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Standard Specification for Sodium Chloride¹

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^{ε1} NOTE—10.1 was revised editorially in December 2020.

1. Scope

1.1 This specification covers sodium chloride intended for use as a deicer and for road construction or maintenance purposes.

1.2 The values stated as SI units are to be regarded as the standard.

1.3 For purposes of determining conformance to this specification, values for chemical analysis shall be rounded to the nearest 0.1 %, and values for grading shall be rounded to the nearest 1 %, in accordance with the rounding method in Practice E29.

1.4 The text of this specification references notes and footnotes that provide explanatory material. These notes and footnotes shall not be considered as requirements of the specification.

1.5 The following precautionary caveat pertains only to the test method in Annex A1 of this specification: *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.6 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

¹ This specification is under the jurisdiction of ASTM Committee D04 on Road and Paving Materials and is the direct responsibility of Subcommittee D04.31 on Calcium and Sodium Chlorides and Other Deicing Materials.

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2. Referenced Documents

2.1 ASTM Standards:²

C136/C136M Test Method for Sieve Analysis of Fine and Coarse Aggregates

C670 Practice for Preparing Precision and Bias Statements for Test Methods for Construction Materials

E11 Specification for Woven Wire Test Sieve Cloth and Test Sieves

E29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications

E287 Specification for Laboratory Glass Graduated Burets

E288 Specification for Laboratory Glass Volumetric Flasks

E534 Test Methods for Chemical Analysis of Sodium Chloride

3. Classification

3.1 This specification covers sodium chloride obtained from natural deposits (rock salt) or produced by man (evaporated, solar, other) and recognizes two types and two grades as follows:

3.1.1 *Type I*—Used primarily as a pavement deicer or in aggregate stabilization.

3.1.1.1 *Grade 1*—Standard grading (Note 1).

3.1.1.2 *Grade 2*—Special grading (Note 1).

3.1.2 *Type II*—Used in aggregate stabilization or for purposes other than deicing.

NOTE 1—Grade 1 provides a particle grading for general application, and has been found by latest research to be most effective for ice control and skid resistance under most conditions. Grade 2 is the grading typical of salt produced in the western United States and is available in states of the Rocky Mountains region and west, which may be preferred by purchasers in that area.

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

4. Chemical Requirements

4.1 The sodium chloride shall conform to the following requirement for chemical composition, except for the tolerance stated in 6.1 and 6.2:

Sodium chloride (NaCl), min, % 95.0

5. Physical Requirements

5.1 Grading:

5.1.1 *Type I*—The grading of Type I sodium chloride, when tested by means of laboratory sieves conforming to Specification E11, shall conform to the following requirements for particle size distribution, except for the tolerance stated in 6.1 and 6.1.1:

Sieve Size	Mass % Passing	
	Grade 1	Grade 2
19.0 mm (¾ in.)	...	100
12.5 mm (½ in.)	100	...
9.5 mm (⅜ in.)	95 to 100	...
4.75 mm (No. 4)	20 to 90	20 to 100
2.36 mm (No. 8)	10 to 60	10 to 60
600 µm (No. 30)	0 to 15	0 to 15

5.1.2 *Type II*—The grading of Type II sodium chloride shall conform to the grading requirements imposed or permitted by the purchaser under conditions of the intended use.

6. Permissible Variations

6.1 In the case of sodium chloride sampled after delivery to the purchaser, tolerances from the foregoing specified values shall be allowed as follows:

6.1.1 *Grading*—Five percentage points on the maximum value for the range for each sieve size, except the 12.5 mm (½ in.) and 9.5 mm (⅜ in.) for Grade 1 and 19.0 mm (¾ in.) for Grade 2.

6.1.2 *Chemical Composition*—0.5 percentage point.

7. Condition

7.1 The sodium chloride shall arrive at the purchaser's delivery point in a free-flowing and usable condition.

8. Sampling

8.1 Not less than three sample increments shall be selected at random from the lot (Note 2). Each increment shall be obtained by scraping aside the top layer of material to a depth of at least 25 mm (1 in.) and taking a 500-g (approximately 1-lb) quantity of sodium chloride to a depth of at least 150 mm

(6 in.). Sampling shall be done by means of a sampling thief or other method that will ensure a representative cross section of the material. The sample increments shall be thoroughly mixed to constitute a composite sample representative of the lot.

NOTE 2—A lot may be an amount agreed upon between purchaser and supplier at the time of purchase.

9. Test Methods

9.1 *Chemical Analysis*—Test for compliance with the requirements for chemical composition in accordance with the following methods:

9.1.1 *Routine Control*—Use of the “Rapid Method” in Annex A1 is permitted for routine control and approval.

9.1.2 *Referee Testing*—In case of controversy, determine the chemical composition of the sample using the current version of Test Method E534.

9.2 Grading shall be determined by Test Method C136/C136M.

10. Inspection

10.1 The purchaser or purchaser's representative shall be provided free entry and necessary facilities at the production plant or storage area if the purchaser elects to sample sodium chloride at the source.

11. Rejection and Rehearing

11.1 The sodium chloride shall be subject to rejection if it fails to conform to any of the requirements of this specification.

11.2 In the case of failure to meet the requirements on the basis of an initial sample of a lot represented, two additional samples shall be taken from the lot and tested. If both additional samples meet the requirements, the lot shall be accepted.

12. Packaging and Marking

12.1 The sodium chloride shall be delivered in bags or other containers acceptable to the purchaser, or in bulk lots. The name of the producer and the net weight shall be legibly marked on each bag or container, or in the case of bulk lots, on the shipping or delivery report.

13. Keywords

13.1 salt; snow and ice removal; sodium chloride; stabilization; winter maintenance

ANNEX
(Mandatory Information)
A1. RAPID METHOD OF ANALYSIS FOR SODIUM CHLORIDE
A1.1 Scope

A1.1.1 This annex covers a rapid method for chemical analysis of sodium chloride.

A1.1.2 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

A1.2 Significance and Use

A1.2.1 The procedure for chemical analysis in this annex determines the total amount of chlorides present in the sample and expresses that value as sodium chloride.

A1.2.2 This rapid method of analysis does not distinguish between sodium chloride and other evaporite chloride compounds with ice-melting capabilities. Typical rock salt and solar salt sometimes contains small amounts of CaCl_2 , MgCl_2 , and KCl , depending on the source of the material. When this rapid method is used on continuing shipments from a known source, it will provide a fast, essentially accurate determination of the sodium chloride content of the material furnished. Thus, the need for testing by the referee method, Test Method E534, is reduced.

A1.3 Apparatus

A1.3.1 *Glassware*—Standard weighing bottles, volumetric flasks (conforming to Specification E288, Class C or better), and burets (conforming to Specification E287, Class B or better).

A1.3.2 *Balance*, having a capacity of at least 20 g, accurate and readable to 0.01 g.

A1.4 Reagents

A1.4.1 *Nitric Acid (HNO_3)*, dilute ($\text{HNO}_3\text{:H}_2\text{O}$, 1:4 by volume).

A1.4.2 *Calcium Carbonate (CaCO_3)*—Reagent grade, low chloride, powder.

A1.4.3 *Silver Nitrate Solution*—0.05 N AgNO_3 .

A1.4.4 *Sodium Chloride (NaCl)*—Reagent grade.

A1.4.5 *Potassium Chromate (K_2CrO_4) Solution*—(50 g K_2CrO_4 /L).

A1.5 Procedure

A1.5.1 Thoroughly mix the composite sample obtained under 8.1, and reduce by quartering or by means of a sample

splitter to approximately 500 g. Pulverize the reduced sample to pass a 300- μm (No. 50) sieve.

A1.5.2 *Standardization*—Standardize the silver nitrate (AgNO_3) solution daily, using 10 g of reagent grade sodium chloride (NaCl) following the applicable procedure in A1.5.3.

A1.5.3 From the pulverized sodium chloride, obtain a test sample with a mass of 10.00 ± 0.01 g and place in a beaker with 250 mL distilled water. Add 10 mL of the diluted nitric acid solution (HNO_3 , 1 + 4 by volume) and stir for 20 min at room temperature to put the salt in solution. Transfer the solution, including any insoluble material, to a 2-L volumetric flask, dilute to the mark with distilled water, and mix. With a pipet, draw off 25 mL of the solution and place in a white porcelain casserole. Add 0.5 g of calcium carbonate (CaCO_3) to neutralize the excess HNO_3 , and adjust the pH to approximately 7. Add 3 mL of the potassium chromate (K_2CrO_4) solution as an indicator and titrate dropwise with the silver nitrate (AgNO_3) solution until a faint but distinct change in color occurs—a persistent yellowish brown endpoint (see Note A1.1), comparable to standardization. Estimate the titer from the buret to the second decimal place.

NOTE A1.1—The color of the initial solution is lemon-yellow. With addition of the calcium carbonate (CaCO_3) and stirring, the initial solution becomes opaque, with a creamy lemon-yellow color. Addition of the silver nitrate (AgNO_3) solution produces silver chloride, which begins to agglomerate as the titration progresses, and the lemon-yellow color will begin to have whitish, opaque swirls of silver chloride. As the titration proceeds, the red color formed by addition of each drop begins to disappear more slowly. Continue the addition dropwise until a faint but distinct change in color occurs and the yellow-brown to faint reddish-brown color persists. The first stable presence of red silver chromate is the endpoint. If the endpoint is overstepped, a deep reddish-brown color occurs.

A1.6 *Calculate*—Calculate the total chlorides expressed as percent NaCl as follows:

$$P = [(A/B) \times (C/D)] \times 100 \quad (\text{A1.1})$$

where:

A = reagent grade NaCl used, g,

B = 0.05 N AgNO_3 solution required to titrate the reagent grade NaCl , mL,

C = 0.05 N AgNO_3 solution required to titrate the sample being tested, mL,

D = test sampling mass, g, and

P = total chlorides, expressed as sodium chloride, in the sample being tested, %.

A1.6.1 If moisture is apparent in the sample, dry a duplicate 10-g sample of the pulverized salt at 105 °C and correct the mass of the sample accordingly.