



BSI Standards Publication

Conservation of cultural heritage — Guidelines for design of showcases for exhibition and preservation of objects

Part 1: General requirements

National foreword

This British Standard is the UK implementation of EN 15999-1:2025. It supersedes BS EN 15999-1:2014, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee B/560, Conservation of tangible cultural heritage.

A list of organizations represented on this committee can be obtained on request to its committee manager.

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European foreword

This document (EN 15999-1:2025) 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of an identical text or by endorsement, at the latest by December 2025, and conflicting national standards shall be withdrawn at the latest by December 2025.

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.

This document supersedes EN 15999-1:2014.

EN 15999-1:2025 includes the following significant technical changes with respect to EN 15999-1:2014:

- added Clause 5: The showcase role in the preventive conservation risk management plan
- added Clause 6: Showcase practical design
- added Clause 7: Project planning

EN 15999 consists of the following parts, under the general title “*Conservation of cultural heritage — Guidelines for design of showcases for exhibition and preservation of objects*”:

- *Part 1: General requirements*
- *Part 2: Technical aspects.*

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.

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

Introduction

A key objective of a showcase is to display objects of cultural heritage while acceptably reducing their conservation risks. Conservation risks include total loss, physical damage, chemical and biological deterioration (e.g. by accidents, theft, vandalism, natural disasters, humidity, temperature, dust, pollutants, light, pests).

As an important tool for preserving and protecting cultural heritage objects, many complex and interrelated factors can be addressed using showcases. They can support the preventive conservation strategy of a heritage institution. The type of showcase, and its properties, should be selected to address those factors deemed to pose significant risks. A poorly constructed or unsuitable showcase can under some circumstances damage objects.

Because of the complexity of the role of the showcase for preventive conservation but also for the exhibition design, this document is addressed to everyone involved in the process of the procurement, e.g. curators, conservators, scientists, architects, graphic designers, lighting designers, manufacturers and other decision makers.

1 Scope

This document specifies general requirements for showcases for safe and secure display of cultural heritage objects complying with the requirements for preventive conservation. This document focuses on so-called passive showcases, those with unpowered climate conditioning systems. The role a showcase plays in preventive conservation is determinable via a site-specific risk assessment of relevant factors, which are mentioned in this document.

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 15898:2019, *Conservation of cultural heritage — Main general terms and definitions*

EN 16163, *Conservation of cultural heritage — Guidelines and procedures for choosing appropriate lighting for indoor exhibitions*

EN 15999-2:2025, *Conservation of cultural heritage — Guidelines for design of showcases for exhibition and preservation of objects — Part 2: Technical aspects*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 15898:2019 and in EN 15999-2:2025 and the following apply.

ISO and IEC maintain terminology 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

active showcase

showcase (3.15) using physical means and processes (e.g. airtightness, sorption) and using electric devices for controlling climate conditions and/or pollution inside of the *showcase* (3.15)

3.2

air exchange

exchange due to an airflow through gaps and openings, or molecular diffusion through permeable materials

3.3

air exchange rate

volume of showcase air exchanged per unit time divided by the total showcase volume

Note 1 to entry: Unit: 1/t 1/day or d⁻¹ is frequently used for showcases.

3.4**air pollutants**

airborne pollutants, which can generate damage to the objects on display

Note 1 to entry: Airborne pollutants such as gaseous or particulate chemical contaminants induced into the environment can cause corrosion, incrustation, colour fading, soiling, deterioration or other forms of damage to the objects on display.

3.5**display space**

space in the *showcase* (3.15) where the objects are displayed and which can contain other elements such as panels, *supports* (3.17), graphics, monitoring equipment, etc

3.6**dust**

solid particles of matter entrained and transported in air; and possibly being deposited on surfaces

Note 1 to entry: Examples of solid particles of matter: pollen, skin, soil, sand.

3.7**hygrometric half-time**

time needed for the relative humidity in the *showcase* (3.15) to move half way from its initial value to the relative humidity value in the environment

3.8**microclimate**

climate in the *display space* (3.4) of the *showcase* (3.15)

3.9**modular showcase**

showcase (3.15) that can be partially disassembled or rebuilt in different configurations

3.10**moisture sorbent**

material that captures or releases moisture to control relative humidity

3.11**passive showcase**

showcase (3.15) only using physical means and processes (e.g. airtightness, sorption), and not using electric devices for controlling climate conditions and/or pollution inside of the *showcase* (3.15)

3.12**resistance time**

working time of the test person carrying out the manual burglary test

Note 1 to entry: The resistance time includes times of less than 5 s each for tool changes, e.g. exchanging a screwdriver for a crow bar.

[SOURCE: EN 1627:2021, 3.12 [1]]

3.13**safety**

pertaining to human health

3.14

security

protection against theft and physical damage

3.15

showcase

enclosure of any dimension for preserving and displaying objects in specified safe and secure conditions

Note 1 to entry: The term “display case” is sometimes used as a synonym.

3.16

stakeholder

individual, company or institution who is affected by the design, performance, purchase or use of a *showcase* (3.15) over its lifetime

3.17

support

construction, material or device to hold and support or mount one or more objects without interference or damage and designed to provide stability to an object

4 Principles and components of a showcase

4.1 General

Showcases display objects and provide access to objects for staff members, while shielding against environmental and security hazards. This document takes into account all uses of showcases: temporary showcase, showcase without oxygen, oversized, existing, historical or modular showcase, showcase in uncontrolled ambient environment, etc. This document applies to all stages of the life-cycle of a showcase from concept design to recycling.

The fundamental functions of showcases are to:

- a) display objects;
- b) protect objects;
- c) ensure preservation, to minimize damage to and deterioration of objects.

4.2 Components and materials of the showcase

4.2.1 General

A showcase normally consists of:

- a) a display space for objects (4.2.2);
- b) technical compartments (4.2.3);
- c) installation and fixing of the showcase (4.2.4);
- d) linings of the display space and supports for objects (4.2.5);
- e) construction materials (4.2.6).

4.2.2 Display space

The display space presenting the objects is surrounded by walls, of which at least one is transparent.

The dimensions of the display space shall take into account the size of the object, its preservation and security needs, supports and mounts, accessibility by staff, viewing condition for visitors, and other exhibition elements such as panels and graphics, etc.

The seal between the door or opening panel and the showcase maintains an appropriate air exchange rate.

The opening shall give sufficient access to the display space for safe handling of the objects and for maintenance. The showcase shall remain stable during opening and when it is fully opened.

The display space provides room for installation of sensors/devices to monitor the microclimate or other internal environmental or security parameters and facilitates the collection of data.

4.2.3 Technical compartments

Technical compartments are publicly hidden parts of the showcase where devices or materials for environmental control (e.g. lighting, microclimate, pollutants), and security can be located.

A showcase can contain one or more technical compartments.

Technical compartments containing sorbents for humidity or pollutant control shall connect with the display space so they can take effect on objects. For this use of the technical compartment sufficient air exchange with the display volume is essential.

NOTE The installation of the technical compartment adjacent to the display volume works best. Sufficient gaps for moisture exchange between the technical compartment and the display volume are essential to support the function of the moisture sorbent.

Technical compartments containing heat, vibration or pollutant generating components (e.g. lamps, fans) are to be avoided. If no other technical solution can be found, these compartments are isolated from the display space so they do not transfer any hazards to objects. Air from these compartments is exchanged with the environment via vents. Heat generating components are best located in technical compartments above the display space.

Technical compartments shall be separately accessible for maintenance; without requiring or allowing access to the display space.

4.2.4 Installation and fixing of the showcase

The base of the showcase shall be strong and large enough to ensure the showcase is physically stable so it cannot topple. If this is not possible, the showcase shall be securely fixed to the floor, wall or ceiling. Alternatively, or in combination, the showcase base shall be weighted with additional material to act as ballast.

If a support is needed to fix the showcase, it shall take into account the weight of the showcase, its contents and the quality of the substrate (e.g. wall or floor).

The showcase base, plinth or any other form of support shall limit vibrations (see 5.9, 5.11) transmitted into the display space via associated walls, floor, or ceiling.

4.2.5 Lining of the display space and object supports

Linings and object supports are not integral part of the showcase. Nevertheless, all linings and object supports in the display space shall be tested to confirm their compatibility with the objects in the same way as the construction materials. The linings should be easy to maintain and/or replace.

The supports shall maintain the physical integrity of the objects, without exerting undue pressure, tension or torque. The objects together with their support(s) shall be stable. The system of fixing shall hold the objects safely even in case of vibrations.

The contact between the objects and the support(s) shall be insulated with an intermediate material of appropriate density and texture, and ensure their chemical stability.

4.2.6 Construction materials

4.2.6.1 Characteristics of construction materials

Contact with, or interaction between, objects and the materials of the showcase shall be carefully considered. Not all materials are suitable for long-term use with objects.

The materials, and their off-gassing constituents, shall not react with objects. The materials used to construct the showcase, e.g. the structure, glazing, inserts, varnishes, sealants, adhesives, paints, textiles, etc. shall be selected on the basis of professionally recognized materials testing protocols (see EN 15999-2:2025, Annex G) or less reliably, by checking available documentation (e.g. compliance certificates, technical and safety data sheets).

4.2.6.2 Off-gassing of construction materials

After the final construction and finishing of a showcase adequate time shall be given to ensure proper curing and off-gassing to limit chemical pollution inside the display space from materials used e.g. adhesives, sealants, coatings. A curing time reduces the risk of negative impact of volatile air pollutants inside the showcase to the objects. This applies to showcases completed off-site (e.g. in a factory) and on-site (e.g. in a museum).

NOTE Some materials can be sources of humidity (e.g. marble, concrete) which can also require some time to off-gas, i.e. to dry.

It is not recommended that objects shall be installed during this period in the showcase without some precautions.

If material needs time to off-gas, the showcase manufacturer shall indicate a recommended period; this recommendation can include advice for the room temperature and ventilation. If no indication is given, a period of four weeks is suggested as a minimum. During the ventilation time the door shall be open and the environment where the showcase is located should be well ventilated.

Additional measurement of air quality (see EN 15999-2:2025, Annex G) in the showcase is recommended before its use, depending on the sensitivity of the objects.

4.3 Expected lifetime and maintenance cycle

The span of time in which a showcase is fully functional defines its useful lifetime. When considering future expenditures on labour-time, consumables and repairs, there are ongoing economic and ecological costs to sustaining effective showcases. These future costs should be included as decision criteria when anticipating showcase budgets: capital and operating.

The three categories of showcases regarding life span are: single use for temporary exhibition, repeated use for temporary exhibitions, and long-term exhibitions.

To achieve useful lifespans greater than approximately 5 years, two key aspects can be considered:

- a) longevity of construction materials;
- b) maintenance of the mechanical components (e.g. opening systems and gaskets) and extra mechanical, electrical and electronic features (e.g. lighting, active microclimate, filtering, alarm and security monitoring systems).

Maintenance of each component or feature needs to be undertaken following the guidance of its manufacturer.

Showcases can be categorized according to their duration of use in long-term and temporary exhibitions. Temporary showcases can be further divided between single-use and multiple-use.

- c) Temporary showcases – single use: the construction remains fully functional for the exhibition period, plus any likely extensions of the exhibition.
- d) Temporary showcases – multiple use: the construction remains fully functional for e.g. 5 to 10 years.
- e) Long-term showcases: the construction remains fully functional during the planned span of the exposition should be specified.

5 Showcase specifications for risk management

5.1 General

Objects on display are exposed to risks from damage by accidents, theft, vandalism, natural disasters and by environmental parameters such as humidity, temperature, pollutant (gaseous, particulate and direct contact between materials), dust, light and pests.

NOTE 1 Table A.1 lists potential events or circumstances which can have an effect on the showcase design.

The showcase plays a role in the risk management of an institution. It can assist with lowering risk-levels by reducing the likelihood of damage occurring to an object, and by reducing the severity of consequences when damage does occur. Some risks shall be controlled, while others may be judged as acceptable or tolerable.

NOTE 2 Risk assessments by methods described in IEC 31010 [2] help to evaluate the magnitude of a risk.

The following paragraphs provide information on risks commonly identified by stakeholders before a showcase is designed.

5.2 Theft

5.2.1 General

The risk assessment shall determine a suitable security level for a showcase. The showcase shall be an integrated part of the security management of the entire premises. The role of the showcase for securing the objects may depend on opening hours and closing hours of the exhibition.

The object value and the overall intervention time t_0 , either current or projected, shall be considered in the risk assessment. A showcase security class shall be selected in correspondence to the security requirements appraised by the risk assessment.

The operation of alarms and defence systems may be adjustable, depending on opening and closing hours and shall be integrated into the security management of the entire premises.

5.2.2 Intervention time

Knowing the overall intervention time t_0 to an alarm, in order of magnitude (less than 5 min, 5-10 min, more than 10 min), is essential to estimate the degree of resistance required for the showcase.

The overall intervention time t_0 can be estimated by considering the potential duration of all processes from the actual alarm to the intervention at the showcase. To prevent theft the resistance time t_R shall be longer than the overall intervention time t_0 (see Formula (1) and Formula (2)).

$$t_0 = t_1 + t_2 \quad (1)$$

$$t_R > t_0 \quad (2)$$

where

- t_0 overall intervention time of security personnel to an alarm, takes into account t_1 and t_2 ,
- t_1 detection and the transmission time (transmission by the security staff or the electronic alarm system),
- t_2 intervention time (arrival on security staff, police officers, etc.) and if applicable, reaction (set up systems to block the escape of persons who have entered the premises),
- t_R resistance time of the showcase, depending on the security concept, the resistance times for the perimeter, premises, building, room and showcase can be accumulated.

5.2.3 The object value

The object value can be classified in 3 categories taking into account the historical, symbolic and financial aspects:

- inestimable, unique;
- large range of values, coveted on the market;
- no coveted.

5.2.4 Showcase security class recommendation

Table 1 presents the different scenarios for the value of the object/collection and the overall intervention time and recommends showcase security levels (Showcase class). For each scenario several solutions, showcase classes, are suggested and the table provides the minimum level of security to achieve for the showcase. A procedure to evaluate the resistance of showcases from serial production to burglary attacks by an attack test is given in EN 15999-2:2025, Annex B.

Table 1 — Different scenarios between the recommended showcase security classes* as defined in EN 15999-2:2025, Annex A

	Object(s) value		
Intervention time t_0	Inestimable	Large range of values	No covered on the market
	Recommended security level	Recommended security level	Recommended security level
> 10 min	A* or B*	A or B	A, or B
< 5 to 10 min	A or B	A, B or C	A, B or C
< 5 min	A or B	A, B or C	A, B, C, D or E
* With class A being the most resistant, up to class E, the least resistant.			

5.3 Fire

A risk assessment shall be carried out to evaluate the likelihood with which fire can break out on the premises and the rate in which fire could develop (fire growth and flame spread). Indication for the assessment can be found in the literature (see [3]).

The likelihood of fire propagation can depend on:

- the existing cultural assets protection plan, the rapidity of intervention, the training of staff and safety personnel;
- the building regulation on fire safety, fire systems (detection, alarm, extinguish measures);
- the building structure;
- electrical appliances in or near by the showcase.

The showcase shall be considered part of the fire safety management system of the building/museum. It is essential that a specific fire intervention plan is developed in order to reduce possible damage to the objects contained inside the showcases and reduce the intervention time.

Based on a fire risk assessment, which takes in consideration the peculiarities of the building, environmental protection measures implemented outside of the showcase are essential. The following measures can be taken:

- reduce the amount of combustible materials inside the room;
- appropriate separation distances between combustible materials within the room;
- installation of the showcase in a fire compartmented area with respect to the rest of the building;
- installation of outside fire shielding of the showcase by water curtain systems (in accordance with EN 12845:2015+A1:2019 [4]) or by fire/smoke curtains.

A fire safety engineer shall be consulted in order to assess the real fire risk within the building and identify the appropriate measures for the most effective protection of assets. The fire resistance of the showcase shall be adapted to the magnitude of the fire risk.