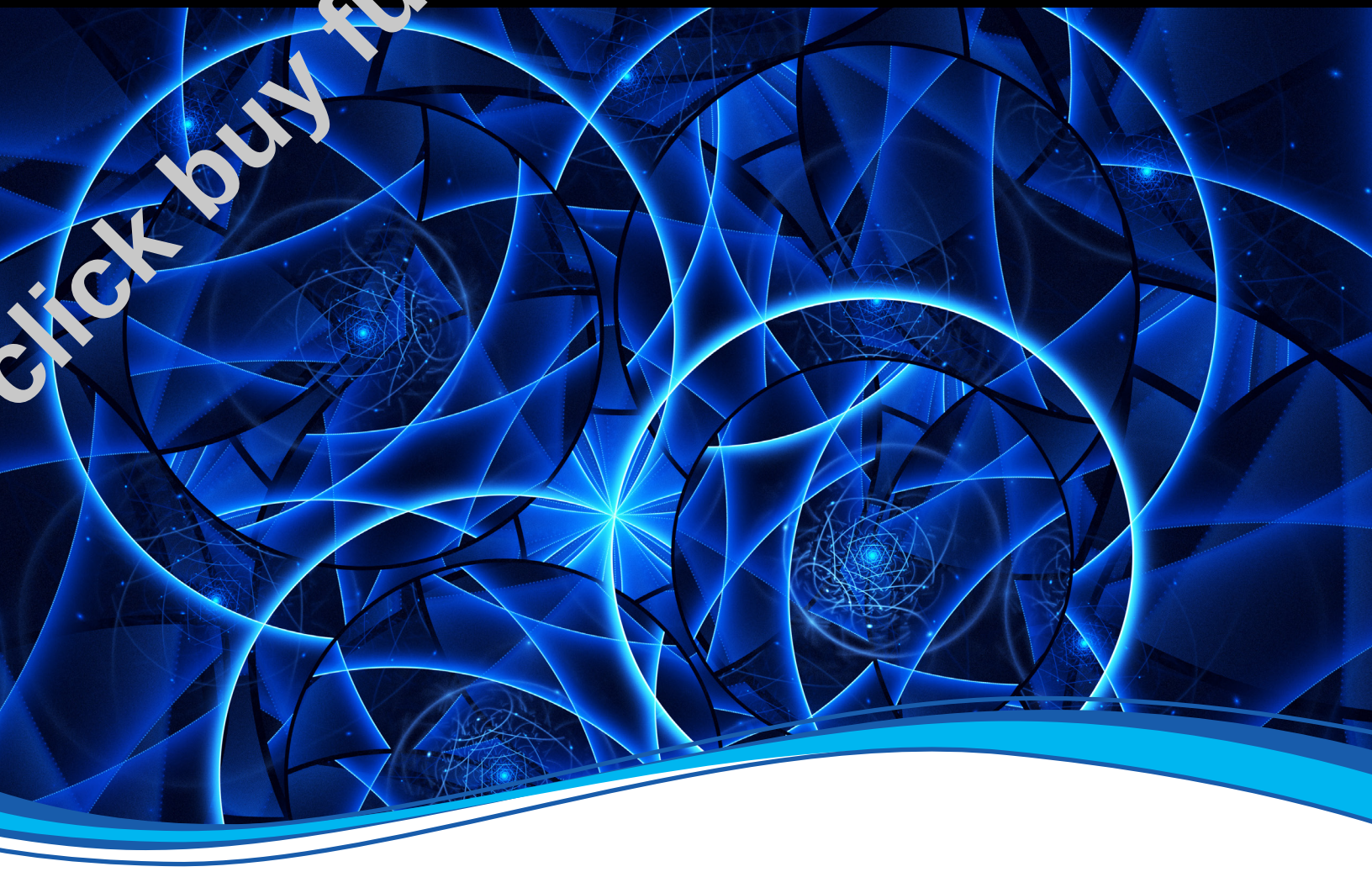
Manual of Water Supply Practices

M75

Elastomers for Waterworks:

Pipes, Valves, and Fittings



American Water Works Association

Manual of Water Supply Practices

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Elastomers for Waterworks: Pipes, Valves, and Fittings

First Edition

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Manual of Water Supply Practices—M75, First Edition

Elastomers for Waterworks: Pipes, Valves, and Fittings

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Managing Editor/Project Manager: Melissa Valentine
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Production: Innodata
Senior Specialist - Manuals: Willadee Hitchcock
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Library of Congress Cataloging-in-Publication Data

Names: Ballun, John V. | American Water Works Association, issuing body.
Title: M75 - elastomers for waterworks : pipes, valves, and fittings / by John Ballun.
Other titles: Elastomers for waterworks : pipes, valves, and fittings
Description: First edition. | Denver, CO : American Water Works Association, 2020. | Includes bibliographical references and index. |
Summary: "This manual presents the history and general application of elastomers in waterworks pipes, valves, and fittings. The principles used for evaluating, selecting, testing, and maintaining various seals will be presented"-- Provided by publisher.
Identifiers: LCCN 2020021167 | ISBN 9781647170042 (paperback)
Subjects: LCSH: Elastomers--Handbooks, manuals, etc.
Classification: LCC TS1925 .B24 2020 | DDC 678.1028/4--dc23
LC record available at https://lccn.loc.gov/2020021167

Printed in the United States of America

ISBN 978-1-64717-004-2 eISBN 978-1-61300-547-7

DOI https://doi.org/10.12999/AWWA.M75ed1

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Preface

This manual presents the history and general application of elastomers in waterworks pipes, valves, and fittings. The principles used for evaluating, selecting, testing, and maintaining various seals will be presented. It is a discussion of recommended practice, not an American Water Works Association (AWWA) standard. This document provides guidance on generally available elastomers and products and their application. Questions about specific situations or applicability to specific valves or fittings should be directed to the manufacturer or supplier.

Information contained in this manual is useful for operators, technicians, and engineers for gaining a basic understanding of the use and selection of elastomers. There are many special materials that are beyond the scope of this manual and require special consultations with suppliers and manufacturers. The elastomer properties and resistance data are generic, and actual data from the intended valve and fitting manufacturer should be obtained before making the final selection of an elastomer. This manual provides information on elastomers used in many AWWA Standards, including the following:

- AWWA C110, Ductile-Iron and Gray-Iron Fittings
- AWWA C111, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
- AWWA C115, Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges
- AWWA C151, Ductile Iron Pipe, Centrifugally Cast
- AWWA C153, Ductile Iron Compact Fittings
- AWWA C200, Steel Water Pipe, 6 In. (150 mm) and Larger
- AWWA C207, Steel Pipe Flanges for Waterworks Service, Sizes 4 In. Through 144 In. (100 mm Through 3,600 mm)
- AWWA C221, Fabricated Steel Mechanical Slip-Type Expansion Joints
- AWWA C223, Fabricated Steel and Stainless-Steel Tapping Sleeves
- AWWA C227, Bolted, Split-Sleeve Couplings
- AWWA C228, Stainless Steel Pipe Flange Joints for Water Service – Sizes 2 In. Through 72 In. (50 mm Through 1,800 mm)
- AWWA C230, Stainless-Steel Full-Encirclement Repair and Service Connection Clamps for 2-in. Through 12-in. (50-mm Through 300-mm) Pipe
- AWWA C300, Reinforced Concrete Pressure Pipe, Steel-Cylinder Type
- AWWA C301, Prestressed Concrete Pressure Pipe, Steel-Cylinder Type
- AWWA C302, Reinforced Concrete Pressure Pipe, Non-Cylinder Type
- AWWA C303, Concrete Pressure Pipe, Bar-Wrapped, Steel-Cylinder Type
- AWWA C502, Dry-Barrel Fire Hydrants
- AWWA C503, Wet-Barrel Fire Hydrants
- AWWA C504, Rubber Seated Butterfly Valves, 3 In. (75 mm) Through 72 In. (1,800 mm)
- AWWA C507, Ball Valves, 6 In. Through 60 In. (150 mm Through 1,500 mm)
- AWWA C508, Swing-Check Valves for Waterworks Service, 2-In. Through 24-In. (50-mm Through 600-mm) NPS

- AWWA C509, Resilient-Seated Gate Valves for Water Supply Service
- AWWA C510, Double Check-Valve Backflow Prevention Assembly
- AWWA C511, Reduce Pressure Principle Backflow Prevention Assembly
- AWWA C512, Air-Release, Air/Vacuum, and Combination Air Valves for Water and Wastewater Service
- AWWA C515, Reduced Wall, Resilient-Seated Gate Valves for Water Supply Service
- AWWA C516, Large-Diameter Rubber-Seated Butterfly Valves, Sizes 78 In. (2,000 mm) and Larger
- AWWA C517, Resilient-Seated Cast-Iron Eccentric Plug Valves
- AWWA C518, Double-Disc Swing Check Valves for Waterworks Service, 2-In. Through 48-In. (50-mm Through 1200-mm) NPS
- AWWA C519, High Performance Waterworks Butterfly Valves – 3 In. (75 mm) Through 60 In. (1,500 mm)
- AWWA C520, Knife Gate Valves, Sizes 2 In. (50 mm) Through 96 In. (2,400 mm)
- AWWA C606, Grooved and Shouldered Joints
- AWWA C900, Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 60 In. (100 mm Through 1,500 mm)

This manual refers to AWWA standards, which are available for purchase from the AWWA Bookstore by calling (800) 926-7337 or online at www.awwa.org/bookstore.

Manufacturers graciously provided illustrations and other documentation. AWWA does not endorse any manufacturer's products, and the names of the manufacturers have been removed from the material provided.

Metrification Note: Valve and fitting sizes are listed in their current US designation—inches. To obtain an approximate metric equivalent, use a conversion factor of 25.4 mm per inch.

Acknowledgments

The M75 Elastomers Subcommittee, which developed and reviewed this manual, had the following personnel at the time:

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Chapter 1

Introduction

Elastomeric linings, gaskets, diaphragms, and seals play an essential role in the operation of water distribution systems. They are used in pipes, valves, and fittings to provide tight seals for joints and valve closure members under various operating parameters including pressure, temperature, and chemical environments. There are no defining industry or AWWA material standards for specific elastomers used in the waterworks industry. Therefore, it is important to understand the chemistry, properties, and test methods associated with elastomers when selecting and specifying their use.

All materials can degrade while in service. The physical changes due to the environment, ultraviolet light exposure, wear, corrosion, chemical compatibility, fatigue, and temperature are understood for most metallic components. For elastomers, these changes are not as well cataloged and understood and can be substantially different for various and combined service conditions. Degradation and other property changes can impact expected service life and preventive maintenance frequencies. Because elastomers have different rates of degradation, the intended service life and operational compatibility are always important for proper elastomer selection.

A marked change occurred in the US waterworks industry in the 1980s when many water utilities changed from chlorine to chloramine disinfection to meet new trihalomethane (THM) standards for drinking water. Within a few months of the conversion, Ft. Lauderdale, Fla., reported rubber flappers in toilet tanks breaking down; Topeka, Kans., reported gaskets and diaphragms on backflow prevention assemblies beginning to deteriorate; and in Ingleside, Tex., the seating materials of filter backwash valves failed prematurely. These events led to several studies in the industry to better understand commonly used elastomers and their applications in the waterworks industry (Reiber 1993).

Product application and service history are important factors for elastomer selection. The selection of an elastomer for use as a dynamic seal in a safety-related valve for a nuclear power plant is much more critical than the elastomer used for a residential water heater relief valve. However, components of water systems are expected to perform as designed