

Teknisk specifikation

SIS-CEN/TS 16163:2014

Publicerad/Published: 2014-09-19

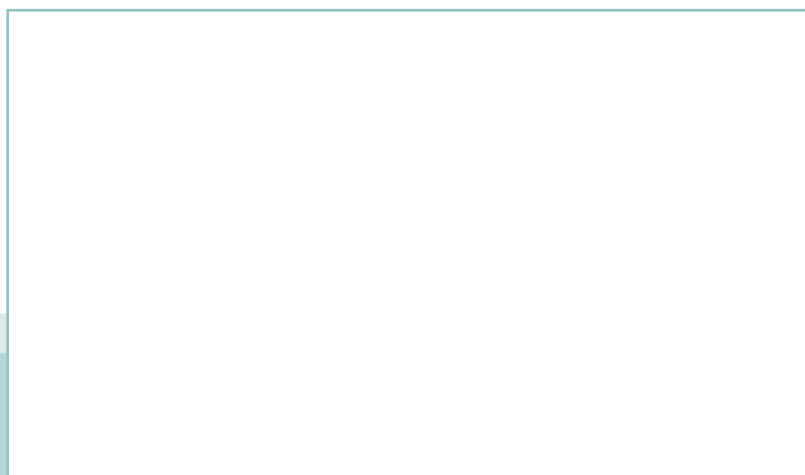
Utgåva/Edition: 1

Språk/Language: engelska/English

ICS: 97.195

Bevarande av kulturarv – Riktlinjer och processer för ljussättning av utställningar

Conservation of Cultural Heritage – Guidelines and procedures for choosing appropriate lighting for indoor exhibitions



Standarder får världen att fungera

SIS (Swedish Standards Institute) är en fristående ideell förening med medlemmar från både privat och offentlig sektor. Vi är en del av det europeiska och globala nätverk som utarbetar internationella standarder. Standarder är dokumenterad kunskap utvecklad av framstående aktörer inom industri, näringsliv och samhälle och befrämjar handel över gränser, bidrar till att processer och produkter blir säkrare samt effektiviserar din verksamhet.

Delta och påverka

Som medlem i SIS har du möjlighet att påverka framtida standarder inom ditt område på nationell, europeisk och global nivå. Du får samtidigt tillgång till tidig information om utvecklingen inom din bransch.

Ta del av det färdiga arbetet

Vi erbjuder våra kunder allt som rör standarder och deras tillämpning. Hos oss kan du köpa alla publikationer du behöver – allt från enskilda standarder, tekniska rapporter och standardpaket till handböcker och onlinetjänster. Genom vår webbtjänst e-nav får du tillgång till ett lättnavigerat bibliotek där alla standarder som är aktuella för ditt företag finns tillgängliga. Standarder och handböcker är källor till kunskap. Vi säljer dem.

Utveckla din kompetens och lyckas bättre i ditt arbete

Hos SIS kan du gå öppna eller företagsinterna utbildningar kring innehåll och tillämpning av standarder. Genom vår närhet till den internationella utvecklingen och ISO får du rätt kunskap i rätt tid, direkt från källan. Med vår kunskap om standarders möjligheter hjälper vi våra kunder att skapa verklig nytta och lönsamhet i sina verksamheter.

Vill du veta mer om SIS eller hur standarder kan effektivisera din verksamhet är du välkommen in på www.sis.se eller ta kontakt med oss på tel 08-555 523 00.



Standards make the world go round

SIS (Swedish Standards Institute) is an independent non-profit organisation with members from both the private and public sectors. We are part of the European and global network that draws up international standards. Standards consist of documented knowledge developed by prominent actors within the industry, business world and society. They promote cross-border trade, they help to make processes and products safer and they streamline your organisation.

Take part and have influence

As a member of SIS you will have the possibility to participate in standardization activities on national, European and global level. The membership in SIS will give you the opportunity to influence future standards and gain access to early stage information about developments within your field.

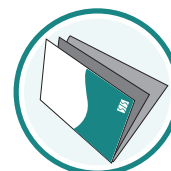
Get to know the finished work

We offer our customers everything in connection with standards and their application. You can purchase all the publications you need from us - everything from individual standards, technical reports and standard packages through to manuals and online services. Our web service e-nav gives you access to an easy-to-navigate library where all standards that are relevant to your company are available. Standards and manuals are sources of knowledge. We sell them.

Increase understanding and improve perception

With SIS you can undergo either shared or in-house training in the content and application of standards. Thanks to our proximity to international development and ISO you receive the right knowledge at the right time, direct from the source. With our knowledge about the potential of standards, we assist our customers in creating tangible benefit and profitability in their organisations.

If you want to know more about SIS, or how standards can streamline your organisation, please visit www.sis.se or contact us on phone +46 (0)8-555 523 00



Denna tekniska specifikation är inte en svensk standard. Detta dokument innehåller den engelska språkversionen av CEN/TS 16163:2014.

This Technical Specification is not a Swedish Standard. This document contains the English version of CEN/TS 16163:2014.

© Copyright/Upphovsrätten till denna produkt tillhör SIS, Swedish Standards Institute, Stockholm, Sverige. Användningen av denna produkt regleras av slutanvändarlicensen som återfinns i denna produkt, se standardens sista sidor.

© Copyright SIS, Swedish Standards Institute, Stockholm, Sweden. All rights reserved. The use of this product is governed by the end-user licence for this product. You will find the licence in the end of this document.

Uppllysningar om sakinnehållet i detta dokument lämnas av SIS, Swedish Standards Institute, telefon 08-555 520 00. Standarder kan beställas hos SIS Förlag AB som även lämnar allmänna uppllysningar om nationell och internationell standard.

Information about the content of this document is available from the SIS, Swedish Standards Institute, telephone +46 8 555 520 00. Standards may be ordered from SIS Förlag AB, who can also provide general information about national and international standards.

Dokumentet är framtaget av kommittén för Bevarande av kulturarv, SIS/TK 479.

Har du synpunkter på innehållet i det här dokumentet, vill du delta i ett kommande revideringsarbete eller vara med och ta fram standarder inom området? Gå in på www.sis.se - där hittar du mer information.

TECHNICAL SPECIFICATION
SPÉCIFICATION TECHNIQUE
TECHNISCHE SPEZIFIKATION

CEN/TS 16163

April 2014

ICS 97.195

English Version

**Conservation of Cultural Heritage - Guidelines and procedures
for choosing appropriate lighting for indoor exhibitions**

Conservation du patrimoine culturel - Lignes directrices et
procédures concernant le choix d'un éclairage adapté pour
les expositions en intérieur

Erhaltung des kulturellen Erbes - Leitlinien und Verfahren
für die Auswahl geeigneter Beleuchtung für
Innenausstellungen

This Technical Specification (CEN/TS) was approved by CEN on 14 October 2013 for provisional application.

The period of validity of this CEN/TS is limited initially to three years. After two years the members of CEN will be requested to submit their comments, particularly on the question whether the CEN/TS can be converted into a European Standard.

CEN members are required to announce the existence of this CEN/TS in the same way as for an EN and to make the CEN/TS available promptly at national level in an appropriate form. It is permissible to keep conflicting national standards in force (in parallel to the CEN/TS) until the final decision about the possible conversion of the CEN/TS into an EN is reached.

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, 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
Foreword.....		4
Introduction		5
1 Scope		6
2 Normative references		6
3 Terms and definitions		6
4 Symbols		11
5 Sensitivity of cultural property to light.....		12
5.1 General.....		12
5.2 Mechanisms of damage		12
5.2.1 General.....		12
5.2.2 Photochemical		12
5.2.3 Radiant heating.....		13
5.2.4 Biological effects		13
5.3 Sensitivity and classification for cultural property.....		14
5.4 Limitations for total luminous exposure		14
6 Light measurement.....		15
6.1 Measurement of illuminance		15
6.2 Measurement of UV radiation.....		16
7 Exhibition lighting.....		16
7.1 General.....		16
7.2 Viewing conditions		16
7.3 Visual adaptation		16
7.4 Contrast ratios		17
7.5 Colour appearance		17
7.6 Colour rendering.....		17
7.7 Backgrounds to exhibits.....		18
7.7.1 General.....		18
7.7.2 Luminance of backgrounds.....		18
7.7.3 Colour of backgrounds		18
7.8 Glare.....		19
7.9 Modelling		20
7.10 Historic furnishings & interiors.....		21
7.11 Simulation and mock-ups		21
Annex A (informative) Characteristics of light sources		22
A.1 Daylight.....		22
A.2 Electric sources		22
A.2.1 General.....		22
A.2.2 Incandescent lamps		23
A.2.3 Fluorescent lamps		24
A.2.4 Solid State Lighting		24
A.2.5 Metal Halide lamps.....		26
Annex B (informative) Glasses and films characteristics		27

B.1	Glasses	27
B.2	Window films	27
B.3	Other protection	27
	Annex C (informative) Filters	28
	Annex D (informative) Relative damage	29
	Annex E (informative) Lamps and lighting attachments	30
	Bibliography	31

Foreword

This document (CEN/TS 16163:2014) has been prepared by Technical Committee CEN/TC 346 "Conservation of Cultural Heritage", the secretariat of which is held by UNI.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] 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 announce this Technical Specification: 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, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

Lighting is needed for many specific functions in museums and other cultural heritage buildings, for example, for research, conservation and permanent or temporary exhibitions. Lighting is one of the most important factors enabling visitors to fully enjoy works of art and other cultural property. In fact, lighting is a key medium in which visitors interpret and appreciate cultural heritage. Enough light is needed to see well but this may present a challenge when what is being viewed will deteriorate in the presence of light. Where cultural heritage is judged to be worth preserving for future generations it is essential to consider the controlled use of light. Indeed, light is an environmental factor, which is a threat to many objects. Alone or in combination with other environmental factors (temperature, humidity, pollution, etc.) light causes fading, discoloration and embrittlement of a wide range of materials. This damage is cumulative and irreversible: no conservation treatment can restore change of colour or loss in strength of materials damaged by light. Therefore, the challenge of museum exhibition lighting is to find an appropriate compromise between the long term preservation of the exhibit and the needs of visitors to view them within a suitable exhibition design. As an integral part of exhibition lighting, the following aspects should be considered:

- the conservation aspect, related to the sensitivity of the exhibit at different wavelengths of the incident radiant energy, the spectral composition of the light source and the total luminous exposure,
- the visual aspect, related to the impact of lighting on the visitor experience: lighting has to allow visitors to see exhibits on display, with the correct colour perceptions without glare, reflections or insufficient illumination,
- the design aspect related to the concept and position of the exhibition architecture, the point of view of the curator and all others involved in the scenographic and/or didactic objectives of the exhibition.

Due to its non-technical nature the last mentioned aspect cannot be dealt with in this Technical Specification.

This Technical Specification uses terms defined in European (EN 12665 and EN 15898) and International (CIE International lighting vocabulary) terminology standards, but their definitions have been adapted to the intended users of this specification.

1 Scope

This Technical Specification defines the procedures as well as the means to implement adequate lighting, with regard to the conservation policy. It takes visual, exhibition and conservation aspects into account and it also discusses the implications of the lighting design on the safeguarding of cultural property. This Technical Specification gives recommendations on values of minimum and maximum illumination levels. It aims to provide a tool for setting up a common European policy and a guide to help curators, conservators and project managers to assess the correct lighting that can assure the safeguarding of the exhibits. This Technical Specification covers lighting for heritage objects on exhibition in both public and private sites and does not consider lighting in other cultural heritage contexts such as open-air collections, etc.

2 Normative references

Not relevant.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1

accent lighting

lighting focused on an exhibit or a group of exhibits to emphasize them

[SOURCE: CIE S 017/E:2011]

3.2

annual luminous exposure

H_m

total luminous exposure per year (unit: lux hours per years, lx h / a)

Note 1 to entry: One year of museum display is approximately 3 000 h. See also 3.35.

3.3

blue wool test: test for light fastness

certified set of eight pieces of wool each dyed with a different specific blue dye graded to fade after a set exposure to light

[SOURCE: ISO 105-B08:1995]

Note 1 to entry: This system is usually referred as Blue Wool Standard (BWS) and it is used in museums to assess the radiation exposure of materials. The eight wool pieces are numbered #1 to #8, each about 2 to 3 times as sensitive as the next. High sensitivity is defined as materials rated #1, #2, or #3; medium as #4, #5, or #6; and low as #7, #8. A panel of selected blue wool samples is left at the measurement point and after a period it can be seen which samples have faded and the dose of light received determined.

3.4

colour rendering

effect of an illuminant on the colour appearance of exhibits by conscious or subconscious comparison with their colour appearance under a reference illuminant

[SOURCE: CIE S 017/E:2011 or IEC-IEV:1987, 845-02-059]

3.5

colour rendering index

R_a

derived from the colour rendering indices for a specified set of 8 test colour samples

Note 1 to entry: R_a has a maximum of 100, which generally occurs when the spectral distributions of the light source and the reference light source are substantially identical.

[SOURCE: CIE S 017/E:2011 or IEC-IEV:1987-845-02-61 and CIE 015:2004]

3.6

colour temperature

T_c

temperature of a Planckian radiator whose radiation has the same chromaticity as that of a given stimulus (unit: kelvin, K)

[SOURCE: CIE S 017/E:2011 or IEC-IEV:1987, 845-03-049; see also CIE 015:2004]

3.7

cultural heritage

tangible and intangible entities of significance to present and future generations

Note 1 to entry: The term "exhibit" is used in this standard for cultural heritage. In specific professional contexts, other terms are used: e.g. "artefact", "cultural property", "item".

[SOURCE: EN 15898]

3.8

damage potential

P_{dm}

ratio of effective damaging irradiance and the illuminance at a point on the surface for a specific light source (unit : W/lm)

3.9

daylight

visible part of global solar radiation

Note 1 to entry: When dealing with actinic effects of optical radiation, this term is commonly used for radiations extending beyond the visible region of the spectrum.

[SOURCE: IEC-IEV:1987, 845-09-84]

3.10

daylighting

lighting for which daylight is the light source

[SOURCE: CIE S 017/E:2011]

3.11

daylight factor

D

ratio of the illuminance at a point on a given plane due to the light received directly or indirectly from a sky of assumed or known luminance distribution, to the illuminance on a horizontal plane due to an unobstructed hemisphere of this sky, excluding the contribution of direct sunlight to both illuminances

Note 1 to entry: Glazing, dirt effects, etc. are included.

Note 2 to entry: When evaluating the lighting of interiors, the contribution of direct sunlight needs to be considered separately.

[SOURCE: CIE S 017/E:2011 and IEC-IEV, 1987, 845-09-087]