INTERNATIONAL STANDARD

ISO 11799

Second edition
2015-12-01

Information and documentation — Document storage requirements for archive and library materials

Information et documentation — Prescriptions pour le stockage des documents d'archives et de bibliothèques

Reference number
ISO 11799:2015(E)

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Contents

Page

Foreword ..... **iv**

Introduction ..... **v**

1 Scope **1**

2 Terms and definitions **1**

3 Risk management **2**

4 Construction of the building **2**
4.1 Security 2
4.2 Indoor climate stability 3
4.3 Inner structure and load requirements 3

5 Installation and equipment **3**
5.1 Services 3
5.2 Fire prevention 4
5.3 Fire detection 4
5.4 Fire extinguishing 4
5.5 Storage environment 4
5.5.1 Illumination 4
5.5.2 Humidity and temperature 5
5.5.3 Ventilation and air quality 5
5.6 Furniture and equipment 6

6 Maintenance **6**

Annex A (informative) **Fire prevention systems** **7**

Annex B (informative) **Fire fighting systems** **8**

Annex C (informative) **Recommended climatic conditions for the long-term storage of archive and library materials** **9**

Annex D (informative) **Guidance for air pollutants** **10**

Bibliography **11**

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 46, *Information and documentation*, Subcommittee SC 10, *Requirements for document storage and conditions for preservation*.

This second edition cancels and replaces the first edition (ISO 11799:2003), which has been technically revised.

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Introduction

Archives and libraries are institutions established to collect, preserve and make available materials intended for consultation.

Archive and library collections wherever they are stored normally contain a wide variety of material and formats. These are mainly documents on paper, parchment, palm leaves, papyrus and may also include photographic, audio-visual documents and digital formats on diverse types of carriers (mechanical, photo, magnetic, optical). All these materials ideally require specific storage conditions to ensure their long-term preservation and access.

NOTE See the Bibliography for ISO standards on storage of specific materials.

Figures and quantities given in this International Standard are intended for general international guidance. This International Standard presents some facts and general rules to be considered when a purpose built repository is designed, when an old building originally designed for another use is converted, or when a building already in use as repository is renovated, with respect to energy efficiency and sustainable development.

This International Standard applies to the long-term storage of archive and library materials for their lifetime. It takes into account that the materials are stored and allow current usage as well.

Depending on the climate and economic situation of individual countries, it may be difficult to create and maintain ideal conditions for the long-term storage of archive and library materials.

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Information and documentation — Document storage requirements for archive and library materials

1 Scope

This International Standard specifies the characteristics of repositories used for the long-term storage of archive and library materials. It covers the siting and construction and renovation of the building and the installation and equipment to be used both within and around the building.

It applies to all archive and library materials held in repositories, where mixed media may be stored together with paper-based materials. It does not preclude the establishment of separate areas or compartments within individual repositories, where the environment can be controlled to create conditions suitable for the needs of specific archive materials.

In a number of fields, national or local building regulations may encompass such matters as construction, safety and security for public buildings and buildings in which valuable objects are stored (fire precautions, emergency exits, security against earthquakes, theft, burglary, terrorist acts, etc.), as well as services and equipment in professional use. This International Standard therefore avoids detailed rules and regulations in these fields, except when recommending what may be additions to these requirements.

2 Terms and definitions

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

2.1
archive and library materials
all types of documents kept in archives and libraries regardless of their physical format, mainly books, manuscripts, files, maps, graphic collections and other documents consisting of paper, but also parchment, papyrus, films, photographic materials, audiovisual recordings, magnetic and optical media, as well as bindings and protective material

2.2
document
recorded information or material object which can be treated as a unit in a documentation process

2.3
long-term storage
storage, for a period of undefined length, of material kept for permanent retention

2.4
maintenance
actions of prevention or correction to support long-term functionality of repositories and the systems that support them.

[SOURCE: EN 13306:2010]

2.5
repository
building or room designed or arranged and used specifically and exclusively for long-term storage of archive and library materials

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3 Risk management

An overall assessment including an evaluation of the need and the risks should take place especially considering possible hazards.

The site for an archive and/or library repository building should consider the following risks:

— flooding;

— subsidence or landslides;

— tsunamis, frequent volcanic activity, or earthquakes;

— fire or explosions from adjacent site activities;

— accidents on nearby air runways or train tracks;

— proximity to strategic installations which would be a target in an armed conflict, terrorist attack or civil unrest;

— proximity to a plant, installation or natural source that emits harmful gases, smoke, dust, etc.;

— proximity to a place or a building which attracts rodents, insects and other pests.

The building shall be designed to protect the holdings by mitigating for hazards including the following:

— intentional harm;

— fire;

— water;

— pests;

— contaminants;

— light, UV, IR;

— temperature extremes or harmful fluctuations;

— humidity extremes or harmful fluctuations.

In order to minimize the harmful effects of external climatic variations, careful attention should be given to the building's orientation, landscaping, the overall climate of the site and the construction of the building.

The building shall be designed to facilitate the safe movement of holdings and assist the recovery from significant threats i.e. consideration of smoke hatches, floor drains and ramps.

A post-occupancy evaluation will ensure that the objectives have been met and the desired effects have been achieved.

4 Construction of the building

4.1 Security

The repository shall be secured against theft, burglary, vandalism and terrorism. Precautions should be taken against arson. The repository shall be either a purpose-built detached building or a self-contained unit within a building. Precautions shall be taken against entrances being used by unauthorized people. The building design should facilitate monitoring.

NOTE 1 For more information on precautions against arson, see Reference [8].

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NOTE 2 For more information on security in archives and libraries see Reference [14].

Emergency exits shall be constructed in such a way that they can easily be opened from the inside and that they cannot be opened from the outside, with the exceptions for fire response.

In the interests of security, it is recommended that storage areas should have no windows or skylight or they shall be fitted to provide adequate security (see also 5.5).

4.2 Indoor climate stability

Temperature and relative humidity have an impact on the holdings. Therefore storage areas should be designed to provide a stable internal environment appropriate to the preservation of the materials (see Annex C).

This can be partially achieved by constructing the external walls, roof and floor of the building from materials that, as far as possible, insulate the interior from external climatic changes without comprising air supply and circulation required for both collection storage and human occupancy. Walls, floors and ceilings inside the repository should be made of materials that have a high thermal inertia and moisture buffering.

Positive or at least neutral air pressure in repositories is recommended to maintain appropriate, conditioned environment and keep dust, pollutants and unconditioned air from entering the room.

NOTE For more information, see the Reference [15].

4.3 Inner structure and load requirements

For reasons of efficient climate control, fire safety and to limit loss of holdings in the event of fire, the repository should be compartmentalized.

The walls (including doors), floors and ceilings between single rooms and compartments, and between storage and other areas of the building shall be constructed so as to prevent fire (and water) from spreading into a neighbouring unit.

The floor load shall be calculated to include the specific volume and type(s) of archival records, the containers, and the static or movable shelving, cabinets and/or cases.

Structural support overall, or in specific higher load areas should be provided.

It is recommended that shelving configuration be considered during design to ensure shelving structural support, aisle width, and movement of materials are appropriate for materials types and containers to be stored.

Drains are recommended if water is used for fire protection, with protection against the entry of pests and water. Drainage shall be configured to carry water completely away from the building.

Provide space for safe and efficient movement of holdings. Inner structural supports and doorways will need to be designed to enable safe, unimpeded movement of collections of material by all available means of transport.

All inner structural systems should be engineered with bracing to resist movement or tipping that could result in a collapse or other damage to the holdings.

5 Installation and equipment

5.1 Services

Supply systems for electricity, gas and liquids, and drains shall not be located in, above or adjacent a room in the repository, unless needed in that room for a specific function directly connected with the repositories.

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A building management system control should be in a different fire compartment than the repository.

5.2 Fire prevention

The aim is to avoid a fire within the repository and make the repository impregnable for fire from the outside.

NOTE For further information, see Annex A.

5.3 Fire detection

All parts of the building shall be provided with a fire detection system connected to a central monitoring panel. Such a system shall respond automatically to the presence of fire by detecting smoke or other products of combustion. Heat detection devices shall only be installed as the sole method of detection in areas where other types of detectors may be inappropriate or unsuitable.

All parts of the building shall, in addition, be provided with manually operated fire-alarm call points which can be used by occupants to indicate the presence of a fire.

The central fire-alarm control panel should provide the ability to monitor all components of the system and should visually display the status of the system.

Panels should be located in a convenient, central location which is continuously monitored while the repository is occupied or open. Where the panel is not located at or near the probable fire-brigade entry point, a supplementary or repeater panel should be provided for the use of the fire brigade.

5.4 Fire extinguishing

The repository shall be equipped with fire extinguishers. Consideration should be given to the benefits offered by an automatic fire fighting system. Gas- or water-based fire fighting systems with no additives are recommended in repositories.

Fire extinguishing measures should be designed complying with the material stored, the design of the building, considering the size of the fire compartments, higher density structure, type of shelving, etc.

NOTE For further information, see Annex B.

5.5 Storage environment

5.5.1 Illumination

The damage caused by light is cumulative. Intensity, duration and spectral distribution of any illumination in a repository should be controlled to minimize damage. Different materials react differently to light. Some are more prone to be affected than others. Light in general is damaging and should be kept at a minimum. Direct daylight shall be excluded.

In a building not primarily designed as a repository, but adapted for that purpose, windows should be blocked or as a minimum be screened by curtains or blinds, and/or by solar filtering on the window glass (IR, UV, visible radiation).

Similar screening provisions are recommended for offices, public reading rooms and any other room in which documents are exhibited. At an easily accessible place outside the repository, there should be a central switch indicating whether all lights and other electrical circuits in the repository are turned off. It should be ensured that illumination is powered off, through time controls, motion detection, or other means.

A repository room shall not be illuminated more than is necessary for retrieval and replacement of documents, room inspection and cleaning.

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For the two latter purposes, an illumination of about 100 lux on the floor level is sufficient. The distance between the lamp and the nearest unprotected material should be considered with regards to the heat the lamp generates.

5.5.2 Humidity and temperature

Repositories for archive and library materials shall be kept at a relative humidity below the point where microbiological activity occurs.

Repositories for archive and library materials should be kept at a cool temperature, ideally controlled in a building with high thermal and hydric inertia (see 4.2).

NOTE According to the present state of knowledge, there is an increasing risk of microbiological activity above 60 % relative humidity, and increased brittleness at low relative humidity. The lowest acceptable humidity for long-term storage of archive and library materials is under discussion. For different kinds of materials, different limits are recommended, but there is no general agreement, either upon temperature or upon humidity. In general materials last longer at lower temperatures and at lower relative humidity. As guidance, the data in Annex C may be used.

5.5.3 Ventilation and air quality

5.5.3.1 General

The purpose of air ventilation is to ensure an appropriate air quality in archival storage in order to keep the records clean and dry and to discourage microorganisms, safeguard health by avoiding mold outbreaks, and to avoid damage to records.

5.5.3.2 Ventilation

Ventilation includes both air exchanges and air circulation in the archival storage area. Air circulation is necessary in all locations and all levels to minimize the risk of developing microclimates that may cause a mold growth. Air exchange is necessary to prevent the build-up of off-gassing from the holdings, i.e. acetic and formic acids.

5.5.3.3 Particulates

Accumulations of particulates can encourage growth of microorganisms. Some particulates contain burned hydrocarbons, sulfur and other compounds that harm collections. A particulate filtration system, if necessary, should be designed for both air supply and return air ducting.

To avoid an internal source of particulates, it is recommended that all concrete block walls be primed and painted, and concrete floors hardened with sealant to prevent particulate accumulations inside the storage area.

5.5.3.4 Gaseous contaminants

Gaseous contaminants can cause irreversible damage to holdings (i.e. discoloration of silver-based photographic holdings, and distortion of plastic films due to increased acidity, etc.). Gaseous pollution-related damage is cumulative, is influenced by other environmental factors (i.e. relative humidity and temperature), (See Annex D for further information).

NOTE 1 The most common contaminants from external sources, found in archival storage areas are forms of NO(x) and SO(x) from the combustion of hydrocarbons. Ozone from external sources; in higher concentrations in urban areas; is readily converted to an inactive form and is not found in high concentrations in most archival storage facilities.

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Archives and libraries should restrict the use of sources of VOCs and particulates.

NOTE 2 Examples of common sources are: laminated boards, carpeting, paints, and varnishes that are oil-based, or contain polyurethane, foams that contain polyurethane; acid-curing silicone sealants and adhesives; cellulose nitrate lacquers and adhesives; vinyl; pressure sensitive adhesives that release VOCs, unstable chlorine polymers (PVCs); and sulfur containing materials.

5.6 Furniture and equipment

The furniture and equipment used for the storage of holdings shall support the weight and sizes of the holdings.

No furniture or equipment other than that intended for storage and handling of documents shall be used in a repository.

The materials used for furniture or equipment shall be chemically inert, not combustible, and not emit, attract or retain dust. Nor shall they be liable, through decomposition in the event of fire or for other reasons, e.g. natural aging, to emit substances harmful to the materials stored, e.g. acidic gases. The choice of material shall minimize, in the case of fire, the emission of harmful substances, smoke and soot.

For the correct functioning of the principles of creating stable environmental conditions (see 5.2), no holdings shall be stored in close proximity to an outside wall. There should be a distance of at least 200 mm between items and wall.

In compact shelving to assist the air circulation, there should be a gap of not less than 25 mm between units outside operating hours.

Storage of records should be held at least 100 mm from the floor surface with regard to the risk of water damage.

In order to allow easy access for normal and emergency use, and to allow air circulation, ample space should be left between the shelves (or blocks of shelving) and between shelves (or blocks of shelving) and walls.

6 Maintenance

The institution shall continuously monitor changes in the building and its surroundings. Appropriate action shall promptly be taken to restore protection if changes impair the archive and library premises protection level.

All installations in the repositories shall be maintained and checked for proper function and any shortcomings shall be corrected. Function checks and actions taken shall be documented.

NOTE Examples of functional checks are regular check of air temperature and relative humidity in the repositories, inspection of fire alarms, fire damper, smoke extract fans, smoke hatches, fire extinguishing equipment, moisture alarms, burglar alarms, automatic door closers and lighting equipment.

The institutions shall develop and adopt internal procedures and rules for the use of the repositories.

In order to facilitate the supervision and operation of the repository, the institution should collect and compile documentation of the building and premises, the fire protection, and the technical installations present on the site, or that may affect the premises function.

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Annex A
(informative)

Fire prevention systems

A hypoxic system relies on the continuous introduction of nitrogen into a store, so as to keep the oxygen concentration below 15 %. This means that it is physically impossible for a fire to start or propagate. This is different from all other systems, which rely on a fire producing sufficient heat, smoke or flame to trigger the release of the extinguishing agent. This is quite new technology, but it is probably the most effective for compact or high-density racking. A disadvantage of these systems is that the building must be constructed to a very high standard of air-tightness.

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Annex B
(informative)

Fire fighting systems

Possible fire fighting systems include (but are not limited to): water sprinklers, water mist and inert gas. The suitability of a system should be considered in the context of the particular store, including consideration of its size, construction method and materials, condition, nature of the collection stored, type of racking used.

Water sprinklers (both wet and dry pipe systems) have the advantage of being familiar and well understood. They are effective in most contexts, although it may be difficult to guarantee that enough water could reach the seat of a fire in compact or high-density racking.

Water mist systems have the advantage of using very small quantities of water, so that the amount of damage to collections adjacent to the seat of the fire is minimized. Because the technology is newer than conventional sprinklers, installers and users may be less familiar with it. As with sprinklers, it may be difficult to guarantee the effectiveness of water mist systems in compact or high-density racking.

On discharge, an inert gas system injects sufficient gas (often argon or nitrogen) into a storage space to reduce the oxygen concentration below 15 %, at which level a fire cannot propagate. These systems are only suitable for small repositories, possibly containing the most valuable items or those which are most vulnerable to damage by water. A disadvantage of these systems is that the building must be constructed to a very high standard of air-tightness.

NOTE Properly designed, installed and maintained water mist or sprinkler systems do far less damage than manually fighting a fire that has not been contained by an automatic fire extinguishing system. The risk of accidental discharge is very small.

Where water-based fire protection systems are to be installed, provision shall be made for rapid drainage from all protected spaces. Provision shall be made for adequate floor drainage, including the installation of sump pumps as an added measure of protection. Shafts, staircases and drains should be so configured that water leaving one space does not enter another. Intermediate floors in multi-storey repositories should be waterproofed.

Even if an automatic fire extinguishing system is provided, it is recommended to install:

— portable fire extinguishers;

— hose reels or racks;

— hydrant systems;

— dry risers.

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Annex C
(informative)

Recommended climatic conditions for the long-term storage of archive and library materials

Generally speaking, lowering the temperature and/or lowering the relative humidity will lengthen the life of documents. High relative humidity and temperature increase deterioration processes and as well as the risk for mould attack.

For some groups of documents on modern materials, there are standards for long-term storage, e.g. for photographic documents of different kinds, audiovisual and sound records. For documents made of more traditional materials like palm leaves, paper, papyrus, parchment, and a lot of other materials used for records around the world, no International Standards on their storage exist.

It is necessary for an archive library or organization to assess its holdings, to find out what may be the storage environment covering their needs. The outdoor environment in the specific region should also be accounted for.

The most common approach to control relative humidity and temperature is by using energy driven machinery, active control of environment. As an alternative, indoor environment can be achieved by constructing a repository where the building materials and structure contribute to keep the climate at the desired level and prevent major changes in the indoor climate, so called passive controlled.

The table below is based on ISO 18934:2011.

This can be used as a general guide, but it is strongly recommended that publications on this topic are consulted for more details about areas of application, alternative storage conditions for different purposes, geographical varieties, etc.

Table C.1 — Climatic conditions

Condition[a]	Temperature range °C	Suitability
Room	16 to 23	Fair
Cool	8 to 16	Good
Cold	0 to 8	Very Good
Subzero	-20 to 0	Necessary for some materials as colour photos and film

[a] Assuming 30 % to 40 % RH for each condition.

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Annex D
(informative)

Guidance for air pollutants

A room with positive air pressure uses fans to move a steady flow of air out of the room, replacing the air inside with a filtered source. The fans may push air from the inside, or pull air out of the room by creating negative air pressure in surrounding enclosed locations.

Preferred air handling systems for positive air pressure in records storage are characterized by the following:

— separate air handling systems for records storage;

— isolation from sources of pollutants (i.e. loading dock, machine room, or food service);

— outdoor air intakes located to limit introducing dust and pollutants, and filtered, and sufficient air exchanges to maintain air quality (T, RH and pollutant levels) based on room size, records volume and type (i.e. records off-gassing volatile organic compounds, such as acetate film, etc.).

To reduce the impact of gaseous air pollutants, the use of an air filtration system is advisable.

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ICS 01.140.20

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