

**Conservation of cultural heritage - Extraction and
determination of soluble salts in natural stone and
related materials used in and from cultural heritage**

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

See Eesti standard EVS-EN 16455:2014 sisaldab Euroopa standardi EN 16455:2014 inglisekeelset teksti.	This Estonian standard EVS-EN 16455:2014 consists of the English text of the European standard EN 16455:2014.
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English Version

Conservation of cultural heritage - Extraction and determination of soluble salts in natural stone and related materials used in and from cultural heritage

Conservation du patrimoine culturel - Extraction et détermination des sels solubles dans la pierre naturelle et les matériaux associés utilisés dans le patrimoine culturel

Erhaltung des kulturellen Erbes - Auflösung und Bestimmung von löslichen Salzen in Naturstein und artverwandten Materialien des kulturellen Erbes

This European Standard was approved by CEN on 25 July 2014.

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Foreword

This document (EN 16455:2014) has been prepared by Technical Committee CEN/TC 346 "Conservation of cultural heritage", the secretariat of which is held by UNI.

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of an identical text or by endorsement, at the latest by March 2015 and conflicting national standards shall be withdrawn at the latest by March 2015.

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Introduction

Soluble salts are often present in stones and other porous inorganic building materials as alteration products of chemical or biological origin. They can originate from surface deposition of environmental pollutants or from water capillary transport from other external sources and also from materials themselves or from conservation interventions.

Soluble salts present in *porous inorganic materials* can, (depending on material properties, environmental conditions or possible treatments the surrounding conditions), initiate physical-chemical degradation processes.

This standard describes a procedure to extract soluble salts present in porous inorganic materials to determine the ions and to estimate the content of soluble salts.

There are several test methods for the analysis of salts, for example:

- a) recognition of salt crystals by microscopy;
- b) qualitative chemical reactions. These make it possible to identify the type of *anions and cations* present in a solution, after dissolution of salts in water (i.e. sulphates, nitrates, chlorides);
- c) semiquantitative tests. These are mostly based on colourimetric reactions that lead to the formation of coloured compounds formed by each *anion* and its specific reagent;
- d) X-ray diffraction, which provides information on the nature of a salt (in *crystalline form*) identifying the mineralogical composition of a compound;
- e) spectroscopic techniques like flame photometry, AAS (Atomic Absorption Spectrometry), ICP-AES (Inductively Coupled Plasma - Atomic Emission Spectrometry) for cations;
- f) ion chromatography which makes it possible to identify and quantify separately anions and cations.

1 Scope

This European Standard provides a methodology for the qualitative and quantitative analysis of anions and cations obtained by dissolution of soluble salts present in either natural stone or other porous inorganic materials constituting cultural heritage and in materials and products used for their conservation. The methodology requires samples to have been taken from the cultural property.

The main ions considered in this standard are:

Cl^- , NO_2^- , NO_3^- , SO_4^{2-} , Na^+ , K^+ , NH_4^+ , Ca^{2+} , Mg^{2+}

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 15898:2011, *Conservation of cultural property — Main general terms and definitions*

EN 16085:2012, *Conservation of Cultural property — Methodology for sampling from materials of cultural property — General rules*

ISO 3310-1, *Test sieves — Technical requirements and testing — Part 1: Test sieves of metal wire cloth*

ISO 3310-2, *Test sieves — Technical requirements and testing — Part 2: Test sieves of perforated metal plate*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 15898:2011 and EN 16085:2012 and the following apply.

3.1

soluble salts

salts that readily dissolve in a solvent such as water in order to form a solution; the solubility is dependent on the salt and the temperature of water

3.2

conductivity

measure of the ability of water to conduct an electrical current; it is highly dependent on the amount of dissolved solids (such as salt) in the water

3.3

specific conductivity

conductivity of a solution measured between two electrodes 1 cm^2 in area and 1 cm apart

Note 1 to entry: The units are $\mu\text{S} \cdot \text{cm}^{-1}$.

3.4

porous inorganic material

material including natural stones e.g. sandstone limestone and marble; as well as artificial materials such as mortar, plaster brick and other materials