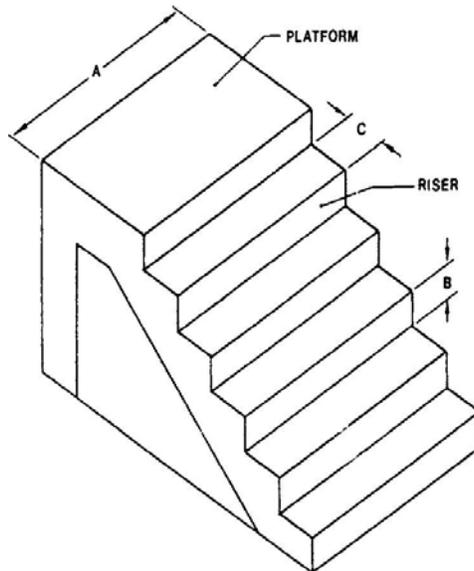
23.4.3 The overload test shall be conducted in accordance with the advertised weight capacity if that figure is higher than the minimum weight capacity listed in Table 6.

**TABLE 6**

Age Determination (years)	Weight (lb/kg)
1	84/37.8
2	87/39.6
3	126/56.7
4	129/59.1
5	150/67.8
6	177/79.8
7	207/93.6
8	243/111
9	267/121.2
10	315/143.7
11	363/165
12	360/164.1

### 23.5 TUMBLE TEST FOR WHEELED TOYS

23.5.1 Wheeled toy samples 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, Figure 39.



- (A) 38" (96.52 cm)
- (B) 7" (17.78 mm)
- (C) 8 7/8" (22.54 cm)

**Figure 39 Stair Fixture**

23.5.2 Stair treads may be constructed from wood, cement, or metal. The CPSC test fixture utilizes wood treads with metal support.

- 23.5.3 The toy, including accessories, shall be tested 2 times in each of four attitudes:
- Forward end-over-end
  - Rearward end-over-end
  - Left side first
  - Right side first

23.5.4 The toy shall be pushed over the edge of the top step in the appropriate attitude and allowed to fall of its own weight. The stair fixture is required to be secured prior to testing.

23.5.5 The test shall be considered complete for an attitude even if the toy does not reach the bottom of the flight of steps.

## 23.6 DYNAMIC STRENGTH TEST FOR WHEELED RIDE-ON TOYS

23.6.1 Load the toy on its standing or sitting surface for 5 minutes with the appropriate mass in accordance with Table 4.

23.6.1.1 Secure the load to the toy in a position corresponding to the normal use of the toy.

23.6.1.2 If the toy is intended to bear the mass of more than one child at a time, test each sitting or standing area simultaneously.

23.6.1.3 Attach the infrared velocity measurement instrument to the ride-on toy. Check for proper operation prior to testing.

23.6.1.4 Verify the test velocity is within the required range.

23.6.2 Reposition the step from the side of the baby walker test platform and lock into the test position. Drive the toy three times at a speed of  $6.6 \pm 0.7$  ft/s ( $2 \pm 0.2$  m/s) into a non-resilient step with a height of 2 in (50 mm).

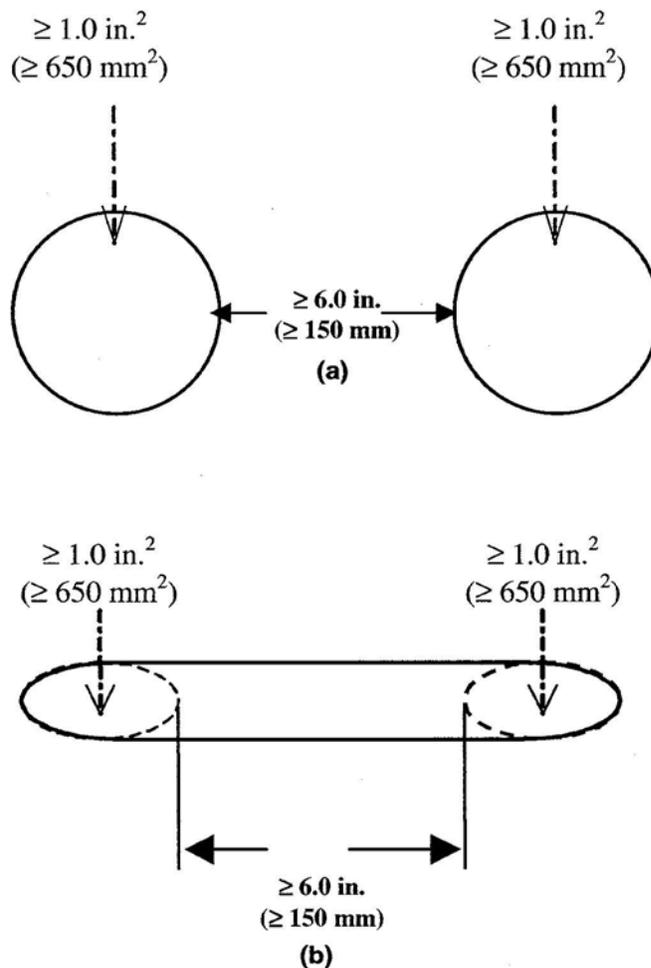
23.6.3 The toy sample shall also be tested and meet the requirements of section 9, Test criteria and Procedures.

## 24. CONFINED SPACES

### 24.1 VENTILATION

24.1.1 Toy samples made of impermeable material, having a door or lid, encloses a continuous volume greater than  $1.1 \text{ ft}^3$  ( $0.03 \text{ m}^3$ ), and in which all integral dimensions are 6 in. (150 mm) or more, shall be inspected to ensure one of the following:

24.1.1.1 A minimum of two openings each having a total area of at least  $1 \text{ in}^2$  ( $650 \text{ mm}^2$ ) placed at least 6 in (150 mm) apart, Figure 40.



**Figure 40 Minimum Ventilation Hole Sizes**

24.1.1.2 One opening that is the equivalent of the two 1.0-in<sup>2</sup> (650 mm<sup>2</sup>) openings expanded to include the separation area provided this leaves opening areas of 1.0 in<sup>2</sup> (650 mm<sup>2</sup>) on either side of the 6 in (150 mm) spacing.

24.1.2 The ventilation openings shall be unobstructed when the toy 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.

24.1.3 A permanent partition or bars (two or more) that effectively limit the continuous space by making the largest internal dimension less than 6 in are not subject to this requirement.

## 24.2 CLOSURES

24.2.1 Closures to enclosures (such as lids, covers, and doors) shall not be fitted with automatic locking devices.

24.2.2 Closures shall be of a type that can be opened with a force of 10 lbf (44.5 N) or less when tested as follows:

24.2.2.1 With the closure in a closed position, apply a 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.

24.2.2.2 The force measurement shall be made by means of a calibrated force gauge. The gauge shall not have a full-scale range exceeding 30 lbf (130 N).

## 24.3 TOYS THAT ENCLOSE THE HEAD

24.3.1 Toys that enclose the head, such as space helmets, and are made of an impermeable material shall provide means for breathing by the incorporation of unobstructed ventilation areas.

24.3.2 Inspect the toy sample for ventilation areas that consist of a minimum of two holes, with a minimum area of 2 in<sup>2</sup> (1300 mm<sup>2</sup>) of ventilation and at least 6 in. (150 mm) between holes.

## **25. WHEELS, TIRES, AND AXLES**

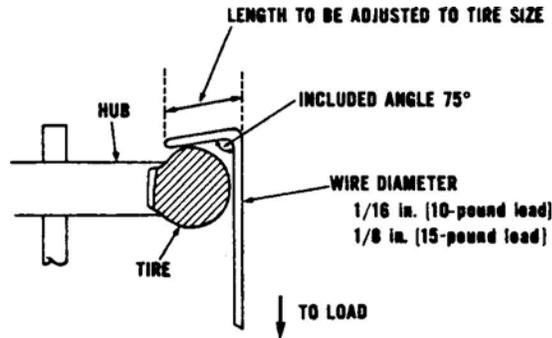
25.1 Toy samples requiring assembly shall be tested in the form in which the toy would be used by the purchaser. Use of simple household tools or special tools provided by the manufacturer may be used during testing.

### 25.2 Removal of Tires

25.2.1 The toy shall be clamped so that the wheel axle is vertical.

25.2.2 A wire hook shaped as shown in Figure 41 shall be positioned on the lower tire.

25.2.3 Use a calibrated force gauge or weight to apply  $10 \pm 0.5$  lb ( $4.5 \pm 0.2$  kg) to samples with an age determination of less than 18 months. The load shall be applied gradually over a period of 5 s and maintained for 10 s.



**Figure 41 Wire Hook**

25.2.4 Use a calibrated force gauge or weight to apply  $15 \pm 0.5$  lb ( $6.8 \pm 0.2$  kg) to samples with an age determination of greater than 18 months. The load shall be applied gradually over a period of 5 s and maintained for 10 s.

25.2.5 Test all parts and pieces in accordance with section 9, Test Criteria and Procedures.

### 25.3 Toys Assembled with Snap-in Axles

25.3.1 The toy sample shall be secured horizontally in a test fixture capable of securely holding the toy sample without affecting the integrity of the axle assembly.

25.3.2 A  $15 \pm 0.5$  lb ( $6.8 \pm 0.2$  kg) weight shall be applied perpendicular to the axis of the axle 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.

25.3.3 If the axle cannot be hooked as described above, the toy shall be held horizontally and a  $10 \pm 0.5$  lb ( $4.5 \pm 0.2$  kg) dead weight shall be attached (or apply equivalent force using a force gauge) to one wheel by means of a hook or clamp.

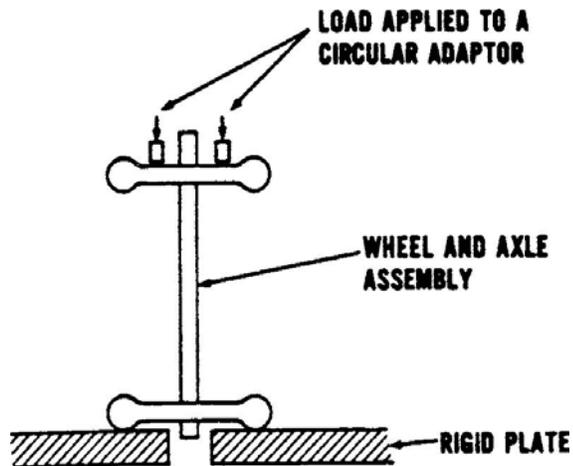
25.3.4 In each case, the load shall be applied gradually over a 5-s period and then be maintained for a total of 10 s.

25.3.5 After being subjected to the tests of this section, wheels, tires, or axles shall be tested to the requirements of section 9, Test criteria and Procedures.

### 25.4 Compression Test for Snap-in Wheel and Axle Assemblies

25.4.1 This test shall be performed if the axle and wheel are removed by the procedure described in 25.3.

25.4.2 The wheel and axle assembly shall be positioned with the axle vertical over a hole in a rigid plate, as shown in Figure 42.



**Figure 42 Axle Test Fixture**

25.4.3 The hole shall be large enough in diameter to permit the axle to pass through.

25.4.4 A load of  $20 \pm 0.5$  lb (89 N) shall be applied to the upper wheel, using a suitable circular adaptor to prevent interference with the axle.

25.4.5 The load shall be applied gradually over a 5 sec period and then maintained for a total of 10 s.

25.4.6 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.

25.5 After being subjected to the tests of this section, wheels, tires, or axles shall be tested to the requirements of section 9, Test criteria and Procedures.

## **26. HOLES, CLEARANCE, AND ACCESSIBILITY OF MECHANISMS**

### **26.1 GENERAL TEST REQUIREMENTS:**

26.1.1 Accessible clearances between movable segments on toy samples with age determinations less than 96 months shall be tested as follows:

26.1.1.1 Insert a  $3/16$  in (5 mm) diameter rod in accessible clearances.

26.1.1.2 If the  $3/16$  in (5 mm) diameter rod fits into the opening, the opening shall also admit a  $1/2$  in (13 mm) diameter rod in order to prevent the trapping of fingers.

26.1.2 Accessible holes in sheet metal and other rigid material in toy samples intended for children aged 60 months or less shall be tested as follows:

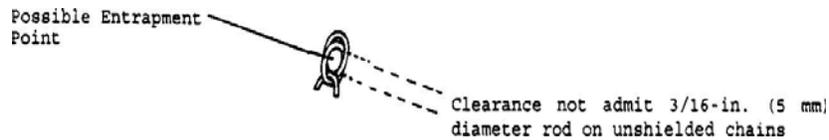
26.1.2.1 Insert a 1/4-in (6 mm) diameter rod to a depth of 3/8 in (10 mm) or greater into any accessible, circular hole in any rigid material less than 0.062 in (1.58 mm) in thickness or greater.

26.1.2.2 If the 1/4-in (6 mm) diameter rod can be inserted, it shall also admit a 1/2 in (13 mm) diameter rod.

## 26.2 CHAIN TEST REQUIREMENTS:

26.2.1 Chains in toys that support the weight of a child, such as hanging seats or similar indoor devices, intended for children 3 years or less in age shall be shielded if the chain is accessible.

26.2.2 Accessible chains that are not shielded shall not allow the insertion of a 0.19 in (5 mm) diameter rod between two links, as in Figure 43, with the chain in slack configuration.



**Figure 43 Chain Link Clearances**

26.2.3 All power transmission chains and belts in ride-on toys shall be shielded.

26.2.4 Clockwork, battery operated, inertial, or other power-driven mechanisms in toy samples with age determinations less than 60 months shall not be accessible when tested in accordance with 9.2, Hazard Determination Tests.

## 26.3 WINDING KEY TEST REQUIREMENTS:

26.3.1 Samples with age determinations of 3 years or less that use winding keys that rotate as the mechanical toy mechanism unwinds shall be tested for pinch hazards as follows:

26.3.1.1 A 1/4 in (6 mm) diameter rod shall be inserted in the clearance between the flukes of the key and body of the toy.

26.3.1.2 If the 1/4 in (6 mm) diameter rod can be inserted, it shall also admit a 1/2-in (13 mm) diameter rod.

26.3.1.3 There shall be no opening in the flukes of the key that can admit a 0.19 in (5 mm) diameter rod.

## 26.4 COIL SPRING TEST REQUIREMENTS:

26.4.1 Coil springs (either compression or extension) that form part of a component that carries the weight of a child shall be tested for accessibility unless either of the following occurs:

26.4.1.1 A 0.12 in (3 mm) diameter rod cannot be inserted freely into the coil.

26.4.1.2 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).

## **27. SIMULATED PROTECTIVE DEVICES (SUCH AS HELMETS, HATS, AND GOGGLES)**

27.1 All rigid toys that cover the face, such as goggles, space helmets, or face shields including items with cutout eye holes and items that cover the eyes, shall be constructed of impact-resistant material.

27.2 Toy samples that cover the face shall be tested as follows:

27.2.1 Secure the sample in a suitable clamp with that portion that covers or surrounds the eyes (in the case of cutout eye holes) in a horizontal plane.

27.2.2 Drop a 5/8 in (16 mm) diameter steel ball weighing  $0.56 + 0.03, -0.0$  oz (15.8 g + 0.8 , - 0.0 g) 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.

27.2.3 In the case of toys with cutout eye holes, impact the area that would be directly adjacent to the eyes in normal use.

27.2.4 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.

27.3 Pieces generated from testing in 27.2 shall be tested for sharp edges, sharp points, and parts that could enter the eye per section 9, Test Criteria and Procedures.

## **28. PROJECTILE TOYS**

28.1 The discharge mechanism as well as the projectile shall conform to the requirements specified in this section after testing in accordance with the appropriate test methods that follow.

28.2 These requirements apply to toys that are intended to launch projectiles into free flight by means of a discharge mechanism in which the kinetic energy of the projectile is determined by the toy and not by the user.

28.3 Discharge mechanisms shall be unable to discharge potentially hazardous improvised projectiles without modification.

28.3.1 The toy shall be tested to this requirement by inserting a cylindrical rod or similar item that has a similar mass and diameter equal to or less than the axial diameter of the manufacturer-provided projectile.

28.3.2 The specifications of the test projectile shall be left to the discretion of the person performing the test.

28.3.3 Test personnel shall attempt to fire the test projectile from the toy sample. The projectile will be considered to have launched if the projectile separates from the toy sample.

28.4 Toy samples shall be tested by firing the projectiles, propelled by their discharge mechanism, three times into a concrete block wall (or equivalent surface).

28.4.1 The wall shall be located a distance of 1 ft (300 mm) plus the length of the projectile from the front end of the launcher.

28.4.2 The discharge mechanism shall be aimed perpendicular to the wall.

28.4.3 The first ballistic screen shall be located between the end of the launcher and the second ballistic screen.

28.5 Any rigid projectile fired from a toy that has a kinetic energy that exceeds 0.08 J shall have an impact surface(s) of a resilient material.

28.5.1 Kinetic Energy Determination—the kinetic energy of a projectile shall be determined from the following equation:

$$\text{Kinetic energy} = 1 / 2 mv^2$$

Where:

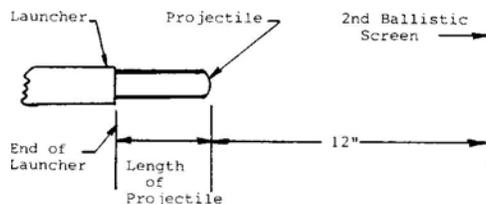
m = mass of projectile, kg

v = velocity of the projectile (meter/sec), where v = distance/time (meter/sec)

28.5.2 The mass of a projectile (m) shall be determined by weighing a sample on a laboratory balance.

28.5.3 The velocity of a projectile (v) shall be determined by firing a sample from the discharge mechanism of the toy across ballistic screens placed a known distance apart (s, meters) and recording the time (t, seconds) to travel that distance in accordance with the manufacturer's operating instructions.

28.5.4 When performing the test to measure the velocity of a projectile, a second screen shall be placed a distance no more than 1 ft (300 mm) plus one projectile length from the point at which the entire projectile enters free flight, Figure 44.



**Figure 44 – Ballistic Screen Location**

28.5.5 The velocity used to calculate the kinetic energy shall be the average of five measurements.

28.6 All projectiles intended to be fired from the toy sample shall be tested for sharp edges, sharp points, or small parts that would fit within the small part test cylinder shown in Figure 13 in accordance with section 9, Test Criteria and Procedures, based on the age determination.

28.7 Measure the tip radius of the projectiles intended to be fired from the toy sample. The projectiles shall have a tip radius less than 0.08 in (2 mm).

28.8 Any protective tip shall meet the following requirements:

28.8.1 The projectile shall be subjected to use and abuse testing in accordance with Section 9, Test Criteria and Procedures and the protective tip shall not become detached during the test at less than the specified torque or tension in Table 1.

28.8.2 The protective tip shall not produce or reveal hazardous points or edges when fired into a solid object, in accordance with the test methods described in this section.

28.9 Arrows shall have a protective tip that complies with 28.5 and 28.6.

28.10 These requirements do not apply to discharge mechanisms incapable of storing energy independent of the user, or intended to propel a ground-based vehicular toy along a track or other surface, or when the projectile is inaccessible to a child when it leaves the discharge mechanism.

## **29. TEETHERS, TEETHING TOYS, AND SQUEEZE TOYS**

### **29.1 TESTING REQUIREMENTS:**

29.1.1 Teether, teething, and squeeze toy samples shall be tested using the rattle test fixture.

29.1.2 Place the rattle test fixture shown in Figure 24 on an elevated horizontal plane surface. Allow a minimum vertical space equal to the longest axis of the sample being tested to perform the test.

29.1.3 Insert any portion of the test sample (in the most adverse orientation) to the opening in the test fixture under its own weight and in a non-compressed state.

29.1.4 Repeat this procedure after performing the use and abuse tests of Section 9.

29.1.5 Rigidly constructed teether, teething, and squeeze toy samples incorporating nearly spherical, hemispherical, or circular flared ends shall be designed such that the ends are not capable of entering and penetrating to the full depth of the supplemental test fixture illustrated in Figure 24. All samples shall meet this requirement when tested under the force only of its own weight and in a non-compressed state.

### **29.2 TEST PROCEDURE:**

29.2.1 Place the supplemental rattle test fixture on an elevated horizontal plane surface. Allow a minimum vertical space equal to the longest axis of the sample being tested to perform the test.

29.2.2 Insert any portion of the test sample (in the most adverse orientation) into the opening in the test fixture under its own weight and in a non-compressed state.

29.2.3 Sample ends shall not be capable of entering and penetrating to the full depth of the cavity in the supplemental test fixture.

### 29.3 EXCLUSION:

The requirements shall not apply to teething toys that are composed of liquid filled beads that are attached to form a ring of beads that are threaded on a flexible cord or string.

## **30. TOYS INTENDED TO BE ATTACHED TO A CRIB OR PLAYPEN**

30.1 Toys attached to a crib or playpen in the manner prescribed by the manufacturer's instructions shall be visually inspected for hazardous protrusions as follows:

30.1.1 Verify all corners are rounded. Non-rounded corners shall meet the requirements of section 9, sharp point requirements.

30.1.2 Inspect all surface contours and component transitions to ensure there are not abrupt changes that can result in a catch point for string, cord, elastic, ribbon, or loose clothing.

30.1.3 Ensure all bolts and fastening hardware are recessed or similarly protected to avoid an entanglement hazard.

30.1.4 Inspect for any potential catch point hazard not defined in 30.1.1 – 30.1.3.

30.1.5 Perform use and abuse testing in accordance with section 9, Test Criteria and Procedures and repeat 30.1.1 – 30.1.4.

## **31. TOY CHESTS**

31.1 Toy chests shall be assembled in accordance with the manufacturer's instructions before testing lid support mechanisms.

31.2 Toy chests with vertically opening, hinged lids are required to have lid-support mechanism capable of supporting the lid at any position in the arc of travel of the lid from within 2 in. (50 mm) of the fully closed position, through a 60° arc.

31.3 The lid-support mechanism shall not allow the lid to drop vertically more than 0.50 in. (13 mm) under its own weight. The lid-support mechanism shall not require adjustment to insure adequate lid support at any time during testing.

31.3.1 Lift the lid to any position in its arc of travel to a distance greater than 2 in. (50 mm) but less than 60° from the lid's fully closed position measured at the outermost edge of the lid.

31.3.2 Release the lid, and measure the distance a specific point in the approximate center of the outermost edge of the lid moves. The point shall be determined by test personnel prior to testing.

31.4 Subject the lid to 7000 opening and closing cycles using the small scale cyclic test facility. One cycle consists of raising the lid from its fully closed position to fully open and

returning it to fully closed. 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.

31.4.1 Each cycle shall be completed every  $15 \text{ s} \pm 1 \text{ s}$ . The 7000 cycles shall be completed within 72 h of beginning the test

31.5 The sample shall be retested to the requirements of 31.3.1 – 31.3.3.

31.6 All accessible gaps between components of the mechanism or between the mechanism and the toy chest or its lid shall be tested for pinch and crush hazards by inserting a 0.19 in (5 mm) diameter rod. 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.

31.6.1 The clearance 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.

31.7 Any toy chest having a door or lid that encloses a continuous volume greater than  $1.1 \text{ ft}^3$  ( $0.031 \text{ m}^3$ ) and in which all of the internal dimensions are 6 in (150 mm) or more shall have an unobstructed ventilation area of greater than a total of  $2 \text{ in}^2$  ( $1300 \text{ mm}^2$ ) over two or more separate openings situated at least 6 in (150 mm) apart.

31.7.1 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  $90^\circ$  angle simulating the corner of a room.

31.7.2 If a permanent partition or 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.

31.8 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 (44.5 N) or less.

#### 31.8.1 *Vertically Hinged Lids*

31.8.1.1 Place the lid in a closed position.

31.8.1.2 Apply a gradually increasing force up to 10 lbf (44.5 N) in an upward direction perpendicular to the plane of the lid at a point within 1 in (25 mm) from its geometric center.

31.8.1.3 Record the maximum force to cause the lid to begin to open.

#### 31.8.2 *Other Lids, Covers, and Doors*

31.8.2.1 For all other closures, apply a gradually increasing force in the direction required to open a completely closed toy chest.

31.8.2.2 Record the maximum force to cause the closure to begin to open.

## **32. TOY GUN MARKING**

### **32.1 DEFINITION**

32.1.1 Samples including, but 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 shall be subjected to the tests of this section.

### **32.2 TESTING REQUIREMENTS**

32.2.1 Samples must be marked or manufactured in one of the ways outlined in 32.2.2 – 32.2.4.

32.2.2 Samples shall contain a blaze orange plug, or brighter orange colored plug, affixed into the muzzle end of the barrel. It must be an integral part of the toy.

32.2.3 Verify the “blaze orange” color referred to in 32.2.2 in Federal Standard 595a, Colors Used in Government Procurement, Color 12199, by visually comparing the sample color with the reference standard.

32.2.4 Measure the plug to ensure it is not recessed more than 0.25 in. (6 mm) from the muzzle end of the barrel.

32.2.5 Measure the orange band covering the circumference of the muzzle end of the barrel to ensure it is a minimum of 0.25 in. (6 mm) wide.

32.2.6 Samples shall be tested to section 9 for small parts, sharp points, and sharp edges based on the age determination of the sample.

32.2.7 All labels and markings on the sample shall remain attached and legible after testing to 32.2.6.

### **32.3 EXEMPTIONS**

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

32.3.2 Non-firing collector replica antique firearms that look authentic and may be a scale model but are not intended as toys.

32.3.3 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.

32.3.4 Decorative, ornamental, and miniature objects having the appearance, shape, or configuration of a firearm and measure no more than 1.50 in (38 mm) high by 2.75 in (70 mm) long. The length excludes the length of the gun stock.

### 33. TOYS WITH SPHERICAL ENDS

#### 33.1 TESTING REQUIREMENTS

33.1.1 Toy samples with age determinations less than 18 months and having a total weight less than 1.1 lb (0.5 kg) are required to be tested if they have spherical, hemispherical, or circular flared ends attached to a shaft, handle, or support that has a smaller cross section.

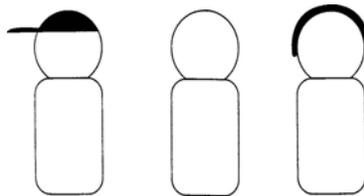
33.1.2 The requirement shall not apply to soft-filled (stuffed) toys or soft-filled parts of toys or parts of fabric and soft play figures made of textiles.

33.1.3 Each sample shall be tested by passing it through the cavity of the supplemental test fixture shown in Figure 24, Rattle and Supplemental Rattle Test Fixtures. The test shall be accomplished by passing the rattle through the test fixture vertically without applying an external force. The test sample shall be tested using the force of its own weight and be in a non-compressed state prior to testing.

33.1.3.1 The sample end shall not be capable of entering and penetrating past the full depth of the cavity.

33.1.4 All preschool figures with an age determination of less than 3 years shall be tested if they meet the following requirements:

- (1) Round, spherical, or hemispherical end with tapered neck attached to a simple cylindrical shape without appendages, Figure 45.
- (2) Overall length not exceeding 2.5 in. (64 mm). This includes figures with added or molded features such as hats or hair, which retain the rounded shape of the end.



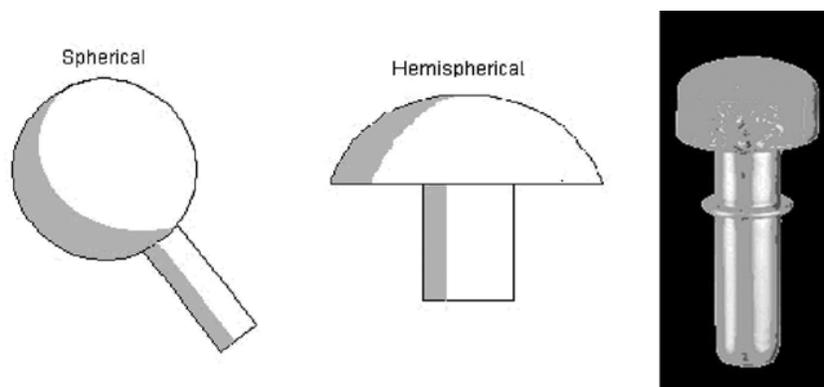
**Figure 45 – Hazardous Preschool Figure Shapes**

33.1.5 Toys intended for children between the ages of 18 and 48 months, nail, screw, and bolt shapes that weigh less than 1.1 lb (0.5 kg) and incorporate spherical or hemispherical ends attached to a shaft or handle (Figure 46) shall be so designed that such ends are not capable of entering and penetrating past the full depth of the cavity of the supplemental test fixture (see Figure 24). A toy shall meet this requirement when tested under the force only of its own weight and in a non-compressed state.

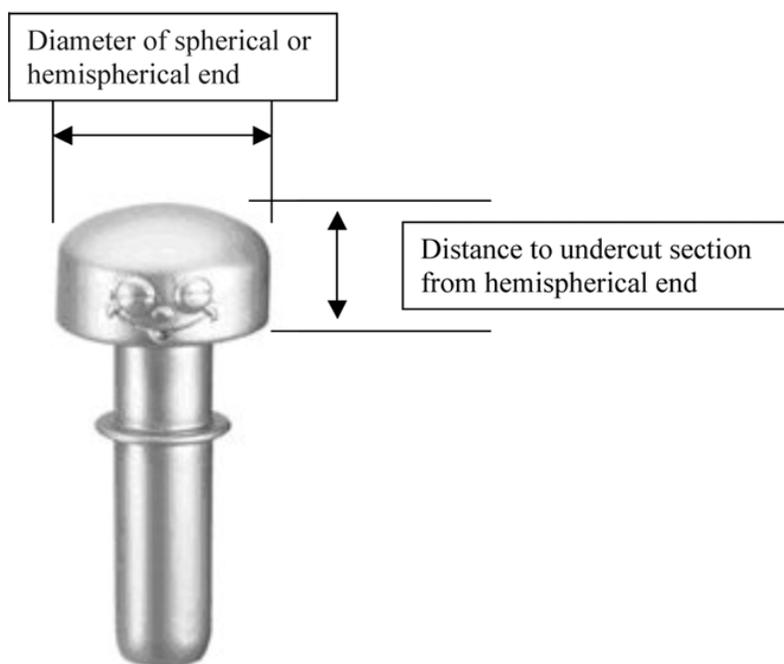
33.1.5.1 These requirements do not apply to the following nail, screw, and bolt shapes:

- (1) Soft-filled shapes and fabric shapes.
- (2) Shapes with an overall length less than 2.25 in (57.1mm).
- (3) Shapes whose spherical or hemispherical ends as shown in Figure 47 are less than 0.6 in (15 mm) in diameter.
- (4) Shapes with flexible ends.

(5) Shapes where the distance to the undercut as shown in Fig. 47 is greater than 1.75 in (44.4 mm).



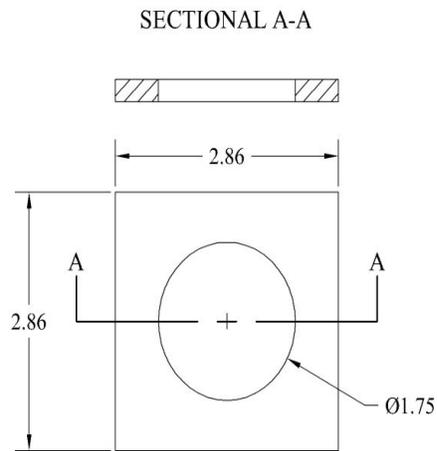
**Figure 46 – Examples of Spherical Ends**



**Figure 47 – Hazardous Preschool Figure Shapes**

### 34. SMALL BALLS

34.1 Loose balls in toy samples with age determinations less than 3 years shall be tested using the small ball test fixture, Figure 48, Ball Test Fixture.



SMALL BALL TEST FIXTURE

**NOTES:**

MTL:  $\frac{1}{4}$ " thick Acrylic

TOL:  $\pm .01$ "

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**Figure 48 Small Ball Test Fixtures**

34.2 Place the ball test fixture on a flat surface like the edge of a table or desk, such that the opening is unobstructed by a solid surface.

34.3 Carefully place the ball into the opening, Figure 49, Small Ball Test. The test shall be accomplished in a vertical direction without applying an external force.



**Figure 49 Small Ball Test**

34.4 The sample ball shall not be capable of entering and completely passing through the full depth of the cavity without compression.

34.5 A ball which does pass through the template is determined to be a “small ball.”

## **35. POMPOMS**

35.1 Pompoms in toy samples with age determinations less than 3 years shall be tested to the seam test requirements of section 9.

35.2 Any components, pieces, or individual strands of the pompom that are liberated during the torque and tension tests are not subject to this test. Test the pompoms by putting the uncompressed free ends into the small ball (1.75 in) test fixture.

35.3 Pompoms detached during testing must not pass entirely through the small ball test fixture under their own weight.

## **36. HEMISPHERIC SHAPED OBJECTS**

### **36.1 DEFINITION**

36.1.1 These requirements apply to toy cup, bowl, or one-half egg-shaped objects having a nearly round, oval, or elliptical opening and one of the following:

36.1.1.1 Minor and major inner dimensions between 2.5 in (64 mm) and 4.0 in (102 mm).

36.1.1.2 Volume of less than 6.0 oz (177 ml).

36.1.1.3 Depth greater than 0.5 in (13 mm).

36.1.1.4 Age determination less than 3 years

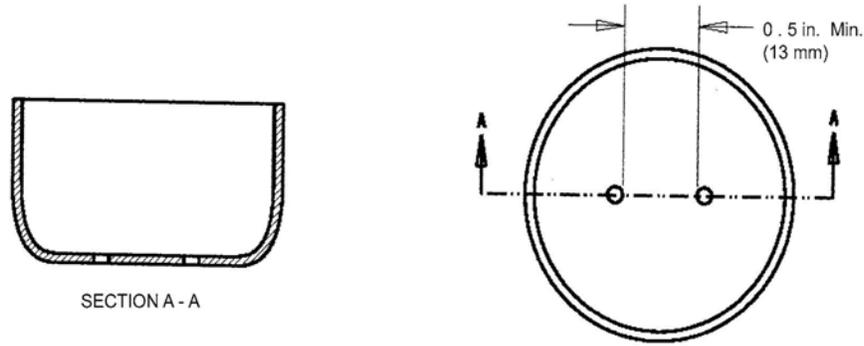
### **36.2 TEST REQUIREMENTS**

36.2.1 Measure the cup/bowl/half egg-shaped sample object. The sample must contain at least one of the following:

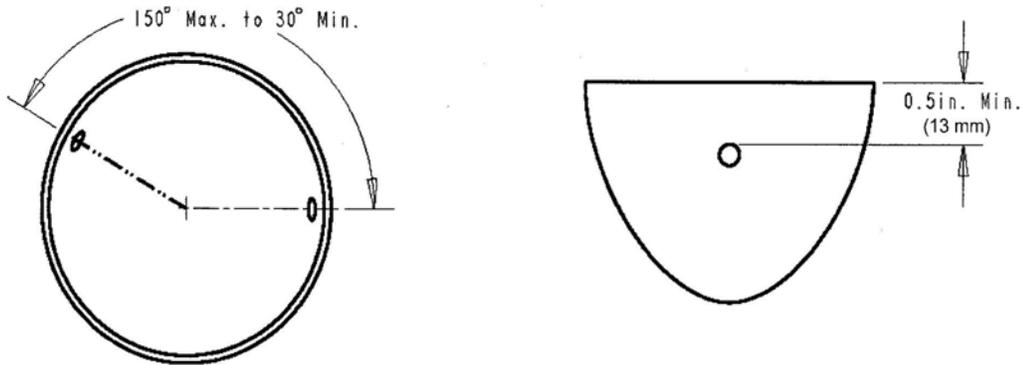
36.2.1.1 At least two holes of any shape with a minor dimension of 0.080 in. (2 mm) that are a minimum of 0.5 in (13 mm) from the rim. This shall be measured along the outside contour.

36.2.1.1.1 The two holes shall be a minimum of 0.5 in. (13 mm) apart if the openings are placed in the base of the object, Figure 50.

36.2.1.1.2 The two holes must be placed at least 30° but not more than 150° apart if the openings are not placed in the base of the object, Figure 51.

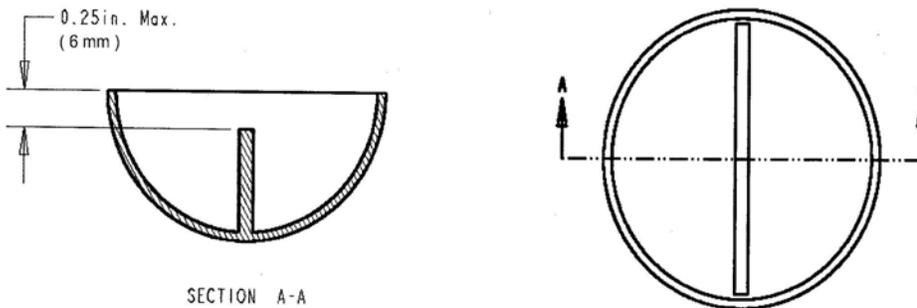


**Figure 50 – Bowl Base Opening**



**Figure 51 – Opening Placement**

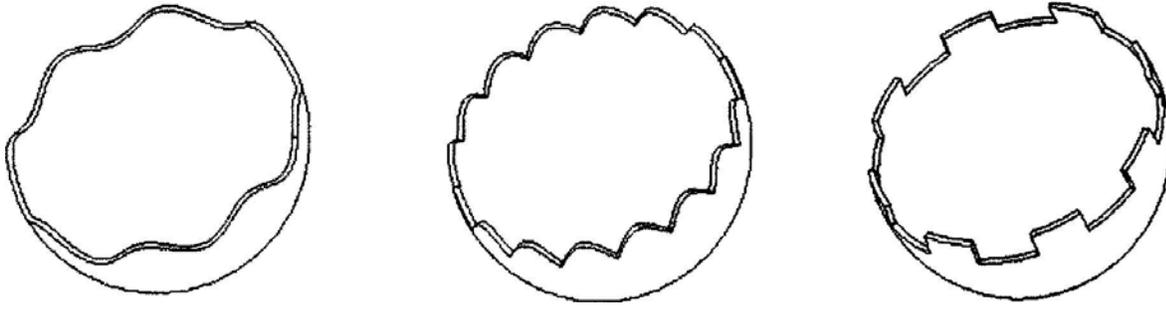
36.2.1.2 The plane of the open end of the cup shape shall be interrupted at the center by some type of divider that extends to 0.25 in (6 mm) or less from the plane of the open end of the cup, Figure 52.



**Figure 52 - Rib through Cup Center**

36.2.1.3 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.

36.2.1.4 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), Figure 53.



**Figure 53 – Scalloped Edge Pattern**

36.2.1.5 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 must be at least 0.5 in (13 mm) from the rim as measured along the outside contour.

### 36.3 EXEMPTIONS

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

36.3.2 Objects intended to hold liquids for children greater than 24 months (for example, pots and pans).

36.3.3 Airtight containers required for functional integrity (for example, modeling clay containers).

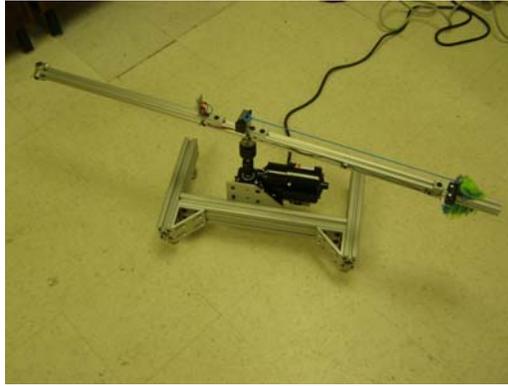
36.3.4 Non-detachable (as determined by testing in accordance with section 9.2) components of larger products (for example, bowl-shaped smoke stack that is permanently attached to a toy train or a swimming pool that is molded into a larger toy).

36.3.5 Containers that are part of the retail package and intended to be discarded after the toy is removed from the package.

## **37. YO-YO BALLS**

### 37.1 TEST REQUIREMENTS

37.1.1 Attach the yo-yo elastic tether toy sample to the holding device, a typical yo-yo ball has a small loop, as shown in Figure 54.



**Figure 54 Yo-Yo Ball Test Fixture**

37.1.2 Rotate the product in a horizontal plane to achieve a constant rotational speed at  $80 \pm 5$  rev/min.

37.1.3 Rotation shall be started slowly and increased to 80 rev/min over a period of 10 to 60 sec.

37.1.4 If the sample cannot be rotated at 80 rev/min, testing shall be performed at maximum achievable speed. The actual rotational speed shall be documented in the test report.

37.1.5 Preset the test fixture to the maximum length (20 inches) of the tether. The tether length does not include the mass at the end, or the holding means (the loop). Place the yo-yo ball in the fixture.

37.1.5.1 Confirm the compression paddle has been engaged.

37.1.5.2 Turn on the pass/fail circuit.

37.1.5.3 Present the stroboscope to 80 flashes/minute.

37.1.5.4 Slowly accelerate the test fixture to 80 rev/min until velocity is achieved. Check the pass/fail indicator light (light indicates yo-yo ball does not meet the maximum tether length requirement)

37.1.6 Measure the length of the tether when the tether is fully extended during rotation. The tether does not include either the mass at the end or the means of holding the sample (loop). Toys with an end mass greater than 0.02 kg (0.04 lb) shall have a maximum cord length less than 50 cm (20 in.) during rotation.

## 37.2 EXEMPTIONS

37.2.1 Paddle balls including sport balls with wrist or ankle straps (strap is measured with the unloaded product placed on a horizontal surface) longer than 27.6 in (70 cm) which are intended to be returned to the user are not required to be tested.

## 38. MAGNETS

38.1 Testing shall be accomplished on samples with age determinations of greater than 3 years and less than 96 months which contain any type of magnetic component.

38.1.1 Toys must not contain a loose as-received hazardous magnet or a loose as received hazardous magnetic component.

38.1.2 Toys shall not liberate a hazardous magnet or a hazardous magnetic component after being tested.

### 38.2 EXEMPTIONS

38.2.1 This test requirement does not apply to magnets used in motors, relays, speakers, electrical components, and similar devices where the magnet is not part of the play pattern of the toy.

38.2.2 Hobby, craft, and science kit-type items intended for children over 8 years of age, where the finished product is primarily of play value, that contain a loose as-received hazardous magnet or a loose as-received hazardous magnetic component, or both, are exempt provided they comply with the requirements for safety labeling.

### 38.3 TEST REQUIREMENTS:

38.3.1 Place the magnet, toy, or part of toy containing an embedded magnet into the small parts cylinder, Figure 13, both before and after testing. The article or any detached part(s) shall be inserted in any orientation and without compressing it. If the part fits entirely into the cylinder, then it is considered a small part (see Figure 14 in section 9).

38.3.2 Turn on the gauss meter. Zero the probe with the gauss chamber. Set the meter to record the maximum absolute DC flux density.

38.3.2.1 Place a gauss meter probe's tip in contact with the pole surface of the magnet.

38.3.2.2 If the magnet is imbedded/attached as part of a magnetic component, extract the magnet from the component.

38.3.2.3 Keep the gauss meter's probe perpendicular to the surface.

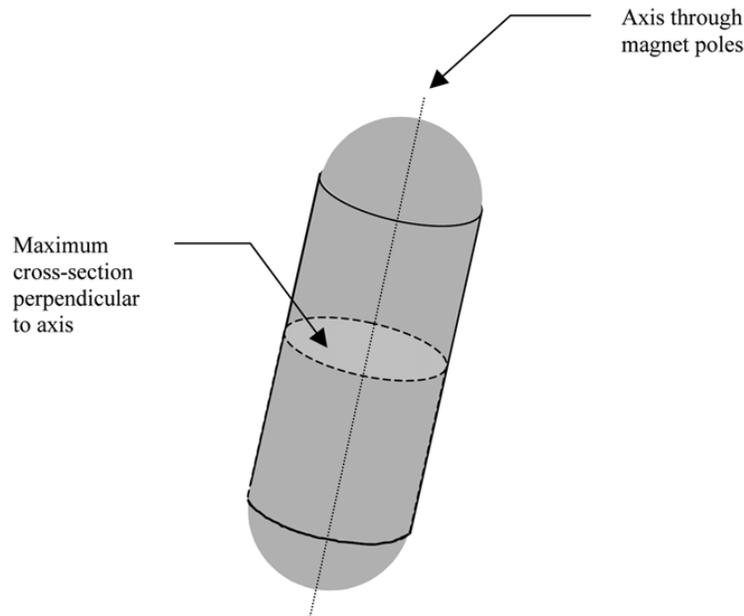
38.3.2.4 Move the probe across the surface for 15 seconds to locate the maximum absolute flux density.

38.3.2.5 Record the maximum absolute flux density reading.

*NOTE:* A minimum of 3 magnets of each size should be tested on both sides of each magnet. The average of the maximum readings from each side of all tested magnets should be used when determining the maximum absolute density.

38.3.3 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 the axis through the magnet poles, as shown in Figure 55.



**Figure 55 Pole Surface (Magnet without Flat Surface)**

*NOTE:* Use the area of the largest single pole on multi-pole magnets, which can be determined using magnetic field viewing film or equivalent.

38.3.4 Calculate the flux index ( $\text{kG}^2 \text{mm}^2$ ) by multiplying the area of the pole surface ( $\text{mm}^2$ ) of the magnet by the square of the maximum flux density ( $\text{kG}^2$ ). A component or free magnet with a flux index of 50 or greater that fits entirely inside the small parts cylinder in 38.3.1 is considered hazardous.

#### 38.3.5 Magnet Use and Abuse Testing

38.3.5.1 Each component shall be tested independently.

38.3.5.2 A new sample shall be used. All the testing in this section must be performed in series on each unique component.

#### 38.3.5.3 Cycling as Received

38.3.5.3.1 The magnetic parts shall be brought together to the distance that initiates magnetic attraction, released, and then pulled apart to the distance where magnetic attraction ceases.

38.3.5.3.2 Each part or assembly shall be subjected to one thousand (1000) cycles of attraction and separation. One attachment and detachment shall count as 1 cycle.

38.3.5.3.3 If only one magnet or magnetic part is provided with the toy, then another metal part or surface of the toy, in accordance with the toy's intended play pattern, shall be used for cycling tests. The testing may be automated or performed manually.

#### 38.3.5.4 Impact Test

38.10.4.1 Place the magnet 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 2.2 lb (1.0 kg) and a diameter of 3.1 in (78.7 mm) through a distance of 4.0 in (101.6 mm) onto the magnet or magnetic component.

38.5.4.2 Determine if a hazardous magnet or a hazardous magnetic component is generated in accordance with 38.3.1 – 38.3.4.

#### 38.3.5.5 Torque Test & Tension Test

38.3.5.5.1 Perform Torque and tension tests in accordance with section 4.1 of this manual. Determine if a hazardous magnet or a hazardous magnetic component is generated in accordance with 38.3.1 – 38.3.4.

38.3.5.5.2 Repeat the cyclic testing of 38.3.5.3.

## 39. PAINT AND SIMILAR SURFACE-COATING MATERIALS

### 39.1 REQUIREMENT:

39.1.1 Paint and other similar surface-coating materials applied to toys shall comply with the lead content provisions under 16 CFR 1303 of the Consumer Product Safety Act. The **total** lead concentration in the nonvolatile content of paint or in a dry paint film shall not exceed 0.009% (90 ppm) (effective August 14, 2009).

39.1.2 Also, surface-coating materials shall not contain antimony, arsenic, barium, cadmium, chromium, lead, mercury, or selenium with a **soluble** content of any of these elements above the tolerances listed in Table 7. The tested material will be only the non-volatile material, such as a dried paint film.

**Table 7**  
**Maximum Soluble Migrated Element in ppm (mg/kg) Toy Material**

Element	Maximum Content (ppm)	Analytical Correction
Antimony (Sb)	60	60%
Arsenic (As)	25	60%
Barium (Ba)	1000	30%
Cadmium (Cd)	75	30%
Chromium (Cr)	60	30%
Lead (Pb)	90	30%
Mercury (Hg)	60	50%
Selenium (Se)	500	60%

## 39.2 APPARATUS AND REAGENTS:

39.2.1 Normal laboratory apparatus such as flasks, graduated cylinders, vials, etc.

39.2.2 Metal Sieve - plain weave, stainless steel, nominal opening 0.5 mm, nominal wire diameter 0.315 mm

39.2.3 Any acceptable means of measuring pH (calibrated digital pH meter or pH paper)

39.2.4 Membrane Filter – 0.45 µm

39.2.5 Reagents - 0.07 mol/l HCl and 2.0 mol/l HCl made from analytical reagent grade HCl and at least type 3 water

39.2.6 Centrifuge – capable of  $5000 \pm 500$  g

## 39.3 SAMPLE PREPARATION

39.3.1 The sample shall be the toy in the form in which it is marketed, excluding the packaging and packaging components.

39.3.2 The test sample (paint or similar surface coating) shall be collected from a single toy sample. There shall be no combining of material from more than one sample sub.

39.3.3 Identical materials (paint or similar surface coating) in a single sample sub may be combined. A single test sample shall not consist of more than one material or color (composite testing is not allowed).

39.3.4 Only regions accessible through normal use and abuse may be considered for testing.

39.3.5 Safely scrape the coating off the test sample and grind it through the metal sieve, obtaining at least 100 mg (0.1 g) of coating material, if available. Record in grams the actual mass obtained.

39.3.5.1 If only between 10 and 100 mg of coating material can be obtained, use that amount and record the actual mass for the analytical report, but use 0.1 g as the mass.

39.3.5.2 If only less than 10 mg of coating material can be obtained, do not perform this test.

39.3.5.3 If the coating material, by its nature, cannot be ground through the sieve, it may be tested as removed from the toy.

## 39.4 TEST PROCEDURE

39.4.1 Prepare a sample as per section 39.3, the mass collected (in grams) will be called “M.”

39.4.2 Calculate ( $M \times 50 \text{ ml/g}$ ). The resulting number will be the volume (“V”) in milliliters of 0.07 mol/l HCl that will be used for extraction.

39.4.2.1 If the mass of collected coating material matched the conditions of 39.3.5.1, use 5.0 ml of 0.07 mol/l HCl as “V.”

39.4.3 Add the required volume of 0.07 mol/l HCl and shake for 1 minute.

39.4.4 Check the pH of the mixture using either a pH meter or pH paper.

39.4.4.1 If the pH is greater than 1.5, add drop wise 2.0 mol/l HCl until the pH is between 1.0 and 1.5.

39.4.5 Protect the mixture from light.

39.4.6 Place the mixture in a hot bath at  $37 \pm 2^\circ\text{C}$ .

39.4.7 Shake the mixture evenly for 1 hour, then let stand for 1 additional hour.

39.4.8 Remove the mixture from the hot bath.

39.4.9 Separate the insoluble material via either a 0.45  $\mu\text{m}$  pore size filter or centrifuge at 5000 g for ten minutes and decant off the clear solution.

39.4.10 Analyze the clear solution according to proper procedures specific to the instrument being used. Analysis procedures for ICP-OES and FLAA and GFAA are based on the methodology in ASTM E1613-04. ICP-MS may also be employed with appropriate procedures, such as EPA 6020A. In each case, appropriate settings and calibrations for each element of interest must be used.

39.4.10.1 It is important to ensure that the standards being used contain the element(s) of interest at appropriate concentrations.

39.4.10.2 The standards should be made using a matrix as similar as possible to the sample.

39.4.11 Calculate the ppm (or  $\mu\text{g/g}$ ) of restricted element extracted using the ICP results in  $\mu\text{g/mL}$  (“C”), the mass of the collected surface coating material (“M”), and the volume of 0.07 mol/l HCl solution used (“V”) (accounting for any additional dilution factor (“D”). For example, if 2 ml of the extraction solution is diluted to 100 ml to allow for analysis by ICP,  $D=100/2=50$ .  
 $\text{ppm} = C \times V \times D / M$ .

39.4.11.1 Calculate the analytical correction and determine if the maximum content of an element has been exceeded as defined in Table 7.

39.4.11.1.1 Example calculation: Analysis determined 100 ppm of cadmium, cadmium has a 30% analytical correction, calculating the adjusted analytical results gives  $100 \times 0.7 = 70 \text{ ppm Cd}$ . This adjusted analytical result is below the maximum allowable soluble cadmium content of 75 ppm; therefore and that surface coating material meets the soluble cadmium standard of F963.

39.4.11.1.2 Example calculation: Analysis determined 90 ppm of chromium, chromium has a 60% analytical correction, calculating the adjusted analytical results gives  $90 \times 0.4 = 36$  ppm Cr. This adjusted analytical result is above the maximum allowable soluble chromium content of 30 ppm; therefore that surface coating material exceeds the soluble chromium standard of F963.

## 40. JAW ENTRAPMENT IN HANDLES AND STEERING WHEELS

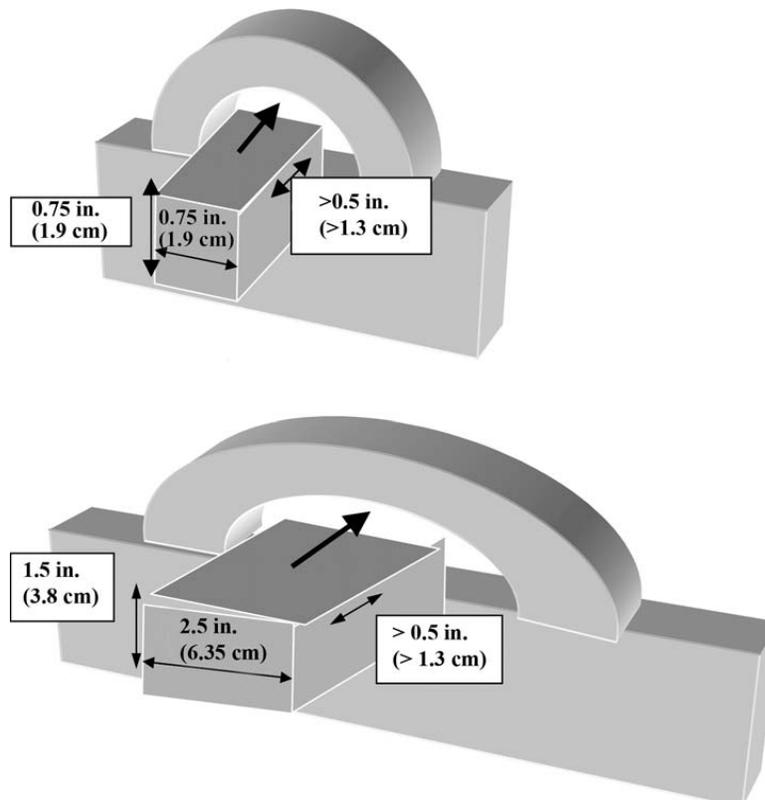
40.1 Toys with handles, steering wheels, or other similar components located such that they are accessible for teething and intended for children under 18 months of age (such as activity tables intended to be played with by a standing child, large bulky toys, stationary floor toys, push toys intended to be pushed by a child walking upright, and ride-on toys) are required to meet the jaw entrapment requirements.

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

### 40.2 REQUIREMENT

40.2.1 Openings in handles and steering wheels that allow passage of a 0.75 in x 0.75 in (1.9 cm x 1.9 cm) block, Figure 56, to any depth greater than 0.5 in (1.3 cm) must also allow passage of a 1.5 in by 2.5 in (3.8 cm by 6.35 cm) block to any depth greater than 0.5 in (1.3 cm).

40.2.2 The block shall be oriented such that the 2.5 in (6.35 cm) dimension is along the long dimension of the handle or steering wheel opening, as shown in Figure 56.



## **Figure 56 Jaw Entrapment Fixtures**

### **41. TEST REPORT AND CERTIFICATION**

41.1 The CPSC Test Report for Testing of Toys and Other Articles Intended for Use by Children Ages 0 through 8 years is used for all reporting of results. This report is in electronic form and is available in the CPSC directory CIS, PRODTEST.

41.2 The CPSC Test Report for Testing of Toys and Other Articles Intended for Use by Children Ages 0 Through 8 years is available only to authorized CPSC personnel.

41.3 Reports are prepared on the form specified herein and shall be certified as to the accuracy and conformance to all the requirements of the applicable regulations.