Brass and North American Drinking Water Regulations

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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 comply with lead-free requirements. This piece summarizes the North American regulatory landscape and 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 public[i]. 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 fixtures[ii]. 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, 2014[iii]. 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 requirements were 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 relatively 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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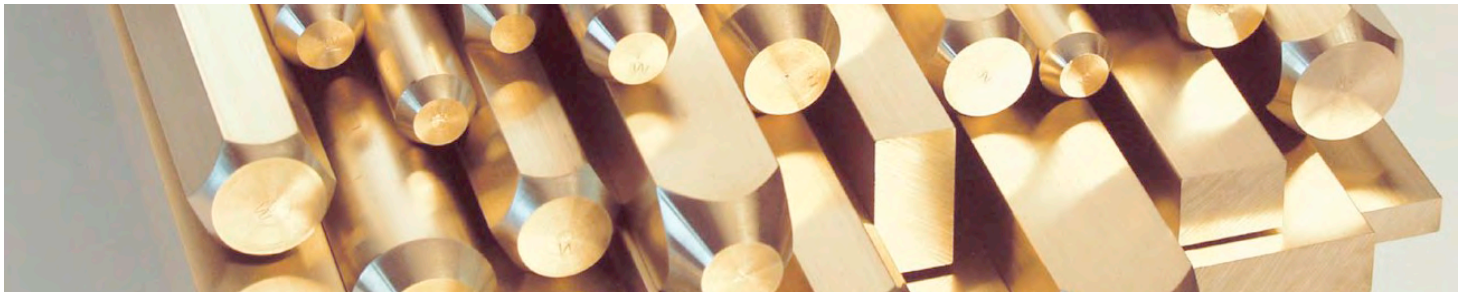

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Product Designers and Engineers

Product designers and engineers have many options to meet lead-free requirements with brass. Importantly, there are no direct restrictions on the use of brass alloys as the requirements apply to fabricated devices. Thus, both leaded and lead-free alloys can be specified so long as the component is designed properly to meet the 0.25% maximum for wetted surface area, and pass the lead leachate testing (see below for details). This flexibility allows product designers and engineers to take full advantage of multiple brass alloy solutions that each offer an attractive combination of properties.

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 products to NSF Standard 61: Drinking Water System Components Health Effects[v]. NSF 61 is a pass/fail test that exposes plumbing components to aggressive, artificial test waters and measures the amount of lead and other contaminants that leach out over a set time. The max limit for discharged lead is 5 µg for endpoint devices (e.g., faucets) and 3 µg for components (e.g., valves)

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 scrap from certain alloy families (e.g., silicon and bismuth-containing) to avoid upstream recycling issues.

Lower NSF 61 Lead Limits Take Effect in 2024

After extensive stakeholder discussions, the NSF Joint Committee, which governs NSF 61, decided to lower the maximum allowable limits of leached lead from plumbing endpoint devices as part of an ongoing public health protection effort[vii]. The more stringent criteria require the maximum amount of lead leaching to be reduced from 5 to 1 µg for endpoint devices (e.g., faucets), and from 3 to 0.5 µg for other components such as shut-off valves. Certification to the new requirements is optional for the next three years to allow manufacturers time to transition. The new limits become mandatory on Jan. 1, 2024.

Labeling and Identification for End-Users

Manufacturers use several different markings on products, packaging and literature to indicate lead-free compliance. To help end-users identify compliant products, the U.S. EPA maintains a list 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). Products certified to the more stringent lead limits described above will bare new markings to indicate compliance with the lower limit.

Lead-free marking examples for packaging, literature & components

End-users can also verify the compliance status of products 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[viii].

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.

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i - “U.S. Safe Drinking Water Act,” Pub. L. 93–523; 1974. https://bit.ly/2IB5ukY
ii - California Assembly Bill (AB) 1953, Changes, Lead Plumbing, 2006, https://bit.ly/3pqSmQ3
iii - “Reduction of Lead in Drinking Water Act,” Pub. L. 111-380; 2011. https://bit.ly/36tYezA
iv - NSF 372 – Drinking Water System Components, Lead Content, https://bit.ly/36xVpx9
v - “NSF/ANSI 61 – Drinking Water System Components – Health Effects,” NSF International and American National Standard, last revised 2020, https://bit.ly/36xVH7d
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: https://bit.ly/2UkvxPE
vii - Plumbing Standard Revisions Tighten Lead Leaching Criteria in Drinking Water, NSF Intl: https://bit.ly/2Um4le1
viii - “NSF 61 Certified Drinking Water System Companies,” NSF Intl: https://bit.ly/3pkTPHI