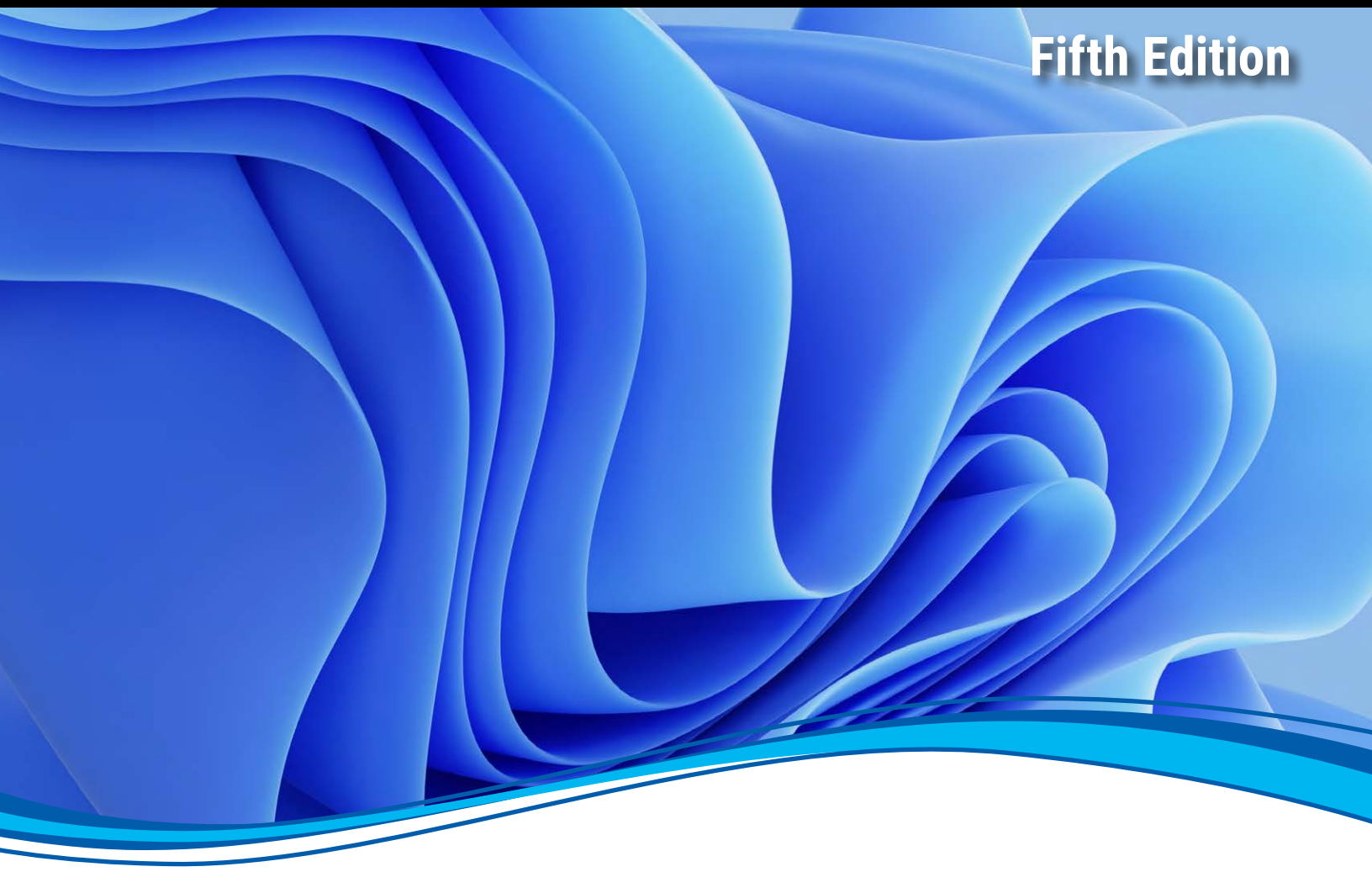
Manual of Water Supply Practices

M14

Backflow Prevention and Cross-Connection Control

Recommended Practices

Fifth Edition



American Water Works Association

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Backflow Prevention and Cross-Connection Control: Recommended Practice

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American Water Works Association

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Preface

A dedicated group of volunteers from the Cross-Connection Control Committee of the American Water Works Association (AWWA) dedicated countless hours preparing the revisions to this manual of practice. This publication is the fifth edition of AWWA Manual M14, *Backflow Prevention and Cross-Connection Control: Recommended Practices*, originally published in 1973. We encourage interested readers to pursue additional information on backflow prevention–related topics through other AWWA resources.

The purpose of this manual is to educate and inform interested backflow prevention and cross-connection control program managers and administrators about the most current practices; explore advantages and disadvantages of various policies regarding backflow prevention programs; and provide thoughtful and meaningful topics for consideration when developing, implementing, and managing programs. This manual is not intended to be a reference for governmental codes, laws, or regulations or to be used as a training manual. However, the committee recognizes that the manual is used for such purposes on occasion due to the knowledge and expertise of the committee members, past and present, who have contributed to this manual. The manual is designed to provide the user with an understanding of cross-connection control and backflow prevention.

The manual commences with the explanation of basic concepts within the industry, explores means and methods of preventing backflow, addresses backflow prevention practices, and provides guidance for implementing backflow prevention and cross-connection control programs to both the novice and experienced program manager.

Revisions to the fifth edition were made throughout the manual; however, previous users of the manual may notice that significant effort was afforded to revising Chapters 3 and 5. The primary goal of this effort was to provide thought-provoking content to enable program managers to achieve greater success within their program. New manual users will benefit from the expanded historical content added to Chapter 1.

It is the intent of the Cross-Connection Control Committee that users will obtain knowledge of the industry and that the manual will be a valuable tool for use in implementing an effective cross-connection control program to protect public health. The Cross-Connection Control Committee and AWWA welcome your comments and suggestions for improving future editions of this manual. Please send an email to ets@awwa.org to provide feedback on the contents of this manual.

Mitch LeBas, PE
Chair

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Acknowledgments

The AWWA Distribution & Plant Operations Division gratefully acknowledges the contributions made by those volunteers who drafted, edited, and provided the significant and critical commentary essential to updating AWWA Manual M14. The Steering Committee members dedicated numerous hours in the final stages of preparation of this edition to ensure the overall technical quality, consistency, and accuracy of the manual.

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AWWA Policy Statement on Cross-Connection

The American Water Works Association (AWWA) recognizes water utilities have the responsibility to supply potable water to their customers. In the exercise of this responsibility, water utilities or other responsible authorities must implement, administer, and maintain ongoing backflow prevention and cross-connection control programs to prevent backflow; protect public water systems from the hazards originating on the premises of their customers, such as the interface

between water systems and fire prevention/control systems; and protect public water systems from temporary connections that may impair or alter the water.

The return of any water to the public water system after the water has been used for any purpose on the customer's premises or within the customer's plumbing system is unacceptable and opposed by AWWA.

Water utilities or other responsible authorities should assure that effective backflow prevention measures are implemented commensurate with the degree of potential hazard and likelihood of occurrence to ensure protection of the water in public water distribution systems. Customers, together with authorities, are responsible for preventing contamination of the public water supply due to cross-connections with their plumbing systems and for maintaining associated backflow prevention devices.

If appropriate backflow prevention measures have not been taken, water utilities or other responsible authorities should take or initiate reasonable measures to ensure that public water distribution systems are protected from actual or potential backflow hazards. These measures could include the testing, installation, and assurance of proper operation and installation of backflow prevention assemblies, devices, and methods commensurate with the degree of hazard and likelihood of occurrence at the service connection, point of use, or both. If these actions are not taken, water utilities should be empowered to suspend service.

To reduce the risk customer plumbing systems pose to the public water distribution system, water utilities' backflow prevention programs should include public education and coordination with the cross-connection efforts of local authorities, particularly public health and plumbing officials. This is of increasing importance given the growing application of dual plumbing systems utilizing recycled water. In areas lacking a health or plumbing enforcement agency, water utilities should additionally promote the design and maintenance of customer plumbing systems for health and safety and to protect their customers from backflow hazards.

Practices specified in this policy statement are consistent with all other pertinent AWWA policy statements.

Adopted by the Board of Directors Jan. 26, 1970, revised June 24, 1979, reaffirmed June 10, 1984, and revised Jan. 28, 1990, and Jan. 21, 2001, reaffirmed Jan. 16, 2005, revised Jan. 17, 2010, revised June 8, 2014, and revised Jan. 12, 2023.

METRIC CONVERSIONS

Linear Measurement				
inch (in)	×	25.4	=	millimeters (mm)
inch (in)	×	2.54	=	centimeters (cm)
foot (ft)	×	304.8	=	millimeters (mm)
foot (ft)	×	30.48	=	centimeters (cm)
foot (ft)	×	0.3048	=	meters (m)
yard (yd)	×	0.9144	=	meters (m)
mile (mi)	×	1,609.3	=	meters (m)
mile (mi)	×	1.6093	=	kilometers (km)
millimeter (mm)	×	0.03937	=	inches (in.)
centimeter (cm)	×	0.3937	=	inches (in.)
meter (m)	×	39.3701	=	inches (in.)
meter (m)	×	3.2808	=	feet (ft)
meter (m)	×	1.0936	=	yards (yd)
kilometer (km)	×	0.6214	=	miles (mi)
Area Measurement				
square meter (m^2)	×	10,000	=	square centimeters (cm^2)
hectare (ha)	×	10,000	=	square meters (m^2)
square inch ($in.^2$)	×	6.4516	=	square centimeters (cm^2)
square foot (ft^2)	×	0.092903	=	square meters (m^2)
square yard (yd^2)	×	0.8361	=	square meters (m^2)
acre	×	0.004047	=	square kilometers (km^2)
acre	×	0.4047	=	hectares (ha)
square mile (mi^2)	×	2.59	=	square kilometers (km^2)
square centimeter (cm^2)	×	0.16	=	square inches ($in.^2$)
square meter (m^2)	×	10.7639	=	square feet (ft^2)
square meter (m^2)	×	1.1960	=	square yards (yd^2)
hectare (ha)	×	2.471	=	acres
square kilometer (km^2)	×	247.1054	=	acres
square kilometer (km^2)	×	0.3861	=	square miles (mi^2)
Volume Measurement				
cubic inch ($in.^3$)	×	16.3871	=	cubic centimeters (cm^3)
cubic foot (ft^3)	×	28,317	=	cubic centimeters (cm^3)
cubic foot (ft^3)	×	0.028317	=	cubic meters (m^3)
cubic foot (ft^3)	×	28.317	=	liters (L)
cubic yard (yd^3)	×	0.7646	=	cubic meters (m^3)

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Chapter 1

Introduction

The concern of maintaining safe drinking water is nothing new. Archeological studies reveal that as early as 3000 BC, the ancient Egyptian State had a government official who was required to inspect the country's water supply every 10 days. With the widespread use of water closets in the nineteenth century came direct cross-connections with water mains. These direct connections brought into focus a problem, as one nineteenth-century authority stated, "foul matters may get into the pipes."*

Government and industry professionals are aware of the need to control cross-connections to help prevent contaminants from getting into the plumbing system and public water system. Public health officials are aware that improperly designed plumbing fixtures, as well as plumbing systems, can allow contaminants or pollutants to enter the plumbing system and ultimately be introduced into the public water system. This situation became evident when, in 1933, defective and improperly designed plumbing and fixtures caused an epidemic in Chicago. More than 1,400 cases of amebic dysentery and at least 98 deaths were traced to a waterborne outbreak. The City of Chicago and the US Public Health Service identified cross-connections at two hotels as a major cause of the outbreak (Gorman and Wolman 1939).

The need to protect public health by preventing contaminants and pollutants from entering the public water system or plumbing system is firmly established. According to the US Environmental Protection Agency (USEPA; 2001), cross-connections and backflow represent a significant public health risk. On March 14, 1928, the New England Water Works Association passed a resolution addressing cross-connections. The June 1928 issue of the *Journal of the New England Water Works Association* states, "The association strongly urges that states adopt suitable laws and regulations covering the control of cross-connections and that, in each community, an investigation of the existing cross-connections is made immediately, and a program for the control thereof be inaugurated by the local authorities. The Association recommends that where possible, the inspection be made through the cooperative efforts of state and municipal authorities on the one hand and owners and

* A.J. Keenan, C.S.I., B.C. Section, AWWA Cross-Connection Control, September 1977.