



**American Water Works
Association**

The Authoritative Resource on Safe Water®

ANSI/AWWA C655-09
(First Edition)

AWWA Standard

Field Dechlorination



Effective date: March 1, 2010.

This first edition approved by AWWA Board of Directors June 14, 2009.

Approved by American National Standards Institute Jan. 14, 2010.

6666 West Quincy Avenue
Denver, CO 80235-3098
T 800.926.7337
www.awwa.org

Advocacy
Communications
Conferences
Education and Training
Science and Technology
Sections



Documents
Document Sharing Hub

Copyright © 2010 American Water Works Association. All Rights Reserved.

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 codes of any governmental authority. AWWA standards are intended to represent a consensus of the water supply industry that the product described will provide satisfactory service. When AWWA revises or withdraws this standard, an official notice of action will be placed on the first page of the classified advertising 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 publication. 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.

All rights reserved. No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopy, recording, or any information or retrieval system, except in the form of brief excerpts or quotations for review purposes, without the written permission of the publisher.

Copyright © 2010 by American Water Works Association
Printed in USA

Committee Personnel

The Dechlorination Subcommittee for this standard had the following personnel at the time:

Robert J. Gordhamer, *Chair*

L. Aguiar, Miami–Dade Water & Sewer Department, Miami, Fla.	(AWWA)
P.F. Burg, Integra Chemical Company, Kent, Wash.	(AWWA)
K.C. Choquette, Des Moines, Iowa	(AWWA)
B.J. Dougan, Pollard Water.com, Redmond, Wash.	(AWWA)
D.H. Eaton, Romac Industries Inc., Bothell, Wash.	(AWWA)
R.J. Gordhamer, Measurement Technologies Inc., Redmond, Wash.	(AWWA)
B. Graves, Tessenderlo Kerley Inc., Fresno, Calif.	(AWWA)
F.H. Grenning, Hydro Flow Products Inc., Arlington Heights, Ill.	(AWWA)
L.F. Rains, Medford Water Commission, Medford, Ore.	(AWWA)
L.J. Ruffin, L.J. Ruffin & Associates, Orlando, Fla.	(AWWA)
D.A. Skeaton, EBMUD, Oakland, Calif.	(AWWA)
J.L. Stapf, Hernando County Utilities, Brooksville, Fla.	(AWWA)
B.G.A. Wilcher, Arden Industries, Shingle Springs, Calif.	(AWWA)

The AWWA Standards Committee on Disinfection of Facilities, which reviewed and approved this standard, had the following personnel at the time of approval:

Marc S. Solomon, *Chair*

General Interest Members

K.C. Choquette, Des Moines, Iowa	(AWWA)
C.B. Hagar, Carollo Engineers, Phoenix, Ariz.	(AWWA)
J.M. Henderson, Concord, Mass.	(AWWA)
P.L. Kline,* Standards Engineer Liaison, AWWA, Denver, Colo.	(AWWA)
T. Lambert, Florida Department of Environmental Protection, Orlando, Fla.	(AWWA)
M.S. Solomon, Winzler and Kelly Consulting Engineers, Santa Rosa, Calif.	(AWWA)
T.W. Walker, New York State Department of Health, Victor, N.Y.	(AWWA)
M.L. Wentink, Nebraska Department of Health and Human Services Division of Public Health, North Platte, Neb.	(AWWA)

* Liaison, nonvoting

Producer Members

R.J. Gordhamer, Measurement Technologies Inc., Redmond, Wash.	(AWWA)
W.B. Huebner, Mine Hill, N.J.	(AWWA)
M.L. Johnsen, Johnsen Corrosion Engineering, Lincoln, Neb.	(AWWA)

User Members

T.F. Clark, Monroe County Water Authority, Rochester, N.Y.	(AWWA)
D.J. Hartman,* Greater Cincinnati Water Works, Cincinnati, Ohio	(AWWA)
L.A. Hensley, GDS Associates Inc., Marietta, Ga.	(AWWA)
R.C. Lorenz, Westerville Water Plant, Westerville, Ohio	(AWWA)
T.W.D. MacDonald, Cambridge Water Department, Cambridge, Mass.	(NEWWA)
P.M. Marchand, Providence Water Supply Board, Providence, R.I.	(NEWWA)
B. Reilley-Matthews, MWRA, Southborough, Mass.	(AWWA)
E.D. Schwartz, Plainsboro, N.J.	(AWWA)
J.L. Stapf, Hernando County Utilities, Brooksville, Fla.	(AWWA)

* Liaison, nonvoting

Contents

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

SEC.	PAGE	SEC.	PAGE
<i>Foreword</i>		2	References 2
I	Introduction vii	3	Definitions 2
I.A	Background vii	4	Requirements
I.B	History vii	4.1	Materials 3
I.C	Acceptance vii	4.2	Chemical and Nonchemical Dechlorination 3
II	Special Issues viii	4.3	Dechlorination Plan and Procedures 10
II.A	US Regulations viii	4.4	Dechlorination Methods 12
II.B	Canadian Regulations ix	5	Verification
II.C	Determination of Method Used for Dechlorination x	5.1	Residual Chlorine Level 13
III	Use of This Standard x	5.2	Residual Testing 13
III.A	Purchaser Options and Alternatives x	6	Delivery 14
III.B	Modification to Standard xi	<i>Tables</i>	
IV	Major Revisions xi	1	Chemical Reactions for Dechlorination With Free Chlorine 5
V	Comments xi	2	Dechlorination Chemical Reactions With Chloramines 5
<i>Standard</i>			
1	General		
1.1	Scope 1		
1.2	Purpose 1		
1.3	Application 1		

This page intentionally blank.



Foreword

This foreword is for information only and is not a part of ANSI/AWWA C655.

I. Introduction.

I.A. *Background.* This standard describes procedures, materials, and requirements for the dechlorination of chlorinated or chloraminated water discharges. It includes current dechlorination regulations, chemical and nonchemical dechlorination, dechlorination plans and procedures, dechlorination methods, and verification.

I.B. *History.* This is the first version of this standard, and it was approved by the AWWA Board of Directors on June 14, 2009.

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 and the Conference of State Health and Environmental Managers (COSHEM). The American Water Works Association (AWWA) and the Association of State Drinking Water Administrators (ASDWA) joined later.

In the United States, authority to regulate products for use in, or 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 effects of products and drinking water additives from such products, state and local agencies may use various references, including

1. An advisory program formerly administered by USEPA, Office of Drinking Water, discontinued on April 7, 1990.
2. Specific policies of the state or local agency.
3. Two standards developed under the direction of NSF, NSF[†]/ANSI[‡] 60, Drinking Water Treatment Chemicals—Health Effects, and NSF/ANSI 61, Drinking Water System Components—Health Effects.

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

† NSF International, 789 N. Dixboro Road, Ann Arbor, MI 48105.

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

4. Other references, including AWWA standards, *Food Chemicals Codex*, *Water Chemicals Codex*,* and other standards considered appropriate by the state or local agency.

Various certification organizations may be involved in certifying products in accordance with NSF/ANSI 60. Individual states or local agencies have authority to accept or accredit certification organizations within their jurisdiction. Accreditation of certification organizations may vary from jurisdiction to jurisdiction.

Annex A, “Toxicology Review and Evaluation Procedures,” to NSF/ANSI 60 does not stipulate a maximum allowable level (MAL) of a contaminant for substances not regulated by a USEPA final maximum contaminant level (MCL). The MALs of an unspecified list of “unregulated contaminants” are based on toxicity testing guidelines (noncarcinogens) and risk characterization methodology (carcinogens). Use of annex A procedures may not always be identical, depending on the certifier.

ANSI/AWWA C655 does not address additives requirements. Thus, users of this standard should consult the appropriate state or local agency having jurisdiction in order to

1. Determine additives requirements including applicable standards.
2. Determine the status of certifications by parties offering to certify products for contact with, or treatment of, drinking water.
3. Determine current information on product certification.

II. Special Issues.

II.A. US Regulations.

1. The United States Environmental Protection Agency (USEPA) has established Water Quality Criteria (WQC) for total residual chlorine (TRC) concentrations permissible in receiving waters to protect aquatic life and water quality. These concentrations are based on acute and chronic toxicity effects for aquatic life. Under the acute toxicity criterion, the one-hour average chlorine concentration of the stream should not exceed 0.019 mg/L (19 µg/L) more than once every three years, on average. Under the chronic toxicity criterion, the four-day average concentrations should not exceed 0.011 mg/L (11 µg/L) more than once every three years, on average.

Most states in the United States use 0.019 mg/L (19 µg/L) as the acute criterion and 0.011 mg/L (11 µg/L) as the chronic criterion for TRC for receiving streams. Some states have adopted a toxicity-based criterion for water quality for TRC. The state regu-

* Both publications available from National Academy of Sciences, 500 Fifth Street, NW, Washington, DC 20001.

latory agencies require water utilities to abide by the receiving water quality criterion while discharging chlorinated waters. In addition, the regulatory agencies use WQC to develop maximum allowable chlorine concentrations while issuing general or individual permits for discharge of chlorinated water into streams.

Chlorine discharge limits in water releases into receiving streams and wetlands shall not exceed 0.01 mg/L (or a more stringent limit).

2. In addition to residual chlorine concentrations, some other water quality parameters must be monitored during disposal of chlorinated waters. For example, dechlorination of chloramine residuals may result in the release of ammonia. USEPA has determined the maximum allowable acute and chronic concentrations of ammonia based on the pH, temperature, and the type of aquatic habitat present (warm- vs. cold-water species) in receiving waters. Under the most stringent conditions, (cold-water species, pH of 9, 30°C), a one-day average total ammonia concentration must not exceed 0.58 mg/L as NH_3 and a four-day average must not exceed 0.08 mg/L as NH_3 .

Most states have adopted the USEPA criteria as the water quality standards for ammonia. Water utilities using combined chlorine often maintain a residual chlorine concentration of less than 1.5 mg/L in potable waters, with a chlorine-to-ammonia ratio of 4:1 to 5:1 by mass. This will result in a total ammonia concentration of approximately 0.4 to 0.5 mg/L, which is less than the acute criterion of 0.58 mg/L for total ammonia under the worst-case scenario. A tenfold dilution of chloraminated water in the receiving stream will result in compliance with the chronic ammonia concentration criterion (0.08 mg/L as NH_3) under the most stringent conditions.

For the majority of dechlorination operations, ammonia released from chloramines is likely to be within regulatory requirements. However, some states may have regulations more stringent than the USEPA criteria for selected waters. Caution must be exercised in releasing dechloraminated water into receiving streams under such conditions.

II.B. *Canadian Regulations.*

1. Canadian Environmental Quality Guidelines (1987) propose a water quality criterion of 0.020 mg/L of total residual chlorine for receiving streams. Many provincial regulatory agencies have adopted this chlorine concentration as the WQC. However, the criteria for chlorine and chloramine concentrations are currently being reviewed under the 1999 water quality guidelines.

Like the United States, each province has set its own discharge regulations to dechlorinate prior to discharge into receiving streams.

2. In general, the water quality criteria for ammonia, dissolved oxygen, and pH in Canada are similar to those in the United States. In Newfoundland, the pH