

American Water Works Association

ANSI/AWWA B408-98

(Revision of ANSI/AWWA B408-93)



AWWA STANDARD
FOR
LIQUID POLYALUMINUM CHLORIDE



Effective date: Jan. 1, 1999.

First edition approved by AWWA Board of Directors Jan. 31, 1993.

This edition approved June 21, 1998.

Approved by American National Standards Institute Nov. 9, 1998.

AMERICAN WATER WORKS ASSOCIATION

6666 West Quincy Avenue, Denver, Colorado 80235

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. 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, 11 W. 42nd St., 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 © 1999 American Water Works Association
Printed in USA

Committee Personnel

The AWWA Subcommittee on Polyaluminum Chloride, which developed this standard, had the following personnel at the time:

James D. Edwards, *Chair*

J.D. Edwards, Burgess and Niple Ltd., Columbus, Ohio	(AWWA)
B.A. Keogh, Sternson Ltd., Brantford, Ont.	(AWWA)
C.B. Lind, General Chemical Corporation, Syracuse, N.Y.	(AWWA)
K.S. Salmen, Nalco Chemical Company, Naperville, Ill.	(AWWA)
P.E. Shaughnessey, Western Water Management Inc., North Kansas City, Mo.	(AWWA)

The AWWA Standards Committee on Iron Salts, Aluminum Salts, and Related Coagulant Aids, which reviewed and approved this standard, had the following personnel at the time of approval:

Thomas M. Vandiver, *Chair*

Consumer Members

B.S. Aptowicz, Philadelphia Water Department, Philadelphia, Pa.	(AWWA)
T.A. Barber Jr.,* Coca-Cola Company, Atlanta, Ga.	(AWWA)
J.E. Brown, United Water Services, Houston, Texas	(AWWA)
J.P. Corless Jr., Washington Suburban Sanitation Commission, Laurel, Md.	(AWWA)
S.A. Dolan, United Water Delaware, Wilmington, Del.	(AWWA)
E.D. Lowther Jr., American Water Works Service Company, Voorhees, N.J.	(AWWA)
C.A. Owen, Tampa Water Department, Tampa, Fla.	(AWWA)
R.S. Schultz, Bloomington Engineering & Water, Hudson, Ill.	(AWWA)
J.S. Trotter, City of Bloomington Utilities, Bloomington, Ind.	(AWWA)
T.M. Vandiver, Laboratory Services, Lawrenceville, Ga.	(AWWA)
D.P. Wolz, City of Wyoming Wastewater Treatment Plant, Grandville, Mich.	(AWWA)

General Interest Members

M.B. Alvarez, CH2M Hill Inc., Orlando, Fla.	(AWWA)
D.T. Duke, Engineer, East Liverpool, Ohio	(AWWA)
J.E. Dyksen,† Council Liaison, United Water New Jersey, Hackensack, N.J.	(AWWA)
J.D. Edwards, Burgess & Niple Ltd., Columbus, Ohio	(AWWA)
J.J. Gemin, Proctor & Redfern Ltd., Kitchener, Ont.	(AWWA)
R.D. Harriger, Alexandria Bay, N.Y.	(AWWA)

*Alternate

†Liaison, nonvoting

J.F. Myatt, *	Proctor & Redfern Ltd., London, Ont.	(AWWA)
J.W. Patterson,	Patterson Associates Inc., Chicago, Ill.	(AWWA)
E.S. Ralph, †	Standards Engineer Liaison, AWWA, Denver, Colo.	(AWWA)

Producer Members

D.E. Gordon,	QC Corporation, Baltimore, Md.	(AWWA)
L.N. Hjersted,	Kemiron Inc., Bartow, Fla.	(AWWA)
C.B. Lind,	General Chemical Corporation, Syracuse, N.Y.	(AWWA)
J.J. Pavlicek,	PVS Technologies, Detroit, Mich.	(AWWA)
F.E. Rowe,	Boliden Intertrade Inc., Atlanta, Ga.	(AWWA)
K.S. Salmen,	Nalco Chemical Company, Naperville, Ill.	(AWWA)
Gene Shull,	Fe3 Inc., Bacliff, Texas	(AWWA)
R.A. Smith,	Rhodia Technical Service, Woodbury, Conn.	(AWWA)

*Alternate

†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
Foreword		4	Requirements
I Introduction.....	vii	4.1 Physical Requirements.....	2
I.A Background.....	vii	4.2 Chemical Requirements	2
I.B History	vii	4.3 Impurities.....	2
I.C Acceptance	viii	5	Verification
II Special Issues	viii	5.1 Sampling	3
II.A Storage and Handling		5.2 Test Procedures—General	3
Precautions.....	viii	5.3 PACl Content as Percent Al	3
III Use of This Standard.....	ix	5.4 PACl Content as Percent	
III.A Purchaser Options and		Al ₂ O ₃ —Benchmark Method	5
Alternatives.....	ix	5.5 PACl Basicity.....	7
III.B Modification to Standard.....	ix	5.6 Product Turbidity	8
IV Major Revisions.....	ix	5.7 Chloride	8
V Comments	ix	5.8 Rejection—Notice of	
		Nonconformance	12
Standard		6	Delivery
1 General		6.1 Marking.....	12
1.1 Scope	1	6.2 Packaging and Shipping	12
1.2 Purpose	1	6.3 Affidavit of Compliance.....	13
1.3 Application.....	1	Table	
2 References	1	1 Temperature Corrections for	
3 Definitions	2	Volumetric Solutions.....	10

This page intentionally blank.

Foreword

This foreword is for information only and is not a part of AWWA B408.

I. Introduction.

I.A. *Background.* Polyaluminum chloride (PACl) products are commercially available as liquids in the United States and Canada. This standard covers liquid PACl for use in municipal and industrial water supplies. *Polyaluminum chloride* is a misnomer, however, since these products contain a mixture of polymers (actually aggregates of oligimers) of aluminum chloride hydroxide (Chemical Abstract Service [CAS] No. 1327-41-9) with the empirical formula $Al_n(OH)_mCl_{(3n-m)}$ for $0 < m < 3n$. At least the following four CAS numbers: 1327-41-9, 10284-64-7, 14215-15-7, and 12042-91-0; have been used for various types of PACl. *Basicity* (hydroxyl number) refers to the average number of hydroxide ions per aluminum atom in the PACl molecules, or m/n . In some PACl products, an anion other than chloride, such as sulfate, may also be present, but this anion should be present in much lower concentrations than the chloride ion if the product is being sold as PACl.

The basicity of PACl products can range from 0 to 2.5, though the basicity should not be 0 if the product is being sold as PACl. The basicity is converted to “percent basicity,” using the following formula:

$$\text{percent basicity} = \frac{(\text{OH/Al}) \times 100}{3}$$

Where:

Al and OH are expressed as moles/litre

The values for percent basicity of liquid PACl products can range from about 10 to 83.3. The basicity of the product does not necessarily relate directly to product performance, so the highest basicity may not give the best performance in a particular application.

Polyaluminum chloride products contain varying amounts of PACl, the concentration of which is conventionally expressed as “percent by weight as Al” or “percent as Al.” The range of PACl content in PACl products is about 2.5 to 13 percent as aluminum (5 to 25 percent as Al_2O_3).

Polyaluminum chloride can be commercially manufactured from a number of aluminum-containing raw materials, including aluminum metal, alumina trihydrate, aluminum chloride, aluminum sulfate, and combinations of these. The products can contain by-product salts, such as sodium/calcium/magnesium chloride or sulfate, depending on the manufacturing process. The presence of these salts is not harmful to product performance or to those handling the product. Recognizing that the purity of PACl can vary with the manufacturing process, the purchaser should ask the supplier for information concerning potential impurities.

This standard provides methods for analysis of active PACl expressed in percent as aluminum (or Al_2O_3), percent basicity, turbidity, and specific gravity.

I.B. *History.* In 1988, the AWWA Standards Committee on Iron Salts, Aluminum Salts, and Related Coagulant Aids organized a subcommittee to prepare a standard for PACl products. The first draft of the standard was reviewed in 1989 and the final draft was approved in 1992. The first edition of ANSI/AWWA B408, Standard for Liquid Polyaluminum Chloride, was approved by the AWWA Board of

Directors on Jan. 31, 1993. This edition was approved by the AWWA Board of Directors June 21, 1998.

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 all direct and indirect drinking water additives. Other members of the original consortium included the American Water Works Association Research Foundation (AWWARF) 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 in 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 two standards developed under the direction of NSF, ANSI[†]/NSF[‡] 60, Drinking Water Treatment Chemicals—Health Effects, and ANSI/NSF 61, Drinking Water System Components—Health Effects.

Various certification organizations may be involved in certifying products in accordance with ANSI/NSF 60 (61). 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.

Appendix A, “Toxicology Review and Evaluation Procedures,” to ANSI/NSF 60 (61) 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 Appendix A procedures may not always be identical, depending on the certifier.

AWWA B408-98 addresses additives requirements in Sec. 4.3 of the standard. The transfer of contaminants from chemicals to processed water or the residual solids is becoming a problem of greater concern. The language in Sec. 4.3.2 is a recommendation only for direct additives used in the treatment of potable water to be certified by an accredited certification organization in accordance with ANSI/NSF Standard 60, Drinking Water Treatment Chemicals—Health Effects. However, users of the standard may opt to make this certification a requirement for the product. Users of this standard should also 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 all 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. Storage and Handling Precautions. Liquid PACl is a clear to slightly hazy solution that is acidic and corrosive to common metals. Suitable materials for

*Persons in Canada, Mexico, and non-North American countries should contact the appropriate authority having jurisdiction.

†American National Standards Institute, 11 W. 42nd St., New York, NY 10036.

‡NSF International, 3475 Plymouth Rd., Ann Arbor, MI 48106.