Irish Standard
I.S. EN 16682:2017

Conservation of cultural heritage - Methods of measurement of moisture content, or water content, in materials constituting immovable cultural heritage

I.S. EN 16682:2017

Incorporating amendments/corrigenda/National Annexes issued since publication:

The National Standards Authority of Ireland (NSAI) produces the following categories of formal documents:

I.S. xxx: Irish Standard — national specification based on the consensus of an expert panel and subject to public consultation.

S.R. xxx: Standard Recommendation — recommendation based on the consensus of an expert panel and subject to public consultation.

SWiFT xxx: A rapidly developed recommendatory document based on the consensus of the participants of an NSAI workshop.

This document replaces/revises/consolidates the NSAI adoption of the document(s) indicated on the CEN/CENELEC cover/Foreword and the following National document(s):

NOTE: The date of any NSAI previous adoption may not match the date of its original CEN/CENELEC document.

This document is based on:	*Published:*
EN 16682:2017	2017-03-01

This document was published under the authority of the NSAI and comes into effect on:	ICS number:
2017-03-24	97.195
	NOTE: If blank see CEN/CENELEC cover page

NSAI	T +353 1 807 3800	Sales:
1 Swift Square,	F +353 1 807 3838	T +353 1 857 6730
Northwood, Santry	E standards@nsai.ie	F +353 1 857 6729
Dublin 9	W NSAI.ie	W standards.ie

Údarás um Chaighdeáin Náisiúnta na hÉireann

National Foreword

I.S. EN 16682:2017 is the adopted Irish version of the European Document EN 16682:2017, Conservation of cultural heritage - Methods of measurement of moisture content, or water content, in materials constituting immovable cultural heritage

This document does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

For relationships with other publications refer to the NSAI web store.

Compliance with this document does not of itself confer immunity from legal obligations.

In line with international standards practice the decimal point is shown as a comma (,) throughout this document.

This page is intentionally left blank

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 16682

March 2017

ICS 97.195

English Version

Conservation of cultural heritage - Methods of measurement of moisture content, or water content, in materials constituting immovable cultural heritage

Conservation du patrimoine culturel - Méthodes de mesurage de la teneur en humidité, ou teneur en eau, de matériaux constituant un patrimoine culturel immatériel

Erhaltung des kulturellen Erbes - Verfahren zur Bestimmung des Feuchte- bzw. Wassergehalts in Materialien des unbeweglichen kulturellen Erbes

This European Standard was approved by CEN on 25 December 2016.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

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

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Contents

Page

European foreword

This document (EN 16682:2017) 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 September 2017, and conflicting national standards shall be withdrawn at the latest by September 2017.

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.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

The specific field of cultural heritage is characterized by particular needs and in most cases the existing standards devised for normal materials cannot be applied. The moisture content, or the water content, in materials is of primary relevance for the preservation of cultural heritage. High content can be very damaging (e.g. salt dissolution and mobilization, fungal infestation, corrosion, swelling) as well as low content (e.g. salt crystallization, shrinkage, wood cracking) or alternating high/low content. It is therefore important to determine and control this variable to assess the risk of damage and take preventive conservation measures.

Different methods exist to measure moisture content, or water content, in modern building materials, based on different physical or chemical principles but most of them are not applicable to cultural heritage and need to be adapted to this aim.

Generally, non-destructive methods are recommended but their accuracy may be limited. In turn, the most accurate methods require sampling and can only exceptionally be used. Readings taken with non-destructive methods may not be comparable especially because they are expressed in different units. The interpretation of measurements may be obscured by a number of factors (e.g. material, salts, temperature) to which the methods are subject.

This European Standard considers and specifies characteristics, operative methodologies, pros and cons of all methods of measurements and establishes a uniform presentation of data and units. It is addressed to anyone who needs to measure or interpret readings of moisture content, or water content, in building materials (particularly masonry and wood), and in general to whoever is responsible for the preservation and maintenance of heritage buildings.

1 Scope

This European Standard is aimed to inform and assist users in the choice and use of the most appropriate method to obtain reliable measurements of the moisture content, or water content, in wood and masonry (including brickwork, stonework, concrete, gypsum, mortars, etc.) in the specific case of the built cultural heritage.

It provides a basic framework to take and interpret this kind of measurements on the above cultural heritage materials that have undergone weathering, pest attack, salt migration or other transformations over time.

It specifies four absolute methods (i.e. gravimetric, Karl Fischer titration, azeotropic distillation and calcium carbide); explains their characteristics, pros and cons, and gives specifications for the transformation of readings into the same unit to make measurements taken with different methods comparable.

It specifies the three principal relative methods (i.e. electrical resistance, capacitance, and relative humidity in equilibrium with the material), pointing out their characteristics and uncertainties when used in the field of cultural heritage.

In addition, it provides an informative overview of ten other relative methods, their characteristics, pros and cons.

It gives specifications for the calibration of the various methods. It also compares the above methods in relation to their accuracy, sampling requirement, sample size, laboratory or field use, and other problems encountered in the field of cultural heritage to prevent instrument misuse, reduce uncertainties and avoid reading misinterpretation.

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 ISO 374-1, *Protective gloves against chemicals and micro-organisms - Part 1: Terminology and performance requirements*

EN 420:2003+A1:2009, *Protective gloves - General requirements and test methods*

EN 455-1:2000, *Medical gloves for single use - Part 1: Requirements and testing for freedom from holes*

EN 772-10:1999, *Methods of test for masonry units - Part 10: Determination of moisture content of calcium silicate and autoclaved aerated concrete units*

EN 837-1:1996, *Pressure gauges - Part 1: Bourdon tube pressure gauges - Dimensions, metrology, requirements and testing*

EN 1428:2012, *Bitumen and bituminous binders - Determination of water content in bituminous emulsions - Azeotropic distillation method*

EN 13183-1:2002, *Moisture content of a piece of sawn timber - Part 1: Determination by oven dry method*

EN 13183-2:2002, *Moisture content of a piece of sawn timber - Part 2: Estimation by electrical resistance method*

EN 13183-3:2005, *Moisture content of a piece of sawn timber - Part 3: Estimation by capacitance method*