



**International
Standard**

ISO 11799

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

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

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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 document 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).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents. ISO shall not be held responsible for identifying any or all such patent rights.

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

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 46, *Information and documentation* Subcommittee SC 10, *Requirements for document storage and conditions for preservation*.

This third edition cancels and replaces the second edition (ISO 11799:2015), which has been technically revised.

The main changes are as follows:

- updated content to reflect ISO standards/technical reports published after the second edition, including ISO/TR 19814 and ISO/TR 19815;
- increased detail and guidance on facility requirements and considerations.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

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

Archive and library collections, wherever they are stored, normally contain a wide variety of materials and formats. These are mainly documents on paper, parchment, palm leaves, papyrus and generally also include photographic, audio-visual documents and digital formats on diverse types of carriers (mechanical, photographic, magnetic, optical). All these materials ideally require specific storage conditions to ensure their long-term preservation and access. Note that separation by media type is rarely possible in archive and library storage settings, and that most collections will include a variety of materials.

NOTE See ISO 18934^[3] and ISO 18911^[1] on storage of specific materials.

In a number of fields, national or local building regulations can 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 document therefore avoids detailed rules and regulations in these fields, except when recommending what can be added to these requirements.

This document 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. The same applies for underground storage facilities which are intended to function as or are already in use as storage facilities.

This document applies to the long-term storage of archive and library materials. It takes into account that the materials are stored and must allow active usage as well. Note that this document is about the design and construction requirements for archive and libraries storage spaces. ISO/TR 19814^[7] and ISO/TR 19815^[8] serve as companion documents which guide program activities and operations once the physical structure of the store is in place. As such, this document also does not specifically address the design or construction requirements of support spaces to collections storage areas (e.g. supplies storage, receiving areas, and quarantine spaces). Throughout this document, the term “repository” is used to refer specifically to a collection’s storage space, as opposed to a broader facility which may include a repository as well as other support spaces.

Depending on the climate and economic situation of individual institutions, it can be difficult to create and maintain optimal conditions for the long-term storage of archive and library materials. In these cases, it is expected that the institution will choose a path that meets the most appropriate compromise given needs and resources. Information that factors into these decisions should be documented with overall project documentation (see 5.3) to inform future professionals as to the decisions made and why.

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

1 Scope

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

This document applies to all archive and library materials held in repositories, where mixed media can 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.

This document does not specify exhibition or display guidelines.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions 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 archive and library material

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

3.2 building fabric

materials that enclose the interior of a building, separating the interior from the exterior (walls, floor and roof) and includes a number of different materials that collectively form the external envelope of the building

3.3 document

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

3.4 environmental monitoring

recording and analysis of various environmental conditions – including temperature, relative humidity, light, vibration, or other factors – which impact the long-term preservation of collections materials

3.5 hazard

source of potential harm to collections

Note 1 to entry: Broad examples may include events such as earthquakes, fires, theft, or others.

[SOURCE: ISO 21110:2019, 3.7, modified — Collections was specified in the definition; Note 1 to entry was replaced.]

3.6 integrated design

collaborative method for designing buildings which emphasizes viewing the building as an interconnected and interdependent whole rather than an accumulation of its separate components

Note 1 to entry: For cultural heritage, this includes the involvement of collections and facilities specialists as part of the design team.

3.7 life expectancy

length of time that information is predicted to be retrievable in a system under extended storage conditions

Note 1 to entry: Life expectancy designation (LED) is a rating in years for the life expectancy of records, e. g., LE-1000, indicates that the records are expected to be usable for 1 000 years.

[SOURCE: NISO TR01-1995]

3.8 long-term storage

storage, for a period of undefined length, of material kept for permanent retention

[SOURCE: ISO/TR 19815:2018, 3.22]

3.9 maintenance

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

[SOURCE: EN 13306:2010]

3.10 repository

building, room, or space designed or arranged and used specifically and exclusively for long-term storage of *archive and library materials* ([3.1](#))

3.11 risk

effect of uncertainty on objectives; the potential for damage occurring to collections materials from a particular hazard based on likelihood, frequency, or progress

Note 1 to entry: Adapted from ISO 21110:2019^[4] and *Preventive Conservation: Collection Storage*^[51]

4 Sustainability — Collections storage and preservation

4.1 General

Conserving archival and library heritage for generations to come includes sustaining protective storage that presents very low risks to collections. Understanding and minimizing the running costs, energy use and carbon emission potential of maintaining collections in good condition indefinitely is essential to their long-term conservation, in order not to contribute to wider ecological and environmental hazards which themselves would threaten to undermine the practice and purpose of conserving collections. Institutions should strive to invest in building structures that will last for a minimum 100+ years, while recognizing that

internal systems (mechanical, lighting, sustainable technologies) will by necessity require reinvestment on ~30 year cycles. This reinvestment cycle also allows for the inclusion of new technologies and new scientific knowledge on a periodic basis.

4.2 Specifying storage spaces/conditions

In setting out to design or review the qualities of a storage facility intended to hold archival and library materials, the nature and use of these materials shall be defined and the range of safe storage conditions shall be identified accordingly. Note that recent research has shown that many archival materials can tolerate certain seasonal ranges of environmental conditions without adversely affecting longevity (see [Annex B](#)). Using these environmental ranges, in conjunction with proper housing/packaging for materials (such as archival quality boxes, folders, and sleeves where appropriate) can reduce the overall energy consumption, and improve the long-term sustainability, of the storage facility.

Temperature-sensitive materials that profit from or require storage at especially low temperatures (e.g. cellulose acetate film and colour media) and acutely moisture sensitive materials that require dry microclimate packaging (e. g. polyester-base magnetic tape) shall be identified, packaged and stored accordingly in microenvironments so that there is no need for the constant operation of specialized environments throughout the year for the entire archive and library collection. Please note that this standard does not address specific design requirements for frozen collections storage facilities, but that envelope and mechanical specifications for these environments will differ from standard storage construction. Frozen storage facilities for long-term preservation shall always be kept separate from frozen environments for quarantine (pests, mould, etc.) purposes.

An organization planning a new or renovated collections storage facility shall explore the potential for designs which incorporate the following characteristics:

- envelope designs and site/facility layouts which mitigate or buffer the majority of external energy loads;
- the possibility for a non-mechanically-controlled (or primarily non-mechanically-controlled) environment that can maintain appropriate conditions throughout the course of a year (whether in a seasonal or steady climate);
- a high material volume percentage storage design (i.e., an efficient storage design where the volume of material in the space is significantly higher than free air volume);
- the use of uninsulated ground-contact floor slabs which provide a heat/energy sink that mitigates energy loads on an upper structure;
- appropriate and effective vapor control layers or seals in all structural elements.

5 Design planning

5.1 Identify design participants

All construction projects involving the storage of archives and library collections shall utilize an “integrated design” approach that includes:

- the participation of staff from the organization, including preservation and/or collections management staff and facilities/operations staff;
- applicable external experts in the design and operation of collections preservation environments (beyond the general architecture/engineering team);
- relevant architectural and engineering disciplines to the specific project.

This team involvement should initiate as part of predesign and establishment of program requirements and continue through to construction and final building/mechanical commissioning.

The nature and needs of collections storage facilities, whether new facilities, renovation projects, or adaptive reuse, require careful consideration of appropriate design requirements for both collections and sustainable operation; while this standard provides general requirements and guidance, these cannot be applied universally. Relevant staff and external experts, who are intimately familiar with any existing conditions as well as future needs for collections objects, shall be included to inform the appropriate balance between facility design for preservation, sustainability, historic preservation concerns, or other factors.

Note that the design of a storage space is often subject to local regulatory body review and approval.

5.2 Establish design priorities

Design priorities for archive and library storage facilities will vary depending on the institution and its specific needs and resources. Before jointly addressing design specifications as a team, the institution shall carefully define its expectations relative to a series of factors to guide the design and construction process. Those factors should include:

- available budget or budget limitations;
- expected preservation quality/collection longevity;
- need for specialized storage environments (frozen, dry, high security, etc.);
- size/extent of collections to be stored in each storage environment;
- sustainability requirements (including construction materials, operation, etc);
- achievement of target environmental conditions;
- expected building longevity;
- aesthetic architectural requirements;
- occupancy expectations and access requirements (public or staff only, etc.);
- future collections growth requirements;
- disaster risk prevention.

5.3 Establish design specifications

The institution shall, with the assistance of external consultants and designers as appropriate, establish an initial set of design specifications and program requirements to guide the design and construction process. These are to serve as an initial informative document to the broader design team to establish expectations for the finished facility, and should include factors as addressed in [Clause 6](#), including:

- design environmental ranges for storage zone(s);
- any preferred systems or requirements for:
 - building envelope;
 - mechanical systems;
 - lighting;
 - fire suppression;
 - security;
 - flooring;

- storage furniture;
- planned occupancy patterns and storage capacity;
- preferred operational or control characteristics.

Design specifications and program requirements may be updated throughout the course of the design and construction project, based on the findings and decisions of the integrated design team. Original and successive versions shall be preserved as part of the project documentation to record original intent versus the negotiated final design and construction.

5.4 Risk assessment

5.4.1 General

A risk assessment shall be carried out when deciding where to locate a new building or collection space intended to house cultural heritage collections, whether for storage, display or other use. Existing sites, buildings or rooms, vaults, or caves housing collections shall be re-assessed against risks periodically, particularly when new hazards are known to have emerged. Information and data shall be gathered and assessed in order to formulate site and design requirements to meet applicable environment, security, fire, flood, earthquake, landslide and other protection standards and regulations in any new or renovated facility. As part of the risk assessment, the methodology and steps below shall be included. The risks set out in the following clauses shall be considered when:

- planning, constructing or adapting the building or collection space (including risks associated with the construction works themselves, in an existing building),
- equipping the building, and
- managing the building once in use.

NOTE For details, consult ISO 21110^[4] and ISO 31000^[6].

5.4.2 Hazards to collections

The nature and use of the collections to be housed shall define requirements for the qualities and design of a building or room in which they are to be placed. The organization shall identify the hazards that affect its collections and evaluate the likelihood and impact of those hazards occurring. The following hazards are common to cultural heritage collections and shall be assessed:

- fires;
- water (fresh water supply and wastewater);
- natural events (torrential rain, strong winds, flooding, landslide, snowslide, earthquake, wildfire, lightning, etc.);
- environment (internal and external): unsuitable/inappropriate temperature, humidity, light and pollution including gaseous and particulate (see [Annex B](#) and [Annex C](#) for examples of guidance information regarding environmental risks and sensitivities of collection materials),
- load-bearing capacity;
- bio-deterioration (pests and mould, endogenous decomposition);
- theft, robbery;
- risk of war or conflict;
- vandalism (including arson).

The hazards associated with the location of a building shall be identified in accordance with local and national guidance (i.e. flood zones, expected sea rise, etc.). The location within a building of activities and services that may create a hazard, e.g. kitchens, laboratories, water storage tanks, oil tanks, combustion equipment, HVAC systems, and electrical switchgear shall be taken into account in the risk assessment. Handwash and sanitary installations within storage areas should be avoided and internal water pipe runs should be avoided.

5.4.3 Site risk assessment

5.4.3.1 Hazards identification

When selecting a site for a new construction or reviewing an existing building (above- or below-ground) a risk assessment shall be undertaken to identify and document the hazards of each potential site and the likelihood of each of the identified hazards causing damage. Specific hazards may include those that result in the sudden loss of, or extensive damage to collections (e.g. the collapse of the building, fire, flood or landslide) or those hazards that can result in damage over time (e.g. insect attack, pollution or climate).

Correlations of individual risks should also be taken into consideration. When selecting spaces within an existing building (whether part or whole) for re-use for heritage collections, a risk assessment shall be undertaken with reference to the strategy outlined in [5.4.1](#). It is recognised that in many cases natural hazards due to the local climate (e.g. high temperature and relative humidity, risk of hurricanes or cyclones) or geology (e.g. risk of seismic activity) cannot be eliminated and must be accepted and mitigated as far as possible.

Local planning and environmental regulations will always influence where a building is located. No site can be completely free from hazards, but when selecting and planning for a new construction, the probability of the hazards identified causing loss or damage to heritage materials, and the potential cost of mitigation or recovery, is to be assessed and taken into account.

The risk assessment shall include but does not have to be limited to more common hazards associated with the following:

- natural hazards
 - flooding, water penetration (from the sea, rivers and lakes, rainwater and snowmelt), including current and projected water/sea levels/rainfall rates;
 - landslides, avalanches, sink holes, uplift, seismic and volcanic activity;
 - wildfire (from nearby dry vegetation, lightning)
 - hurricanes, tornados or cyclones;
 - solar flares or other events impacting magnetic fields;
 - underground radioactive materials, such as radon.
- human-made hazards
 - road, rail, mining or similar tunnels under or close to the building or elevated roadways, railways or tramways (e.g. risk of collapse or excessive and regular vibration);
 - sites or areas used for the storage or processing of highly flammable materials (e.g. petro-chemicals, explosives, paint and tyres) at risk from fire or explosions, or at risk from water or chemicals used to deal with such hazards;
 - sites on or adjacent to a place emitting harmful gases, pollutants, smoke, dust, etc. or vibration sources, such as open cast mining, incinerator, cement works, etc.;
 - sites adjacent to a place or activity that will attract rodents, insects and other pests, such as food storage or processing, waste management, landfills, etc.;

- nuclear power stations, plants or other radioactive facilities (including waste and storage sites);
- airports and their associated flight paths;
- high voltage power lines and substations (risk of e.g. collapse or fire);
- defence and other target establishments;
- buildings and places that may become the focus of civil disturbances;
- strong magnetic fields (artificial).

In order to minimize the harmful effects of exposure to sunlight and strong winds that affect air infiltration, careful attention shall be paid to orientation, landscaping and the site's microclimate. Selection of a new site that is below the 1 % ('100 year') flood level shall be avoided, if possible. Where a history of springs and underground watercourses exists, these shall be taken into account as heavy and prolonged rainfall may reactivate them.

5.4.3.2 Accessibility of site

In addition to assessing the likelihood and impact of the above, an assessment shall be made of the accessibility of the site to emergency services at all times. The accessibility to the site includes the likely call out time of fire and other emergency services. This is especially important if the building site is remote or accessible only through dense traffic or narrow streets. For example, remote buildings may need additional fire protection measures to allow for additional time for fire service response. The site should include safe and secure transportation spaces, unobstructed access to the building for larger vehicles while at the same time meeting security standards. Sites should have multiple access points; in the aftermath of natural disasters or other events, single-point entry may be blocked, leaving the facility inaccessible.

5.5 Location of repository within structure

For new facilities, the repository location in relation to other aspects of the facility (occupied work areas, receiving areas, etc.) shall ideally be located in one of two areas:

- Central to the facility, surrounded on all sides by other environments/zones which buffer the repository from the exterior environment. Depending on exterior conditions, this can both reduce overall energy loads on the repository, as well as protect it from any failures of the exterior envelope.
- Away from direct sun exposure; in the northern hemisphere this may be on the north side of a facility, with other building programs/elements located on the south side, with the reverse arrangement for the southern hemisphere. While the repository may still have direct exposure to the exterior envelope, the majority of the heat load will be buffered by other sections of the building. Note that this arrangement may be superseded by other risk factors on the site.

5.6 Subgrade storage considerations

Subgrade storage facilities (underground vaults, cave systems, or larger human-made facilities) can be used to great effect for long-term storage and preservation, and have a number of advantages over above-grade facilities (such as lower and more stable temperature), provided certain risks can be managed. Institutions considering the use of subgrade storage facilities shall specifically account for:

- knowledge of ground-water levels and the likelihood of groundwater rise over time;
- intrusion of surface water;
- in natural vaults/caves, an understanding of the geologic makeup and content of the surrounding strata, specifically as it pertains to preservation risks;
- appropriate water and moisture control, either through envelope design or mechanical intervention;
- the provision of ventilation/fresh air even if the storage environment is not occupied full-time;

- the provision of appropriate fire protection systems;
- the assurance of structural stability (whether natural or man-made);
- multiple paths of ingress/egress.

Using subgrade storage in suitable geographic settings and with the correct design can often provide for appropriate preservation conditions with a minimum of mechanical intervention or energy expenditure, greatly increasing the overall sustainability of the storage solution. Institutions shall consider:

- natural ambient subgrade temperatures, and whether those are suitable for preservation needs without mechanical control;
- designs which strive for overall passive operation;
- unoccupied facilities (no permanent workstations) which require a minimum of ventilation/fresh air.

6 Building materials and assembly

6.1 Building fabric and environmental protection

6.1.1 General

The influence of outdoor climate conditions on indoor environments is partially determined by the construction and quality of the building fabric. The external building fabric of storage areas should be designed to contribute to a stable internal environment appropriate to the preservation of the collection. A new building designed to provide an environment requiring climate control (e.g. heating in winter, or cooling in summer) shall be capable of maintaining specified conditions in the event of the failure of the equipment for a minimum of 48 h or until alternative arrangements can be made.

6.1.2 Insulation and thermal stability (Thermal)

This can be partially achieved by constructing the external walls, roof and floor of the building from materials that, as far as possible, protect the interior from temperatures that are greater or less than internal conditions, and from the impacts of external temperature changes.

The two principal components of this are:

- thermal mass – the capacity of the building fabric to absorb, store and release heat. The buffering effect reduces rapid temperature fluctuations within the storage environment.
- insulation – If allowed to heat or cool from prolonged external conditions the fabric will absorb this energy and release it at a slower rate into the storage environment. Insulation on the external face of the thermal mass will delay its temperature change when the external temperature is greater or less than that of the thermal mass.

New repository construction shall include sufficient thermal mass/insulation to mitigate external temperature changes to either:

- allow for passive interior environmental control (in the interest of sustainable operation) at acceptable preservation conditions;
- or to minimize thermal loads sufficiently to reduce the mechanical intervention necessary to achieve the selected preservation conditions.

Existing facilities/repositories should strive to retrofit, where possible, by means of addition of insulation to appropriate floor, wall, or roof structures. This process will likely require specialist input into the overall appropriate envelope structure.

External weather conditions should be assessed to evaluate the impacts of temperature on the performance requirements of the thermal fabric. Permanently higher or lower temperatures than the internal conditions will not be stabilised by insulating the thermal mass as it will get heated or chilled over a long duration.

6.1.3 Airtightness

For the insulation to perform effectively the fabric also needs to be protected from air leakage, that is the leaking of controlled internal air to the outside through gaps in the construction and the uncontrolled external air replacing it.

New construction should incorporate an air seal strategy. The air seal membrane may be achieved through products such as paper-based building wrap products or utilizing the vapour seal membrane. Where two storage repositories are connected, or a storage repository links directly to another room or corridor that is not maintained at the same environmental conditions, an air seal shall be used in the wall/zone envelope separating the two spaces. Airlocks may be utilized at entrance points as necessary; the layout of the airlock shall allow for the movement of staff and collections.

Consideration shall be given to the type and position of an airtightness membrane within the wall structure to prevent the risk of interstitial condensation forming within the external fabric of the building^[30].

6.1.4 Hygroscopicity/permeability (Vapor)

Fluctuations in humidity are reduced by maintaining an appropriate temperature range but can be further protected by construction practices.

- One option is to provide a hygroscopic face (such as open-textured concrete block finished in water-based paint) to the internal surfaces of the repository, which provides for internal moisture buffering utilizing the structure. This should be used in association with a vapor control layer to mitigate the passage of moisture vapor between outside and inside.
- Another is to seal the interior surfaces of the repository against moisture absorption, and rely on mechanical intervention to specifically manage interior relative humidity conditions. This may reduce overall moisture content in the structure if that is an overall concern.

Moisture passes through a structure both with and independently of air leakage. Institutions shall identify and implement a vapor control strategy; this shall be considered independently of airtightness.

Vapor permeability is the measure of how quickly water vapor will diffuse through a particular medium from areas of high vapor pressure to low vapor pressure. Building fabric with a high permeability will allow moisture to diffuse through the structure quickly, making it more difficult to keep moisture out and dehumidify in humid environments or to maintain interior moisture levels when humidifying. Envelope structures (whether at the whole-building level or for an interior zone/space) with a low vapor permeability slow the rate of diffusion and make it easier to control and maintain appropriate dew points in collections environments through humidification and dehumidification. For existing structures where the inclusion of the vapor membrane may not be feasible in the original wall structure, application may be achieved through the construction of an interior added wall or surface. The design of this new wall for thermal and vapor control shall be determined by a qualified professional.

Vapor control can be achieved through the use of membranes in the external building fabric; their location is relative to the thermal insulation, typical outdoor conditions and direction of vapor movement to prevent the risk of interstitial condensation forming^[30]. The penetration of these membranes can result in the loss of local vapor control, and can lead to inappropriate internal microenvironments or damage to the envelope structure. Any penetration through the finished envelope or membrane shall be well-sealed.

6.1.5 Air pressurization and repositories

All repositories shall be neutral or positively pressurized relative to their surrounding spaces (whether internal or outdoors). Positive pressurization requires the mechanical addition of outside air, which is often a primary source of energy (heat and moisture) and pollutant (particulate or gaseous) load, into the repository. Design and program strategies such as non-occupied repositories and balanced airflow