What Are Heavy Metals?
Heavy metals are naturally occurring metallic elements that may be used in the production of many consumer products. Also referred to as toxic metals and toxic chemicals, heavy metals are known to cause harm to the environment in addition to adversely affecting human health based on a number of toxicity factors, including dose, age, gender, type of exposure, and more.

The most well-known and commonly regulated heavy metals in the consumer product market are antimony, barium, cadmium, chromium, lead, and mercury. Methods of exposure to these chemicals can include oral consumption, inhalation, transdermal, and hand-to-mouth.

Regulations That Address Heavy Metal Hazards
There are several agencies on both federal and state levels that are responsible for enforcement of regulations related to heavy metals. Among these regulations are, but not limited to, the Consumer Product Safety Act (CPSA), Consumer Product Safety Improvement Act (CPSIA), Federal Hazardous Substances Act (FHSA), Child Safety Protection Act (CPSC), California Proposition 65, California Safer Consumer Products Act (SCP) (Green Chemistry Law), Illinois Lead Poisoning Prevention Act, Massachusetts Toxics Use Reduction Act, Washington Children’s Safe Products Act, and Maine Toxic Chemicals in Children’s Products Act.

Antimony And Barium
The American Society for Testing and Materials (ASTM) is one of the oldest standards developing organizations and is a globally recognized leader in the development and delivery of international voluntary consensus standards. ASTM standard F963 prohibits pacifiers from containing any of the following heavy metals in surface coatings or substrate materials in excess of the limits listed in the standard: antimony, arsenic, barium, cadmium, chromium, lead, mercury, and selenium. In addition, there are federal proposals to restrict antimony under the Safe Kids’ Jewelry Act and Children’s Toxic Metals Act.

There are several forms of antimony which can be found throughout the environment at low levels and exposure to a specific type of antimony is difficult to determine. Exposure can occur through a variety of sources including drinking water, skin contact, inhalation, and consuming foods containing the chemical. Adverse effects on human health include irritation to eyes, skin, and lungs resulting in pneumoconiosis, heart problems, joint and muscle pain, anemia, diarrhea, stomach pain, vomiting, and stomach ulcers. At this point it is unknown as to whether antimony causes cancer, birth defects or other reproductive harm.

Cadmium
The ASTM F963 addresses a limit on cadmium in substrates and surface coatings for toys; in addition to specific requirements for soluble cadmium in small metal parts. However, there are no federal restrictions on cadmium in all children’s products as the CPSC terminated a petition in October 2012 that would have further regulated cadmium in children’s products.

ASTM released a standard for children’s jewelry (ASTM F2923) and adult jewelry (ASTM F2999). ASTM F2923 defines jewelry as items intended to be worn as an ornament and designed for or primarily intended for children under the age of 12. Although this ASTM standard is voluntary, retailers and consumers may require or expect compliance. Voluntary standards are considered industry best practices or “industry-consensus” standards, and the CPSC considers them to be the starting point from which to design your product. Federal agencies can use statutory authority to enforce voluntary standards the same as mandatory standards, even if a voluntary standard is not incorporated by reference into a federal law.
Material exemptions: The CPSC has determined that certain materials and classes of materials do not exceed the lead content limits, and while compliance is required, testing these identified materials is not. These materials include precious and semi-precious gemstones, wood, paper and...
Paperboard (and their coatings that soak into the paper and cannot be scraped off), CMYK process printing inks, dyed and undyed textiles (excluding after-treatment applications such as screen prints, transfer, and decals as well as leather and vinyl), plant or animal derived materials, such as beeswax, seeds, bone and feathers, surgical steel, and precious metals.

Based on CPSC’s Statement of Policy regarding testing and certification of lead content in children’s products, lead testing is not required on products or components that are made entirely of exempt materials, and no testing is required to prove that an item is made of an exempted material (for example, you don’t have to test a cotton shirt to prove that it is cotton). When products contain components made of both exempted and non-exempted materials, only the non-exempted materials need to be tested, but the entire finished product must be certified for compliance. A screen printed children’s t-shirt would require lead testing of the screen print only, not the shirt itself, but a certificate of compliance would need to be issued for the finished product—the printed children’s shirt.

California’s Metal Containing Jewelry Law: Restricts lead content in jewelry for all consumers. It includes the definition of jewelry watches as well as detachable shoe and clothing ornaments and hair accessories. The law was enacted in 2006 as the result of a 2004 Proposition 65 consent judgment with a number of jewelry manufacturers, distributors and retailers. The law classifies materials as Class 1, 2 or 3 and sets limits on the amount of allowable lead for each class.

- **Class 1 Materials** are materials that are not likely to contain lead. All Class 1 Materials are acceptable for use if the jewelry is made entirely of the material. The Class 1 Material list includes but is not limited to stainless steel, sterling silver, gold, and natural materials including coral, feathers and shells.

- **Class 2 Materials** are more specific to the lead levels present in the materials. Electroplated metal must have less than 6 percent lead by weight. Unplated metal must have less than 1.5 percent lead. Plastic and rubber materials must have less than 200 ppm of lead by weight. And, a dye or surface coating is considered a Class 2 Material if it has less than 600 ppm of lead by weight.

- **Class 3 Materials** are materials that are not Class 1 or Class 2 materials. All Class 3 materials must contain less than 600 ppm of lead by weight.

In order to comply with the California Lead Containing Jewelry Law, a manufacturer or supplier of jewelry must provide certification that the jewelry is in compliance. This certification should be provided to the person who is distributing the jewelry or the certification can be displayed prominently on the shipping container or on the jewelry’s packaging. Additionally, the manufacturer or supplier must, upon request from the DTSC (and within 28 days) provide to DTSC technical documentation or other information showing that the jewelry is in compliance with the law.

Individual persons who violate the law may be subject to civil penalties up to $2,500 per day per violation. The fines are higher for manufacturers, suppliers and distributors who “knowingly and intentionally manufactures, ships, sells, offers for sale, or offers for promotion jewelry in violation of the law.” In these instances, fines may be between $5,000 and $100,000, or imprisoned up to a year, or both. Businesses that “knowingly and with intent to deceive falsifies any document or certificate required by the law” could receive fines up to $50,000, or imprisoned up to a year, or both.

The test methods required by the Metal-Containing Jewelry law require specific sample preparation and testing procedures for certain materials as outlined in sections 25214.4 and 25214.1 of the California Health and Safety Code. Test methods found in EPA Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846 (Third Edition) are required to determine compliance.

This law is completely separate from Proposition 65 and is not pre-empted by the CPSC. Compliance with Prop 65 and the Metal Containing Jewelry Law is required. Under the Metal Containing Jewelry Law manufacturers have two options for providing certification of their jewelry’s compliance:

1. Upon request, provide certification to the entity selling/distributing the manufacturer’s jewelry; or
2. Displaying the certification in a prominent location on the shipping container or the jewelry packaging.

**Mercury**

The federal Mercury Containing Battery Management Act limits mercury in batteries to 25 mg per cell. Some state legislation further restricts mercury, particularly in batteries and battery-operated novelties. The limit is typically considered to be less than 5 mg per cell, which is expected to reduce the likelihood of mercury having been added intentionally. There are a number of states that have passed mercury in batteries and novelties laws. These laws cover products that are intended for personal or household enjoyment, including but not limited to: toys, figurines,
adornments, games, cards, ornaments, yard statues and figurines, candles, jewelry, holiday decorations and footwear and other apparel items.

States with these battery restrictions include California, Connecticut, Illinois, Maine, Michigan, New Hampshire, Ohio, Oregon and Texas. There is proposed legislation in certain states for further mercury restrictions. States continue to consider additional product safety requirements. You should always check with your state to make sure you have current information.

Additional Requirements For Toys

The Consumer Product Safety Commission (CPSC) notes on their website that, “for toys, ASTM F963-11, Standard Consumer Safety Specification for Toy Safety, places additional limits on the amount of antimony, arsenic, barium, cadmium, chromium, lead, mercury, and selenium based on the soluble portion of that material using a specified extraction methodology given in the standard.”

It is necessary to conduct ASTM F963-11 solubility testing on applicable toys for antimony, arsenic, barium, cadmium, chromium, lead, mercury, and selenium because those are not covered by 16 CFR § 1303.1. For lead, however, testing for the soluble limit is not necessary for products subject to 16 CFR § 1303.1 because the maximum total lead content in paint is 90 ppm in 16 CFR § 1303.1, which is a more stringent requirement in all cases."

The CPSC addresses the testing referred to here and other requirements specifically for toys in their frequently asked questions (FAQs) on toys and the mandatory toy standards.

California Proposition 65: This legislation is also known as the Safe Drinking Water and Toxic Enforcement Act of 1986, with the initial purpose to protect California citizens from chemicals known to cause cancer, birth defects or other reproductive harm. The list has grown to more than 900 chemicals and new chemicals continue to be added. Prop 65 is essentially a labeling requirement—if your product contains a chemical on the list, a warning statement is required to alert consumers of its presence so that consumers can then make informed purchasing decisions. Proposed changes to Prop 65 are even more stringent and expected to be implemented in the near future. PPAI has created a Prop 65 Best Practices guide for our members.

Product Concept and Sourcing Considerations

When selecting a product and a production partner, it is not enough to simply understand regulations and how they apply to your product. It is essential that you evaluate your production partners to ensure they have proper chemical controls in their facilities. Consider asking:

- How are chemicals sourced?
- How are chemicals stored?
- How are chemicals mixed? What controls do you have in place?
- How do you label chemicals? What languages do you include on those labels?
- Do you have SDS on-site for all chemicals in use?
- Is your team trained to handle chemical spills / human exposure?
- Do you regularly inspect your facility to ensure compliance with chemical management procedures? When you find non-conformities, how do you put CAPs in place?
Online Resources:

U.S. National Library of Medicine - Heavy Metals Toxicity and the Environment:
   http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4144270/


ASTM F963-11: http://www.astm.org/Standards/F963.htm
ASTM F963 Quick Facts: http://www.astm.org/toys.html
ASTM F2923-14: http://www.astm.org/Standards/F2923.htm
ASTM F2999-14: http://www.astm.org/Standards/F2999.htm

FHSA 16 CFR 1500: https://www.cpsc.gov/PageFiles/77793/027.txt


CPSC Study on XRF Technology:


Consumer Product Safety Improvement Act (CPSIA):

CPSIA ASTM F963:

Child Safety Protection Act (CSPA):
http://www.cpsc.gov/PageFiles/105423/cspa.pdf

Ban of Lead-Containing Paint and Certain Consumer Products Bearing Lead-Containing Paint:

California Proposition 65: http://oehha.ca.gov/prop65.html

PPAI Prop 65 Best Practice:


California Safer Consumer Products Act (SCP):
https://www.dtsc.ca.gov/SCP/SaferConsumerProductsProgram.cfm

California Lead in Jewelry: Metal-Containing Jewelry Law:
https://www.dtsc.ca.gov/PollutionPrevention/ToxicsInProducts/MetalJewelryLaw.cfm

Illinois Lead Poisoning Act:

Massachusetts Toxics Use Reduction Act:
https://malegislature.gov/Laws/GeneralLaws/PartI/TitleII/Chapter21I

Maine Toxic Chemicals in Children's Products Law:
http://www.maine.gov/dep/safechem/

Washington Children's Safe Products Act:

PPAI State Regulations Best Practices:
http://www.ppai.org/media/1819/pr-bp-state-regulations.pdf

PPAI State Regulations Summary:
http://www.ppai.org/media/1845/pr-guide-state-regulations-chart.pdf

PPAI Jewelry Product Responsibility Best Practice:
http://www.ppai.org/media/1810/pr-bp-jewelry.pdf

Safe Kids' Jewelry Act:
http://thomas.loc.gov/cgi-bin/query/z?c111:S.2975.IS:

Children's Toxic Metals Act:
https://www.govtrack.us/congress/bills/111/hr4428/text

European RoHS Directive:

Mercury Containing Battery Management Act:

Safer States Network:
http://www.saferstates.com/