



SLOVENSKI STANDARD
SIST EN 17443:2021

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Oprema za zimska vzdrževalna dela - Sistemi za proizvodnjo slanice - Zahteve in preskusne metode

Winter service equipment - Brine production systems - Requirements and test methods

Winterdienstsausrüstung - Soleerzeugungsanlagen - Anforderungen und Prüfmethoden

Matériels de viabilité hivernal - Unités de production de saumure - Exigences et méthodes d'essais

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Winter service equipment - Brine production systems - Requirements and test methods

Matériels de viabilité hivernale - Unités de production
de saumure - Exigences et méthodes d'essai

Winterdienstausrüstung - Soleerzeuger -
Anforderungen und Prüfverfahren

This European Standard was approved by CEN on 28 June 2021.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

Contents	Page
European foreword.....	4
Introduction	5
1 Scope.....	6
2 Normative references.....	6
3 Terms and definitions	6
4 Materials.....	7
4.1 Chlorides	7
4.2 Water	7
5 Requirements.....	8
5.1 Brine production capacity	8
5.2 Brine concentration	8
5.3 Brine purity.....	8
5.3.1 General.....	8
5.3.2 Content of water insoluble matter.....	9
5.3.3 Size of suspended particles	9
5.4 Other requirements	9
5.4.1 Additional components.....	9
5.4.2 Pumping system	10
5.4.3 Blending systems.....	11
5.4.4 Protection of the environment.....	11
6 Sampling.....	11
7 Test methods	11
7.1 General.....	11
7.2 Brine production capacity	11
7.2.1 Direct method.....	11
7.2.2 Indirect method.....	12
7.3 Brine concentration	12
7.4 Brine purity.....	13
7.4.1 General.....	13
7.4.2 Content of water insoluble matter.....	13
7.4.3 Size of suspended particles	13
8 Safety requirements at design stage and for use.....	13
Annex A (informative) Systems for continuous and batch production of brine (examples, schematic drawings).....	14
A.1 Water flow through stationary bulk salts (NaCl, CaCl ₂ , MgCl ₂).....	14
A.1.1 Upward water flow design.....	14
A.1.2 Downward water flow design.....	15
A.2 Forced circulation design (batch operation)	15
A.3 Blending systems.....	16
A.3.1 Dilution of concentrated brines.....	16
A.3.2 Mixing of NaCl brine with other brines (CaCl ₂ , MgCl ₂) and additives.....	16
Annex B (normative) Sampling of the produced brine.....	17

B.1	Sampling of the produced brine	17
B.2	Labelling and distribution of samples	17
B.3	Sampling report	18
Annex C (informative)	Conversion factors: Used amount of water/produced quantity of brine	19
C.1	Dissolution of dry sodium chloride	19
C.2	Dissolution of calcium chloride, 77 % (flakes)	19
C.3	Dissolution of calcium chloride, anhydrous, 96 % (prills)	20
C.4	Dissolution of magnesium chloride, hexahydrate, 47 % (flakes, pellets)	20
	Bibliography	21

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(standards.iteh.ai)

[SIST EN 17443:2021](https://standards.iteh.ai/catalog/standards/sist/fd5a2580-b8b8-4624-b64f-198a7cd915cb/sist-en-17443-2021)

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EN 17443:2021 (E)

European foreword

This document (EN 17443:2021) has been prepared by Technical Committee CEN/TC 337 “Road operation equipment and products”, the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by February 2022, and conflicting national standards shall be withdrawn at the latest by February 2022.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

Any feedback and questions on this document should be directed to the users’ national standards body. A complete listing of these bodies can be found on the CEN website.

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Introduction

De-icing agents in solid and liquid form are important for the winter maintenance of roads. They can prevent respectively eliminate slippery road conditions. Brines are used for anti-icing (preventive winter maintenance) and de-icing (curative winter maintenance) in pure form or in mixture with solid sodium chloride as pre-wetted salt.

The document describes the requirements for brine production systems and their testing methods.

The aim of this document is an easy description of the product specifications for tenders and other purchasing procedures.

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EN 17443:2021 (E)

1 Scope

This document specifies the essential requirements of stationary systems for production of brines for winter road maintenance and includes tests of these requirements. Installation boundary: chloride and water inlet to the saturator, brine outlet to the spreading machine. Within the scope are materials, brine storage and brine loading/unloading equipment also. Mobile systems for production of brines *in situ* are not content of this document.

The following points are not covered by this document:

- System and construction requirements;
- Requirements according to national and European legislations.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 15144, *Winter maintenance equipment - Terminology - Terms for winter maintenance*

EN 16811-1:2016, *Winter service equipment and products - De-icing agents - Part 1: Sodium chloride - Requirements and test methods*

EN 16811-2:2016, *Winter service equipment and products - De-icing agents - Part 2: Calcium chloride and Magnesium chloride - Requirements and test methods*

ISO 2479, *Sodium chloride for industrial use - Determination of matter insoluble in water or in acid and preparation of principal solutions for other determinations*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 15144, EN 16811-1, EN 16811-2 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1 brine

solution of chloride (sodium chloride, NaCl; calcium chloride, CaCl₂; magnesium chloride, MgCl₂) or of combinations of these chlorides in water

Note 1 to entry: Sodium chloride (NaCl, salt) is produced as rock salt, as solar salt, and as vacuum salt. Rock salt is extracted by mechanical mining of natural salt beds. Solar salt is produced by solar evaporation of sea water or brine from salt deposits and by extraction from salt lakes. Solar salt from sea water is named as sea salt. Vacuum salt is prepared by the evaporation of water from brine. Used salt (waste salt) come from secondary aluminium smelters, from fishery industry, from leather industry, etc. REACH registered synthetic by-product salts derive from chemical reactions (e.g. from gas cleaning in waste incinerators).

3.2

brine production system

equipment for dissolving chlorides in water (saturator), including brine dilution to the concentration for application in winter road maintenance, and brine storages, as well as pumping systems (loading/unloading), measurements, control technologies and blending systems (see Annex A)

3.3

brine production capacity

hourly produced litres brine with the required concentration and purity

4 Materials

4.1 Chlorides

The quality of the chlorides (NaCl , CaCl_2 , MgCl_2) shall be in accordance with EN 16811-1 and EN 16811-2 respectively.

The NaCl and sulfate content of the de-icing salt can be specified within the limits of EN 16811-1 by the buyer depending on his individual needs. It can also be specified within these limits at the national level (national annexes to this European Standard). In addition, the salt buyer can specify the maximum content of water insoluble matter in sodium chloride used for brine production in the procurement procedure for salt.

Salt for brine production shall meet EN 16811-1:2016, Annex A.1, resp. EN 16811-2:2016, Annex A.1 and Annex A.2. The requirements of the related document should be handed over to the manufacturer of the equipment. The buyer shall inform the manufacturer of the brine production system with the product information sheet which chloride qualities are available.

[SIST EN 17443:2021](http://standards.iteh.ai/catalog/standards/sist/en-17443-2021)

NOTE The sodium chloride (NaCl) has different granulometry and purity, depending on the production type (rock salt, sea/solar salt, vacuum salt) or from the production site (mine, etc.). Variety in granulometry influences the dissolving properties. Impurities such as water insoluble matter (silicates) and poorly water and brine soluble calcium sulfate in salts cause an additional expenditure for their removal of the brine production system.

4.2 Water

For brine production systems in principle suitable are drinking water (tap water), water from rivers, lakes, ponds, well water, collected water from road maintenance depots, rainwater, etc.

Water to be used in case of production of brines out of NaCl , CaCl_2 and MgCl_2 or dilute brines should be of a quality which allows the production of brines within the allowed values for heavy metals, arsenic and hydrocarbons (NaCl brine according to EN 16811-1:2016, Table 6; CaCl_2 and MgCl_2 brines according to EN 16811-2:2016, Table 8). Water for dissolving can be with a content of salt when brine is produced in a continuous process. For brine production in batch process, water for dissolving should be without salt or with a maximum concentration of 5 weight % salt. Water for dilution should be better without chloride. The content of water which is used for dilution of brine shall guarantee the required brine concentration.

Sulphate, expressed as SO_4 , in the standards EN 16811-1 and EN 16811-2 is specified differently (those values are for NaCl brine less than 0,6 weight % in a 10 weight % brine, for CaCl_2 brine less than 0,5 weight % calculated for the anhydrous product and for MgCl_2 brine less than 1,0 weight % in a 10 weight % brine). In the water to be used, sulphate should be less than 1 g SO_4 per litre, and the resulting brine should be according to the brine specifications in the standards EN 16811-1 and EN 16811-2.

EN 17443:2021 (E)

The content of water insoluble matter and size of suspended particles in the water shall conform in total to the requirements for water insoluble matter in brine (5.3.1 and 5.3.2).

Water for brine production shall meet the same requirements as listed in Table 1 in this document and should be handed over to the manufacturer.

NOTE 1 Water with a high hardness can lead during the brine production with calcium chloride and rock salts to precipitation of calcium carbonate.

NOTE 2 Iron chloride in water acts as flocculant and causes problems in brine filters on spreading machines.

5 Requirements**5.1 Brine production capacity**

The brine production capacity depends on following conditions:

- Adequate chloride and water supply;
- Water capacity;
- Chloride quality (grain size, chemical composition);
- Temperature (air, water).

Considering these conditions, a tolerance of max. -5% of the required brine production capacity (l brine/h) is acceptable. The cleaning time (removal of solid waste) shall be accounted for in production capacities.

SIST EN 17443:2021

NOTE Production interruptions lasting several days, rapid temperature drops, also accelerated by strong cold winds, can result in recrystallization inside the brine production system and cause disturbances in brine production.

5.2 Brine concentration

Consistent quality: The required brine concentration is constantly produced over the production period. Concentration levels of the produced brine are continuously monitored behind blending system resp. circulation system to ensure the brine meets the specification. Brines which are out of specification shall be corrected.

Tolerance: A tolerance of not more than $\pm 1,0$ weight % of the required brine concentration is acceptable.

NOTE The required brine concentration is specified by the equipment buyer.

Brine production systems shall ensure that pure and diluted brine does not create problems with recrystallization in valves, pumps, and nozzles. Especially sodium chloride brine should not be more concentrated than 22 weight % (tolerance $\pm 1,0$ weight %).

5.3 Brine purity**5.3.1 General**

The requirements are valid for the brine that goes into the spreading vehicle (direct from brine production system or from separate brine storage tanks). The requirements are in line with the requirements for solutions of chlorides in EN 16811-1 and EN 16811-2.

5.3.2 Content of water insoluble matter

The total content of water insoluble matter in the produced brine shall conform with the requirements in Table 1.

Table 1 — Total content of water insoluble matter in brine

Brine	Limit weight %
Sodium chloride (NaCl)	max. 0,03
Calcium chloride (CaCl ₂)	max. 0,2
Magnesium chloride (MgCl ₂)	max. 0,1

NOTE Water insoluble matter (silicates), calcium sulphate (anhydrite, gypsum), calcium carbonate and solid sodium chloride can be suspended in brine.

5.3.3 Size of suspended particles

The size of suspended particles shall not be bigger than 0,5 mm. For special spreaders, the buyer can also specify smaller maximum particle size.

5.4 Other requirements

5.4.1 Additional components

The brine production system shall be at least equipped with the following components:

- Back-flow preventer (no return valve, water lock), if connected to the drinking water system;
- Brine level control (e.g. pressure sensor): min./max. or continuously (corresponds with brine overflow protection);
- Take-back option which enables to unload brine from trucks if not all brine is used;
- Brine leakage monitoring, with an automatic stop of the brine production in case of leakage;
- Dry-running protection for brine pump;
- Equipment for manual or automatic purge of undissolved solids, if impure chlorides are used. The required cleaning cycles, including the time requirement, shall be specified, depending of the chloride purity. The separated brine from the purge shall be reintroduced into the dissolving process. The percentage of the purged material shall be specified;
- Brine purification, if necessary, e.g. with filter or hydrocyclone; filters and hydrocyclones should be sized for the required flow rate to the brine tanks (see 5.4.2);
- Freeze protection of water pipes, water flowmeter, etc. by isolation and/or heating pads or heating cables, with a minimum thermostat temperature of +3°C;