

ANSI/AWWA **B512-23**
(Revision of ANSI/AWWA B512-15)

AWWA Standard

Sulfur Dioxide

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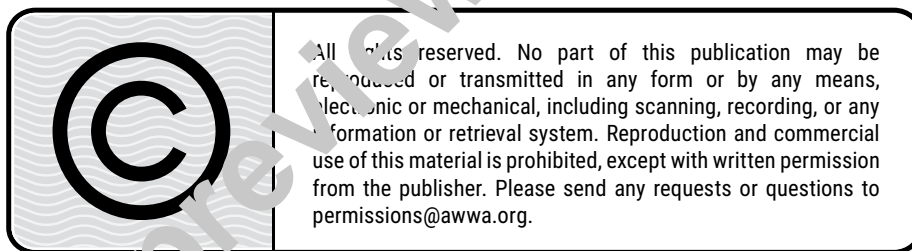
AWWA Standard

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Committee Personnel

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

Nathan K. Dunahee, *Chair*

General Interest Members

N.K. Dunahee, Burns & McDonnell, Kansas City, Mo.

N.J. Edman (*liaison, nonvoting*), Standards Group Liaison, AWWA, Denver, Colo.

T. Gillogly, Carollo Engineers, Inc., Walnut Creek, Calif.

M.V. Liga, LAN Inc., Houston, Tex.

C.B. Lind, Flanders, N.J.

M.S. Reed (*liaison, nonvoting*), City of Fort Worth, Fort Worth, Tex.

Producer Members

J.E. Boll, Carus Corporation, Peru, Ill.

J.M. Gonzalez, PVS Technologies Inc., Johns Island, S.C.

User Members

B.E. Perron, Salem-Beverly Water Supply Board, Beverly, Mass.

M. Ramon, City of Houston, Houston, Tex.

G. Terrell, Birmingham, Ala.

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Foreword

This foreword is for information only and is not a part of ANSI/AWWA B512.

I. Introduction.

I.A. *Background.* Sulfur dioxide (SO₂), or sulfurous oxide, is a colorless, nonflammable, pungent, suffocating gas. This reducing agent is widely used to remove chlorine and other oxidants from water. Sulfur dioxide is corrosive to mild steel if moisture is present.

Sulfur dioxide is manufactured by burning sulfur in air or from the roasting and smelting of sulfide ores. Generally, sulfur dioxide is purified by using intricate scrubbing methods to remove metal impurities. The sulfur dioxide gas is compressed to form liquid sulfur dioxide, which can then be fed either as a liquid or as a gas. Sulfur dioxide liquid or gas is commercially available at nominally 100 percent strength.

Sulfur dioxide dosage for dechlorination is based on the level of residual chlorine to be removed. The required theoretical dosage for dechlorination is 0.9 mg/L of SO₂ per 1.0 mg/L of residual chlorine (not chlorine dosage). In practice, a ratio of 1:1 is generally used.

Sulfur dioxide mixed with water reacts almost instantaneously with chlorine, converting the chlorine (Cl₂) to chloride (Cl⁻) and the residual sulfur dioxide to sulfate (SO₄²⁻).

When plant capacity is expressed in million gallons per day (mgd), the sulfur dioxide feed rate in pounds per day (lb/d) can be calculated using the following formula:

$$\text{SO}_2 \text{ lb/d} = \text{Cl}_2 \text{ residual ppm} \times 8.34 \times \text{mgd of plant}$$

The following properties of sulfur dioxide (SO₂) may be useful:

Odor	Pungent
Melting point	-99°F (-72.7°C)
Boiling point at atmosphere	14.0°F (-10°C)
Specific gravity of liquid at 0°C (water = 1)	1.434
Specific gravity at 80°F (27°C)	1.363
Critical temperature	314.8°F (157.1°C)
Molecular weight	64.06

For additional information on chemical and physical properties and safety information, refer to the technical information and safety data sheet (SDS) available

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

from the supplier or manufacturer and the Compressed Gas Association's (CGA's) booklet CGA G-3, *Sulfur Dioxide*.[†]

I.B. *History.* The first edition of ANSI/AWWA B512, Sulfur Dioxide, was developed by the AWWA Standards Committee on Taste and Odor Control Chemicals and approved by the AWWA Board of Directors on Jan. 27, 1991, with an effective date of June 1, 1991. Subsequent revisions of ANSI/AWWA B512 were approved on June 15, 1997; Jan. 20, 2002; Jan. 27, 2008; and Jan. 24, 2015. This edition was approved on March 13, 2023.

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 (formerly AwwaRF) and the Conference of State Health and Environmental Managers (COSHEM). 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 four standards developed under the direction of NSF[§]: NSF/ANSI/CAN 153, Drinking Water Treatment Chemicals—Health Effects; NSF/ANSI/CAN 154, Drinking Water System Components—Health Effects; NSF/ANSI/CAN 372, Drinking Water System Components—Lead Content; and NSF/ANSI/CAN 600, Health Effects Evaluation and Criteria for Chemicals in Drinking Water.

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

NSF/ANSI/CAN 600 (which formerly appeared in NSF/ANSI/CAN 60 and 61 as Annex A, "Toxicology Review and Evaluation Procedures") does not stipulate a

[†] Compressed Gas Association Inc., 8484 Westpark Drive, Suite 220, McLean, VA 22102.

[‡] Persons outside the United States should contact the appropriate authority having jurisdiction.

[§] NSF International, 789 North Dixboro Road, Ann Arbor, MI 48105.

[¶] Standards Council of Canada, 55 Metcalfe Street, Suite 600, Ottawa, ON K1P 6L5 Canada.

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 NSF/ANSI/CAN 600 procedures may not always be identical, depending on the certifier.

ANSI/AWWA B512 addresses additives requirements in Sec. 4.3.2 of the standard. The transfer of contaminants from chemicals to processed water or to residual solids is becoming a problem of great 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 NSF/ANSI/CAN 600 *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. *Safety.* Sulfur dioxide is a colorless, nonflammable, pungent gas or liquid with a vapor density of 2.26. Sulfur dioxide reacts with water or free moisture to form sulfurous acid, which is corrosive.

The odor threshold for sulfur dioxide is usually 0.3–2.5 ppm. Levels of 20 ppm usually cause coughing, while short exposures to 400–500 ppm may be fatal. The Occupational Safety and Health Administration (OSHA) has set the permissible exposure level (PEL) for sulfur dioxide at 5 ppm as the 8-h time-weighted average (TWA). National Institute for Occupational Safety and Health (NIOSH) and California Occupational Safety and Health Act of 1973 (Cal/OSHA) have 8-h TWA PEL of 3 ppm and short-term exposure level (STEL) of 5 ppm because sulfur dioxide is irritating to the respiratory system and corrosive to the eyes and skin, and it causes burns.

When handling sulfur dioxide, wear chemical safety glasses, rubber gloves, and rubber protective clothing. For additional information, study the supplier’s SDS.

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 B512, Sulfur Dioxide, of latest revision.
2. Whether compliance with NSF/ANSI/CAN 60, Drinking Water Treatment Chemicals—Health Effects, is required.
3. Details of federal, state, provincial, territorial, and local requirements. (Section 4).
4. The grade or purity required (see Sec. 4.1, Sec. 4.2, and Sec. 4.3).
5. Whether the purchaser will reject product from containers or packaging with missing or damaged seals. The purchaser may reject product from milk containers or packages with missing or damaged seals unless the purchaser's tests of representative samples, conducted in accordance with Sec. 5.1 through Sec. 5.3, 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 the shipment.
6. If the purchaser desires to sample and analyze shipments received, agreement with the supplier as to the number of samples to be taken is necessary (Sec. 5.1.3.1).
7. If required, an affidavit of compliance or certificate of analysis (Sec. 5.4 and Sec. 6.3).
8. Size of containers (Sec. 6.2).
9. Quantity required (see Sec. 6.2.1.1).
10. Whether alternative security measures have been adopted to replace or augment the security measures set out in Sec. 6.2.2 and Sec. 6.2.3.

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

IV. Major Revisions. Major revisions made to the standard in this edition include the following:

Minor boilerplate language updates in the following sections:

- I.C. Acceptance
- III.A. Purchaser Options and Alternatives
- Section 2: References
- Section 4: Requirements
- Sec. 4.3.2 Product Certifications

- Sec. 5.5 Notice of Nonconformance
 - Sec. 6.3 Affidavit of Compliance.
2. Updated values in II.A. Safety
 3. Updated catalog numbers in Sec. 5.3.3 Water—Karl Fischer titrimetric method.

V. Comments. If you have any comments or questions about this standard, please contact AWWA Engineering and Technical Services at 303.794.7711; write to the department at 6666 West Quincy Avenue, Denver, CO 80235-3098; or email at standards@awwa.org.

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**American Water Works
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ANSI/AWWA B512-23
(Revision of ANSI/AWWA B512-15)

AWWA Standard

Sulfur Dioxide

SECTION 1: GENERAL

Sec. 1.1 Scope

This standard describes sulfur dioxide, a compressed, nonflammable liquefied gas, for use in the treatment of potable water, wastewater, or reclaimed water to remove excess residual chlorine.

Sec. 1.2 Purpose

The purpose of this standard is to provide the minimum requirements for sulfur dioxide, including physical, chemical, sampling, testing, packaging, and shipping requirements.

Sec. 1.3 Application

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