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ANSI/AWWA **C622-19**
(First Edition)

AWWA Standard

Pipe Bursting of Potable Water Mains 4 In. (100 mm) to 36 In. (900 mm)

Effective date: March 1, 2020.

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Approved by American National Standards Institute Sept. 16, 2019.



American Water Works
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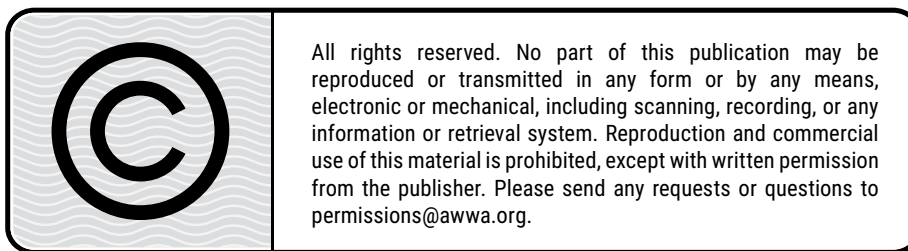
AWWA Standard

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Foreword

This foreword is for information only and is not a part of ANSI/AWWA C622.*

I. Introduction.

I.A. *Background.* Pipe bursting is a trenchless process for replacing an existing pipeline with a new pipeline and is a well-established trenchless method of pipeline replacement that has been in use in the United States for several decades. The process was first developed in the United Kingdom in the late 1970s for replacing natural gas pipelines without having to excavate a trench for the entire existing alignment. The pipe bursting process is a form of pipeline rehabilitation that replaces the original pipe with a new pipe that is the same or larger diameter. The new pipeline is a fully functional pipe replacement method. In the United States, the technology was modified and used to replace water and wastewater pipelines. Existing water mains of sizes between 4 in. (100 mm) in diameter to 36 in. (900 mm) in diameter have been successfully pipe burst.

The pipe bursting process consists of either a pneumatic (air powered) or static (hydraulically powered) pipe bursting system that fractures or splits the existing water main while simultaneously expanding the surrounding soils and installing a replacement pipe of equal or larger diameter. A static (hydraulic) pipe bursting system uses rods that are pushed into the existing water main then attached to “roller cutters” (as needed depending on the host pipe material) and an expander, which pulls a new pipe through during the process. The pipe bursting tool is designed to utilize the existing pipeline as a guiding alignment for the replacement pipe. The bursting tool moves through the existing pipe while fragmenting or splitting the existing pipe and pushing the original pipe materials into the surrounding soil as the tool, expander, and replacement pipe progress. The expander, which is attached to the new pipe being pulled through, is slightly larger in outside diameter than the new pipe. This allows a small temporary annulus to be created between the replacement pipe and surrounding soil. The annulus created is dependent on the type of soil surrounding the existing pipe. Depending on the original methods and materials used for installation of the existing pipe, compressible pipe backfill materials such as sandy or loamy soils in the existing trench section may also aid in expanding the areas around the water main to create an annulus. Pipeline materials that can be burst include the following: plastic, ductile iron, cast iron, steel, steel reinforced concrete, high-density polyethylene (HDPE), polyvinyl chloride (PVC), asbestos cement, and fiberglass. Fracturable pipe materials

* American National Standards Institute, 25 West 43rd Street, Fourth Floor, New York, NY 10036.

such as cast iron, asbestos cement, thin-walled plastic/PVC, and fiberglass can be pneumatically pipe burst. Nonfracturable pipe materials such as ductile iron, steel, reinforced concrete, thick-walled PVC, and HDPE generally require and are best suited for the static (hydraulic) pipe bursting method.

In static (hydraulic) pipe bursting, pull force is applied to the expander through steel pulling rod assemblies inserted through the existing pipe. The expander transfers the horizontal pulling force into a radial force that breaks the existing pipe and expands the cavity, providing space for the new pipe. With the rod method, steel rods are inserted into the existing pipe from the pulling shaft (receiving pit). When the rods reach the insertion pit, the bursting head is connected to the rods and the new pipe is connected behind the expander. Typically, a hydraulic power pack unit powers the equipment pulling the rods. The pulled rod sections are removed as the pipe progresses. The expander and the new pipe are pulled through the fractured existing pipe. The process continues until the bursting head reaches the receiving pit, where it is disconnected from the new pipe.

Static (hydraulic) pipe bursting technology includes the “pipe splitting” method through the addition of a “splitter” in front of the pipe burst expander head that splits the existing pipe. Properly designed and manufactured roller blade cutting wheel assemblies allow bursting of nonfracturing types of pipe such as steel and ductile/cast iron water pipes, concrete, and HDPE as well as some repair clamps or fittings that may be on the pipeline. Static systems can pull in all types of new pipe materials including fusible PVC, restrained joint PVC, plastic pipe, HDPE, and restrained joint ductile iron pipe.

The pneumatic pipe bursting system has a bursting tool that is a soil-displacement hammer driven by compressed air. An expander is attached to the front of the pneumatic hammer for “reversible tools” or on the back of the pneumatic hammer for a rear flair tool, depending on soil conditions and any upsizing requirements. The pneumatic hammer assembly is launched into the host pipe via the entry excavation. The bursting tool is connected to a constant-tension, variable-speed winch cable that has been placed inside the host pipeline at the receiving excavation. The size of the winch being used depends on the sizes of pipe being burst, length of run, and soil conditions. The constant tension of the winch keeps the bursting tool and expander in contact with the unbroken section of pipe and centered within the host pipe. The winch tension, when combined with the percussive power of the hammer, helps maintain the hammer and expander inside the existing pipe’s center. The percussive action of the hammering and cone-shaped head is similar to hammering a nail into the wall; each hammer stroke pushes the cone-shaped

head a short distance along its path. It cracks and breaks the existing pipe with each stroke. The expander combined with the percussive action push the fragments and the surrounding soil away, providing space for the new pipe. The pneumatic system is used to pipe burst only fracturable existing pipelines such as cast iron, asbestos cement, concrete, fiberglass, and plastic/PVC. The only new pipe material that can be pulled in with the pneumatic system is HDPE pipe. One consideration of the pneumatic process is the oiled air discharge from the pneumatic hammer exhausts into the new potable water pipe during installation. This creates a significant potential for contamination of the potable water pipe that would require thorough cleaning and residuals testing before being placed into service. While there may be occasions where a nontypical water main material has been installed and is replaced by bursting with a pneumatic method, static (hydraulic) bursting is the more common method used for water main replacement.

I.B. *History.* The AWWA Standards Committee on Pipe Rehabilitation was formed in 1998 to develop standards on the topic. Development of this standard was authorized and initiated in 2009 in response to the water industry's request for a standard on pipe bursting. This edition was approved by the AWWA Board of Directors on Oct. 28, 2019.

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.

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. Two standards developed under the direction of NSF, NSF/ANSI/CAN‡ 60, Drinking Water Treatment Chemicals—Health Effects, and NSF/ANSI/CAN 61, Drinking Water System Components—Health Effects.

* NSF International, 789 N. Dixboro Road, Ann Arbor, MI 48113.

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

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

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 61. Individual states or local agencies have authority to accept or accredit certification organizations within their jurisdiction. Accreditation of certification organizations may vary from jurisdiction to jurisdiction.

Annex A, "Toxicology Review and Evaluation Procedures," to NSF/ANSI/CAN 61 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 Annex A procedures may not always be identical, depending on the certifier.

ANSI/AWWA C622 does not address additives requirements. 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.

II. Special Issues.

II.A. *Chlorine and Chloramine Degradation of Elastomers.* The selection of materials for water service and distribution piping is critical 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 materials, chemical concentration, contact time, contact surface area, elastomer cross section, environmental conditions, and 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.B. *Advisory Information on Material Application.* Pipe bursting is a dynamic process where a replacement water main is installed in the same alignment as the

^{*} Both publications available from National Academy of Sciences, 500 Fifth Street, NW, Washington, DC 20001.

existing main without the need for removing the host main, and with minimal trench excavations being required. Existing conditions are critical to the success of the process. Locating and identifying existing pipe location and depth, crossing utilities, nearby utilities, connections, fittings, couplings, repair clamps, soil material, and groundwater are critical. It is important to specify requirements for pipe material, pipe bursting equipment, and Constructors' Qualifications.

II.C. *Constructor Experience.* The constructor should have project experience and be trained by the pipe bursting equipment provider(s) in the successful application of pipe bursting. Supervisory personnel should have project experience to ensure that the host and replacement pipe is suitably prepared and that the pipe bursting equipment is applied within the manufacturer's requirements.

II.D. *Distributing Information to Customers.* The purchaser shall distribute appropriate information to its customers who will be affected by the rehabilitation work before beginning any fieldwork. Customers may be informed using "door hanger" notices, water bill notifications, newspaper articles, or electronic notifications.

II.E. *Handling Asbestos Cement Pipe.* The handling of asbestos cement pipeline materials is regulated at the federal, state, and local levels of government. It is important to research the handling guidelines for the specific area where the water main to be replaced is located during the design process. Regulations pertaining to the generation of and subsequent management of the airborne friable material (e.g., capturing, containment, encapsulation, subsurface location, handling, disposal) are in place and shall be followed. Specific job site and worker protections are also identified and regulated.

II.F. *Pipe Bursting of Asbestos Cement (AC) Pipe.* Regulations regarding the disposal of hazardous waste may apply to pipe bursting of AC pipe. It is important to research and understand these regulations before undertaking a project where AC pipe fragments will remain (buried) in a public or private right of way.

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

III.A. *Purchaser Options and Alternatives.* The following information should be provided by the purchaser.

1. Standard used—that is, ANSI/AWWA C622, of latest revision.
2. Whether compliance with NSF/ANSI/CAN 61, Drinking Water System Components—Health Effects, is required.

3. Details of federal, state, and local requirements regarding existing and replacement pipe, fitting service materials (Sec. 4.2.1.1).
4. Type and size of replacement pipe to be used (4.2.2).
5. Identification of any existing asbestos cement pipe in the project (4.3.6).
6. The experience and submittal requirements for the designer, constructor, and inspector, and a requirement that the submittals be provided concurrent with or before the bid.
7. Whether a warranty on the materials and workmanship of the constructor is required, and the length of time and terms of the warranty.
8. Method of pipe bursting should it be specifically required—either pneumatic or static (hydraulic).
9. Type of pipe joining method to be used (4.2.2.1).

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. This is the first edition of this standard.

V. Comments. If you have any comments or questions about this standard, please call the AWWA Engineering and Technical Services Department at 303.794.7711, FAX at 303.795.7603, write to the department at 6666 West Quincy Avenue, Denver, CO 80235-3098, or e-mail at standards@awwa.org.



**American Water Works
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ANSI/AWWA C622-19
(First Edition)

AWWA Standard

Pipe Bursting of Potable Water Mains 4 In. (100 mm) to 36 In. (900 mm)

SECTION 1: GENERAL

Sec. 1.1 Scope

This standard describes the materials and procedures for rehabilitation of existing potable water pipelines 4 in. (100 mm) to 36 in. (900 mm) in diameter using pipe bursting. Potable water pipeline materials that can be pipe burst include asbestos cement, cast iron, ductile iron, fiberglass, high-density polyethylene (HDPE), polyvinyl chloride (PVC), plastic, reinforced concrete, and steel.

Sec. 1.2 Purpose

The purpose of this standard is to provide the minimum requirements for pipe bursting existing potable water pipelines 4 in. (100 mm) up to and including 36 in. (900 mm) in diameter using pipe bursting techniques, including materials and quality of work.

Sec. 1.3 Application

This standard can be referenced for rehabilitation of existing potable water mains using pipe bursting techniques. The stipulations of this standard apply to the pipe bursting operations when this document has been referenced.