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AWWA Standard

Replacement and Flushing of Lead Service Lines

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American Water Works Association

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Committee Personnel

The AWWA Standards Subcommittee on Lead Service Lines, which developed this standard, had the following personnel at the time of approval:

M. Bain, Greeley and Hansen, Indianapolis, Ind.
N.V. Deshpande, Greater Cincinnati Water Works, Cincinnati, Ohio
J. Eisnor, Halifax Water, Halifax, N.S.
K.C. Friedman, Clorox Services Company, Pleasanton, Calif.
T.C. Gilbert, Onondaga County Water Authority, Syracuse, N.Y.
S. Gould, Pape Dawson, Austin, Tex.
M.E. Grahek, Knoxville, Tenn.
D.A. Granados, Massachusetts Water Resources Authority, Boston, Mass.
B.J. Haas, A.Y. McDonald Manufacturing, Dubuque, Iowa
R. Kopansky, Philadelphia Water Department, Philadelphia, Pa.
K.C. Morgan, City of Kansas City, Kansas City, Mo.
R.T. Nishijima, Clorox Services Company, Pleasanton, Calif.
K. Oberoi, Charleston Water System, Charleston, S.C.
P.J. Olson (*liaison, nonvoting*), Standards Engineer Liaison, AWWA, Denver, Colo.
S.D. Osborne, OSD LLC, Lexington, Mass.
S. Predmore, Greater Cincinnati Water Works, Cincinnati, Ohio
D.M. Randall, Denver Water, Denver, Colo.
R.W. Roost, Lansing, Mich.
C.G. Rubeiz, Plastics Pipe Institute, Fairfax, Va.
M.K. Schmelling, DC Water, Washington, D.C.
G. Scoby, Cross Bore Consultants, Los Gatos, Calif.
R. Slabaugh, Arcadis, Indianapolis, Ind.
F. Trinchini, City of Vaughan, Vaughan, Ont.
C. Venkatesh, Sundt Construction, Georgetown, Tex.
S.H. Via, American Water Works Association, Washington, D.C.
A.J. Weiss, Onondaga County Water Authority, Syracuse, N.Y.

The AWWA Standards Committee on Distribution System Operations and Management, which reviewed and approved this standard, had the following personnel at the time of approval:

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Kanwal Oberoi, *Chair*
Ken Morgan, *Vice-Chair*

Service Provider/Consultant Members

M.N. Agbodo, Veenstra Kimm, Overland Park, Kans.
M.L. Altland, Mott MacDonald, Iselin, N.J.
D.A. Feuer, Woolpert Inc., Englewood, Colo.
L. Furatian, Stantec Consulting, Abbotsford, B.C.
S. Gould, Pape Dawson, Austin, Tex.
S.R. Mason, Kimley-Horn and Associates Inc., Austin, Tex.
B. McDonald, Black & Veatch, Phoenix, Ariz.
S.D. Osborne, OSD LLC, Lexington, Mass.
R.S. Hughes (*liaison, nonvoting*), Standards Council Liaison, Gannett Fleming Inc., Audubon, Pa.

Management Interest Members

H. Huddle, NAVFAC—Washington Public Works Department, Washington Navy Yard, D.C.
B.A. Macler, Orinda, Calif.
J. Mukri, Xylem, Milton, Ont.
P.J. Olson (*liaison, nonvoting*), Standards Engineer Liaison, AWWA, Denver, Colo.
P. Rogers, University of Southern Mississippi, Petal, Miss.

User Members

T.A. Blomstrom, Rochester Public Utilities, Rochester, Minn.
J.E. Dyksen, Suez Water, North Haledon, N.J.
M.E. Grahek, Los Angeles Department of Water, Los Angeles, Calif.
D.A. Granados, Massachusetts Water Resources Authority, Boston, Mass.
Y. Hong, Greater Cincinnati Water Works, Cincinnati, Ohio
K.C. Morgan, City of Kansas City, Kansas City, Mo.
A. Nabors, Birmingham Water Works Board, Birmingham, Ala.
K. Oberoi, Charleston Water System, Charleston, S.C.
G. Ramon, Little Rock Wastewater, Little Rock, Ark.
D.M. Randall, Denver Water, Denver, Colo.
A.J. Weiss, OCWA, Syracuse, N.Y.
J. Zhao, Golden State Water Co., Cerritos, Calif.

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Foreword

This foreword is for information only and is not a part of ANSI/AWWA C810.*

I. Introduction

I.A. *Background*. Replacement of lead service lines and subsequent flushing are important processes for ensuring the delivery of safe drinking water. The American Water Works Association (AWWA) Policy Statement on Lead Service Line Management supports protecting public health through the reduction of exposure to lead in drinking water and encourages communities to develop a lead reduction strategy that includes identifying and removing all lead service lines over time. This standard is intended to describe essential procedures for the replacement of lead service lines, including the following elements: appropriate tools and techniques; flushing a service line after replacement; factors to consider in optimizing flushing; instructions to inform customers affected by the replacement, including additional risk reduction measures and distribution of pitcher point-of-use (POU) filter systems; and verification of lead level management prior to return to service. Although partial replacements should be discouraged, this standard also describes procedures for partial replacement and repair situations where full service line replacement is not possible or practical.

I.B. *History*. Development of this standard was authorized by the AWWA Standards Council in 2015 and was assigned to the AWWA Standards Committee on Distribution Systems Operations and Management. A Subcommittee on Lead Service Lines was formed to draft the standard. The first edition of the standard was approved by the AWWA Board of Directors on June 11, 2017. This second edition of C810 was approved on Oct. 13, 2025.

I.C. *Acceptance*. In May 1985, the US Environmental Protection Agency (USEPA) entered into a cooperative agreement with a consortium led by NSF International (NSF) to develop voluntary third-party consensus standards and a certification program for direct and indirect drinking water additives. Other members of the original consortium included the Water Research Foundation (formerly AwwaRF) and the Conference of State Health and Environmental Managers (COSHEM). AWWA and the Association of State Drinking Water Administrators (ASDWA) joined later.

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In the United States, authority to regulate products for use in, or in contact with, drinking water rests with individual states.[†] Local agencies may choose to impose requirements more stringent than those required by the state. To evaluate the health effects of products and drinking water additives from such products, state and local agencies may use various references, including

1. Specific policies of the state or local agency.

2. Four standards developed under the direction of NSF:[‡] NSF/ANSI/CAN[§] 60, Drinking Water Treatment Chemicals—Health Effects; NSF/ANSI/CAN 61, Drinking Water System Components—Health Effects; NSF/ANSI/CAN 372, Drinking Water System Components—Lead Content; and NSF/ANSI/CAN 600, Health Effects Evaluation and Criteria for Chemicals in Drinking Water.

3. Other references, including AWWA standards, *Food Chemicals Codex*, *Water Chemicals Codex*,[¶] and other standards considered appropriate by the state or local agency.

Various certification organizations may be involved in certifying products in accordance with NSF/ANSI/CAN 60 and 61. Individual states or local agencies have authority to accept or accredit certification organizations within their jurisdictions. Accreditation of certification organizations may vary from jurisdiction to jurisdiction.

NSF/ANSI/CAN 600 (which formerly appeared in NSF/ANSI/CAN 60 and 61 as Annex A, "Toxicology Review and Evaluation Procedures") does not stipulate a maximum allowable level (MAL) of a contaminant for substances not regulated by a USEPA final maximum contaminant level (MCL). The MALs of an unspecified list of "unregulated contaminants" are based on toxicity testing guidelines (noncarcinogens) and risk characterization methodology (carcinogens). Use of NSF/ANSI/CAN 600 procedures may not always be identical, depending on the certifier.

ANSI/AWWA C810 does not address additives requirements. Thus, users of this standard should consult the appropriate state or local agency having jurisdiction in order to

1. Determine additives requirements, including applicable standards.

2. Determine the status of certifications by parties offering to certify products for contact with, or treatment of, drinking water.

3. Determine current information on product certification.

[†] Persons outside the United States should contact the appropriate authority having jurisdiction.

[‡] NSF International, 789 North Dixboro Road, Ann Arbor, MI 48105.

[§] Standards Council of Canada, 55 Metcalfe Street, Suite 600, Ottawa, ON K1P 6L5 Canada.

[¶] Both publications available from National Academies Press, 500 Fifth Street, NW, Washington, DC 20001.

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II. Special Issues

II.A. *Prioritizing Lead Service Line Replacement.* Suggested items listed below are examples of situations encountered that led to lead service line replacements. These scenarios are not all encompassing but rather provide guidance for scenarios that may be encountered by a water system when planning or considering lead service line replacement projects or programs:

- Known high concentration of lead service lines within a localized area.
- Lead service lines where water quality (WQ) sample results suggest elevated levels of lead could be coming from service lines.
- Any lead service line physically disturbed by dig-ins, excavations, repairs, or similar activities.
- Existing known partial lead service lines through customer documentation of service line repairs or historical water system repair practices.
- Known lead service lines replaced as part of residential redevelopment.
- Known lead service lines associated with critical customers (schools, day care centers, hospitals, dialysis centers, or other identified sensitive populations as defined by the USEPA).
- Lead service lines identified during or as part of scheduled underground infrastructure work or street restoration work that could be replaced concurrently, to minimize negative impact to customers.
- Consideration of presence of lead goosenecks and galvanized service lines following lead service lines.

II.B. *Optimizing Corrosion Control Treatment*. Corrosion of piping and solder can be a primary source of lead contamination in drinking water. Optimizing corrosion control treatment may help a water system to minimize this source of lead contamination. Water systems may consider appropriate corrosion control treatments that include pH adjustment, alkalinity adjustment, addition of corrosion inhibitors, and other corrosion control treatments. Additional guidance on applying corrosion control treatments can be found in the AWWA Manual of Water Supply Practice M58—*Internal Corrosion Control in Water Distribution Systems,* the AWWA "Corrosion Control Implementation Framework," and the 2013 *Journal AWWA* article "Strategies for Assessing Optimized Corrosion Control Treatment of Lead and Copper" (these documents are available through the AWWA Lead resource page: www.awwa.org/lead).

II.C. *Reuse or Replacement of Service Line Fittings, Valves, and Water Meters.* The scope of this standard covers replacement of lead service lines. Water systems may choose to reuse or replace the related fittings, valves (corporation stops and curb stops),

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and water meters, based on the site-specific age and condition of those components and based on the water system–specific replacement schedules and practices. The Reduction of Lead in Drinking Water Act requires that all newly installed pipes, fittings, and fixtures meet the current definition of "lead free." The reuse of existing fittings (that may or may not meet the current definition of "lead free") is allowed by the Reduction of Lead in Drinking Water Act if reused in their original locations.

II.D. *Water System Communication Planning for Lead in Drinking Water*. Water systems are facing a new communications challenge related to lead in drinking water. Water systems are required under the Safe Drinking Water Act to communicate lead risks when there is an exceedance of the lead action level as defined in the Lead and Copper Rule and as part of their consumer confidence reports. Water systems conducting mandatory lead service line replacements must meet specific outreach requirements targeting affected buildings/households. Beyond these requirements, many water systems also communicate lead exposure risks proactively in consumer confidence reports, on websites, and through other means.

The Lead and Copper Rule Revisions (LCRR) include additional communication requirements. Community water systems will need to ensure existing practices and supporting resources are adequate to return sample results and provide informational materials to buildings/households within three days of when individual lead sample results exceeding the rule's Action Level are reported by the laboratory. Results not exceeding action levels should be reported within 30 days. Water systems must conduct Tier 1 public notice within 24 h of any systemwide Action Level exceedance (more than 10 percent of lead values in compliance data sets for a required monitoring period are greater than the Action Level).

Under the new Lead and Copper Rule Revisions, if a water system has a service line inventory that contains lead, galvanized pipe, unknown material, or lead connectors, the system will need to be prepared to take the following steps. Adopt new or revised standard operating practices for contacting buildings/households in advance of distribution system construction that offers an opportunity to fully replace lead and galvanized lines requiring replacement. Engagement includes prior notice, pursuit of full replacement, funding information, delivery of filters, instructions for postreplacement or disturbance flushing, and postreplacement water sample collection.**

Water systems should be planning to communicate lead exposure risks in a proactive and targeted manner not only when lead service lines are repaired or replaced

** Via, S. 2022. "LCRR Compliance Involves More Than Lead Service Lines." *Journal AWWA*, 114(2)6–8.

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but also when routine maintenance work on water mains may disturb lead service lines. This change may dramatically alter the frequency of direct-to-customer lead communications and require a new level of planning by water system managers and communicators.

II.E. *Grounding and Bonding of Electrical Circuits on Piping*. If the lead service line is replaced with a nonmetallic pipe or if a nonconductive plastic coupling (dielectric coupling) is used within a few feet of the building, the property owner may need to take additional measures to ensure the structure has sufficient grounding. Historically, connection to the building piping system was used for grounding the building's electrical system. By removing the underground metal piping, an alternative grounding strategy may be needed (see Uniform Plumbing Code 604.10).

All metal water systems should be "bonded." Failure to adequately bond the potable water piping systems to the electrical system increases the potential for both fire and electrocution should the piping system become energized (see National Electric Code).

II.F. *Chlorine and Chloramine Degradation of Elastomers.* The selection of materials is critical for water service and distribution piping systems in locations where there is a possibility that elastomers will be in contact with chlorine or chloramines. Documented research has shown that elastomers such as gaskets, seals, valve seats, and encapsulations may be degraded when exposed to chlorine or chloramines. The impact of degradation is a function of the type of elastomeric material, chemical concentration, contact surface area, elastomer cross section, environmental conditions as well as temperature. Careful selection of and specifications for elastomeric materials and the specifics of their application for each water system component should be considered to provide long-term usefulness and minimum degradation (swelling, loss of elasticity, or softening) of the elastomer specified.

II.G. *Particulate Lead.* Once particulate lead enters building plumbing, especially if the plumbing contains galvanized iron pipe, it is difficult to fully flush all of the particulate lead out of the pipes, and release of lead into the water can continue after the lead service line is removed.

II.H. *Reduction of Lead Exposure*. The release of lead following full or partial replacement or disturbance of a lead service line can occur for a variety of reasons. Underlying reasons and their effects vary from home to home or building to building. Thus, residents should be provided with access to information for reducing their exposure to lead. Although collecting samples for the analysis of lead can be useful in trying to understand the extent of the disturbance, this standard does not require that lead samples be collected. Such test results can overestimate or underestimate lead

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occurrence. It is beyond the scope of this standard to address sampling design and data interpretation, which will vary from water system to water system and sometimes from building to building. Actions that consumers can take to reduce their exposure to lead include: daily flushing before use of water; NSF/ANSI 53 lead-certified home water filters; or certified bottled drinking water. Bottled drinking water can be considered as a secondary option given cost and environmental concerns.

III. Use of This Standard. It is the responsibility of the user of an AWWA standard to determine that the products and/or processes described in that standard are suitable for use in the particular application being considered.

III.A. *Purchaser Options and Alternatives*. This standard is written as though the replacement and flushing work will be performed by the purchaser's (generally the water system's) personnel. Where the work is to be performed using a separate contract or as part of a contract for replacing service lines,[††] appropriate provisions should be included in the purchase documents to ensure the constructor is specifically instructed as to its responsibilities. The following information should be provided by the purchaser:

1. Standard used—that is, ANSI/AWWA C810, Replacement and Flushing of Lead Service Lines, of latest revision.
2. Whether compliance with NSF/ANSI 61, Drinking Water System Components—Health Effects, is required.
3. Details of federal, state, provincial, territorial, and local requirements (Section 4).
4. Method(s) of replacement to be used—open cut, trenchless on new route, or trenchless using existing route (Sec. 4.1).

III.B. *Modification to Standard*. Any modification of the provisions, definitions, or terminology in this standard must be provided by the purchaser.

IV. Major Revisions. Major revisions made to the standard in this edition include the following:

1. Updated Foreword Sec. I.C Acceptance to include reference to NSF/ANSI/CAN 372 and NSF/ANSI/CAN 600 standards.
2. Revised suggested guidance on prioritizing lead service line replacement in the Foreword (Sec. II.A).
3. Revised suggested guidance on communication plans to include requirements from the Lead and Copper Rule Revisions (LCRR) (Foreword Sec. II.D).

[††] Refer to other AWWA standards and manuals for design criteria for various service line materials.

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4. Added guidance to Foreword Sec. II.F Chlorine and Chloramine Degradation of Elastomers, Sec. II.G Particulate Lead, and Sec. II.H Reduction of Lead Exposure.

5. Revised Figure 1 to better represent typical meter and valve configurations.

6. Revised language on filters (Sec. 1.1 and Sec. 4.3.1).

7. Revised the section on locating lead service lines to include information regarding service line inventories, scrape test requirements, hydro-excavation requirements, and documentation (Sec. 4.1.1).

8. Added a section on worker safety to the preparation requirements (Sec. 4.1.2.5).

9. Revised the requirements for disposal of lead service lines and requirements regarding buried lead pipe remnants (Sec. 4.1.3.3, Sec. 4.1.4, and Sec. 4.1.5.2).

10. Added a section on replacement service line pipe material (Sec. 4.1.6).

11. Revised requirements regarding delayed replacements (Sec. 4.2.3).

12. Added requirement for communicating lead test results to customers per LCR (Sec. 4.3.2).

13. Updated flushing guidance (Sec. 4.4).

14. Revised the guidance for water test results following replacement (Sec. 5.2).

15. Added an appendix with example instructions for residents for flushing (Appendix A).

16. Added an appendix with information regarding supply of a pitcher point-of-use (POU) filtration system as a provision within the LCRR and LCRI (Appendix B).

V. Comments. If you have any comments or questions about this standard, please call AWWA Standards and Optimization Programs at 303.794.7711; write to the department at 6666 West Quincy Avenue, Denver, CO 80235-3098; or email standards@awwa.org.

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ANSI/AWWA C810-25
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AWWA Standard

Replacement and Flushing of Lead Service Lines

SECTION 1: GENERAL

Sec. 1.1 Scope

This standard describes essential procedures for the replacement of lead water service lines and flushing following replacement. Essential procedures include the following: appropriate tools and techniques; flushing a service line after replacement; factors to consider in optimizing flushing; and instructions to provide customers affected by the replacement, including additional risk reduction measures and distribution of pitcher point-of-use filter systems. This standard also describes procedures for partial replacement and repair situations where complete lead service line replacement is not possible or practical.

Sec. 1.2 Purpose

The purpose of this standard is to define the minimum process requirements for the replacement of lead service lines and for flushing following replacement.

Sec. 1.3 Application

This standard can be referenced in the purchase documents for the replacement of lead service lines and can be used as a guide for the appropriate replacement tools and techniques, flushing practices and procedures, communications with customers, and verification of successful completion. The stipulations of this standard apply when this document has been referenced and only to the extent referenced.

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