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

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National foreword

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

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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).

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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.

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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.

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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

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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

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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.

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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;

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— 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).

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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.;

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— 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;

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