



**American Water Works  
Association**

*Dedicated to the World's Most Important Resource®*

**ANSI/AWWA B200-17**  
(Revision of ANSI/AWWA B200-12)

**AWWA Standard**

# Sodium Chloride

Effective date May 1, 2017.  
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Approved by American National Standards Institute Jan. 24, 2017.



# Committee Personnel

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

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\* Liaison, nonvoting

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# Foreword

*This foreword is for information only and is not a part of ANSI/AWWA B200.*

## **I. Introduction.**

I.A. *Background.* Bedded salt<sup>†</sup> deposits are the remains of ancient seas that have evaporated. Bedded deposits occur in horizontal layers of the mineral halite. These layers range from several feet to hundreds of feet (meters) in thickness and are between several feet and several thousand feet (meters) below the surface of the earth. Some bedded deposits between 25,000 ft and 50,000 ft (7,600 m and 15,200 m) below the surface of the earth have been subjected to pressures that have caused the salt to move upward through overlying sedimentary layers toward the Earth's surface. Presently, these deposits exist as domes of nearly pure salt that may be as large as 2 mi (3.2 km) in diameter and are sometimes found within a few feet of the Earth's surface.

Concentrated brine<sup>†</sup> is found in surface lakes or underground pools. Along sea-coasts, the oceans provide a virtually unlimited source of salt.

Rock salt is produced by the conventional room-and-pillar mining method. After sinking a shaft to the salt level, the face, or vertical area, is drilled and may be undercut. The drill holes are loaded with explosives, and the explosives are detonated. The fragmented salt that results is crushed, screened, transported to the shaft, and hoisted to the surface.

Solar salt is produced by the natural evaporation of seawater or more concentrated brine from surface lakes or underground formations in shallow ponds.

Solution-mined brine, from which evaporated salt is produced, is obtained by drilling wells into bedded or domal rock-salt deposits and injecting water into the deposit. The water dissolves the rock salt to produce a saturated brine. Salt deposits can be solution-mined through a single set of concentric pipes or through two or more separate pipes within the same deposit. The brine can then be evaporated to produce dry salt by vacuum-pan evaporation or modifications of vacuum-pan evaporation, grainer evaporation, or the Alberger process.

In vacuum-pan evaporation, cubic "vacuum-granulated" salt crystals form in the brine during evaporation and are removed as a slurry, which is then dewatered and dried.

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

† The terms *salt* and *brine* are used to describe the chemical compound sodium chloride (NaCl).

word and revised definitions, limits, and test procedures. The 1993 edition included a revised acceptance statement and definitions. The 1998 edition of ANSI/AWWA B200 was revised to conform to AWWA standard style. The ninth edition of ANSI/AWWA B200 was approved by the AWWA Board of Directors on June 11, 2006. The last revision was approved on Jan. 22, 2012. 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 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 B200 addresses additives requirements in Sec. 4.3 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. 4.3.4 is a recommenda-

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

† NSF International, 789 North Dixboro Road, Ann Arbor, MI 48105

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

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 changes made to the standard in this revision include the following:

1. Sec. 6.2.6.2, Chain of Custody, was revised to be a requirement.

2. Sec. 6.3, Affidavit of Compliance, was revised to request the affidavit be provided by the manufacturer of the product and not the supplier.

**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](mailto:standards@awwa.org).



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# Sodium Chloride

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## SECTION 1: GENERAL

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### **Sec. 1.1 Scope**

This standard describes sodium chloride in the forms of rock, vacuum-granulated, compressed vacuum-granulated, solar, and compressed solar salt for use in the recharging of cation-exchange materials in water supply service for softening municipal and industrial potable water, wastewater, and reclaimed water supplies. Additionally, sodium chloride is used in the recharging of anion-exchange materials for nitrate removal or dealkalization of municipal and industrial supplies.

### **Sec. 1.2 Purpose**

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

### **Sec. 1.3 Application**

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

9. *Solar salt*: Salt produced by evaporating, via the action of sun and wind, seawater, lake brine, or saline groundwater in shallow ponds.

10. *Supplier*: The party that supplies materials or services. A supplier may or may not be the manufacturer.

11. *Tamper-evident packaging*: Packaging having one or more indicators or barriers to entry that 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, closed, and sealed bags and trucks or trailers with locking devices constitute two effective forms of tamper-evident packaging.

12. *Vacuum-granulated salt*: Salt produced by evaporation of brine under special conditions designed to control crystal size and purity.

13. *Wastewater*: A combination of the liquid and water-carried waste from residences, commercial buildings, industrial plants, and institutions, together with any groundwater, surface water, and stormwater that may be present.

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## SECTION 4: REQUIREMENTS

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### Sec. 4.1 Physical Requirements

4.1.1 *General*. The material shall be homogenous and in a crystalline, granular, or compressed form.

4.1.2 *Foreign matter*. The material shall be free from dirt, fibers, lint, chips, trash, or other foreign matter.

4.1.3 *Color*. The material shall be white, grayish pink, brown, or brownish white, or of a distinguishing color added by the producer.

4.1.4 *Fineness*.\*

4.1.4.1 Rock salt shall be of such fineness that 100 percent of it shall pass a ¾-in. (19-mm) sieve and not more than 5 percent of it shall pass a No. 60 (0.25-mm) sieve.

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\* Sieve numbers referred to in this standard are US Standard Sieve Series numbers, as specified in ASTM E11.

**Table 1 Maximum impurity limits**

	Maximum Limit—Percent by Weight				
	Rock Salt	Vacuum-Granulated Salt	Compressed Vacuum-Granulated Salt	Solar Salt	Compressed Solar Salt
Moisture	3.00	0.20	0.50	3.00	0.50
Dry Basis					
Water-soluble impurities					
Calcium and magnesium (Ca and Mg)	1.50	0.15	0.15	0.60	0.60
Sulfate (SO <sub>4</sub> )	3.00	0.35	0.35	1.40	1.40
Water-insoluble impurities	2.00	0.05	0.05	0.15	0.15
Total impurities (soluble + insoluble)	4.00	0.50	0.50	2.00	2.00
Grease, fat, or oil	0.01	0.01	0.01	0.01	0.01

4.3.4 *Product certifications.* Sodium chloride is a direct additive used in the treatment of potable water. This material should be certified as suitable for contact with, or treatment of, drinking water by an accredited certification organization in accordance with NSF/ANSI 60. Evaluation shall be accomplished in accordance with requirements that are no less restrictive than those listed in NSF/ANSI 60. Certification shall be accomplished by a certification organization accredited by the American National Standards Institute.

## SECTION 5: VERIFICATION

### Sec. 5.1 Inspection

If desired by the purchaser, the shipment shall be inspected at the point of destination for evidence of foreign matter, such as dirt, fibers, lint, chips, or trash, that would be detrimental to the use of the salt.

### Sec. 5.2 Sampling

If an inspection is performed as specified in Sec. 5.1 and the shipment passes the inspection, sampling shall be as specified in this section.

5.2.1 *Sampling.* Samples shall be taken at the point of destination.

5. Test for water insolubles (see Sec. 5.5.1).
6. Save filtrate from water-insoluble test, dilute in a volumetric flask to a 1-L stock solution for subsequent analyses.

#### 5.2.6.2 Vacuum-granulated and compressed vacuum-granulated salt.

1. Obtain a dry sample (use procedure in Sec. 5.4.1).
2. Transfer 100-g sample to a 1-L volumetric flask.
3. Add 800 mL of distilled water and dissolve the salt.
4. Add 2 mL of concentrated hydrochloric acid (HCl) to solubilize water-insoluble calcium salts, particularly calcium carbonate (CaCO<sub>3</sub>).
5. Dilute to volume and mix to make stock solution for subsequent analyses.

### Sec. 5.3 Test Procedures—General

Sampling shall be conducted according to Sec. 5.2 of this standard. The purchaser shall complete the laboratory examination of the sample within five days after the shipment is received. Methods of testing sodium chloride shall conform to the procedures presented in the following sections. Alternative procedures shall only be used with the written approval of the purchaser. In any case of conflict, the methods of this standard shall prevail.

### Sec. 5.4 Moisture

#### 5.4.1 Procedure.

1. Weigh (to the nearest 0.01 g) 50 g of rock or solar salt or 100 g (to the nearest 0.01 g) of vacuum-granulated, compressed vacuum-granulated, or compressed solar salt, in an as-received condition, into a previously dried and tared moisture dish.
2. Place in an oven at 110°C. After 2 hours, remove to a desiccator; cool and weigh. Repeat until constant weight is obtained.

#### 5.4.2 Calculation.

$$\frac{\text{loss of weight} \times 100}{\text{weight of sample}} = \text{percent moisture} \quad (\text{Eq 1})$$

### Sec. 5.5 Insoluble Matter

#### 5.5.1 Procedure for rock, solar, and compressed solar salts.

1. Transfer a 200-mL prepared sample from Sec. 5.2.6.1 (Item 6) to a 1-L Erlenmeyer flask. Wash blender with 100 mL of distilled water. Add blender wash and 300 mL of distilled water to flask to obtain a total of 600 mL of water.

2. Ammonium purpurate indicator. A ground mixture of the dry powder and sodium chloride provides a stable form of indicator. Mix 0.20 g ammonium purpurate (murexide) with 100 g of reagent-grade NaCl and grind the mixture to pass a No. 40 to No. 50 sieve.

3. EDTA titrant, 0.0100*M*. Dissolve 3.72 g of the reagent grade of the disodium salt of EDTA in 1,000 mL of distilled water. Standardize against standard calcium solution using the procedure described in Sec. 5.6.2. Standard EDTA titrant, exactly 0.0100*M*, is equivalent to 0.4008 mg Ca per 1.00 mL of titrant used. Titrant should be kept in heat-resistant glass or plastic bottles. Molarity *M* is used in the Sec. 5.6.3 calculation.

4. Standard calcium solution. Dry several grams of calcium carbonate powder (primary standard or special reagent low in heavy metals, alkalis, and magnesium) at 110°C overnight or longer. Weigh 1.000 g into a 500-mL Erlenmeyer flask. Slowly add 1:1 HCl until all the CaCO<sub>3</sub> has dissolved. Add 200 mL of distilled water; boil to expel CO<sub>2</sub>. Cool, add a few drops of methyl red indicator, and adjust to the intermediate orange color by adding 3*N* NH<sub>4</sub>OH or 1:1 HCl, as required. Transfer quantitatively to a 1-L volumetric flask and fill to the mark with distilled water. This standard solution is equivalent to 0.4008 mg Ca per 1.00 mL. Also, the standard solution is equivalent to 1.000 mg CaCO<sub>3</sub> per 1.00 mL.

#### 5.6.2 Procedure.

NOTE: Because the indicator is unstable at the high pH in this procedure, the titration should be performed immediately after adding indicator to the alkaline solution.

1. Pipette a 50- to 100-mL aliquot of stock into a separate 400-mL beaker for rock-salt analyses (depending on purity), 50 mL for vacuum-granulated and 100 mL for solar and compressed salt, so that the calcium content is 5 to 100 mg.

2. Dilute to 200 mL with water, if necessary. Add 2.0 mL 1*N* NaOH solution or a volume sufficient to produce a pH of 12 to 13. Stir for a few minutes before titrating. The target pH for titration is 12.5, but this is measurable only with a "low-sodium error" glass electrode.

3. Add 0.1 to 0.2 g of the Sec. 5.6.1(Item 2) indicator mixture. Without delay, add EDTA titrant slowly and stir continuously until the color of the solution changes from pink to purple at the end point. Record the milliliters of EDTA titrant and use for calculation (Sec. 5.6.3).

4. Check the end point by adding 1 or 2 drops of titrant in excess to make certain that no further color change takes place.

3. If the reddish tint does not disappear, take another aliquot and add approximately 1 mL of inhibitor to the sample before adding the buffer and indicator. This serves as an inhibitor to interfering ions.

#### 5.7.4 Calculation.

$$\frac{M \text{ of EDTA} \times \text{mL EDTA} \times 10^5}{\text{mL of aliquot titrated}} = \begin{matrix} \text{mg/L total hardness} \\ \text{(TH) as CaCO}_3 \end{matrix} \quad (\text{Eq 4})$$

From Sec. 5.6.3,

$$\frac{M \text{ of EDTA} \times (\text{mL EDTA} \times 4.008) \times 10^4}{\text{mL of aliquot titrated}} = \text{mg/L Ca} \quad (\text{Eq 5})$$

$$\frac{(\text{TH} - 2.5 \text{ Ca})(2.432)(10^{-5})(\text{mL aliquot titrated})}{\text{grams of sample in aliquot}} = \begin{matrix} \text{percent magnesium} \\ \text{(Mg, dry basis)} \end{matrix} \quad (\text{Eq 6})$$

## Sec. 5.8 Sulfate

### 5.8.1 Reagents.

1. Hydrochloric acid, 2 percent by weight, in distilled water.
2. Barium chloride, 10 percent by weight, in distilled water.

### 5.8.2 Procedure.

1. To exactly 100 mL of the test solution (Sec. 5.2.6.1 and 5.2.6.2), add 2 mL of 2 percent hydrochloric acid and boil. While the solution is boiling, add a slight excess of barium chloride solution with rapid stirring and set aside at room temperature for approximately 18 hours.

NOTE: According to recognized authorities, 1-hour digestion of sulfate on a steam bath produces a precipitate of as high a quality as 18 hours standing at room temperature.

2. Filter through a tight quantitative (Whatman No. 42 or equivalent) filter paper and wash precipitate with hot distilled water until a 25-mL portion of the filtrate shows no more than a slight opalescence with silver nitrate.

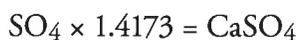
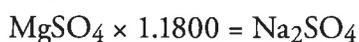
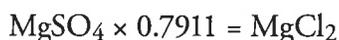
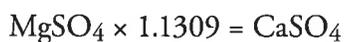
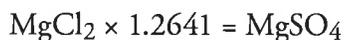
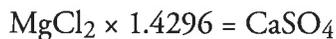
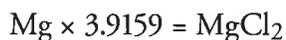
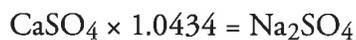
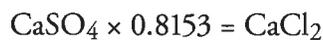
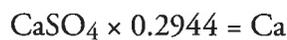
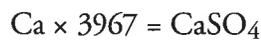
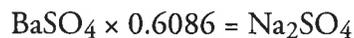
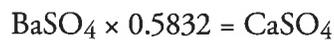
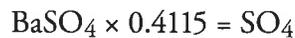
3. Place the filter paper containing the precipitate in an ignited, cooled, and weighed platinum or dried porcelain crucible and heat slowly over a low flame to char the filter paper without allowing it to catch fire. After complete charring, ignite to constant weight over an ordinary burner with the crucible uncovered, cooling in a desiccator between weighings.

NOTE: If charring of the paper is too rapid, some of the barium sulfate will be reduced to barium sulfide. If so, moisten the precipitate with concentrated sulfuric acid, carefully heat to expel the acid, and ignite.

## Sec. 5.11 Total Impurities

5.11.1 *Water-soluble impurities.* The calcium (Ca), magnesium (Mg), and sulfate ( $\text{SO}_4$ ) determined by chemical analysis shall be converted to  $\text{CaSO}_4$ ,  $\text{MgSO}_4$ ,  $\text{Na}_2\text{SO}_4$ ,  $\text{CaCl}_2$ , and  $\text{MgCl}_2$ . Convert sulfate to calcium sulfate ( $\text{CaSO}_4$ ) and the unused calcium to calcium chloride ( $\text{CaCl}_2$ ). If the sulfate in the sample exceeds the quantity necessary to combine with the calcium, convert the calcium to calcium sulfate ( $\text{CaSO}_4$ ) and the unused sulfate first to magnesium sulfate ( $\text{MgSO}_4$ ), and the remaining sulfate, if any, to sodium sulfate ( $\text{Na}_2\text{SO}_4$ ). Convert the unused magnesium to magnesium chloride ( $\text{MgCl}_2$ ). Each salt impurity shall be reported in percent by weight (dry basis) to the third decimal place.

5.11.2 *Conversion factors.*



5.11.3 *Total impurities.* The sum of the soluble impurities (either calcium and magnesium sulfate or chloride) plus the insoluble matter (Sec. 5.5) shall constitute the total impurities in the salt.

## Sec. 5.12 Sodium Chloride Assay

5.12.1 *Rock, solar, and compressed solar salt.* Report assay by difference to the first decimal place.

5.12.2 *Vacuum-granulated and compressed vacuum-granulated salt.* Report assay by difference to the second decimal place.

to applicable laws and regulations, including requirements established by the US Occupational Safety and Health Administration (OSHA).

6.1.2 *Optional.* Packages may also bear the statement: "Guaranteed by (name of manufacturer) to meet the requirements of ANSI/AWWA B200, Sodium Chloride," provided that the requirements of this standard are met.

## **Sec. 6.2 Packaging and Shipping**

Packaging and shipping of sodium chloride shall conform to current federal, state, and local regulations.

6.2.1 *Packaging.* Sodium chloride may be shipped in bulk or in 100-lb (45.4-kg) bags or other commercial packages as specified by the purchaser. Unless otherwise specified, the material shall be packaged in new substantial containers of the type, size, and kind commonly used for the purpose. The containers shall be constructed to ensure acceptance and safe delivery by common or other carriers at the lowest rate to the point of delivery called for in the contract or purchase order. Packages shall be strong enough to permit coarse crushing of the salt if the material becomes caked during storage.

6.2.2 *Bulk container inspection.* Bulk or semibulk containers, such as railcars, trailers, and unit hoppers, shall be carefully inspected by the supplier to ensure the absence of contaminating material before loading the sodium chloride.

6.2.3 *Net weight.* The net weight of packages shall not deviate from the recorded weight by more than  $\pm 2.5$  percent. If exception is taken to the weight of the material received, the exception shall be based on a certified unit weight of not less than 10 percent of the packages shipped and selected at random from the entire shipment.

6.2.4 *Weight certificate.* The purchaser may require that bulk shipments be accompanied by certified-weight certificates, or the weights may be checked by the purchaser at the point of delivery.

6.2.5 *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 on by the manufacturer and purchaser that provide a reasonable assurance of protection against tampering.

6.2.6 *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:

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