



**American Water Works  
Association**

ANSI/AWWA C221-07  
(Revision of ANSI/AWWA C221-01)

The Authoritative Resource on Safe Water®

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*AWWA Standard*

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# Fabricated Steel Mechanical Slip-Type Expansion Joints



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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 for approximately 80 years to accommodate thermal movement in non-buried, 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. This third edition was approved on June 24, 2007.

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 American Water Works Association Research Foundation (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. An advisory program formerly administered by USEPA, Office of Drinking Water, discontinued on April 7, 1990.

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

2. Specific policies of the state or local agency.
3. 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.
4. 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.** This standard has no applicable information for this section.

**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.

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\*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 National Academy of Sciences, 500 Fifth Street NW, Washington, DC 20001.

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 edition.
2. Whether compliance with NSF/ANSI 61, Drinking Water System Components—Health Effects, is required, in addition to the requirements of the Safe Drinking Water Act.
3. Quantity.
4. Wall thickness, schedule, or class.
5. Actual outside diameter(s) (OD) 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[15] and 5.3.1).
8. Details of other federal, state or provincial, 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).
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 (CWI) 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.** Major revisions made to the standard in this edition include the following:

1. Added ANSI/AWWA C224—described coating as an option.
2. Added wording in Sec. 3[6] stating that limit rods are not intended for thrust restraint.
3. Deleted text in Sec. 4.2.2.1 concerning stress combination, equivalent stress comparison to yield and tensile strength values, and packing compressive forces.
4. Deleted text in Sec. 4.2.2.2 concerning stress combination, equivalent stress comparison to yield and tensile strength values, and bolt tension forces.
5. Deleted text in Sec. 4.2.2.4 concerning stress combination, equivalent stress comparison to yield strength, and bolt tension forces.
6. Revised wording in Sec. 4.2.3.1.
7. Added AWS D1.6 reference in Sec. 4.3.2 for welding stainless steel.

V. **Comments.** If you have any comments or questions about this standard, please call the AWWA Volunteer & Technical Support Group at 303.794.7711, FAX 303.795.7603, write to the group at 6666 West Quincy Avenue, Denver, CO 80235-3098, or e-mail [standards@awwa.org](mailto:standards@awwa.org).



American Water Works  
Association

ANSI/AWWA C221-07  
(Revision of ANSI/AWWA C221-01)

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## *AWWA Standard*

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# Fabricated Steel Mechanical Slip-Type Expansion Joints

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## SECTION 1: GENERAL

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### 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 from 3 in. through 144 in. (75 mm through 3,600 mm).<sup>\*</sup> 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 purchasers, manufacturers, and constructors with the minimum requirements for fabricated steel mechanical slip-type expansion joints, including system components, testing, and marking requirements.

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<sup>\*</sup>Metric conversions given in this standard are direct conversions of US customary units and are not those specified in International Organization for Standardization (ISO) standards.