ANSI/AWWA C620-19
(Revision of ANSI/AWWA C620-07 [R17])

American Water Works Association
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AWWA Standard

Spray-In-Place Polymeric Lining for Potable Water Pipelines 4 In. (100 mm) and Larger

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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 C620.*

I. Introduction.

I.A. *Background*. Water pipe rehabilitation through application of polymer based *in situ* spray lining has been used to provide a relatively impervious barrier between the water transported in the pipe and the inside pipe wall to prevent its corrosion and tuberculation. It has been recognized for over 40 years as a viable means of renewing water pipe infrastructure. The advantages of trenchless technology construction are realized, with the added benefits of a small construction site footprint and the potential for rapid return to service.

I.B. *History*. The original pipe rehabilitation method of *in situ* spray lining used cement mortar, and this remains a standard practice in North America. Cement cure time is generally a minimum of 24 h before water can be introduced back into the main. Thus, a temporary water supply system is needed.

A second *in situ* polymeric lining method developed in the United Kingdom (UK) in the 1970s utilizes a two-component epoxy resin liner system that is pumped under pressure through a spray head. The two reactive components are pumped separately within the single umbilical hose and are only mixed together at the spray head, just before application to the pipe wall. Spray epoxy linings continue to be used and protect the host pipe by providing a barrier between the water and the original pipe interior. These polymeric linings cure more rapidly than cement mortar, improve the C factor of the pipe, are durable, and are also resilient to soft and aggressive waters.

Newer polymeric materials are being developed for use in the UK and North America, providing faster cure times and a wider range of performance properties. These materials include polyureas, polyurethanes or some combination of both (hybrids). These two-component, thermosetting, corrosion-resistant, solvent-free polymerics are rapid-setting and can be applied in multiple lifts to provide a semistructural pipe rehabilitation. Pipeline holes and gaps can be spanned depending upon the mechanical properties of the polymeric material as well as the size of the hole or gap. A wide variety of formulations are available, each with their own unique set of properties including enhanced moduli, better water tolerance, shorter cure times, or increased ductility. Many of these polymeric formulations are also certified to NSF/ANSI Standard 61, can meet the requirements of AWWA Class I, II, and III semistructural classifications

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for linings, and may facilitate rapid return to service for water utilities, subject to regulatory agency requirements.

This lining technology using polymeric materials is frequently referred to as spray-in-place polymeric lining, or SIPP. This acronym covers a broad range of materials, and users should acquaint themselves with the performance properties, application, and limitations of each material to assess fitness for a specific use/application

The first edition of AWWA Standard C620, *Spray-Applied In-Place Epoxy Lining of Water Pipelines, 3 In. (75 mm) and Larger*, described the requirements for the materials and application of an epoxy lining to the inside surface of previously installed water pipelines 3 in. (75 mm) in diameter and larger. The water pipelines to be rehabilitated may be constructed of any of the following materials: steel, ductile iron, cast iron, asbestos, cement, and concrete.

The first edition of this standard was approved by the AWWA Board of Directors on June 24, 2007, and it was reaffirmed without revision on June 11, 2017. This edition was approved on Jan. 24, 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). The American Water Works Association (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 60, Drinking Water Treatment Chemicals—Health Effects, and NSF/ANSI 61, Drinking Water System Components—Health Effects.

[*] Persons outside the United States should contact the appropriate authority having jurisdiction.
[†] NSF International, 789 North Dixboro Road, Ann Arbor, MI 48105.

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 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 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 C620 does not address additives requirements. Thus, users of this standard should consult the appropriate 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 is critical for water service and distribution piping 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, flexible couplings, thread sealing compounds, 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, 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.

[*] Both publications available from National Academy of Sciences, 500 Fifth Street, NW, Washington, DC 20001.

II.B. *Handling Precautions*. Unmixed or uncured resin and activators may represent a chemical hazard. The mixing of the resin base and activator should only be permitted under controlled conditions. Personnel are advised to use caution, follow material supplier and manufacturer's written instructions, and to wear protective clothing and proper PPE (i.e., gloves, protective suit, goggles, and suitable respirator) when handling these materials. For proper safety usage, refer to the applicable safety data sheets (SDS) available from the material supplier or manufacturer.

II.C. *Constructor Experience*. The constructor shall have current training and certification from both the product supplier and the lining application equipment provider that the constructor is experienced in the successful application of the required spray-in-place polymeric lining. Supervisory personnel must be competent to ensure that the pipe is suitably cleaned and prepared and that the polymeric components are stored, mixed, and applied within the manufacturer's requirements and in accordance with the manufacturer's quality control requirements.

II.D. *Purchaser's Role*. It is important in the application of spray-in-place polymers that the purchaser or its field representative ensures the constructor's adherence to the quality assurance plan and highlights any variations or omissions which could compromise the installation.

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 shall be provided by the purchaser:

1. Standard used—that is, ANSI/AWWA C620, Spray-in-Place Polymeric Lining for Potable Water Pipelines 4 In. (100 mm) and Larger, of latest revision.

2. Whether compliance with NSF/ANSI 61, Drinking Water System Components—Health Effects, is required, in addition to requirements of the Safe Drinking Water Act.

3. Temporary water supply requirements.

4. Diameter, material, length, age, existing interior lining, maintenance and repair history, and location of pipeline, including plan and profile drawings when available; limits of pipeline shutdowns, if service requirements make limits necessary; location, type, and size of valves; location of interconnecting pipelines, hydrant branches, and service pipes/lines; location of fittings and restrictions that could interfere with cleaning and lining operations; location, diameter, and connections of temporary water

supply, if required; chemical characteristics of the water conveyed and other details of the pipe within the scope of the contract between the purchaser and the contractor.

5. Requirements for the polymeric lining properties and thickness. Nominal dry film thickness (DFT) of polymeric lining required—generally 40 mil (1 mm) and minimum cure time of the liner between its application and reintroduction of water into the pipe.

6. Services furnished by purchaser. Description of services or field operations to be performed by the purchaser, such as locating the main to be cleaned and lined, removal and replacement of line valves, operation of valves, tagging valves that separate the main to be cleaned and lined from the water system to prevent accidental opening, shutting off inflow of water from connecting pipelines, locating and operating blow-offs, connecting and disconnecting temporary water supply to customer services, obtaining permits required for the work, handling customer contacts, disinfection, bacterial acceptance testing, and conducting pressure and flow tests.

7. Additional work to be performed by constructor. Description of work, including repairs to deteriorated pipe, excavation, backfill, and restoration work at access excavations; method of opening and closing access openings in the pipeline; flushing, laying, and removing temporary water supply piping; and operation of main line or blow-off valves.

NOTE: When it is necessary to repair deteriorated pipe before lining, the pipe will be repaired by the purchaser or under provisions of the contract between the purchaser and the constructor.

8. Supply of water for cleaning and lining operations: Location of water sources, method of providing, flow quantity available, metering requirements, cross-connection protection requirements and pressure information.

9. Disposal of cleaning water and debris. Requirements for the disposal of cleaning water, old lining, and other debris; instructions regarding permits from the responsible authorities.

10. Other purchaser options. Further options that may be specified by the purchaser:

a. Affidavit of compliance.
b. Access openings and surface restoration.
c. Traffic control.
d. Cleaning of valves, installing new bolts and gaskets.
e. Disinfection of temporary water supply system.

f. Replacing/repairing faulty/leaking valves.
g. Cathodic protection.
h. Service line and/or meter box repairs.
i. Meter upgrades.
j. Hydrant and isolation valve replacement.

11. Rejection of work. The purchaser should specify a procedure for reporting the rejection of work not performed in accordance with this standard. The purchaser should also outline the responsibility of the purchaser and the constructor in cases of nonstandard work.

12. Warranty period. The purchaser should specify the duration of the warranty period and warranty inspection protocols and outline the responsibility of the purchaser and the constructor in cases of nonconforming work discovered during the warranty period.

13. Option for further investigation. The purchaser may wish to make further investigation of any pipe where the structural condition of the pipeline is questionable before lining.

14. Supply of color chart. To facilitate inspection before and during mixing, the two components may be supplied in two distinct colors that, when mixed together in the proper ratio, shall produce a third distinct color. Whenever requested, the liner manufacturer shall provide to the purchaser its color chart for each unmixed and mixed component.

15. Field quality control requirements. Additional field quality control requirements including inspections, evaluations, sampling, and testing may be imposed at the purchaser's discretion. For example, dry thickness measurement may be taken with random sampling by extracting spool pieces or coupons of pipe after curing.

III.B. *Modification to Standard*. Any modification to 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. The title of the standard was changed from "Spray-Applied In-Place Epoxy Lining of Water Pipelines, 3 In. (75 mm) and Larger" to "Spray-In-Place Polymeric Lining for Potable Water Pipelines 4 In. (100 mm) and Larger."

2. The standard has been extensively revised and amended to include the requirements and procedures for spray-in-place lining of potable water pipes using polymeric materials, including epoxies, polyurethanes, polyureas, and polymeric hybrids.

V. Comments. If you have any comments or questions about this standard, please call AWWA Engineering and Technical Services 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.

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AWWA Standard

Spray-In-Place Polymeric Lining for Potable Water Pipelines 4 In. (100 mm) and Larger

SECTION 1: GENERAL

Sec. 1.1 Scope

This standard describes the requirements for materials, equipment, certification, and procedures for the field application of spray-in-place polymeric (SIPP) linings to the interior of existing potable water pipelines. The water pipelines to be renewed may be constructed of pipe materials such as steel, ductile iron, cast iron, asbestos cement, and concrete. Related work required for performing a complete contract is also generally described.

The standard covers all polymeric materials used in spray-in-place applications including epoxies, polyurethanes, polyureas, and hybrids of these compounds.

The in-situ spray application of polymeric linings is appropriate for pipe sections that can be lined with a computerized spray rig. The umbilical hose of the rig is inserted through the pipeline and then withdrawn progressively and uniformly using a computerized winch and spray head that applies the lining on the pipe surface to provide a continuous, smooth lining of uniform thickness.