ANSI/AWWA B303-10
(Revision of ANSI/AWWA B303-05)

American Water Works Association

The Authoritative Resource on Safe Water®

AWWA Standard

Sodium Chlorite

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Committee Personnel

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

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Contents

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

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Foreword

This foreword is for information only and is not a part of ANSI/AWWA B303.*

I. Introduction.

I.A. *Background.* Sodium chlorite, $NaClO_2$, is made by the partial reduction of sodium chlorate to chlorine dioxide and the chlorine dioxide's subsequent conversion to sodium chlorite in an alkaline solution in the presence of hydrogen peroxide. An excess of both peroxide and caustic is present to ensure complete reaction as follows:

$$2ClO_2 + H_2O_2 + 2NaOH \rightarrow 2NaClO_2 + 2H_2O + O_2$$

Under unfavorable conditions, ClO_2 is also known to dissociate to chloride and chlorate as follows:

$$ClO_2 + 2OH^- \rightarrow ClO_2^- + ClO_3^- + H_2O$$

Any chlorine present would be in the hypochlorite form because of the strong alkaline conditions. Any chlorate ion so formed is recycled through the process to optimize recovery of sodium chlorite. Hypochlorite will react with hydrogen peroxide to yield chloride as follows:

$$OCl^- + H_2O_2 \rightarrow Cl^- + O_2 + H_2O$$

Because there is no source of ammonia or nitrogen in the process, chloramines will not be present as an impurity.

Sodium chlorite is a dry flaked salt, which, because of its powerful oxidizing nature, is shipped in steel drums bearing Department of Transportation (DOT) Yellow (Class 5.1) oxidizer labels. Dry flaked material is formulated by mixing sodium chlorite solutions with stabilizing salts in solution prior to either drying or filtering. The drying or filtering may be coincidental with spraying under atomizing conditions to achieve particle uniformity for flaking characteristics. As marketed in the solid form, sodium chlorite contains approximately 80 percent by weight sodium chlorite; in the aqueous form, it contains approximately 40 percent or less by weight sodium chlorite. Technical sodium chlorite is a white flaked salt with a density of approximately 56 lb/ft^3 (0.90 g/cc). Some material may have a tint of orange, depending on the iron content. Sodium chlorite is stable when sealed or in solution but can ignite in the presence of organic materials. For this reason, the solution should not be allowed to dry out on floors but should be hosed down with minimum splashing.

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

Sodium chlorite dissolves easily in water at ordinary temperatures to form a pale yellow solution. This solution is chemically stable under ordinary temperature and pressure conditions. Solutions above 25–30 percent weight per weight (w/w) may crystallize at moderate ambient temperatures. Crystallization temperatures may vary due to solutions originating either from dilution of slurried or dried materials.

Sodium chlorite used for the onsite production of chlorine dioxide for use as a disinfectant in the treatment of drinking water or for pesticidal use in processing plant-flume water, sewage treatment, slime control in paper mills, and bacteria control in oil wells requires US Environmental Protection Agency (USEPA) registration. Sodium chlorite to be sold and used for drinking water treatment must be registered under a label or labels indicating these uses.

I.B. *History.* The original ANSI/AWWA Standard for Sodium Chlorite was prepared by Committee 7440P. The standard was approved as tentative on Jan. 25, 1965, and made a standard by the AWWA Board of Directors on June 1, 1967. The standard was designated ANSI/AWWA B303-67.

The AWWA Standards Committee on Chlorine, Chlorine Compounds, and Related Alkalies prepared the 1988 edition, which was approved on June 19, 1988. The AWWA Standards Committee on Disinfectants prepared the 1995 edition, which was approved on June 17, 1995. Subsequent editions of ANSI/AWWA B303 were approved on June 11, 2000, and Jan. 16, 2005. This edition was approved on June 20, 2010.

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, now 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 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

* Water Research Foundation, 6666 W. Quincy Avenue, Denver, CO 80235.

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

direction of NSF, NSF*/ANSI 60, Drinking Water Treatment Chemicals—Health Effects, and NSF/ANSI 61, Drinking Water System Components—Health Effects.

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 B303 addresses additives requirements in Sec. 4.4.3 of the standard. The transfer of contaminants from chemicals to processed water or to residual solids is becoming a problem of greater concern. The language in Sec. 4.4.3 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 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 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. *Handling, Storage, and Safety Precautions.* Aqueous sodium chlorite solution is shipped in stainless-steel and fiberglass tank trucks according to US Department of Transportation (DOT) regulations. The temperature in the tanks is maintained to avoid crystallization. On receipt, the purchaser should dilute the solution appropriately to prevent the crystallization of sodium chlorite. As received in loose-fake form in metal containers, sodium chlorite will tolerate some rough handling.

Sodium chlorite in contact with acid will react with rapid evolution of chlorine dioxide gas. When heated above 347°F (175°C), dry sodium chlorite will decompose rapidly, liberating oxygen, with the evolution of sufficient heat to make the

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

decomposition self-sustaining. If the decomposition of sodium chlorite is contained, as in closed containers, the effect is explosive. Therefore, sodium chlorite should be protected at all times from exposure to heat. In case of ignition, normal firefighting equipment is relatively ineffective because sodium chlorite supplies its own oxygen. The temperature of a sodium chlorite fire may exceed 3,992°F (2,200°C), and steam explosions may result if water is sprayed directly on burning material. Mist settings on nozzles should be used to cool burning material after the drums have been isolated.

As a general rule, flammables should be kept away from areas where oxidizing agents, such as sodium chlorite, are stored. Sodium chlorite should be stored only in an enclosed space specially prepared for this purpose. This storage area should be kept cool and should be well ventilated and fireproof. Sodium chlorite should be removed from the storage room only as needed for immediate use. Nonreturnable shipping containers should be properly disposed of as soon as they are empty. The shipping containers should never be used for any other purpose after they are empty.

Sodium chlorite is a very active, strongly oxidizing chemical that, in solid form, reacts strongly with acids, sulfur, combustibles, and organic materials, such as wood, rubber, fats, and oils. When sodium chlorite is to be removed from a drum, a clean nonmetallic scoop or vessel uncontaminated with foreign matter should be used. Dried or caked material should never be chipped or crushed as ignition may result. Complete instructions for the storage and safe handling of sodium chlorite should be obtained from the manufacturer.

Protective clothing should be worn when handling sodium chlorite. Plastic gloves and eye protection should be worn as precautionary measures. Sodium chlorite is poisonous if ingested. If any sodium chlorite comes into contact with clothing or other combustible material (such as paper towels or cotton mops), spontaneous ignition may occur upon drying. The clothing or combustible material should be immediately soaked in water to remove all trace of the sodium chlorite or subsequently incinerated without delay. Refer to material safety data sheets (MSDS) available from the chemical manufacturer or supplier for additional information.

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.

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

1. Standard used—that is, ANSI/AWWA AWWA B303, Standard for Sodium Chlorite, of latest revision.

2. Whether compliance with NSF/ANSI 60, Drinking Water Treatment Chemicals—Health Effects, is required.

3. Method of shipment desired.

4. Details of other federal, state or provincial, and local requirements (Sec. 4.1).

5. Quantity and form of sodium chlorite required (Sec. 4.2).

6. Sodium chlorite content required (Sec. 4.3).

7. 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. 5.3 through 5.10, demonstrate that the product meets the standard. Failure to meet the standard or the absence of, or irregularities in, seals may be sufficient cause to reject a shipment.

8. Whether alternative security measures have been adopted to replace or augment the security measures set out in Sec. 6.2.3 and 6.2.4.

9. Size and type of containers (Sec. 6.2).

10. An affidavit of compliance, or certified analysis, or both, if required (Sec. 6.3).

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. Inclusion of a requirement for compliance with the Safe Drinking Water Act and other federal regulations (Sec. 4.1).

2. Inclusion of a requirement for tamper-evident packaging (Secs. 6.2.3 and 6.2.4).

V. Comments. If you have any comments or questions about this standard, please call AWWA Engineering and Technical Services 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 the group at standards@awwa.org.

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Sodium Chlorite

SECTION 1: GENERAL

Sec. 1.1 Scope

This standard describes sodium chlorite, in either solid (granular, flake, or powdered) or aqueous-solution form, for use in making chlorine dioxide for use in the treatment of potable water, wastewater, and reclaimed water. Sodium chlorite must be packaged, labeled, and registered according to the Federal Insecticide, Fungicide, and Rodenticide Act as administered by the US Environmental Protection Agency (USEPA).

Sec. 1.2 Purpose

The purpose of this standard is to provide purchasers, manufacturers, and suppliers with the minimum requirements for sodium chlorite, including physical, chemical, sampling, packaging, shipping, and testing requirements.

Sec. 1.3 Application

This standard can be referenced in documents for purchasing and receiving sodium chlorite and can be used as a guide for testing the physical and chemical properties of sodium chlorite samples. The stipulations of this standard apply when this document has been referenced and then only to sodium chlorite used in the treatment of potable water, wastewater, and reclaimed water.