



Minnesota

Water Works

Operations Manual



Acknowledgements

The original vision of the people who created this manual was to have it be a “need to know” study guide for people taking the water operator certification exam. The final product has turned out to be much more than just a study guide for taking the exam. All of the information contained in the manual is very useful in understanding the operation of a water supply system, both large and small.

Publication of the first edition of this manual was made possible through a grant from the US Environmental Protection Agency, Office of Drinking Water, to the Minnesota Department of Health and Minnesota Training Coalition.

The Minnesota Department of Health then contracted with the Minnesota Rural Water Association for the layout, design and dissemination of this manual. The Minnesota Department of Health continues to support the updating of this manual.

The expertise of many individuals has been utilized to bring together an overview of key elements of the operation and maintenance of a water system. Some of those individuals include, but are not limited to, John Thom, Gunilla Montgomery, Virginia Reiner, Dick Clark, Doug Mandy, Stew Thornley, Bob Smude, Roger Larson, Gerald Smith, Phil Moroukian, Glen Moreland, and Minnesota Rural Water Association staff members Jim Plahn, Mike Roers, Tim Hagemeyer, Larry Bailey, Sharon Larsen and Ruth Hubbard.

This manual will hopefully give you a basic understanding of a water system. Operators should use this manual as a catalyst for further research of your individual system. We encourage your continued educational growth through attendance at the many training efforts sponsored by Minnesota Training Coalition members.

A special thank you to water industry personnel and professional associations for the use of photographs, graphics, and illustrations for the manual.

Disclaimer

Several photographs and illustrative drawings that appear in this volume have been furnished through the courtesy of various product distributors and manufactures. Any mention of trade name, commercial products, or services does not constitute endorsement or recommendation for use by the Minnesota Department of Health, Minnesota Training Coalition, or the Minnesota Rural Water Association.

Fourth Publication Date: Summer 2009
Third Publication Date: Summer 2001
Second Publication Date: Summer 1997
First Publication Date: Spring 1994



Minnesota Rural Water Association
217 12th Avenue SE
Elbow Lake, MN 56531
800-367-6792
Fax: 218-685-5272
E-mail: mrwa@mrwa.com
World Wide Web: www.mrwa.com



TABLE OF CONTENTS

Water Resources	Chapter 1
Water and Impurities.....	Chapter 2
Regulations and Sanitary Surveys	Chapter 3
Emerging Contaminants.....	Chapter 4
Math	Chapter 5
Well Construction	Chapter 6
Rules Relating to Wells and Borings	Chapter 7
Pumps.....	Chapter 8
Disinfection.....	Chapter 9
Fluoridation.....	Chapter 10
Aeration.....	Chapter 11
Coagulation and Flocculation	Chapter 12
Sedimentation	Chapter 13
Iron and Manganese.....	Chapter 14
Hardness.....	Chapter 15
Lime Softening.....	Chapter 16
Ion Exchange Softening.....	Chapter 17
Filtration.....	Chapter 18
Membrane Filtration	Chapter 19
Taste and Odor	Chapter 20
Distribution System Operation	Chapter 21
Storage	Chapter 22

Cross Connections	Chapter 23
Microbiology.....	Chapter 24
Corrosion.....	Chapter 25
Plan Review and Standards.....	Chapter 26
Security and Emergency Preparedness	Chapter 27
Sampling	Appendix A
Water Operator Certification Summary – Chapter 9400	Appendix B
Minnesota Department of Natural Resources Division of Waters Minnesota Rules Related to Water Appropriation Permits.....	Appendix C
Math Conversions and Formulas	Appendix D
Periodic Table of the Elements	Appendix E
Consumer Confidence Reports	Appendix F
Advisory Council on Water Supply Systems and Wastewater Treatment Facilities – Members	Appendix G
Water and Wastewater Related Training Performed	Appendix H
Minnesota Department of Health – Frequently Called Phone Numbers by Subject.....	Appendix I
Minnesota Department of Health Exam Application.....	Appendix J
Additional Resources	Appendix K