ANSI/AWWA C221-18
(Revision of ANSI/AWWA C221-12)

American Water Works Association
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AWWA Standard

Fabricated Steel Mechanical Slip-Type Expansion Joints

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AWWA Standard

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Contents

All AWWA standards follow the general format indicated subsequently. Some variations from this format may be found in a particular standard.

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Foreword

This Foreword is for information only and is not a part of ANSI/AWWA C221.*

I. Introduction.

I.A. *Background*. Fabricated steel mechanical slip-type expansion joints have been used since the early 1900s to accommodate thermal movement in nonburied, aboveground pipelines, penstocks, and other conduits where expansion and contraction of more than ½ in. (13 mm) needs to be addressed. Though details differ, expansion joints of this type work in the same way and have similar components: a slip pipe, body, gland, packing chamber (with alternate rings of elastomeric material and lubricating rings), and follower ring. The expansion joints may also have a limit ring and limit rods and threaded fasteners (bolts and nuts) that, when tightened, compress the packing in the packing chamber to make a watertight seal while allowing the anticipated axial movement.

I.B. *History*. The first edition of ANSI/AWWA C221 was approved by the AWWA Board of Directors on Feb. 2, 1997. The second edition was approved on Jan. 21, 2001. The third edition was approved on June 24, 2007. The fourth edition was approved on June 10, 2012. This fifth edition was approved on Jan. 20, 2018.

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 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.

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

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

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.

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 C221 does not address additive 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.1. *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, 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

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

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

‡ Both publications available from The National Academies Press, 500 Fifth Street, N.W., Keck 360, Washington, DC 20001.

provide long term usefulness and minimum degradation (swelling, loss of elasticity, or softening) of the elastomer specified.

II.A.2. *Gasket Degradation Study*. A pipe gasket, having the hardness of a compressed elastomer with a large mass relative to the small exposed surface area, thus experiences minimal degradation. This was validated in a research paper reported in the *Journal AWWA*[*], where the pipe gasket degradation in a 110 mg/L chloramine solution was found to degrade just the exposed surface.

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 items should be included by the purchaser:

1. Standard used—that is, ANSI/AWWA C221, Fabricated Steel Mechanical Slip-Type Expansion Joints, of latest revision.
2. Whether compliance with NSF/ANSI 61, Drinking Water System Components—Health Effects, is required.
3. Quantity.
4. Wall thickness, schedule, or class.
5. Actual outside diameter(s) of pipe ends, including any coatings (Sec. 3[1]).
6. Nominal pipe size(s) (Sec. 3[9]).
7. Rated pressure, transient pressure, and test pressure (Sec. 3[16, 19] and 5.3.1).
8. Details of federal, state, and local requirements (Sec. 4.1.1).
9. Slip pipe finish (Sec. 4.1.2).
10. Type of steel (Sec. 4.1.2.1).
11. Bolt, rod, and nut materials (Sec. 4.1.3).
12. Operating temperature range and packing material (Sec. 4.1.4).
13. Tolerances of pipe ends (Sec. 4.1.4.3).
14. Design requirements and length and thickness of body and slip pipe where special performance or installation requirements exist (Sec. 4.2.1).
15. Anticipated axial movement (Sec. 4.2.1 and 4.2.3.3).
16. Special type of bolting (Sec. 4.2.2.5).
17. Type of pipe(s), including specification to which it is made; or specification, tolerance, and preparation of pipe ends (Sec. 4.2.3.2).

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[*] Bonds, R.W. 2004. Effect of Chloramines on Ductile-Iron Pipe Gaskets of Various Elastomer Compounds. *Journal AWWA*, 96:4:153–160.

18. Shop and optional coatings (Sec. 4.4).
19. Material certifications (Sec. 5.1.1.2).
20. Purchaser's inspection requirements (Sec. 5.1.2).
21. Purchaser shall specify if a certified welding inspector is required (Sec. 5.2).
22. Purchaser's proof test requirements (Sec. 5.3.1).
23. Hydrostatic test requirements (Sec. 5.3.2.2).
24. Additional nondestructive weld evaluation (Sec. 5.3.3).
25. Affidavit of compliance (Sec. 6.3).

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. The major changes made to the standard in this edition include the following:

1. An advisory statement was added in the Foreword (Sec. II.A) regarding chlorine and chloramine degradation of elastomers.
2. The scope was revised to include larger than 144 in. sizes (Sec. 1.1).
3. References (Sec. 2) were updated.
4. The definitions of potable water, reclaimed water, and wastewater were added to Definitions (Sec. 3).
5. Sec. 4.2.2.4 Packing Ring was revised for clarity.
6. Sec. 4.3.4 Weld Repairs was revised to remove the reference to ASME IX.
7. Sec. 6.1 Marking, Item 4 was revised to make marking of the rated pressure a requirement.

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 email at standards@awwa.org.

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AWWA Standard

Fabricated Steel Mechanical Slip-Type Expansion Joints

SECTION 1: GENERAL

Sec. 1.1 Scope

This standard describes fabricated steel mechanical slip-type expansion joints having packing chambers for use on pipe with plain, flanged, grooved, or shouldered ends in nominal pipe sizes 3 in. (75 mm)* and larger. The joints shall be manufactured from steel and are intended for use in systems conveying water. Mechanical expansion joints are not intended for use in buried conditions.

Sec. 1.2 Purpose

The purpose of this standard is to provide the minimum requirements for fabricated steel mechanical slip-type expansion joints, including system components, testing, and marking requirements.

Sec. 1.3 Application

This standard can be referenced in documents for purchasing and receiving fabricated steel mechanical slip-type expansion joints and can be used as a guide for inspection and testing. This standard or sections of this standard apply when

* Metric conversions given in this standard are direct conversions of US customary units and are not those specified in International Organization for Standardization standards.