American Water Works Association

AWWA B452a-07
Addendum to
ANSI/AWWA B452-06
Standard
for

EPI-DMA Polyamines

(Approved by the AWWA Board of Directors on June 24, 2007.)

Sec. III.A, added the following:

17. Whether alternative security measures have been adopted to replace or augment the security measures set out in Sec. 6.2.1 and 6.2.2.

18. Whether the purchaser will reject product from containers or packaging with missing or damaged seals. The purchaser may reject product from bulk containers or packages with missing or damaged seals unless the purchaser's tests of representative samples, conducted in accordance with Sec. 5.2, 5.3, and 5.4, demonstrate that the product meets specifications. Failure to meet specifications or the absence of, or irregularities in, seals may be sufficient cause to reject the shipment.

Section 3, added the following:

7. *Tamper-evident packaging:* Packaging having one or more indicators or barriers to entry which, if breached or missing, can reasonably be expected to provide visible evidence to the purchaser that tampering has occurred. The tamper-evident

features of the packaging shall be designed to and shall remain intact when handled in a reasonable manner during manufacture, storage, shipment, and delivery to the purchaser. Properly constructed, labeled, and closed multiwall paper bags and supersacks constitute two forms of tamper-evident packaging.

Section 6, added the following:

6.2.1 *Security requirements for nonbulk shipments.* Packaged product shall be stored, shipped, and delivered in tamper-evident packaging as defined in Section 3, or an alternative method or methods may be agreed upon by the manufacturer and purchaser that would provide a reasonable assurance of protection against tampering.

6.2.2 *Security requirements for bulk shipments.* Bulk quantities of product shall be secured by employing one of the following security measures (or a combination of measures):

6.2.2.1 Seals. Bulk quantities of product may be sealed with a uniquely numbered tamper-evident seal(s). The seal numbers shall be recorded and disclosed on shipping documents, such as the bill of lading. Seals shall be inspected on receipt of product by the purchaser and evidence of tampering or removal should be reported to the carrier and supplier.

6.2.2.2 Chain of custody. A continuous chain of custody may be maintained between the manufacturer and the purchaser during storage and shipment if so specified by the purchaser.

6.2.2.3 Alternative method. An alternative method or methods agreed upon by the manufacturer and purchaser may be implemented that would provide reasonable assurance of protection against tampering.

ANSI/AWWA B452-06
(Revision of ANSI/AWWA B452-98)

American Water Works Association

The Authoritative Resource on Safe Water®

AWWA Standard

EPI-DMA Polyamines

ANSI American National Standards Institute

Effective date: Aug. 1, 2006.
First edition approved by AWWA Board of Directors June 17, 1990.
This edition approved Feb. 12, 2006.
Approved by American National Standards Institute April 17, 2006.

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

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, 25 West 43rd Street, Fourth Floor, New York, NY 10036; (212) 642-4900.

Science and Technology

AWWA unites the entire water community by developing and distributing authoritative scientific and technological knowledge. Through its members, AWWA develops industry standards for products and processes that advance public health and safety. AWWA also provides quality improvement programs for water and wastewater utilities.

Committee Personnel

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

Francis J. Mangravite, *Chair*

General Interest Members

P.H. Hargette, Black & Veatch Engineers, Greenville, S.C. (AWWA)
F.L. Hinker, Santa Rosa, N.M. (AWWA)
T.A. Humphrey,* Standards Council Liaison, City of Portland, Bureau of Water Works, Portland, Ore. (AWWAP)
W.D. Laraway, MPL Services Inc., Long Valley, N.J. (AWWA)
R.D. Letterman, Fayetteville, N.Y. (AWWA)
C.B. Lind, Mauser Corporation, Bridgewater, N.J. (AWWA)
F.J. Mangravite, Public Works Management Inc., Morris Plains, N.J. (AWWA)
T.J. McCandless,* Standards Engineer Liaison, AWWA, Denver, Colo. (AWWA)
C.C. Pintner, Germantown, Tenn. (AWWA)
D.R. Purkiss, NSF International, Ann Arbor, Mich. (AWWA)

Producer Members

F.W. Barvenik, Cytec Industries Inc., Stamford, Conn. (AWWA)
B.S. Johnson, NALCO Company, Naperville, Ill. (AWWA)
G. Tichenor, SNF Chemtall, Riceboro, Ga. (AWWA)

User Members

T.A. Barber Jr., Coca-Cola Company, Atlanta, Ga. (AWWA)
O.J. Dzydzora Sr., United Water Inc., East Stroudsburg, Pa. (AWWA)
S. Liang, Metropolitan Water District of Southern California, La Verne, Calif. (AWWA)
S.R. Lohman, Denver Water, Denver, Colo. (AWWA)
J.C. Routt, Kentucky American Water Company, Lexington, Ky. (AWWA)
C.K. Schreppel, Mohawk Valley Water Authority, Utica, N.Y. (AWWA)

*Liaison, nonvoting

This page intentionally blank.

Contents

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

This page intentionally blank.

Foreword

This foreword is for information only and is not a part of ANSI/AWWA B452.

I. Introduction.

I.A. *Background.* Chemical clarification methods have been used to improve the quality of drinking water supplies since the late 1880s in the United States. In 1967, the first completely synthetic organic polyelectrolyte was accepted by the US Public Health Service for use in treating potable water. The responsibility for accepting additives for drinking water treatment was subsequently assumed by the US Environmental Protection Agency (USEPA) and administered by their Office of Drinking Water as an advisory program. USEPA's acceptance was made by the specific name of the suppliers' product and not by generic type. Epichlorohydrin dimethylamine (EPI–DMA) polyamines (CAS* Nos. 25988-97-0 and 42751-79-1) are one of several types of synthetic organic polyelectrolytes that were accepted for use in potable water treatment under this program, which was discontinued in 1990.

EPI–DMA polyamines are a family of synthetic organic polyelectrolytes (also called polymers or coagulants) used in water treatment to improve the performance of some unit operations in the treatment process, most often by increasing the extent or rate of liquid–solids separation. EPI–DMA polyamines are principally made from two monomers, epichlorohydrin (EPI) and dimethylamine (DMA). EPI–DMA polyamines have a cationic charge, a high relative charge density, low relative molecular weight and are manufactured and sold in solution form.

The important concepts to remember regarding EPI–DMA polyamines include the following:

1. EPI–DMA polyamines are similar to polyDADMAC polymers (ANSI/AWWA B451, Poly [Diallydi-methylammonium Chloride]) in their use, handling, storage, and solution preparation.

2. EPI–DMA polyamines are different from polyacrylamide (PAM) polymers (ANSI/AWWA B453, Polyacrylamide) in their use, handling, storage, and solution preparation.

3. EPI–DMA polyamines are supplied in an aqueous solution form that may be referred to as liquids or aqueous solutions.

*Chemical Abstracts Service, 2540 Olentangy River Road, P.O. Box 3012, Columbus, OH 43210.

4. EPI–DMA polyamines are a family of polymers with a relatively constant charge type and charge density but with different molecular weights and degrees of branching.

5. The physical properties of EPI–DMA polyamines cannot be used to judge product performance. Only laboratory testing, pilot plant studies, or full plant trials can discern product efficacy.

6. EPI–DMA polyamines may contain inactive ingredients, such as salts, depending on the manufacturing method and formulation.

The user should consult the material safety data sheet (MSDS) for product composition information regarding any specific EPI–DMA polyamine product.

I.B. *History.* The AWWA Standards Council authorized development of this standard in 1979. The standard was developed by the AWWA Standards Committee on Polyelectrolytes and was approved by the AWWA Board of Directors on June 17, 1990. The second edition of this standard was approved on June 21, 1998. This third edition of ANSI/AWWA B452 was approved on Feb. 12, 2006.

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 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, NSF†/ANSI‡ 60, Drinking Water Treatment Chemicals—Health Effects, and NSF/ANSI 61, Drinking Water System Components—Health Effects.

---

*Persons outside 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, New York, NY 10036.

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 B452 addresses additives requirements in Sec. 4.2 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. 4.2 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 NSF/ANSI 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 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. *Safety.* EPI–DMA polyamines are not considered to be toxic as household products nor primary skin irritants by the Consumer Product Safety Commission (US Federal Hazardous Substances Act). Good housekeeping procedures and personal cleanliness are recommended when handling EPI–DMA polyamines.

Safety glasses should be worn when handling EPI–DMA polyamines. Good first-aid practices should be followed in all cases of exposure. In case of eye contact, flush with plenty of water for at least 15 min. If irritation develops, call a physician. Consult the MSDS for the specific product for safety procedures before handling any EPI–DMA polyamines.

II.B. *Spill Control.* EPI–DMA polyamines should be disposed of according to federal, state, local, and provincial regulations. A dike should be formed around the spill area to contain as much material as possible. Any remaining material should be removed by adsorbing it on vermiculite or other suitable adsorbing material and placed in a sealable metal container for disposal. The spill area should be thoroughly hosed with water after all possible polymer has been scooped up, absorbed, or wiped up because liquid product can make floors very slippery. Use of warm water is beneficial.

III. Use of This Standard. It is the responsibility of the user of an AWWA standard to determine that the products described in that standard are suitable for use in the particular application being considered.

This AWWA standard can be used to prepare a purchase specification, but is not itself a specification because it cannot address requirements unique to the purchaser's specific situation and does not establish business relationships. In addition, this EPI–DMA polyamines standard does not establish physical and chemical property specifications for any one EPI–DMA polyamine product, because the physical and chemical properties of EPI–DMA polyamines do not always relate to their performance as a coagulant in specific applications.

Following in Sec. III.A.1 through III.A.5 are requirements that the user may consider to develop an EPI–DMA polyamines product purchase specification:

III.A. *Purchaser Options and Alternatives.* The following items should be provided by the purchaser.

1. Standard used—that is, ANSI/AWWA B452, EPI–DMA Polyamines, of latest revision.

2. Whether the recommended compliance with NSF/ANSI 60, Drinking Water Treatment Chemicals—Health Effects is to be required. If this certification is to be required, the purchase documents shall read, "This material shall be certified as suitable for treatment of drinking water by an accredited certification program in accordance with NSF/ANSI 60, Drinking Water Treatment Chemicals—Health Effects."

3. Compliance with USEPA Phase II Rule National Primary Drinking Water Regulations, epichlorohydrin treatment technique requirements (40 CFR 141.111).

4. Approval by or certification as meeting any applicable state, local, or provincial requirements.

5. The EPI–DMA polyamines supplied according to this standard shall contain no substances in quantities capable of producing deleterious or injurious effects on those consuming water that has been treated with EPI–DMA polyamines in accordance with the supplier's recommendations and within the maximum allowed dosage.

Upon request, the supplier shall provide an estimate of the impurities. This estimate shall be based on the maximum concentration of residual monomer (dimethylamine, epichlorohydrin) or impurity present and shall be reported as less than or equal to the maximum concentration.

NOTE: It may not be possible for the supplier to routinely provide the precise value of the residual impurities of each EPI–DMA polyamines shipment. Such measurements are conducted on each manufactured batch, which may then be continuously added to bulk storage tanks from which shipments are continuously extracted.

6. User-specific requirements.

a. Description of application.

b. Estimated annual purchase requirements lb (kg).

c. Typical order quantity lb (kg).

d. Packaging (pails, drum and drum size, drum types, returnable semibulk containers, nonreturnable semibulk containers, bulk by truck, bulk by rail).

e. Delivery requirements (need for: truck with a lift gate; length and coupling sizes of hose needed for bulk delivery; transfer pump; allowed times of delivery; limitations on truck size or weight; sampling protocol; other).

f. Order lead time (number of working days between order placement and delivery necessary if typical lead times are not sufficient).

g. Shipping and billing addresses.

h. Financial terms.

i. Insurance/performance bond requirements.

j. Physical property limitations: If the purchaser knows that certain physical properties cannot be handled by the storage or feed equipment, these properties should be stated.

7. Other user-specific requirements.

8. Sampling requirements (Sec. 5.2).

9. Polymer content. If the purchaser does not know which type of EPI–DMA polyamine is required, the purchaser need not specify the polymer content. Once a

specific product and supplier are chosen, the supplier should be required to provide the percent by weight of polymer in the product.

10. Specific physical and chemical product properties (quality control). Minimum requirements for determining specific product properties should include visual inspection, total solids, and Brookfield viscosity.

a. Visual inspection (Sec. 4.5.1 and 5.3). A quick, useful qualitative test for EPI–DMA polyamines products.

b. Total solids (Sec. 4.5.2 and 5.4.1). Should be used as a requirement as it relates to active polymer content and is important information needed to interpret other tests.

c. Brookfield viscosity (Sec. 4.3.3, 4.3.4, 5.4.2, and 5.4.3). Many suppliers provide for each product the Brookfield viscosity ranges of both a specific concentration of the product and the bulk (undiluted) product. The product concentration and specific Brookfield viscosity test procedure used by the supplier should be used whenever possible. Once a specific EPI–DMA polyamine product has been chosen, the measurement of bulk Brookfield viscosity is a valuable way to determine if there may be a product quality variation. If multiple EPI–DMA polyamine products are being evaluated, the measurement of Brookfield viscosity of a specific polymer solution concentration can be a helpful means of comparison.

d. pH of a solution (Sec. 5.4.4). The pH of EPI–DMA polyamines might be helpful in confirming a quality problem but the pH itself does not directly relate to polymer performance. Many suppliers provide the pH range of a specific concentration of each product.

11. Notice of nonconformance (Sec. 5.5).

12. Manufacturing location contact for quality control inquiries (Sec. 5.6).

13. Marking requirements (Sec. 6.1).

14. Shipping requirements (Sec. 6.2).

15. Affidavit of compliance (Sec. 6.3).

16. Product performance. Performance evaluation via a laboratory jar test or other performance test is essential for confirming EPI–DMA polyamine activity. It is the only way to consider possible changes in the water composition, temperature, or in the type or amount of other chemicals added along with the EPI–DMA polyamines.

III.B. *Modification to Standard.* Any modification of the provisions, definitions, or terminology in this standard must be provided by the purchaser.

IV. Major Revisions. Major changes made to the standard in this revision include the following:

1. A limit was placed on the allowable concentration of Dimethylamine of 1.2 percent by weight (Sec. 4.6).
2. Sec. 5.1, material origin outside of North America was removed.
3. Additional marking requirements (Sec. 6.1) include production facility identification that is traceable through the supplier to the location of production.

V. Comments. If you have any comments or questions about this standard, please call the AWWA Volunteer & Technical Support Group at 303.794.7711, FAX at 303.795.7603, write to the group at 6666 West Quincy Avenue, Denver, CO 80235-3098, or e-mail standards@awwa.org.

This page intentionally blank.

ANSI/AWWA B452-06
(Revision of ANSI/AWWA B452-98)

American Water Works Association

AWWA Standard

EPI–DMA Polyamines

SECTION 1: GENERAL

Sec. 1.1 Scope

This standard describes epichlorohydrin dimethylamine (EPI–DMA) polyamines for water supply service applications.

Sec. 1.2 Purpose

The purpose of this standard is to provide the minimum general requirements for EPI–DMA polyamine products, including physical, chemical, packaging, shipping, and testing requirements and to provide the means of developing requirements for specific EPI–DMA polyamine products.

Sec. 1.3 Application

This standard can be referenced in specifications for purchasing and receiving EPI–DMA polyamine products and can be used as a guide for testing the physical and chemical properties of EPI–DMA polyamine product samples. The stipulations of this standard apply when this document has been referenced and only to EPI–DMA polyamines used in water supply service applications.