

Brass for North American Potable Water Applications

Value Chain Perspectives

Introduction

Ensuring the safety of drinking water is a global priority, particularly with respect to controlling the presence of lead which is known to cause adverse health effects. Professional care has been deployed throughout the brass value chain to ensure that brass materials and components are in compliance with lead-free requirements. This piece summarizes the North American regulatory landscape and reviews how producers and users of brass rod have adapted to meet new requirements.

North American Drinking Water Lead Regulations

The U.S. Safe Drinking Water Act enacted in 1974 governs the quality of drinking water supplied to the American publicⁱ. Following the act, the U.S. Environmental Protection Agency (EPA) set maximum and enforceable limits for many drinking water contaminants including lead. In 1986, the act was amended to include "lead-free" requirements that restricted the amount of lead in pipes and pipe fittings used in the installation or repair of U.S. potable water systems. In 1996, leachate testing was also required for endpoint devices (e.g. faucets, drinking fountains) to ensure safe discharge levels of lead and other contaminants. After August 6, 1998, it became unlawful to sell potable water components that did not meet lead-free requirements.

In 2006, the state of California introduced new lead-free legislation that reduced the permissible lead content to not more than a weighted average of 0.25% with respect to the wetted surfaces of pipes, pipe fittings, plumbing fittings and fixturesⁱⁱ. Shortly after, other states including Maryland, Vermont and Louisiana adopted similar laws.

On January 4, 2011, new federal legislation was passed to harmonize the regulation of lead in drinking water systems. The Reduction of Lead in Drinking Water Act adopted the new California lead limit of 0.25% for wetted surfaces as a national requirement which came into force on January 4, 2014ⁱⁱⁱ. The act also deferred leachate testing requirements to the states and exempted certain products used exclusively for non-potable water applications. In Canada, the same lead-free requirements are being adopted into relevant codes and standards for potable water components.

Brass Suppliers

To help component manufacturers meet lead-free requirements, raw material suppliers developed several types of lead-free alloys. One category is binary alloys which remove lead and compensate with additional copper or zinc. Another category is tertiary alloys which substitute lead for other elements such as silicon, bismuth and sulfur.

As lead-free alloys enter the recycling stream, raw material suppliers must carefully scrutinize incoming brass scrap which is no longer a homogeneous mixture of copper, zinc and lead. This applies to primary scrap returns from industrial manufacturing as well as secondary scrap purchased from dealers. Certain elements present in the scrap stream can act as deleterious impurities depending on the scenario which can cause production and product quality issues. For obvious reasons, leaded scrap must be kept out of the charge material used to produce lead-free alloys. Scrap from binary alloys can be recycled into any brass alloy, but scrap from tertiary lead-free alloys must be kept separate from each other and from any other alloy.



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Product Designers and Engineers

To meet lead-free requirements, product designers and engineers now specify lead-free brass alloys. Importantly, there are no direct restrictions on the use of leaded brass as lead-free requirements apply to fabricated devices. Thus, leaded brass alloys can also be specified so long as the component is designed properly to meet federal and state lead-free requirements for wetted surface area and leachate testing.

This flexibility allows product designers and engineers to take full advantage of multiple brass alloy solutions that each offer an attractive combination of properties. Understanding lead-free requirements and available alloy solutions helps product designers and engineers choose the right material for the job.

Potable Water Component Manufacturers

Manufacturers must demonstrate compliance with federal lead-free requirements by certifying products to NSF Standard 372: Drinking Water System Components – Lead Content^{iv}. NSF 372 is a standard method used to calculate the lead content in a potable water component with respect to the wetted surface area to ensure that the 0.25% limit is not exceeded.

Manufacturers must also satisfy leachate testing requirements at the state level by certifying potable water components to NSF Standard 61: Drinking Water System Components Health Effects^v. NSF 61 is a pass/fail test that exposes plumbing components to water samples and measures the amount of lead and other contaminants that leach out over a set time. The total allowable concentration for discharged lead in NSF 61 is 5 µg/L.

Some states require independent third party certification to NSF 372 and NSF 61 by American National Standards Institute (ANSI) accredited certifiers which is practiced as a national requirement to avoid multiple compliance pathways.

Manufacturers must also adjust machining parameters to accommodate the different manufacturing properties of lead-free alloys and segregate different types of leaded and lead-free brass scrap to avoid upstream recycling issues.

Labeling and Identification for End-Users

Several different markings are used by manufacturers on products, packaging and literature to indicate compliance with lead-free requirements. To help end-users identify compliant products, the U.S. EPA maintains a comprehensive listing of acceptable markings issued by ANSI-accredited third party certifiers^{vi}. Some manufacturers also mark physical products with "LF" (lead-free) or "NL" (no-lead) to designate compliance.



Examples of lead-free markings for packaging, literature and components

End-users can also verify the compliance status of potable water devices by referencing third-party certification listings, specification sheets and manufacturer declarations. For example, a searchable database of NSF 61 compliant products is available on the NSF website^{vii}.

Ideal Materials for Drinking Water Applications

Brass is a versatile engineering material used to make durable products that readily meet lead-free requirements. Brass alloys are 100% recyclable and are made almost entirely from recycled content contributing to a more sustainable and safer planet. Compared to other materials, the unparalleled machinability, excellent corrosion resistance and high scrap value makes brass a preferred material for potable water delivery systems.

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i - "U.S. Safe Drinking Water Act," Pub. L. 93-523; 88 Stat. 1660; 42 U.S.C. § 300f et seq. 1974-12-16.
ii - California Assembly Bill (AB) 1953, Changes, Lead Plumbing, 2006, http://www.leginfo.ca.gov/pub/05-06/bill/asm/ab_1951-2000/ab_1953_bill_20060930_chaptered.html
iii - "Reduction of Lead in Drinking Water Act," Pub. L. 111-380; 124 Stat. 4132; 42 U.S.C. § 300g-6, January 4, 2011
iv - NSF 372 - Drinking Water System Components, Lead Content, http://www.nsf.org/newsroom_pdf/nsf61-372_lead_insert_LWD-1350-0513.pdf

v - "NSF/ANSI 61 - Drinking Water System Components - Health Effects," NSF International and American National Standard, last revised 2013
vi - "How to Identify Lead-Free Certification Marks for Drinking Water System & Plumbing Materials," U.S. Environmental Protection Agency Reference Document EPA/600/F-13/153, October 2013, <http://nepis.epa.gov/Exec/QueryPDF.cgi?Dockey=P100GRDZ.txt>
vii - "NSF 61 Certified Drinking Water System Companies," NSF International, Ann Arbor, MI, USA, available at <http://info.nsf.org/Certified/Common/Company.asp?Standard=061>

