ANSI/AWWA B511-17
(Revision of ANSI/AWWA B511-10)

American Water Works Association

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AWWA Standard

Potassium Hydroxide

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AWWA Standard

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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 B511.*

I. Introduction.

I.A. *Background.* Technical grades of potassium hydroxide, KOH, are also known as caustic potash. Potassium hydroxide is produced electrolytically from potassium chloride in accordance with the reaction:

$$2KCl + 2H_2O \rightarrow 2KOH + Cl_2\uparrow + H_2\uparrow$$

Chlorine and hydrogen gases are also formed in the process.

The electrolytic cell process produces potassium hydroxide solutions of approximately 30 percent strength. Solutions of 45 to 50 percent strength are prepared by further concentration by evaporation.

Potassium hydroxide is available in liquid form in three concentrations: 10 percent, 45 percent, and 50 percent KOH by weight. The 45 percent concentration begins to crystallize at approximately –18°F (–28°C), and the 50 percent concentration begins to crystallize at approximately 50°F (10°C). Potassium hydroxide is also available in a dry form containing at least 90 percent KOH. Dry KOH is available in various forms, such as flake, ground, crystal, beaded, and prilled, which become tacky in air because KOH is hygroscopic. Hence, KOH usually contains some amount of water and impurities as carbonates.

Liquid KOH is usually shipped in insulated tank cars or tank trucks and should arrive at the receiving point in liquid form. Depending on geographical location, tank cars are usually equipped with coils for steam heating. When unloading the potassium hydroxide, the manufacturer's unloading procedures should be followed. In climates where storage temperatures are below the solidification point for the concentration of potassium hydroxide received, the material may be diluted upon unloading to a concentration that will not solidify or require heated storage. Softened water should be used to dilute potassium hydroxide to prevent precipitation of calcium and/or magnesium carbonate, which can clog feed equipment, particularly within small-diameter piping (nominal diameter < ½ in. [1.27 cm]) or tubing.

If the dry form of potassium hydroxide is used, it should be carefully dissolved in water to prepare the desired solution strength.

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A potassium hydroxide solution may be fed by using conventional liquid chemical–feeding equipment. However, when purchasing chemical-feeding equipment, the purchaser should specify that it will be used to handle a corrosive caustic solution.

I.B. *History.* The first edition of the standard for potassium hydroxide was prepared under the direction of the AWWA Standards Committee on Softening and Conditioning Chemicals. It was designated ANSI/AWWA B511-90, Standard for Potassium Hydroxide, approved by the AWWA Board of Directors on June 17, 1990, and had an effective date of Feb. 1, 1991. Subsequent editions were approved on Feb. 9, 1996; Jan. 23, 2000; Jan. 16, 2005; and Jan. 17, 2010. This edition was approved on Jan. 14, 2017.

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). 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.

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 jurisdictions. 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

* Water Research Foundation, 6666 West Quincy Avenue, Denver, CO 80235.
† Persons outside the United States should contact the appropriate authority having jurisdiction.
‡ NSF International, 789 North Dixboro Road, Ann Arbor, MI 48105.
§ American National Standards Institute, 25 West 43rd Street, Fourth Floor, New York, NY 10036.

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 B511 addresses additives requirements in Sec. 4.3.3 of the standard. The transfer of contaminants from chemicals to processed water or the residual solids is becoming a problem of great concern. The language in Sec. 4.3.3 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 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. *Handling Precautions.* Handling of all forms of potassium hydroxide involves several extreme hazards. Considerable heat is generated in the solution or dilution process; therefore, the rate of dilution and the method of cooling should be carefully controlled to prevent boiling or splattering of the liquid. Potassium hydroxide by itself is noncombustible. However, contact with moisture or water may generate sufficient heat to ignite combustible materials. Potassium hydroxide is highly soluble in water at ambient temperature with a solubility of 1.21 kg/L at 25°C (77°F). Both dry and liquid forms rapidly absorb moisture and carbon dioxide from the atmosphere.

KOH solutions in the range of 0.2 to 2.0 percent by weight are irritating on skin or body contact, and higher concentrations are corrosive. Potassium hydroxide can cause severe burns to the skin and eyes; therefore, workers handling it must wear complete protective equipment, including chemical safety goggles. If the possibility of exposure to potassium hydroxide is high, for example during unloading operations, a full-face shield should also be worn. Nonaluminum hard hats are recommended for protection from overhead leaks and splashes.

Boots and gloves should be made of polyvinyl chloride (PVC) or neoprene. Outer clothing should be made of cotton or from suitable synthetic materials such as butyl rubber, natural rubber, nitrile, PVC, or Tychem (potassium hydroxide destroys wool and leather). A neoprene apron will provide additional protection. If the possibility of exposure is high, full suits of neoprene or polyvinyl chloride are recommended. Shirts

should have long sleeves and snug-fitting cuffs. The collars should be buttoned. Trouser bottoms should extend over boot tops. KOH reacts with ammonium salts to produce ammonia and may cause fire. It also reacts violently with acids and is corrosive to most metals in moist air and in solutions with liberation of combustible/explosive hydrogen gas. It attacks some types of plastics, rubber, and coatings.

A full-face-piece respirator approved by the National Institute for Occupational Safety and Health (NIOSH) or the Mine Safety and Health Administration (MSHA) for dusts and mists should be worn when handling dry potassium hydroxide.

Emergency shower and eyewash units should be located near feeding and pumping equipment, where potassium hydroxide is sampled, and where tank cars or trucks are unloaded. Refer to the safety data sheets (SDSs) available from the vendor or manufacturer 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 B511, Potassium Hydroxide, of latest revision.

2. Quantity of potassium hydroxide required.

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

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

5. Type of material—dry or liquid (Sec. 4.2). If dry is ordered, whether ground, flake, crystal, beaded, pulled, or other is desired.

6. For liquid potassium hydroxide, the minimum percentage of potassium hydroxide (Sec. 4.2.2).

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. 5.2, 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.

8. Whether alternative security measures have been adopted to replace or augment the security measures set out in Sec. 6.2.5 and 6.2.6.

9. Form of shipment—bulk or package and the type and size of container (Sec. 6.2).

10. If an affidavit of compliance or certified analysis or both are 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 new language in the Notice of Nonconformance section (Sec. 5.3).

2. Inclusion of new language in the Marking section (Sec. 6.1).

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 department at 6666 West Quincy Avenue, Denver, CO 80235-3098; or email at standards@awwa.org.

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Potassium Hydroxide

SECTION 1: GENERAL

Sec. 1.1 Scope

This standard describes the use of potassium hydroxide (KOH), dry and liquid, for use in the treatment of potable water, wastewater, and reuse or reclaimed water.

Sec. 1.2 Purpose

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

Sec. 1.3 Application

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