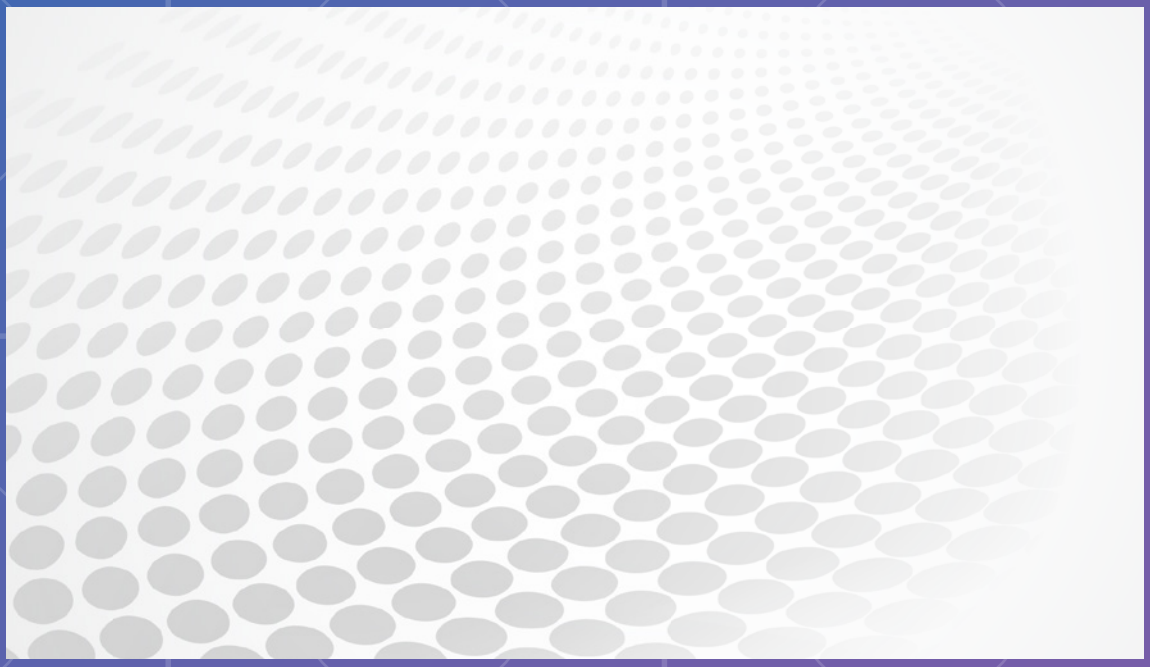
American Water Works Association

Manual of Water Supply Practices

M12

Seventh Edition



Simplified Procedures for Water Examination

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Simplified Procedures for Water Examination

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Technical Editor: Wiley
Cover Composition: Michael Labruyere
Cover Image: Olga Moonlight/Shutterstock.com
Production: Innodata

Library of Congress Cataloging-in-Publication Data
Names: American Water Works Association author
Title: M12--simplified procedures for water examination / by American Water Works Association.
Other titles: Simplified procedures for water examination | Simplified procedures for water examination
Description: 7th edition. | Denver, CO : American Water Works Association, [2025] | Earlier editions published under title: Simplified procedures for water examinations. | Includes bibliographical references and index. | Summary: "This updated manual provides water utility operators with simplified procedures for tests commonly needed for process control in drinking water production. This revision includes 22 new chapters and four new appendices"-- Provided by publisher.
Identifiers: LCCN 2025014993 (print) | LCCN 2025014994 (ebook) | ISBN 9781647171872 spiral bound | ISBN 9781613007143 pdf
Subjects: LCSH: Drinking water--Analysis--Laboratory manuals | Water quality--Measurement--Laboratory manuals | LCGFT: Handbooks and manuals
Classification: LCC TD380 .S56 2025 (print) | LCC TD380 (ebook) | DDC 628.1/62--dc23/eng/20250521
LC record available at https://lccn.loc.gov/2025014993
LC ebook record available at https://lccn.loc.gov/2025014994

ISBN 978-1-64717-187-2 ISBN, electronic 978-1-61300-714-3

http://doi.org/10.12999/AWWA.M12ed7

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Foreword

This publication is the seventh edition and the fifth revision of the original American Water Works Association (AWWA) Manual M12, *Simplified Procedures for Water Examination*. The original manual, published in 1964, was revised in 1975, and a supplement on instrumental methods was added in 1978. A complete revision was done in 1997 and updated in 2002, 2014, and again in 2024. This edition includes basic quality control and disposal guidance that may be superseded by state or local regulations. The appendices were updated to include containers, preservatives, and holding times for any new methods added in this edition. When possible, each chapter follows the same outline and headings for ease of use.

The original goal of the manual—to provide operators with simplified procedures for tests commonly needed for process control in drinking water production—remains the same. Monitoring plant processes through reliable, reproducible analyses enables plant operators to evaluate and optimize those processes to produce the highest possible quality drinking water.

This manual revision includes 22 new chapters, as well as four new appendices. Twenty-five other chapters have been reviewed and revised as necessary to include all new and updated methods, laboratory equipment, safety procedures, and disposal guidelines. Each method chapter follows the same basic format to maintain consistency for the reader: Purpose of Test, List of Simplified Methods, Sample Collection/Preservation, Simplified Procedure, and References. AWWA does not intend to recommend any one manufacturer; therefore, the authors of this manual revision have attempted to provide all the various manufacturer-specific methods available at the time of writing this manual. This manual contains basic information on quantitative analysis, but beginners in the laboratory can gain helpful training from additional resources, such as short courses offered by state departments of health, AWWA sections, and chemical or equipment suppliers. Classroom instruction, demonstrations by experienced teachers, and supervised laboratory work provide valuable additions to independent reading and practice.

The methods in this manual are simplified methods, and it is important to note when more sophisticated methods may be required for compliance monitoring. This manual is not designed to replace *Standard Methods for the Examination of Water and Wastewater*. Manual M12 may serve as a tool to acquire laboratory skills that will eventually facilitate the use of *Standard Methods*. Refer to *Standard Methods* for more information on methods and water quality.

The methods included in Manual M12 are based on the presumption of high-quality water of known and relatively constant composition. State health departments or other regulatory agencies that conduct bacteriological and chemical analyses of drinking waters should be consulted for advice of the applicability of methods to your situation. Some source waters may require the more complicated procedures from *Standard Methods*. Please note that there is a warning section for each procedure to ensure the applicability of the method. It is ultimately up to the user to ensure they are following the most updated method approved by their regulatory agency.

Appendix A provides information regarding containers, recommended minimum volumes, preservation, and maximum holding times. These may be superseded by local or state regulations. Appendix B provides directions for the preparation of common types of reagents. Appendix C provides information on the safe storage of chemicals. A list of the compounds identified in this manual is available in Appendix D. References are presented in Appendix E. Appendix F provides information on how to use the metric system

and make conversions. Appendix G gives information on how to work with chemicals. Appendix H explains significant figures and rounding rules. Appendix I outlines the quality control systems of precision and accuracy. Finally, at the end of the manual is an updated glossary of terms.

If you have any comments or questions about this manual, please e-mail the AWWA Engineering and Technical Service support group at ETSsupport@awwa.org.

Acknowledgments

The AWWA Technical & Educational Council, the Water Quality & Technology Division, and the Water Quality Laboratory Committee gratefully acknowledge the contributions made by those volunteers who drafted, edited, and provided the significant and critical commentary essential to updating M12. The Steering Committee members dedicated many 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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A special thanks to Matthew Rasmussen, Nicole Olmedo, and Matthew Sullivan with Minneapolis Water Treatment and Distribution Services for taking photographs that appear in Chapter 2, "Water Quality Laboratory."

Chapter 1

Laboratory Safety

Matthew Sullivan

Laboratory safety is important. There are many hazards that may be encountered in the water laboratory, and everyone entering these areas must remain alert and vigilant to avoid danger. For information on the safe storage of chemicals, see Appendix C. Take an extra moment or two to follow a safe practice rather than to risk injury. Be especially careful at the end of a shift or when tired because most injuries occur at those times. It is also highly recommended that there be regular safety meetings and checkups for staff. A safety program involving monthly checklists, for example, can catch deficiencies such as gas tanks stored improperly, insufficient labeling of containers, and missing first-aid kit items. Consult local regulations or committees for any guidance on setting up a program (Adams et al. 2023).

For specific safety questions, refer to state or provincial safety laws or to federal Occupational Safety and Health Act (OSHA) regulations. Information on developing a program to manage hazardous chemicals may be found in US Environmental Protection Agency and OSHA publications.

OSHA has modified the Hazard Communication Standard (HCS) to adopt the international Global Harmonizing System (GHS) to improve safety and health of workers through more effective communications on chemical hazards. Since it was first promulgated in 1983, the HCS has provided employers and employees extensive information about the chemicals in their workplaces. The GHS provides a standardized approach to classifying the hazards and conveying the information, including detailed criteria for determining what hazardous effects a chemical pose, as well as standardized label elements assigned by hazard class and category. This will enhance both employer and employee comprehension of the hazards, which will help to ensure appropriate handling and safe use of workplace chemicals. In addition, the safety data sheet (SDS) requirements establish an order of information that is standardized.

US workplaces now receive labels and SDS that are hazard communication (HazCom) 2012/GHS-compliant. Employers must ensure that the new labels and SDS appear in the