



**American Water Works
Association**

The Authoritative Resource on Safe Water®

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

AWWA Standard

Fabricated Steel Mechanical Slip-Type Expansion Joints



Effective date: March 1, 2008.
First edition approved by AWWA Board of Directors Feb. 2, 1997.
This edition approved June 24, 2007.
Approved by American National Standards Institute Dec. 6, 2007.

6666 West Quincy Avenue
Denver, CO 80235-3098
T 800.926.7337
www.awwa.org

Advocacy
Communications
Conferences
Education and Training
Science and Technology
Sections

Copyright © 2008 American Water Works Association. All Rights Reserved.



Documents
Document Sharing Hub

AWWA Standard

This document is an American Water Works Association (AWWA) standard. It is not a specification. AWWA standards describe minimum requirements and do not contain all of the engineering and administrative information normally contained in specifications. The AWWA standards usually contain options that must be evaluated by the user of the standard. Until each optional feature is specified by the user, the product or service is not fully defined. AWWA publication of a standard does not constitute endorsement of any product or product type, nor does AWWA test, certify, or approve any product. The use of AWWA standards is entirely voluntary. AWWA standards are intended to represent a consensus of the water supply industry that the product described will provide satisfactory service. When AWWA revises or withdraws this standard, an official notice of action will be placed on the first page of the classified advertising section of *Journal AWWA*. The action becomes effective on the first day of the month following the month of *Journal AWWA* publication of the official notice.

American National Standard

An American National Standard implies a consensus of those substantially concerned with its scope and provisions. An American National Standard is intended as a guide to aid the manufacturer, the consumer, and the general public. The existence of an American National Standard does not in any respect preclude anyone, whether that person has approved the standard or not, from manufacturing, marketing, purchasing, or using products, processes, or procedures not conforming to the standard. American National Standards are subject to periodic review, and users are cautioned to obtain the latest editions. Producers of goods made in conformity with an American National Standard are encouraged to state on their own responsibility in advertising and promotional materials or on tags or labels that the goods are produced in conformity with particular American National Standards.

CAUTION NOTICE: The American National Standards Institute (ANSI) approval date on the front cover of this standard indicates completion of the ANSI approval process. This American National Standard may be revised or withdrawn at any time. ANSI procedures require that action be taken to reaffirm, revise, or withdraw this standard no later than five years from the date of publication. Purchasers of American National Standards may receive current information on all standards by calling or writing the American National Standards Institute, 25 West 43rd Street, Fourth Floor, New York, NY 10036; (212) 642-4900.

All rights reserved. No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopy, recording, or any information or retrieval system, except in the form of brief excerpts or quotations for review purposes, without the written permission of the publisher.

Copyright © 2008 by American Water Works Association
Printed in USA

Committee Personnel

The Steel Water Pipe Manufacturer's Technical Advisory Committee (SWPMTAC) Task Group for C221, which developed this edition, had the following personnel at the time:

Ram N. Satyarthi, *Chair*

R. Borland, Dresser Inc., Brandford, Pa.(AWWA)
 R.J. Card, Victaulic Depend-O-Lok Inc., Atlanta, Ga.(AWWA)
 K. Clark, Mueller Company, Decatur, Ill.(AWWA)
 R.R. Collins, JCM Industries Inc., Nash, Texas(AWWA)
 D.H. Eaton, Romac Industries Inc., Bothell, Wash.(AWWA)
 Z. Gentile, Ford Meter Box Company, Pell City, Ala.(AWWA)
 B. Kane, Cascade Waterworks Manufacturing Company, Yorkville, Ill.(AWWA)
 S. Lamb, Nickel Development Institute, Huntington, W. Va.(AWWA)
 J.L. Luka, American SpiralWeld Pipe Company, Columbia, S.C.(AWWA)
 M. Mintz, M-Square Associates Inc., Elmont, N.Y.(AWWA)
 R.N. Satyarthi, Baker Coupling Company Inc., Los Angeles, Calif.(AWWA)
 K.L. Shaddix, Smith-Blair Inc., Texarkana, Texas(AWWA)
 M.J. Topps, Viking Johnson Ltd., Hixson, Tenn.(AWWA)
 D.R. Wagner, Wagner Consultants, St. Louis, Mo.(AWWA)

The AWWA Standards Committee on Steel Pipe, which reviewed and approved this standard, had the following personnel at the time of approval:

John H. Bambei Jr., *Chair*

George J. Tupac, *Vice-Chair*

Dennis A. Dechant, *Secretary*

General Interest Members

J.B. Allen, * Standards Engineer Liaison, AWWA, Denver, Colo.(AWWA)
 W.R. Brunzell, Brunzell Associates Ltd., Skokie, Ill.(AWWA)
 R.L. Coffey, HDR Engineering Inc., Omaha, Neb.(AWWA)

* Liaison, nonvoting

H.E. Dunham, MWH Inc., Bothell, Wash.	(AWWA)
S.N. Foellmi, Black & Veatch, Irvine, Calif.	(AWWA)
J.W. Green, McDonough Associates, Inc., Chicago, Ill.	(AWWA)
M.B. Horsley,* Black & Veatch Corporation, Overland Park, Kan.	(AWWA)
J.K. Jeyapalan, CDM, Pipeline Consultant, New Milford, Conn.	(AWWA)
J.L. Mattson, Corrosion Control Technologies, Sandy, Utah	(AWWA)
W.J. Moncrief,* HDR Engineering Inc., San Diego, Calif.	(AWWA)
R. Ortega, Lockwood Andrews & Newnam Inc., Houston, Texas	(AWWA)
A.E. Romer, Boyle Engineering Corporation, Newport Beach, Calif.	(AWWA)
H.R. Stoner, Consultant, North Plainfield, N.J.	(AWWA)
C.C. Sundberg, CH2M Hill, Bellevue, Wash.	(AWWA)
G.J. Tupac, G.J. Tupac and Associates Inc., Pittsburgh, Pa.	(AWWA)
W.R. Whidden, Post Buckley Schuh & Jernigan, Orlando, Fla.	(AWWA)
K.E. Wilson,† Standards Council Liaison, Post Buckley Schuh & Jernigan, Inc., Tampa, Fla.	(AWWA)

Producer Members

S.A. Arnout, Hanson Pipe and Products Inc., Dallas, Texas	(AWWA)
H.H. Bardakjian, Ameron International, Rancho Cucamonga, Calif.	(AWWA)
M. Bauer, Tnemec Company Inc., Kansas City, Mo.	(AWWA)
R.J. Card, Victaulic, Atlanta, Ga.	(AWWA)
R.R. Carpenter, American Cast Iron Pipe Company, Birmingham, Ala.	(MSS)
D. Dechant, Northwest Pipe Company, Denver, Colo.	(AWWA)
B.D. Keil, Continental Pipe Manufacturing Company, Pleasant Grove, Utah	(SPFA)
J.L. Luka,* American SpiralWeld Pipe Company, Columbia, S.C.	(AWWA)
B.F. Vanderploeg,* Northwest Pipe Company, Portland, Ore.	(AWWA)
J.A. Wise, Canus International Sales Inc., Langley, B.C., Canada	(AWWA)

* Alternate

† Liaison, nonvoting

User Members

G.A. Andersen, New York City Bureau of Water Supply, Little Neck, N.Y.	(AWWA)
J.H. Bambei Jr., Denver Water Department, Denver, Colo.	(AWWA)
D.W. Coppes, Massachusetts Water Resources Authority, Southborough, Mass.	(NEWWA)
R.V. Frisz, US Bureau of Reclamation, Denver, Colo.	(USBR)
G. George, Tacoma Water, Water Supply Section, Tacoma, Wash.	(AWWA)
T.J. Jordan, Metropolitan Water District of Southern California, La Verne, Calif.	(AWWA)
M. McReynolds,* Metropolitan Water District of Southern California, La Mirada, Calif.	(AWWA)
G. Oljaca, Greater Vancouver Regional District, Burnaby, B.C., Canada	(AWWA)
V.B. Soto, Los Angeles Department of Water & Power, Los Angeles, Calif.	(AWWA)
G.P. Stine, San Diego County Water Authority, Escondido, Calif.	(AWWA)
J.V. Young, City of Richmond, Richmond, B.C., Canada	(AWWA)

*Alternate

This page intentionally blank.

Contents

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

SEC.	PAGE	SEC.	PAGE
Foreword			
I	Introduction..... ix	4.3	Fabrication..... 11
I.A	Background..... ix	4.4	Coatings..... 12
I.B	History..... ix	4.5	Installation Instructions 12
I.C	Acceptance..... ix	5	Verification
II	Special Issues..... x	5.1	Inspection 13
III	Use of This Standard x	5.2	Quality Assurance..... 13
III.A	Purchaser Options and Alternatives.. xi	5.3	Test Procedures..... 13
III.B	Modification to Standard..... xii	5.4	Nonconformance 14
IV	Major Revisions xii	6	Delivery
V	Comments xii	6.1	Marking..... 14
Standard			
1	General	6.2	Packaging and Shipping..... 14
1.1	Scope 1	6.3	Affidavit of Compliance..... 14
1.2	Purpose 1	Figures	
1.3	Application 2	1	Typical Expansion Joint With Limit Rods..... 4
2	References 2	2	Typical Expansion Joint Configurations 5
3	Definitions 4	Tables	
4	Requirements	1	Minimum Physical Properties of Elastomeric Packing..... 7
4.1	Materials of Construction 6	2	Pipe-End Diameter Tolerance 8
4.2	Design..... 8		

This page intentionally blank.

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.

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