ANSI/AWWA **C904-22**

(Revision of ANSI/AWWA C904-16)

AWWA Standard

Crosslinked Polyethylene (PEX) Pressure Tubing, ½ In. Through 3 In., for Water Service

Effective date: Dec. 1, 2022.
First edition approved by Board of Directors June 11, 2006.
This edition approved June 10, 2022.
Approved by American National Standards Institute July 21, 2022.

American Water Works Association

Currently in preview, click buy full versi

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. This standard does not supersede or take precedence over or displace any applicable law, regulation, or code of any governmental authority. AWWA standards are intended to represent a consensus of the water industry that the product described will provide satisfactory service. When AWWA revises or withdraws this standard, an official notice of action will be placed in the Official Notice 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 ANSI approval. 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, or e-mailing info@ansi.org.

All rights reserved. No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including scanning, recording, or any information or retrieval system. Reproduction and commercial use of this material is prohibited, except with written permission from the publisher. Please send any requests or questions to permissions@awwa.org.

ISBN-13, print: 978-1-61717-107-0

ISBN-13, electronic: 978-1-61300-640-5

DOI: http://dx.doi.org/10.12999/AWWA.C904.22

All rights reserved. No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including scanning, recording, or any information or retrieval system. Reproduction and commercial use of this material is prohibited, except with written permission from the publisher.

Copyright © 2022 by American Water Works Association
Printed in USA

Copyright © 2022 by American Water Works Association. All Rights Reserved

Currently in preview, click buy full version

Committee Personnel

The C904–PEX Subcommittee, which reviewed and developed this revision, had the following personnel at the time of approval:

Lance MacNevin, *Chair*

A.J. Ciechanowski, NSF International, Ann Arbor, Mich.
D.E. Duvall, Engineering Systems Inc., Aurora, Ill.
S. Ferry, PSI Lab Inc., Longmont, Colo.
B.E. Hauger, Bryan Hauger Consulting, Inc., Boulder, Colo.
L. MacNevin, Plastics Pipe Institute, Ashburn, Va.
B. Mills, LyondellBasell, Cincinnati, Ohio
G. Morgan, Borealis, Shawnee, Kans.
L. Reiheld, Viega LLC, Broomfield, Colo.

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

John F. Fishburne, *Chair*

General Interest Members

L. Aguiar, Hazen and Sawyer, Coral Gables, Fla.
E.A. Ambler, AM Trenchless, Sanford, Fla.
J.L. Beaver, Simpson Gumpertz Heger Inc., Waltham, Mass.
J.P. Castronovo, Blue Ridge, Ga.
A. Chastain-Howley (*liaison, nonvoting*), Standards Council Liaison, Black & Veatch, Camden, Maine
K.C. Choquette, Des Moines, Iowa
A.J. Ciechanowski, NSF International, Ann Arbor, Mich.
D.E. Duvall, Engineering Systems Inc., Aurora, Ill.
J.F. Fishburne, Freese & Nichols Inc., Charlotte, N.C.
D.L. McPherson (*alternate*), HDR, Charlotte, N.C.
P.J. Olson (*liaison, nonvoting*), Standards Engineer Liaison, AWWA, Denver, Colo.
G. Scoby, Crossbore Consultants, Los Gatos, Calif.
D.A. Stewart, Stewart HDPE Consulting LLC, Lago Vista, Tex.
S.C. Williams, HDR, Atlanta, Ga.
S. Ziobro, FM Approvals, Chepachet, R.I.

Copyright © 2022 by American Water Works Association. All Rights Reserved

currently in preview, click buy full versi

Producer Members

S. Boros, Pipeline Plastics LLC, Westlake, Tex.
L.J. Gill, IPEX Management Inc., Oakville, Ont.
R. Houle, Reliance Worldwide Corp., Atlanta, Ga.
J.S. Johnston Jr., McElroy Manufacturing Inc., Tulsa, Okla.
D. Langston, WL Plastics Corp., Cedar City, Utah
L. MacNevin (*alternate*), Plastics Pipe Institute, Ashburn, Va.
C.G. Rubeiz, Plastics Pipe Institute, Fairfax, Va.
J. Wright, Georg Fischer Central Plastics LLC, Shawnee, Okla.

User Members

M. Boyce, East Bay Municipal Utilities District, Oakland, Calif.
H. Link, Consultant, Colorado Springs, Colo.
A. Marner, US Bureau of Reclamation, Denver, Colo.
R. McKaskle, City of Tulsa—Engineering Services Dept., Tulsa, Okla.
N. Perez-Jacome, City of Miami Beach, Miami Beach, Fla.
J. Stein, Dallas, Tex.
M.A. Wirtz, City of Fort Wayne, Fort Wayne, Ind.

currently in preview, click buy full versi

Copyright © 2022 by American Water Works Association. All Rights Reserved

Contents

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

SEC. PAGE

Foreword

I Introduction vii
I.A Background vii
I.B History vii
I.C Acceptance vii
II Special Issues ix
II.A Design Criteria. ix
II.B Installation. xi
II.C Water System Disinfection xiv
II.D Squeeze-Off xiv
II.E References xiv
III Use of This Standard xv
III.A Purchaser Options and Alternatives xv
III.B Modification to Standard xvi
IV Major Revisions xvi
V Comments xvii

Standard

1 General

1.1 Scope 1
1.2 Purpose 2
1.3 Application 2

2 References 2

3 Definitions 3

4 Requirements

4.1 Permeation 5
4.2 Materials 5
4.3 Tubing 6

5 Verification

5.1 General 8
5.2 Tests for Qualification of Materials and Processes 8
5.3 Tests for Product Quality Control ... 9
5.4 Nonconformance 9
5.5 Quality Control Records 9
5.6 Plant Inspection by the Purchaser 9

6 Delivery

6.1 Marking 10
6.2 Shipping and Delivery 11
6.3 Affidavit of Compliance 11

Appendixes

A Design and Installation of Crosslinked Polyethylene (PEX) Tubing in Accordance with ANSI/AWWA C904 13
B Bibliography of Sources for Additional Information Regarding Permeation of Polyolefin Tubing 41

Tables

F.1 Hydrostatic Design Basis and Hydrostatic Design Stress for PEX Tubing ix
1 HDS, HDB, and Pressure Class of SDR9 PEX Tubing for Water at 73°F (23°C) 6

Copyright © 2022 by American Water Works Association. All Rights Reserved

currently in preview, click buy full version

SEC.		PAGE
2	Outside Diameters and Tolerances for SDR9 PEX Tubing	7
3	Sustained Water Pressure Test Condition for SDR9 PEX Tubing	7
4	Burst Pressure Requirements for Water at 73°F (23°C) for SDR9 PEX Tubing	7
A.1	Outside Diameter, Tolerance, and Wall Thickness for SDR9 PEX Tubing (CTS)	32
A.2	Average Inside Diameters for SDR9 PEX Tubing (CTS)	32
A.3	Pressure Loss and Velocity Versus Flow Rate for SDR9 PEX Tubing (CTS)	33
A.4	Temperature Compensation Multipliers, F_T	35
A.5	Representative Equivalent Tube Length of Various Tubing Components	35
A.6	Minimum Recommended Bending Radii	35

currently in preview, click buy full versi

Copyright © 2022 by American Water Works Association. All Rights Reserved

Foreword

This foreword is for information only and is not a part of ANSI/AWWA C904.*

I. Introduction.

I.A. *Background*. This standard describes crosslinked polyethylene (PEX) pressure tubing for use primarily as potable service lines in the construction of underground water distribution systems.

This standard describes tubing made with a materials designation code of PEX 1306 or higher, according to ASTM International (ASTM†) Standard F876. This standard describes tubing in nominal dimensions ½ in. through 3 in. with a standard dimension ratio of 9 (SDR9) and pressure class of 160 psi.

I.B. *History*. On June 18, 2002, the American Water Works Association (AWWA) Committee on Polyolefin Pressure Pipe and Fittings was approached to develop a standard describing PEX for water service applications. On June 15, 2004, the polyolefin committee unanimously approved and authorized the development of a new standard for PEX, ½ in. through 3 in., for water service. A new PEX subcommittee was also formed at this time to begin development of this standard within AWWA. The first edition was approved by the AWWA Board of Directors on June 11, 2006. The second edition was approved on Jan. 10, 2016. This edition was approved on June 10, 2022.

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

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

† ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428.

‡ Water Research Foundation, 6666 West Quincy Avenue, Denver, CO 80235.

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

Copyright © 2022 by American Water Works Association. All Rights Reserved

Currently in preview, click buy full version