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Information and documentation — Collections management for archives and libraries

Information et documentation — Gestion des collections pour les archives et les 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 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 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 the following URL: www.iso.org/iso/foreword.html.

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

Introduction

This document is based on ISO 11799 and BS 5454:2012. It is intended to be used with ISO 11799 and ISO/TR 19815.

Information and documentation — Collections management for archives and libraries

1 Scope

This document provides guidance and recommendations in the planning, implementation, maintenance and improvement of the preservation of archive and library collections through:

— recommendations and guidance for preservation planning and ongoing management of physical collections in archives and libraries;

— procedures for managing collections in the stacks, research and reading rooms, conservation facilities and while on exhibit and during transportation.

— guidance and recommendations for appropriate enclosures and containers for archive and library collections.

This document applies to preservation of archive and library physical collections of institutions and volumes small and large. It applies to all collections housed by an institution; their own collections and deposits or loans from other institutions. Some information on digital collections, born digital and digitized, for conservation is included for reference.

This document also applies to collections that are being managed by governmental agencies.

This guidance is intended for collections that are being preserved for long-term use.

Collections intended for long-term use need to be managed to mitigate many risks that can cause loss, including catastrophic loss from fire and floods, risks of vandalism and theft, to instability of materials, including acetate film and acidic paper. Collections management addresses the risks from a holistic perspective. It is recognized that compromises are necessary based on, among other factors, the quantity of collections in archives and libraries. The compromises can be managed when the factors of use, significance, vulnerability of the collections and the expertise and best practices from several fields are included in the decision-making process.

This document covers specifically the operations required to manage the collections environment that are relevant to the preservation policy and plan of the institution. This includes the monitoring of climate stability, control of exposure to light, preventive cleanliness measures and cleaning of the collections storage areas.

The conservation treatment of individual items within the collections is not covered in this document.

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 terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

3.1
accessioning
action of adding *document* (3.8) or group of documents to the collections of an information and documentation organization

[SOURCE: ISO 5127:2001, 4.1.2.16, modified.]

3.2
archival-quality material
material that does not cause harm or reduced life expectancy when in contact with other *items* (3.16)

[SOURCE: SAA Glossary — A Glossary of Archival and Records Terminology]

3.3
archive
organization or part of an organization responsible for selection, acquisition, *preservation* (3.21) and availability of one or more *archives* (3.4)

[SOURCE: ISO 5127:2001, 3.1.02]

3.4
archives
records of the same provenance accumulated by an organization or person in the course of the conduct of affairs and preserved because of their enduring value

[SOURCE: ISO 5127:2001, 3.1.01]

3.5
collection
gathering of *documents* (3.8) assembled on the basis of some common characteristics without regard to their provenance

[SOURCE: ISO 5127:2001, 3.1.07]

3.6
conservation
intervention techniques applied to prevent, arrest or delay *deterioration* (3.7) of a *document* (3.8)

[SOURCE: ISO 5127:2001, 6.1.03]

3.7
deterioration
gradual degradation and possible ultimate destruction of materials arising from damaging inherent properties or interaction with environmental influences

[SOURCE: ISO 5127:2001, 6.1.13]

3.8
document
recorded information or material object which can be treated as a unit in a documentation process

Note 1 to entry: Documents can differ in form and characteristic.

[SOURCE: ISO 5127:2001, 1.2.02]

3.9
dry-stamping
embossed mark for security

3.10
hazard
source of potential harm

[SOURCE: ISO Guide 73:2009, 3.5.1.4]

3.11
memory organization
institution involved in the *collection* (3.5) and *preservation* (3.21) of cultural information, such as a *library* (3.17), *archive* (3.3) or museum that is itself together with its collections, established as a permanent entity

[SOURCE: ISO 27730:2012, 3.6]

3.12
holdings
totality of materials in the custody of an information and documentation organization

Note 1 to entry: Holdings includes all types of materials kept in archives and libraries regardless of their physical format, mainly books, manuscripts, files, maps, seals and graphic collections and other documents consisting of paper, but also parchment, papyrus, films, photographic materials, audiovisual recordings, magnetic and optical media and materials such as stone, metal, wax, textiles. (Partial source ISO 11799)

[SOURCE: ISO 5127:2001, 3.1.13, modified — Note 1 to entry has been added.]

3.13
collections management
activities to stabilize materials for long-term storage by placing materials in appropriate housings and environments

Note 1 to entry: Collections management includes ensuring materials are in containers, that the documents are supported within containers and that fragile documents have individual enclosures for additional protection.

Note 2 to entry: Collections management also includes all aspects of the storage environment, including temperature, humidity and shelving.

[SOURCE: Partial source SAA Glossary — A Glossary of Archival and Records Terminology]

3.14
collections maintenance
actions taken to prepare collections for storage and for use (e.g. packaging)

3.15
housing
actions to enclose collections in *packaging* (3.19) before they are placed in storage

Note 1 to entry: Housing is an action in collections maintenance.

3.16
item
archive or library item
smallest intellectually indivisible unit (e.g. a letter, memorandum, report, photograph, sound recording, book, graphic or map)

[SOURCE: ISO 5127:2001, 2.1.13, modified.]

3.17
library
organization or part of an organization the main aim of which is to facilitate the use of such information resources, services and facilities as are required to meet the informational, research, educational, cultural or recreational needs of its users

[SOURCE: ISO 5127:2001, 3.1.03]

3.18
ownership mark
unique identifying mark made on each *item* (3.16) by the owner

3.19
packaging
layer of protection for *items* (3.16)

Note 1 to entry: Examples include a box, folder and envelope.

Note 2 to entry: Packaging should protect the items from light and pollutants. It also provides some protection from physical damage, pests and moderate changes in temperature or humidity.

3.20
powder-coating
protective and decorative coating formed by the application of a coating powder to a substrate and fusion (and curing if necessary) to give a continuous film

[SOURCE: ISO 8130]

3.21
preservation
all measures taken including financial and strategic decisions to maintain the integrity and extend the life of *documents* (3.8) or collections

[SOURCE: ISO 5127:2001, 6.1.01]

3.22
preventive conservation
measures and actions aimed at avoiding and minimizing future *deterioration* (3.7), damage and loss

Note 1 to entry: Generally indirect measures or actions.

[SOURCE: EN 15898:2011, 3.3.5, modified.]

3.23
radio frequency identification
RFID
electronic device used for security and tracking

3.24
record
document (3.8) created or received and maintained by an agency, organization or individual in pursuance of legal obligations or in the transaction of business

[SOURCE: ISO 5127:2001, 2.2.1.08]

3.25
reformatting
action to create a copy with a format or structure different from the original especially for *preservation* (3.21) or access

[SOURCE: SAA Glossary — A Glossary of Archival and Records Terminology]

3.26
restoration
actions taken to return a *document* (3.8) which has suffered *deterioration* (3.7) or damage as closely as practicable to its original state

[SOURCE: ISO 5127:2001, 6.1.04]

3.27
reversibility
quality of a *conservation* (3.6) *treatment* (3.31) which would allow the *document* (3.8) to be returned to its pre-treated state without damage

Note 1 to entry: Ethical principle within conservation; often difficult, but a consideration in the decision-making before treatment.

3.28
risk
effect of uncertainty on objectives

Note 1 to entry: Risk is often characterized by potential events and consequences or a combination of these.

Note 2 to entry: Risk is often expressed in terms of a combination of the consequences of an event (including change in circumstances) and the associated likelihood of occurrence.

[SOURCE: ISO 31000:2009, 2.1, modified.]

3.29
risk management
coordinated activities to direct and control an organization with regard to *risk* (3.28)

[SOURCE: ISO 31000:2009, 2.2]

3.30
storage area
area of the information and documentation organization where the collections are kept under controlled conditions

3.31
treatment
direct action carried out on an *item* (3.16) or collections for *conservation* (3.6)

3.32
vulnerability
intrinsic properties of something resulting in susceptibility to a *risk* (3.28) source that can lead to an event with consequence

[SOURCE: ISO Guide 73:2009, 3.6.1.6]

4 Preservation in collections management

4.1 Collections management practices

4.1.1 General

Preservation planning and policies are fundamental to the mission and strategic plan of preserving collections in archives, libraries and other cultural institutions. Collections management is integrated into the goals and objectives of the institution through preservation policies and preservation planning.

Written collections management procedures are essential to achieving the preservation plan in archives and libraries, ensuring consistency of procedures followed by staff throughout the institution.

Scientific and technical exchanges with other sectors of heritage preservation are advisable to avoid redundant preservation activities.

4.1.2 Training of staff

All staff responsible for the preservation and use of collections in archives, libraries and other cultural institutions should be informed about their role and the principles of preservation of the materials and types of collections in their care.

Each employee should be instructed and trained in the implementation of the collections emergency plan.

Those responsible for supervising others in the care of collections should have dedicated training in collections management to define the preservation needs of collections, define priority actions and to prepare and implement a preservation plan.

This training may include knowledge of heritage legislation, the standards that apply to the preservation of the collections in their care, the doctrine and professional preservation techniques and practices.

The training and experience of the staff should be relevant to the types of materials in the collections and significance of the collections. The training and experience should include techniques for individual and collective treatments of the appropriate collections. Training in chemical or biological health risks from treatment of collections should also be included.

Continuing training regarding preservation should be included in the preservation plan.

4.1.3 Training of external users

The public, contractors, volunteers and others who handle collections items should be provided with simple information and/or training on preservation and guidelines for handling collections. This may be done through signage or information provided where collections are being handling.

4.2 Preservation policy

4.2.1 General

Formal preservation policies are fundamental to collections management. The purpose of the preservation policies is to ensure that all staff and managers are aware of their preservation responsibility. Preservation policy guides all staff and managers in appropriate actions that ensure the preservation of collections based on specialized knowledge provided by the preservation profession. Guidance that accompanies the policy may explain impacts and consequences of deviation from the policy.

Preservation policies may include: regulations for security and handling of collections, exhibition and loan regulations, transportation regulations, operational rules for collections storage locations, including policies related to cleaning. Additionally, decisions about acquisition, transfer and loans and conservation should adhere to the preservation policy of the institution.

NOTE Policies that avoid smoking, eating and drinking in any area where collections are stored or used is a primary restriction. Smoking leaves tar and nicotine deposits. Food and drink attract insects and rodents, leave residues that cause surface contamination and pose a direct threat to the collections and equipment if spilled.

4.2.2 Documenting policies and procedures

Written collections management procedures are essential to achieving the preservation plan in archives and libraries by ensuring consistency of procedures followed by staff throughout the institution. It is advisable that these procedures are documented in policies or guidance and maintained permanently.

Preservation documentation should include decisions made that may impact the preservation of the collections.

The documentation should specify the date, the name of the person taking the decision and under which authority the procedures of recording, transfer, loan, preservation or conservation are taken.

The record of actions that impact the preservation of the collections may include:

a) documentation of receipt/accessioning/cataloguing, location transfers, or deaccessioning decisions according to institutional policy or regulations;

b) documentation of conservation treatments and preservation actions, including treatments for mould or disinfestations and loans and exhibition times and locations for individual items;

c) documentation of preservation actions including environmental data, specifications for materials used in contact with collections.

4.2.3 Record and transfer of ownership

Information relevant to the acquisition or transfer of collections is kept in a file relative to the collections.

All items being received into the collections should be inventoried, clearly identified and described, with condition information about its state of preservation and location information.

Pre-existing numbers, shelf locations, or inventory numbers should not be removed.

The identification and the description of a document should use the rules and controlled vocabularies relevant to the institution.

Significant items received into the collections, based on the mission, historical or acquisitive value should be identified and provided with appropriate condition assessment and security protection.

It is recommended that significant items be transferred with a signature in any movement or transfer of responsibility.

A list of these significant items may be maintained in a secure location for emergency response planning and to ensure that security protections are maintained, with the list jointly verified annually, or when a change in management occurs.

It is recommended that heritage collections be regularly inspected and inventoried in whole or in part. This may be combined with a condition assessment.

The inspection, or inventory, should be endorsed by at least two people.

4.2.4 Ownership marking

4.2.4.1 General

It is advisable that institutions prepare written documentation of policies on ownership marking unique identifying marks on each item and provide training to all staff who work with the collections.

Traditional collecting practices have often included ownership marking of items. The two reasons given for ownership marking are to deter theft and to establish ownership if the item is recovered.

Ownership marking is advisable, particularly for high use items or items with a risks such as commercial value, items being sent out of the institution on loan and may be required by national regulations.

Options for permanently marking paper-based items include embossing, punching or perforating and ink stamping. Many institutions mark ownership by stamping with indelible ink on the edge or use electronic strips inserted in the spine or text block for theft deterrence for use with exit monitoring. Electronic strips inserted into collections have additional concerns related to adhesives used and the potential for damage to the book structures if inserted into the spine.

It is recognized that the resources required for ownership marking at the item level in an archive or library may be extensive.

There are significant costs associated with marking all collections in an archive or library. It is advisable to consider all options for providing appropriate security.

4.2.4.2 Placement of ownership marks

Ownership marking, primarily for theft deterrence, requires careful consideration. The ownership mark should be indelible to be useful; this is difficult to achieve. The placement of the mark requires consideration and training, so as not to potentially deface an item. It is not recommended to stamp rare or unique collection items with ink. Consulting preservation specialists is advisable.

Placement of the ownership mark is a balance between attempting to deter theft, by making it difficult to remove the mark, without defacing or detracting from the preservation and purpose of the item. If the mark is too close to the edge it is easily removed by trimming or removing a part of the item. If the mark is placed close to, or over the text or writing, it may obscure or detract from the information contained in the document.

Ownership marking should be visible and legible.

To limit handling of items, the ownership mark should be located in the same position for each type of item for ease of inventory.

It is advisable to avoid marking on repaired areas or handling zones.

The ownership marking should not damage the item.

Different types of ownership marking may need to be used for different types of supports or containers.

If ownership marking on the item would deface or devalue the original, the ownership marking may be applied to the container, on an attached tag or on a bookmark.

Photographs of the item with its inventory number may be taken as additional documentation.

Stamping is type of ownership marking and facilitates claims for return if the item is recovered after a theft.

The two systems commonly used in archive and library collections are

— an embossed mark that indicates ownership and

— ink mark that will not bleed if exposed to water or other solvents, that is resistant to fading and has no components that would have adverse effects on paper substrates. It is recommended that pigment/ink conform to ISO 11798.

Another form of property control includes the use of barcodes. The barcode has graphically encoded digital data that allows rapid identification when the barcode is scanned.

A barcode attached to an item can be linked to the identity of the item. The barcodes reader can be used for inventory control and can be used to transfer item-level control information avoiding the errors inherent in repeated manual data entry.

Radio frequency identification (RFID) tags may be used in some libraries. The RFID tags are attached and linked to the identity of an item. The RFID signal is used to identity items using radio waves when transported through the reader and can be used to track locations of items. This process facilitates the inventory during collection movement or transport and may be attached to containers. An RFID tag can be used as an anti-theft device if a reader is located at exterior exits.

4.3 Preservation planning

4.3.1 General

It is advisable to carry out an assessment and document hazards and vulnerabilities of the site and the building and any mitigation in place at the beginning of any preservation strategy.

Documenting preservation planning and policies, access policies, security planning, fire prevention and planning for emergencies, response and recovery in the event of a disaster are all parts of the preservation plan.

The list in 5.3.2 provides guidance to identify general areas that require consideration. No site is completely free from hazards, but when planning for preservation of collections, the probability and extent of hazards causing loss or damage to collections can be assessed and taken into account.

Preservation planning, collections management, preservation and facilities management are collaborative and cooperative activities within an institution.

4.3.2 Avoidance of hazards

When planning a collections management strategy, the preservation risk assessment will document the hazards to or vulnerabilities of the collections and the likelihood of each of the hazards. The preservation risk assessment should lead to preventive conservation measures being implemented to minimize the loss or damage to an acceptable level.

Hazards fall into one of three categories:

— those which result in the sudden loss of, or extensive damage to collections (e.g. the collapse of the building, fire, flood and biological or radiological contamination);

— those which can result in obvious damage to the collections (e.g. insect or rodent attack);

— those which do not result in obvious visible damage but which can cause irreparable long-term damage (e.g. exposure to dust and polluted air).

An assessment is advisable for hazards associated with the following:

a) subsurface road, rail or similar-sized tunnels, or other such sites that are liable to subsidence or landslides;

b) flooding (whether of natural or man-made origin);

NOTE Flooding is a considerable hazard. It is therefore advisable to carefully consider sites that are above the 100-year flood level which are allegedly free from the risk of flooding. Consideration should be given to changes in flooding risks based on climate changes, development and ground water table.

c) sites or areas used for the storage or processing of highly flammable materials (e.g. petrochemicals, explosives, paint and tires), at risk from fire or explosions, or at risk from water or chemicals used to deal with such hazards;

d) elevated roadways, railways or tramways;

e) nuclear power stations, plants or other radioactive facilities;

f) airports and their associated flight paths;

g) overhead high voltage power lines and substations; or

h) defence establishments;

i) adjacency to a place or a building used for the storage or processing of perishable foodstuffs, a waste management facility or similar such site that may particularly attract rodents, insects and other pests;

j) adjacency to an incinerator, working quarry, open cast mine, cement works, stone crushing plant or other such installation emitting harmful gases, smoke, dust, etc.;

k) in an area where the air is known to be polluted, for example, from industrial processes;

l) building exposure to heat and strong winds that affect temperature, air infiltration and site microclimate.

4.3.3 Preservation risk management cycle

The steps necessary from preservation planning to implementation and ongoing to further cycles include:

a) establish the purpose of preservation from the institutions aim, mission, mandate and legislative regulations;

b) gather documentation and data necessary to understand the current situation or conditions;

c) analyse the hazards, vulnerabilities and risks outlined in 5.3.2;

d) decide on next steps, including determining priorities for action;

e) take action, experiment and implement the most successful actions;

f) monitor and assess results to ensure that intended results are obtained;

g) monitor and maintain and communicate results.

In order to be successful in carrying out the preservation management cycle (see Figure 1), a team of staff with a variety of expertise areas provides leadership, however consultation and communication with all staff is necessary for the preservation of the collections.

Figure 1 — Preservation management cycle

Other preservation risk assessment, planning and strategy methodologies have been included in the Bibliography as references.

4.3.4 Documentation for preservation planning

The preservation plan should include a summary of the documentation that accurately describes the mission and authorities that govern the preservation and use of the collections as stated in legislation, regulation or through historical precedent.

The architecture, construction characteristics and materials used to construct the collections storage areas, if documented, are important to understanding the risks and preventive preservation measures that will be used for collections management. Additionally the condition of the infrastructure, installed equipment and any site characteristics should be documented. If documentation does not exist, an inspection, or building condition report can be used for documentation, particularly for existing or historic buildings. This documentation is particularly useful for the collections emergency preparedness and response planning as part of the preservation plan.

Documentation of collections condition at the collection level should include assessments, surveys and documentation of any preventive or conservation operations, reproductions or digitization.

The successive states of preservation of a document may be described in a collection or item level dossier that documents the appearance of the item, any research or analysis carried out relevant to condition or materials and mention the former and recent damages noted and documentation of time spent on exhibition. The preservation dossier may be identified with the same unique identifier connected to the item to which it refers and may be maintained in the archive accession record or library catalogue.

4.4 Emergency preparedness and response plan for collections

4.4.1 General

All archives, libraries and other cultural institutions should have an emergency preparedness and response team and a plan for preparing and responding to emergencies.

The emergency preparedness and response plan should be adapted to the institution, to its environment, its collections and should be reviewed and updated, as necessary, but at a minimum, annually.

The collections emergency preparedness and response plan is a key component of an integrated preservation plan. The plan will need to coordinate with the facilities/building management, personnel safety and emergency preparedness planning.

It is advisable that the collections emergency preparedness plan be coordinated with local authorities, civil protection and emergency responders. The heritage emergency preparedness plan should be included in local and national risk management planning.

4.4.2 Emergency preparedness plan

The collections emergency preparedness and response plan is a defined set of actions to prevent and mitigate risks to the collections and describe actions to be taken in the event of a disaster designed to limit the effects of an emergency event on the collections.

The emergency preparedness plan should define and describe these actions taking into account a location-specific risk assessment, considering the causes and impacts of the highest risks and include priorities based on the collections types and significance.

The emergency preparedness plan should specify an organization chart of the responsibilities and roles and include:

— contact information at all times for those who are on the organization chart;

— the procedures to be followed by each role, the actions that need to occur;

— the information needed for action;

— any partnerships with other responders;

— location of resources and the spaces required during and after the disaster event.

The collections emergency preparedness and response plan should be disseminated as required for implementation and each recipient should be updated as often as the plan is updated.

It is advisable to provide an orientation and training session to familiarize all participants in using the emergency preparedness plan. The training is recommended to be repeated annually.

It is advisable that the emergency preparedness plan integrates actions required to resume normal activities.

The emergency preparedness plan for recovery of digital collections and records related to all collections should define how the data can be accessed from one of the back-up copies, regularly updated and preferably maintained off-site.

4.5 Security of archive and library collections

4.5.1 General

Protection of the premises and collections where archive and library collections are stored, used and exhibited is fundamental to management of collections. The aim is to avoid and block theft and vandalism of the collections.

The security plan should specify the risk assessment that has been completed, the appropriate risk management strategies and the plan for implementing risk prevention procedures and response to incidents.

A security system for archive and library collections includes linked, integrated subsystems of organization procedures, physical barriers (e.g. walls, doors, locks, fences, etc.) and surveillance, monitoring and alarms (e.g. guards, video, motion detection) for control and notification.

A security plan for the collections and the conditions for its implementation should be clearly defined.

The security plan applies to building and collections all hours, all days and all year.

A clear chain of command for notification should be defined to expedite decision making and respond to issues.

The security plan should specify the monitoring and notification for all hazards (e.g. damage from storms, entry of unauthorized persons, etc.).

The security plan should also specify requirements for continuity of security during emergencies and disasters (e.g. civil disturbance, earthquake, etc.).

The security plan should include requirements for all places and times when/where collections are present including during conservation, processing, cataloguing, exhibitions, functions and events, during building maintenance and renovations and during transportation and loan to other institutions.

The security plan should be reviewed periodically and updated to reflect changes in risks and conditions, personnel and procedures.

If a security company is contracted to provide protection, the requirements, written procedures and training need to be comprehensive, explicit and clear, including all responsibilities and roles for normal and emergency operations.

If monitoring is off-site, response time should be specified in the contract with the security company.

If contractually possible, it is advisable that guards be supervised by internal staff.

4.5.2 Security plan

Documentation for security plan includes written organizational measures for the movement of people and collections.

The security plan includes rules and procedures for security guards and other categories of staff, both internal and external contractors and for the public and provides different levels of clearance for each space.

Entry and exit of persons should be registered and traceable. Registers for entry and for document identification and documents for conservation contribute to the security of the collections and thus prove the ownership, the presence and integrity of a document.

All functions and categories of staff who handle the collections should be involved in the preparation of the procedure document for security and its implementation.

It is advisable and may be required, to check the integrity of the collections periodically through inspection and/or inventory.

4.5.3 Security during transport and loan

Transfers of collections for any purpose, including movement between internal locations and off-site facilities should be documented. While in transfer, the collections should be accompanied by a descriptive list of items, an inventory. The information in the documentation should include the

conditions of the movement and signatures of the responsible party. This documentation should be maintained as long as the collections are permanent.

For security reasons, it may be decided that the items are conveyed, or couriered, by the institution staff. The delegated institutional staff should supervise the loading and unloading, of packages and crates with items.

All information concerning transport routes and dates of travel should be confidential.

4.5.4 Documentation of loans and transfers

Whenever collections are loaned or are transferred off-site for use by another institution, documentation of the loan should be prepared that contains the following information: the reason for the request, the decision and the agreement of loan terms and insurance responsibility.

The loan documentation should include the date of the beginning and the end of loan, an itemized inventory of the items in the loan, the value of the items for insurance purposes and all the conditions required for exhibition and/or handling.

5 Collections storage preservation environment

5.1 Overview

Archive and library collections are most efficiently preserved by maintaining environmental conditions cool and dry at all times; in storage, research and reading rooms, on exhibition, during transportation and preservation action. Even if the collections are not regularly used and handled, the environmental conditions have an impact on the preservation of collections.

5.2 Managing the collections storage preservation environment

5.2.1 General

The institutional team should determine the appropriate environmental conditions for the various spaces where collections are housed; these spaces should meet the climate conditions specified by the team throughout the year with minimal excursions beyond the stated limits.

Activities that might impact the collections environment, such as cleaning, maintenance, construction, or events, should be reviewed to determine the potential severity of that impact. When environmental risk is significant an adjustment may be required to the activity, such as the temporary relocation of the collections, provide a microenvironment for the collections or other localized solution to reduce the risk.

Where environments are mechanically controlled by HVAC or other means, these systems should be regularly maintained and controlled according to the institution's environment specifications, with controls and performance data logged and maintained for long-term system and environmental analysis. The environmental performance data is often available through a building management or building automation system.

Specifications for the construction and management of safe and appropriate environmental conditions are covered in more detail in ISO 11799 and ISO/TR 19815.

5.2.2 Monitoring the environment

Spaces that contain collections for extended periods of time including, but not limited to, storage areas, exhibit areas, reading rooms, work spaces, offices and areas for materials that are on loan or in transit, should be continuously monitored for temperature and relative humidity conditions. The spaces should also be checked at periodically for typical light exposure and ultraviolet (UV) light levels.

Instruments used for this data collection vary, with stand-alone data loggers of various types including manual download, hard-wired/Ethernet and wireless models. These data loggers generally provide a functionality, accuracy and ease of use that improves on traditional measurement devices such as hygrothermographs and manual measuring devices.

The data collected from monitoring programs should be analysed to understand environmental trends, persistent or seasonal preservation risks to the collection, such as high temperatures or seasonal high or low relative humidity and documentation maintained of the environmental performance or the impact of environmental adjustments. The data is very useful for communications with internal and external stakeholders.

Institutions may also consider other forms of monitoring, such as pollutant monitoring from both internal and external sources and vibration monitoring to measure the impact of regular or periodic vibrations on materials or building components. Both of these forms of monitoring may be done on a periodic or as-needed basis if a known event has caused an elevated risk.

5.2.3 Controlling light exposure

All the rooms where collections are used, particularly storage and exhibition rooms, should be designed and/or equipped to avoid direct exposure of sunlight on collections.

Collections should be shielded from the effects of both intense light exposure and cumulative light exposure at acceptable levels, while allowing for acceptable reading and observation conditions for both staff and users.

Exposure to UV radiation should be limited as much as possible.

Internal and external light sources include windows, doors, showcases, lamps and overhead lights.

Mitigation of light exposure can be achieved through packaging, storage furnishings such as solid cabinets or drawers, the use of light-blocking curtains and/or UV film on windows or other external light sources and motion-detection for light use and ensuring that lighting sources, including emergency lighting has no UV radiation or using UV filters.

5.3 Preventive environmental measures

5.3.1 General

Collections management includes maintaining clean collections storage areas with preventive measures. The long-term preservation of archive or library collections may be harmed by dust, pollutants and volatile organic compounds (VOCs), including those VOCs produced by deteriorating materials. Cleanliness in collections areas is a primary means to avoid an environment that favours biological hazards including mould.

5.3.2 Exclude exterior sources of pollution

Exclude exterior sources of dust, gaseous pollutants and other pests from collections storage areas by

— sealing all openings and cracks leading to the exterior or uncontrolled interior spaces,

— closing windows and keeping doors opened as little as possible (doors should be fitted with door sweeps and gaskets to seal the opening when closed), and

— maintaining regularly all heating, ventilating and air conditioning (HVAC) system and ensuring each has appropriate filters to diminish the build-up of dust and oily particulates.

5.3.3 Manage internal sources of pollution

The following practices help in managing internal sources of pollution.

— Sufficient air exchanges to prevent an excessive concentration of VOC. Recent research in air exchanges has indicated that few air exchanges are needed, unless collections are off-gassing large amounts of acidic gases (i.e. deteriorating acetate negatives).

— Intermittent separate monitoring of the quantity and sources of dust on the shelving and containers is also recommended and the cleanliness of the floor.

— Specification, review and testing of all materials and products in direct contact during storage, or in permanent proximity to the collections is necessary. Materials used in construction or finishes of the building, furniture or other equipment or to package the collections, including paints, varnishes, insulating materials, wood, cardboard for boxes should be inert and not produce VOCs or dust through their disintegration or chemical alteration.

— Staff should only carry out necessary work in storage areas; processing and other activities should be restricted in the storage areas.

— Supply or non-essential material storage should not be maintained in collections storage areas.

— Construction or renovation work on the premises should be contained and monitored and any dust or debris removed and the area cleaned as soon as possible.

— If mechanical systems are used for air handling, filters should be regularly maintained and replaced according to the manufacturers' specifications or through routine testing.

— It is recommended that indoor air quality be checked, as part of the preservation plan, to establish baseline levels and then to determine changes in gaseous pollutants and concentrations.

5.4 Integrated pest management

5.4.1 General

Insects pose a serious threat to archive and library collections, particularly in tropical, warm and humid, climates. Pests (including insects and rodents) can cause damage to collections if undetected.

If insect damage is evident in the collections, a monitoring program is advisable, using sticky traps with or without pheromones, evaluation of insects found by an entomologist, to evaluate the species and stages of insects present and determine the hazard they present to archives and library collections (see 8.3 for treatment protocols).

Prevention is much better than cure. Cleanliness in collections areas is a primary means to avoid an environment that favours insects. Environments that favour insects and pests include high humidity, warmth, poor air circulation, poor housekeeping and dark, undisturbed locations.

5.4.2 Preventing pest infestation

The building can be made secure to avoid pest infestation with these measures:

— seal/caulk all holes into the building, (e.g. openings for electrical cables, water pipes, telephone connections and waste pipes);

— ensure that doors and windows have a tight fit and should remain closed; install brushes at the bottoms of doors, including revolving doors;

— use fitted small-mesh, insect screening with a tight edge-seal on windows that are used to provide ventilation (screens should be removable for regular vacuuming and/or washing);

— enforce strictly a policy that food and drinks may not be consumed when using archive and library collections and in storage areas;

— keep the building interior maintained and clean, mop up water spills and take care when washing floors and windows that excess water is dried up quickly;

— clean regularly refrigerators and appliances that combine heat and moisture;

— place HVAC dehumidification system in location so that condensate lines will drain quickly, maintain regularly and monitor that there is no standing water;

— wrap cold water pipes with insulation material to avoid condensation and water collection;

— segregate food preparation and consumption, restrooms and any rooms with water sources, in a separate building or segregate the storage area away from public areas, or areas with food and water;

— place all garbage and recycling waste in a vermin-proof container at a distance from the building;

— use a wide paving or gravel surround to the building foundation, with drainage to make sure that there is no standing water next to the building;

— avoid having climbing plants (vines, ivy) growing on walls or the roof;

— avoid plants, shrubs or trees close to a building, particularly flowering species;

— keep all roof drains and downspouts clear of debris and the building free of bird and other animal nests;

— avoid attaching lights to the building walls; ultraviolet light, in particular, attracts flying insects;

— remove carefully spills and food debris and empty waste receptacles regularly;

— avoid conducting receptions and events involving food and drinks in a reading room or adjacent to a collection area.

To avoid introducing pests to a clean, pest-free storage area:

— establish a quarantine policy for new accessions and a room for the inspection of newly acquired material; the quarantine area should be close to the goods entrance/loading dock;

— enclose incoming collections that appear to have insect damage in plastic sheeting and for possible active infestation; if active infestation is found, the collections should be treated and re-monitored before adding to the storage.

If pests are present within the building:

— reduce the spread of the insects or pests by sealing and securing storage area doors and fit these doors with a weather seal;

— fill cracks in inner walls or the floor to prevent insects from entering and infesting cavity areas;

— use gaskets to seal exhibit and storage cases;

— vacuum regularly to remove insects, eggs and casings and dispose of vacuum bags outside the building.

5.5 Cleaning of collections storage areas

Keeping the collections and storage areas clean is a primary preservation activity. The cleanliness of storage areas is important, because dust and oils provide nutrients that promote mould and attract insects and rodents. Cleaning regularly according to a schedule in storage and public areas is advisable.

Documented procedures and instructions and training for safely cleaning the collections storage areas, shelving and work surfaces, containers and collections are advisable.

Floors should be vacuumed and damp-mopped with as little water as possible to reduce the risk of raising the humidity or wetting items on the lowest shelves. If cleaning compounds are allowed, they should be specified based on known products and testing.

Collections that are packaged appropriately and tightly shelving books helps to prevent dust and other particulates from coming into contact with the items in the collections. Charged cleaning cloths with an electrostatic charge may be used for shelves and containers and should be changed frequently. Cleaning cloths with oils or other chemicals may leave a residue.

Vacuum cleaners, particularly those with high-efficiency particulate air (HEPA) filters, may be used to remove dust from carpets, floors, packaging and shelving. Sweeping generally moves the dust and can create more air-borne particulates. HEPA vacuum cleaners, now available for domestic use, are capable of retaining particles as small as 0,5 µm.

5.6 Time out of storage

Care should be taken when moving collections from one environmental condition area to another, as rapid and large changes in either temperature or relative humidity can have severe detrimental effects on some materials.

Depending on the variance in environmental conditions between two spaces, it may be necessary to either package collections before moving, or allow them to slowly acclimate in a third, non-harmful, environment.

Collections should be returned to the storage environment as soon after their use as is practicable.

There should be written procedures and training for the movement of collections between different environmental conditions. For example, movement back into a cold store from a warm reading room may cause condensation from moisture on the inside of polyester sleeves or other impermeable encapsulation.

When collections are repeatedly being used and consequently regularly moving from storage to reading room and back, they should be a priority for copying so that longevity is not compromised.

5.7 Other environments for collections

To minimize the impact of use on collections, it is advisable to minimize the difference between the reading room and storage environment. It is advisable to maintain the research/reading room environment close to the conditions in storage. The research/reading room environment should be monitored and readings compared with the storage environment.

NOTE 1 It is advisable to maintain hygroscopic materials (e.g. collections of parchment, leather, photographs and books with gelatine adhesives) above 40 % relative humidity (RH) to avoid causing desiccation and inflexibility. Maintaining the RH in reading rooms slightly higher than the storage conditions for these hygroscopic materials will reduce the risk of handling. For example, if a folded or rolled parchment document is losing moisture, shrinking or becoming less flexible due to drier conditions, it is likely to resist opening and may break/tear. If the reading room RH is higher than in the storage room, the material will be absorbing moisture, relaxing and becoming more flexible which will reduce the risk of damage.

The temperature may be higher in a reading room, but should be maintained below 25 °C to avoid damage to temperature sensitive collections. The reading room should be kept as cool as the comfort of readers allows.

Measures to reduce temperature in a reading room include: blocking direct sunlight; improving insulation; using cold lighting (e.g. LED lamps); turning heat off when the reading room is closed (e.g. at night) and reducing or controlling heating when it is open; introducing ventilation.

Reducing the temperature can also be used as a means of increasing RH to prevent excessive dryness and/or difference between a reading room and a storage repository.

When it is necessary to move collections from cooler storage conditions, the collections should be placed inside a sealed container in the storage environment, then moved to the reading room to acclimatize and only removed once they reach the same temperature as the reading room.

Collections returning to a cold storage environment should always be reconditioned and then resealed in appropriate enclosures.

Direct sunlight on archive and library collections should be avoided. Blinds or other window coverings should be installed in a reading room to manage sunlight.

Light in the reading room should be free of ultraviolet (UV) radiation. Levels and periods of light exposure in use should be monitored.

NOTE 2 Further information and guidance regarding the effects of light on collections, light levels and monitoring is given in ISO/TR 19815.

6 Shelving for archive and library collections

6.1 Shelf planning

6.1.1 General

Shelving should be planned to meet the needs of the particular repository. It should provide safe and effective storage for collections, whatever their size and shape, combined with ease of withdrawal and replacement.

Collections should not protrude beyond the outer edge of the shelves.

In positioning the shelving, care should be taken to allow for human or mechanical access to all parts of the floor and to shelving for cleaning purposes, as the accumulation of dust can prove harmful to the documents or to those who work in the repository.

The short-term and long-term behaviour of the floor slab/substructure should be taken into account at the planning stage in assessing the suitability of the floor to support the storage equipment and carry the dead and imposed loading.

NOTE Storage loads for archives and libraries are generally in place for many years and it is therefore important that the long-term behaviour of the building is considered. Suspended concrete and timber floors experience long-term deflections (creep) that might exceed the initial floor deflection. This means that a floor that was initially acceptable might become unacceptable over time. This is undesirable and can be a particular problem if mobile storage is adopted.

For the purpose of initial planning, the dimension measured from the centre of one upright to the centre of the next, may be taken as 1 m. However, the actual dimension will vary depending upon the shelving system chosen or the measured size of the collections.

There may be national regulations that apply to shelving in general for safety and specifically to shelving for archive and library collections. National regulations should be used where appropriate.

6.1.2 Basic recommendations for shelving

It is generally recommended that powder-coated metal shelving be used in new or renovated collections environments. Wood or metal for shelving can be used as there are advantages and disadvantages to each. General recommendations are given for the attributes of shelving.

Repository shelving, whether static or mobile, should:

a) be strong enough to carry the potential load;

b) be of a material that is durable and that does not emit substances harmful to the collections in ordinary use or in the event of fire;

c) be easily adjustable, without mechanical aids, to accommodate units of varying size and shape and permit the arrangement of documents in relation to each other;

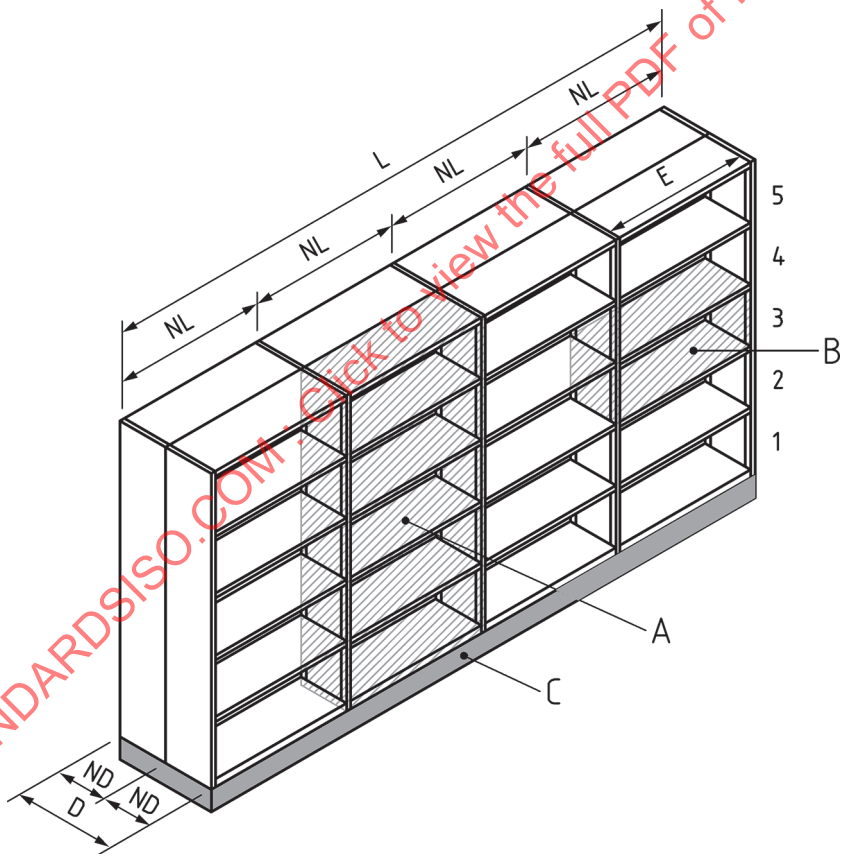
NOTE It is inadvisable to store items or containers so tightly on shelves that they cannot be removed easily.

d) not have features or properties damaging to documents or people, for example: sharp angles, projections, chemical composition;

e) include an unperforated top cover without seams, wider than the shelving, to prevent dust and debris falling onto the contents;

f) permit free circulation of air and, in particular, not be positioned against an outside wall;

g) have provision for labelling each row of shelving, each bay and shelf (see Figure 2).



Key

A	bay	E	clear entry of shelving compartment
B	shelving compartment	L	length of shelving run
C	carriage	NL	nominal length of bay
D	shelving depth (overall depth of double-entry run)	ND	nominal depth of compartment

SOURCE BS 5454:2012

Figure 2 — Shelving arrangement

It is preferable that there is a gap between shelving and a parallel wall wide enough for cleaning.

It is important that material selection for shelving is discussed with suppliers.

6.1.3 Arrangement of runs

The arrangement of runs should be determined by the repository's needs. To save space and increase storage capacity, unnecessary multiplication of gangways and aisles should be avoided.

Runs should be placed such that they are separated from the walls. National regulations may require a specific distance. Where the shelving is parallel to the wall the run ideally should be static separated from the wall by a distance that may be specified in national regulations or at a sufficient distance to allow for cleaning or mounted on a mobile carriage or chassis to allow it to be moved for cleaning. This separation facilitates air circulation as well as repository cleaning and also impedes any transmission of damp which might enter the building structure.

Where direct sunlight into the repository is unavoidable, the runs should be set at right angles to windows to reduce the harmful effects of the sunlight.

6.1.4 Gangways and aisles

The width of gangways and aisles should be determined in accordance with national regulations, if relevant and personnel security concerns.

The aisle and gangway widths should be sufficient to allow freedom of movement and allow the withdrawal and replacement of collection materials without damage and without risks to staff.

The width of aisles should be based on the size of the collection materials and the width of the equipment used to transport materials with allowance for a person to move around the equipment safely.

It is advisable that gangways should be not less than 1 100 mm wide. Aisles should be not less than 750 mm wide and should be wide enough (i.e. shelving depth plus 450 mm) to allow the withdrawal and replacement of documents without damage.

6.1.5 Materials used in shelving

6.1.5.1 Wooden shelving

Historic wooden shelving may be acceptable if it is no longer emitting VOCs and if it is important for historic integrity of the collection or building.

Wooden shelving is often dismissed as a fire hazard due to its flammability. However, if wooden shelves are thick enough and a fire occurs, the wood is likely to smoulder for a long time before igniting. If there is a swift response to the alarm, the shelving will probably remain intact.

There is also concern that certain woods can give out acids harmful to the stored collections and that they might attract some insect pests, even in the normal storage environment. This problem can be avoided by careful selection of the type of wood and a pest management programme. The same constraint applies to wood used in exhibition cases. Wood products made with adhesives are known to give off VOCs, to degrade more rapidly and are not recommended for long-term storage of collections.

6.1.5.2 Metal shelving

Components should be free from burrs, rust, sharp edges, scale and grease.

Metal shelving should be manufactured from material conforming to EN 10139 as a minimum.

Where steel or metal of a higher grade are used, confirmation of their incorporation and their specification should be obtained from the supplier.

The use of other metals is not prohibited.

Uprights and shelves should be finished with a powder-coating to prevent corrosion in the repository environment. The coating used should be inert.

NOTE Although metal shelving is non-combustible, it can buckle and collapse in the heat of a fire, dropping its contents on to the floor.

6.2 Shelf design

6.2.1 General

Shelves should be of a size and shape that fully supports the collections that they are intended to hold, while leaving sufficient space for the contents to be easily and safely withdrawn or replaced.

Excessive shelf deflection can potentially damage collections, either by causing stress to collections stored on a deflecting shelf or by crushing from a deflecting shelf above. Large volumes are especially vulnerable; when the shelf deflects on its long edge, the bottom of the volume can splay while its top is compressed by other volumes.

The maximum permissible deflection (the deflection limit) for the shelves, based on the weights and actual loading conditions, should be agreed on by the person responsible for the archive and the specialist shelving supplier. Where no deflection limit is specified, the maximum permissible edge deflection of any metal shelf should be defined as SPAN/200, i.e. calculated by dividing the shelf length by 200. For example, the maximum permissible deflection of the long edge of a 1 000 mm shelf would be 5 mm (1 000/200).

The minimum distance from the floor to the top of the bottom shelf should be 150 mm, in order to prevent damage occurring to the stored collections from pedestrian or trolley traffic, or from water in the event of fire-fighting or flood.

6.2.2 Uprights

The uprights should be strong enough to support the bay load and the shelf-clips or bearers should be strong enough to support the loading capacity of a shelf.

The uprights and shelf-bearers should not obstruct the withdrawal or replacement of documents or their containers.

Open-sided uprights should be used to allow the free circulation of air.

In areas where volumes are being stored, perforated uprights are allowed. The design of the upright should be such that books and documents cannot become trapped or damaged.

6.2.3 Access

Generally, the shelves and their contents should be accessible and within reach of a person standing on the floor (or integral floor on a multi-tier system).

However, if this does not allow for easy access to the collections, then free standing access steps or a personnel lifting device may be used.

Regulations may apply to work that takes place at heights. Consideration should be given to the weight of boxes of archive and library collections when considering using stairs or ladders for placement and retrieval.

6.2.4 Bracing

Cross-bracing in the bays of double-sided runs should be kept to a minimum in order to allow through-storage of large documents.

6.3 Mobile shelving

6.3.1 Construction

Mobile shelving should be installed only on track supported on level floors.

To prevent the spread of dust, concrete floor surfaces should be sealed where mobile shelving is to be used.

Mobile shelving should not be installed directly on compressible floor coverings.

To assist with air circulation, there should be a gap of not less than 25 mm between units.

The deflection of the floor due to imposed loads should not exceed 1:1 000. This should be calculated to take into account both short- and long-term deflections.

It is recommended that this calculation is carried out in the initial design of the floor structure.

NOTE Mobile shelving saves space, but needs greater floor loading capacity and level floors. Some repositories in the United Kingdom have had problems with floors that have deflected. This causes the mobiles to roll down the slope which presents a possible safety issue to the users of the system. It is difficult, disruptive and expensive to rectify deflected floors.

One technique that can help to prevent deflections exceeding 1:1 000 can include the introduction of a secondary steelwork grid that supports the mobile tracks that can be periodically adjusted to deal with deflections during the design life of the repository. Another technique is the application of an upward deflection (pre-camber) to the rails to offset the predicted downward deflection. However, it might prove difficult to provide an acceptable solution over the complete design life of the repository.

6.3.2 Movement of runs

Mobile shelving should be constructed in such a way that prevents the movement of runs from damaging the documents stored in them.

Documents should be housed completely within the depth of the shelving. The method and speed of operation, acceleration and braking should be such that documents do not slide and fall off the shelves.

It is not recommended that runs of mobile shelving back onto each other unless there is a clearance of a minimum of 150 mm between them. On electronically driven systems, the minimum clearance should be 500 mm.

Where mobile shelving is installed as a result of capacity requirements and the collections being stored are fragile, the use of an electronically operated system fitted with soft-start, soft-stop features is recommended.

Manufacturers' advice should be sought about use of a mobile shelving system based on the individual requirements of the repository, retrieval or pick rates and the type of storage needed for the collections to be stored.

Mobile shelving systems should be operable with one hand.

When selecting the type of mobile shelving system, consideration should be given to the following:

a) Load per carriage or chassis. This determines the effort required to move a mobile carriage and influences which of the drive methods is used.

   Operation by manually pushing or pulling a mobile to create an aisle is not recommended unless the system is a small side-to-side system where the front bay is moved to access the bay behind. This should only be permitted if the load or force required to move the mobile shelving is not greater than 100 N. Where this is likely to be exceeded, a mechanically assisted system should be considered. The mechanical assistance can be increased to reduce the effort required to move the mobile shelving.

Consideration should be given of the effort involved in moving shelving when comparing mechanically assisted systems with electronically operated systems.

b) Length of carriage. This is dependent on the storage area of the repository and the manufacturer's limitations.

c) Type of storage/frequency of use. Mobile shelving systems can be used over a wide range of storage requirements, from a low to a high frequency of use.

d) Mobile shelving rails should be installed flush with the floor surface to avoid a trip hazard to the users. Where it is not practicable to install recessed rails due to building constraints, a composite floor should be built up to the rail height with ramps to this floor surface kept to a minimum. Continual bumping of trolleys over rails and ramps might cause damage to the collections being transported.

Consideration should be given to the number of access aisles in relation to the number of users who may require simultaneous access to the shelving system. An institution whose rate of retrieval is one retrieval per day, for example, needs fewer aisles than an institution with a retrieval rate of several per hour. The anticipated retrievals from and returns to, the shelving system over a given period should be taken into consideration.

NOTE A high pick rate operation may find mobile shelving slow due to the necessity of creating an aisle for potentially every pick.

A manually operated aisle safety lock should be fitted to every mobile carriage or chassis in a mechanically assisted mobile system.

Where electronically operated mobile shelving systems are implemented, the motors should be either fully encased (AC motors) or low voltage (DC motors). The design should conform to national regulations if applicable (see EN 15095).

6.3.3 Stability

The stability of mechanically assisted mobile shelving is influenced by the height-to-depth ratio, speed of acceleration or deceleration as well as loading patterns.

Where the height-to-depth ratio of mobile shelving runs is such that sudden braking, acceleration or uneven loading might cause them to tip or shake, anti-tip devices should be fitted.

Runs having a height-to-depth ratio of less than 5:1 may be considered stable.

It is recommended that runs having a height-to-depth ratio between 5:1 and 7,5:1 are fitted with anti-tip devices.

Runs with a height-to-depth ratio in excess of 7,5:1 but less than 10:1 should be specially designed for stability.

Those with a height-to-depth ratio greater than 10:1 are unstable and should not be used.

NOTE See EN 15095 for the stability data on powered electronic systems.

6.3.4 Load warning notices and shelf usage

Load warning notices that are supplied by the shelving manufacturer or shelving supplier to direct the user on how to use the shelving systems safely should be displayed adjacent to or on the mobile shelving.

Operation and maintenance of shelf systems should be carried out in accordance with the manufacturer's instructions at all times.

NOTE National regulations may apply for notification on mobile shelving and notification or instruction.

6.3.5 Fire control

To assist in fire control, the spines of double-sided runs may be separated by solid metal partitions placed at every five or six runs.

Where an automatic fixed fire-fighting system is installed, the runs of any mobile shelving should be set apart by not less than 25 mm when the repository is unoccupied in order to assist the penetration of the fire-fighting agent to all parts of the storage equipment.

6.4 Storage for oversize documents

6.4.1 General

The equipment for the storage of oversize documents such as maps, plans, diagrams and working drawings should follow all recommendations for safety, materials, finish and ease of withdrawal and replacement of documents that apply to storage furnishing for archive and library collections.

NOTE Oversized items cannot be stored on the standard runs of shelving in the repository designed for the bulk of the collections. This could be due to individual weight or dimensions.

National regulations may govern the handling of large and heavy items. If no such guidance exists, then instruction and guidance should be provided to staff for handling large and heavy items.

6.4.2 Storage area

For ease of handling, the storage area for maps, plans and drawings should be located within the repository as close to the place at which they are consulted as is practicable.

6.4.3 Risk of strain and distortion

Wherever practicable, storage equipment should allow maps, plans and drawings to be stored, unrolled and unfolded to avoid risk of strain or distortion. This applies in particular to maps, plans and drawings of accurate scale from which detailed measurements may have to be taken.

Vertical storage is not recommended for such documents. Vertical storage is acceptable for other oversize material only under the conditions set out in 6.4.6.

NOTE See 6.5 for rolled documents.

6.4.4 Unrolled horizontal storage

Maps, plans and drawings should be stored either in shallow drawers in map-storage cabinets or on special repository-type shelving.

Wherever practicable and for reasons of practicality, drawers should not be fitted at heights greater than 1 400 mm.

The placement of plan chests is particularly important as the space required to access the collections needs to be at least twice the depth of the plan chest plus an additional 450 mm.

6.4.5 Cabinets for oversized documents

Where banks of drawers in cabinets are in use, each drawer should be fitted with an interlock to prevent more than one drawer at a time being opened.

The bottom drawer should be at least 150 mm above floor level.

Drawers should move along their shorter edge.

They should be easy to handle and smooth-running, with bearers to support them to prevent their canting when fully open.

They should be fitted with a safety stop to prevent inadvertent total drawer withdrawal, a protective flap inside the front edge and a lip of not less than 150 mm at the back.

There should be provision for labelling each drawer.

6.4.6 Vertical storage for oversized documents

Where necessary, maps, plans and drawings may be stored hanging, provided that their weight can be supported by the whole of their width. This should prevent distortion.

Documents stored in this way should be mounted on guards, in accordance with BS 4971. Supports should be attached to the guards, not the documents.

6.5 Rolled documents

6.5.1 General

Shelving used for rolled documents should conform to 6.2. Shelving should contain and support the entire document.

Vertical storage should not be used for rolled documents.

Rolled maps, plans and drawings may be stored on shelving which is accessible from both sides.

They should be placed in a single row on each shelf or pair of shelves at right angles to a gangway.

They should not protrude into the gangway.

Where maps, plans and drawings are too long to be stored across shelving accessible from both sides when rolled, they should be stored on shelves designed to the right depth, or stored lengthways on cantilevered shelving.

6.5.2 Cantilever shelving

Cantilever shelving consists of columns and of one or two horizontal beams at the base and at the top to provide stability. A series of arms are attached on which either a shelf is placed or the load is supported by the arms directly.

In order to prevent documents rolling off, shelves may be canted towards the rear of the bay or shelf at an angle not exceeding 10° or fitted with a rounded lip.

Cantilever shelves should also:

a) have a solid back not less than 150 mm high for the whole of their length;

b) be set with the longest side parallel to an aisle or gangway to allow for the easy withdrawal and replacement of the archival documents;

c) have rolled or turned front edges;

d) have provision for labelling;

e) be set with at least 75 mm between the solid back and the wall, where supported on wall brackets to allow for air to circulate.

6.6 Oversize or heavy-bound volumes

To store oversize or heavy bound volumes, shelves should be designed so that they can be stored flat, i.e. on their front or back board faces, not standing upright, to avoid spine damage.

The shelf should support the entire surface area of each volume; therefore the larger of two differently sized volumes should be stacked at the bottom.

The shelf should be of a size that allows the spines or identifying labels (e.g. where boxed) to face outward so that volumes do not have to be turned to read their identification.

Double-sided shelving should be used if oversize volumes in landscape format are stored along with volumes in portrait format.

Individual requirements with regard to shelf deflection should be discussed with the shelving supplier.

6.7 Cupboards and chests

Storage in a cupboard or chest should be considered as it can provide additional security, climatic inertia and resistance against fire, water and light which otherwise might not be obtained.

Cupboards or chests should not be positioned against an outside wall and should not be constructed of material which might be harmful to the documents.

NOTE It can be easier to control a microclimate within a cupboard or chest than the ambient conditions in the room. It is similar to the assistance that boxes and enclosures give for maintaining environmental stability for the documents stored within them.

Cupboards or chests should not be implemented as a means of rectifying problematic environmental conditions.

7 Collections maintenance

7.1 General

The evaluation of collections during accessioning is necessary to ensure preservation from entry (to the institution) to use by the researcher or reader.

The evaluation includes recording any problems or needs so that successive actions will be safe and efficient.

Check the inventory as received to ensure that all items are present and counted.

Check that all collections have appropriate intellectual control to facilitate access. At least a minimum level of description is expected at entry of collections to the institution.

Check the condition and cleanliness of the collections. It is recommended to clean and make sure that collections are quarantined and pest-free before moving them into the collections storage area.

Check that all collections have appropriate packaging (i.e. enclosures, housings, boxes or containers) as needed. Materials used for packaging and in direct contact with collections should be chemically stable, inert and not damage the collections. The packaging should be appropriate for the size, structural characteristics and conditions of the items contained.

Check that damaging materials (acid-containing folders and wrapping paper, plastic folders, metal fasteners, self-stick notes, rubber bands) are removed so that the collections are not damaged by acid, plasticisers and adhesive residues and/or rust.

Many of these actions are time-consuming, but are beneficial for the long-term preservation of the collections.

7.2 Packaging paper, parchment, bound volumes and other traditional archive and library collections

7.2.1 General

Unbound documents, loose maps, plans and bound volumes in a vulnerable condition should be protected by packaging. Collections vary in format and it is essential that packaging is of the correct size, construction and material to suit the items enclosed.

Packaging should be:

a) designed for the intended purpose (i.e. long-term or short-term storage and the accessibility of its contents);

b) designed to fit the document(s) without adding folds or otherwise adapting to fit the container;

c) strong enough to withstand handling and the weight of the document(s) they contain;

d) designed to protect the contents against pollutants and light;

e) constructed from materials that have no adverse effect on the document(s) enclosed as a consequence of vapour exchange or direct contact, in accordance with Annex A.

Boxes should not be overfilled and should close without damaging the collections.

When selecting boxes, consider the ease of handling of both the box and the items within the enclosure. The box should have a method for removing from the shelf (i.e. a pull-string). The enclosure should also be neither so small so that the edges are damaged, or so large that the collections shift within the enclosure.

Packaging materials and applications should conform to the relevant clauses in Annex A.

The preferred boxes and file folders will conform to ISO 16245.

Boxes and enclosures provide good protection. They may be in various forms made from different materials. The more common boxes and enclosures are described in Annex A.

The advantages of using boxes and enclosures for storage are:

a) minimize handling of the items;

b) provide good protection from disasters (e.g. water damage);

c) provide protection from pollutants and slow environmental changes;

d) provide protection from physical damage in storage;

e) provide protection during transit;

f) hold loose material together securely;

g) facilitate handling and effective space management and shelf usage;

h) provide an easy way of labelling collections for identification/location of items without handling.

Boxes and wrappers used in packaging should be clearly and permanently marked with information that facilitates repacking the contents and correct replacement in the repository.

Where a portion of a binding or of the contents is stored in a separate place, this may be recorded directly on the box, but should also be recorded separately in a location index.

Where labels are used for indicating the contents of the box, these should be printed with permanent ink and the boxes themselves should be given a location mark in case the label is lost.

7.2.2 Loose sheets

Items in the form of loose sheets or membranes that are to be stored with other items of similar form or content should be stored flat, or retained in their original folds and should be stored in open-sided envelopes in card folders inside rigid boxes of the type recommended in A.1.5.

Care should be taken to protect seals on single sheet documents. It is inadvisable to place no more than five documents with applied seals into an open-sided envelope.

Single sheets that are deemed to be particularly fragile, significant or valuable may be mounted and housed in plan chests.

Single sheets may be attached with guards to support-sheets of heavier weight and bound in a file or fascicule system. The method of connecting support sheets should allow for dimensional change.

7.2.3 Oversize documents

Oversized documents that do not fit conveniently into the storage system being used (e.g. maps, plans and working drawings) should not be dissected or dismantled for storage.

Depending on their nature and physical state, they should be stored in one of the following ways:

a) flat in portfolios (see A.1.6);

b) rolled inside a cylinder (see A.1.8);

c) in appropriate vertical storage (see 6.4.5)

7.2.4 Rolled documents

Documents that have been designed to be rolled, such as account rolls and inventories, should remain in their rolled form for storage, wherever practicable.

Rolled documents should be packaged and stored:

a) rolled around cylinders (see A.1.8) for support, where necessary;

b) wrapped with paper and boxed individually or in groups;

c) stored separately within a square cross-section tube or box.

Where it is necessary to store rolled documents flat, they should be packaged with a board support and enclosed in a four flap enclosure, covering the document completely (see A.1.7).

Rolled documents should be copied as the continued rolling and unrolling of documents during handling can cause them to become damaged.

NOTE Rolled storage may be used for large documents such as maps that cannot be stored flat owing to their size. Rolling such documents around a rigid cylinder protects them for both storage and handling, but is more demanding on storage space. Recommendations concerning the material and dimensions of cylinders are given in A.1.8.

Small rolls may be stored within a box, each roll wrapped around a cylinder to protect it from the pressure of other rolls. It is essential not to overfill boxes.

The weight of the boxes should be carefully controlled so that they remain easy to handle and transport by staff.

Large rolls that are not to be stored in boxes should be wrapped. Cloth, linen bags or paper are recommended wrapping materials. In some cases manila or kraft paper that meets specifications for long-term storage may be used.

There may be cases where it is preferable to store a rolled document flat, for example when it has become weakened or damaged.

7.2.5 Other traditional archive collections

Archive collections such as palm leaves or bark cloth may be treated as paper.

Documents should generally be stored flat, but textiles and large sheets may be rolled.

Fragile or fragmentary papyri may be stored between glass sheets.

Wooden objects such as tally sticks may be wrapped in acid-free tissue and stored with other collections.

An appropriate conservation expert should be consulted for the storage of fragile, complex or unusual objects that form part of a collection.

7.2.6 Bound volumes

Custom-made book boxes provide the most effective means of protecting bound volumes on the shelves from physical damage whether stored upright or flat and should be used wherever practicable (see 6.6 and A.1.2).

The degree of protection required depends on the physical state of the bound volume and the type and amount of use it is likely to receive.

Where bound volumes are placed on top of one another, their weight should be taken into account to avoid undue pressure on the volume at the bottom and larger bound volumes should be placed under smaller bound volumes.

Bound volumes having limp vellum or parchment covers (i.e. without boards) and bound volumes with vellum text blocks should be stored in a custom-made drop-spine box.

If boards or limp covers are larger than the text block and the volumes are to be stored vertically, a text block support should be incorporated into the box.

Bound albums, which often contain archive materials of differing thicknesses and/or photographs, can be damaged by compression if they are laid flat or stored in piles. They should be stored upright, in a drop-spine box with a text block support if the cover is larger than the internal leaves.

7.2.7 Seals and lead bullae

Documents with pendant seals should have packaging that protects both seal and document.

The following options are recommended for packaging documents with pendant seals:

a) insertion into boxes that permit storage of flat, folded or rolled documents with their seals inside the same package and are horizontally shelved;

b) insertion into acid-free boxes that are strong enough to withstand crushing and that are made of unbuffered purified cellulose fibre;

c) sealed documents individually packaged or separated by fixed and stable dividers;

d) insertion into textile bags that are easy to open and close and made of materials that are anti-static, permeable but not hygroscopic (e.g. polyester) and lint free (i.e. having no loose fibres).

Seals should be supported in such a way that neither they, nor their fasteners, nor the document to which they are attached are subjected to stress.

Lead is particularly vulnerable to corrosion in the presence of low concentrations of organic acids from storage materials. Therefore it should not be stored on or near oak, unseasoned wood, fresh paint or adhesive that can emit such acid vapours.

Storage, display and mounting materials used for lead bullae should be known to be inert towards lead (see PAS 198 for further information regarding lead). Otherwise the lead should be enclosed in its own microenvironment, for example, inside an airtight box made of an inert material.

Documents having lead seals should be stored in rigid containers which do not exert pressure on or rub against the seal and which contain no internal wrapping materials. The best preserved side of the bulla should lie face down in the container.

Gloves should always be worn while storing and handling lead bullae and they should be given temporary protection during consultation, such as a support or mount.

Seals made of cellulose acetate break down slowly, emitting acetic acid gas. Any dye they contain can also migrate to the nearest surface. They should be stored in acid-free vented boxes made, where practicable, of a material containing molecular sieves or other types of pollutant scavenger (see A.2.3. and A.2.4.3.).

7.3 Packaging of analogue photographic material and audiovisual media

7.3.1 Paper-based photographs

Photographs on paper should be packaged according to ISO 18902.

They should never be handled without the use of gloves as the oils and sweat from fingers react with the silver halide in photographic emulsions that forms the image in most black and white formats.

Cotton gloves may transfer oil and sweat from hands to the photographic emulsion.

7.3.2 Glass plate negatives and slides

Glass plate negatives and slides include collodion wet plate negatives and silver gelatine dry plate negatives, where the image is supported by glass.

Gloves should be worn when handling negatives and slides.

They should only be handled by the edges of the glass.

The emulsion side (the image side) should always be placed face down on a clean, dry, dust-free surface.

Where negatives or slides are stored in wooden boxes, they should be removed and placed in paper enclosures and boxes conforming to A.2.3 and A.2.4.3.

Slides which have a glass protection placed onto the emulsion side (the image side) may be placed in polyester sleeves (see A.2.5) and/or envelopes conforming to A.2.4.3.

These should be placed into boxes that meet the specifications for long-term storage of photographic collections.

7.3.3 Photographic sheet film negatives

Sheet film negatives of many different formats are common. They should be packaged according to ISO 18902.

Cellulose nitrate sheet film is not as prone to deterioration as moving image film (see 7.3.5.) because the formulation is different and the gelatine anti-curl layer, on all but the earliest formats of sheet film, blocks or slows the effects of atmospheric pollutants and oxygen that can trigger the onset of degradation. However, cellulose nitrate in any form cannot be extinguished when alight and large quantities of sheet film negatives considerably increase the fire load.

Cellulose nitrate sheet film negatives in large numbers can explode in the event of fire and should be packaged individually using paper sleeves.

Acetylated cellulose plastic negatives and transparencies of all forms (diacetate, acetate butyrate and triacetate, etc.) are unstable and eventually shrink and release acetic acid vapour (known as vinegar syndrome) which can affect neighbouring collections.

Sheet film negatives and transparencies should be packaged in individual paper sleeves and double-enclosed freezer packaging and placed in cold storage.

7.3.4 Microfilm

Silver gelatine type microfilm should be stored in accordance with ISO 18934.

Older microfilm may be on cellulose nitrate or cellulose acetate film and should conform to 7.3.1 and 7.3.3 with regard to storage.

Replacement polyester copies should be made, where permissible.

7.3.5 Moving image film

Moving image films should be wound on plastic bobbins or cores with the emulsion side facing inwards.

The films should have protective leaders at both ends of the reel.

The films should then be placed singly in corrosion resistant metal or inert plastic cans appropriate to their gauge and size. Unless stored at or below 0 °C, or containing a molecular sieve or other type of pollutant scavenger, these cans should have ventilated lids to allow air exchange.

Other materials, such as acidic paper, should be removed.

Where practical, magnetic soundtracks associated with moving image films should be stored apart from the associated film in conditions appropriate for magnetic media (see 7.4.2 and ISO 18911).

Film cans should be stored flat on shelves in stacks no more than 300 mm in height.

Most cinematographic films made before 1951 are likely to be on a cellulose nitrate base. Cellulose nitrate is highly flammable and can be dangerous, producing toxic gases and in extreme cases, exploding in the event of a fire. It is essential to take advice about the storage, copying or disposal of such film.

Handling of photographic nitrate-base films may be regulated by laws covering explosives. The storage of these films may also be regulated by laws covering chemicals. It is important for safety during handling and storage, to follow all relevant laws and regulations. All storage and working rooms should be identified and marked accordingly.

It is preferable that photographic records and cinematographic film on a cellulose nitrate base are not kept in the repository but are copied onto safety film in accordance with ISO 18906 and ISO 10356.

Where the originals are kept, it is essential that they are stored in a separate, well-ventilated repository at a low temperature.

Cellulose acetate film should be inspected for evidence of acetic acid decomposition. The acetic acid gases can be harmful to other collections.

Magnetic soundtracks on an acetate film stock are particularly vulnerable to acetic acid decomposition. Deteriorated magnetic soundtracks should be isolated from other collections, duplicated (if permissible) and frozen.

Specialist advice regarding moving image film should be sought at the earliest opportunity.

NOTE ISO 18934 covers storage conditions for films.

7.4 Machine-readable documents

7.4.1 General

Machine-readable documents and copies of documents should be periodically inspected to check their continued functionality.

Where necessary, they should be copied to replace deteriorating documents and to allow for future access.

For security and environmental reasons, hard copy formats should be kept apart from the originals.

Rewritable material should be protected against both accidental and deliberate erasure.

Magnetic tapes and discs, optical discs and tapes and related devices need special protection to prevent distortion or obliteration of the recording or data.

Where permission has been granted to make copies, two copies should be made and one (or more) copies kept off-site.

NOTE Reference [60].

7.4.2 Magnetic media

7.4.2.1 General

Magnetic audiotape from the mid-1940s to the mid-1970s often used a thin acetate film base, which deteriorates quickly. Modern audio and data tapes use a polyethylene terephthalate (PET) film base with an iron-oxide coating bound with polyurethane. Chromium-dioxide has also been used on tapes with a PET coating.

Most early forms of audiotape should be considered unstable if they have been or are being stored at temperatures above 20 °C and a relative humidity above 40 %.

Magnetic tapes on acetate film deteriorate into a condition termed “sticky shed” in which the magnetic signal particles stick to the play-back head on the equipment and the sound signal is lost. These tapes also develop the characteristic “vinegar syndrome” which auto-catalyses further deterioration and distortion of the film with shrinking, buckling and ultimately becoming brittle, making the tape difficult to impossible to play. The only way to preserve the content is by reformatting (see 8.7.1.).

Until the magnetic tapes can be reformatted, tape formats on cellulose acetate bases, should be stored in cold conditions. The containers may include a molecular sieve or other type of pollutant scavenger or should allow air exchange, for example by having either a ventilated or a loose-fitting lid to decrease the build-up of acids from the breakdown of the acetate film.

Magnetic tapes should be supported at the centre, not by the rim. Containers often have a post in the centre to support the reel.

Each tape should be kept in an aluminium, acid-free card or inert plastic container to exclude dust. See ISO 18933.

Tapes on stable archival-quality materials such as polyester may be placed inside a soft, self-sealing polyethylene bag.

Magnetic floppy discs should be stored standing upright, inside polypropylene or other inert plastic containers.

NOTE 1 Specific guidance on the storage of magnetic media is given in ISO 12606.

NOTE 2 It is advisable to give high priority to the preservation of the audio magnetic tapes by reformatting. Reformatting is an activity which is best carried out by specialists.

NOTE 3 As with most forms of sound recordings, maintenance of playback equipment is of prime importance. It is advisable to collect and maintain playback equipment with the collections.

7.4.2.2 Effects of a magnetic field

Magnetic media may be damaged or erased by magnetic fields and heat sources. Electrical or electronic apparatus that could cause such erasure should not be permitted in the proximity or same storage area with magnetic tapes.

Magnetic media should not be stored or brought near power supplies, electricity generators and cables or lightning conductors.

7.4.2.3 Rewinding

Magnetic print-through (in which the information on one layer of magnetic tape can become imprinted on the next) is unlikely if regularly used materials are stored in accordance with Annex A.

Rewinding should therefore be kept to a minimum, but tapes should be wound to one end after use and before storage.

Single-track tapes may be stored reversed or tail out and rewound at playing speed before use.

After use, all tapes should be stored neatly wound with no turn of the tape projecting above the general mass. If necessary, the tape should be run at playing speed to achieve this.

7.4.3 Gramophone records

Most gramophone record disks in collections are made of polyvinyl-chloride or shellac and use lampblack pigment and ground wood as a filler. Gramophone records generally are three sizes: 12-inch (usually long-play gramophone records at 33 1/3 r/min), 78 r/min records and 7-inch (usually 45 r/min). Gramophone records are often housed in an original, commercial card stock sleeve with a label that identifies the content. Sound quality can be affected by dust and mould gathering in the grooves and by warping or distortion of the surface.

Place each gramophone record in a soft polyethylene inner sleeve, in a card stock outer cover. The inner sleeve should be oriented so the seam is visible at the opening to protect the record from dust and mould. A tightly closed steel cabinet can reduce dust contamination.

The original commercial cover and accompanying literature may be stored separately, if policy dictates that the gramophone records be housed in a stronger card stock enclosure with a flap. Ensure that label information and the location of the original cover are recorded on the new housing.

It is advisable to store gramophone records perfectly upright and supported to ensure that they do not warp. Gramophone records may be stacked upright on shelves in metal cabinets divided into sections between 150 mm and 225 mm, with sufficient lateral pressure applied to the records to prevent warping.

It is advisable to group gramophone records according to size to avoid the issue of distorting the larger gramophone record stored against a smaller size.

Louvres or other openings in the metal cabinets, with particulate filtration, are advisable to provide some air circulation.

Shellac gramophone record discs are fragile and become more brittle as they age. These discs should be stored on static rather than mobile shelving to avoid damage from the vibration and physical shock.

7.4.4 Sound cylinders

Wax cylinders are common late nineteenth century sound recordings. Cylinders can be brittle and require careful storage and handling. Cylinders may be housed in an acid-free box, divided into

compartments so that several cylinders may be housed together. It is recommended that the box have a post attached to the bottom of the box to stand the cylinders vertically in the box. The wax surface should not be touched.

Specialist advice should be sought for the preservation and copying of sound cylinders.

7.5 Electronic media

7.5.1 General

Many archive and library collections have resources and assets that were either originally created and accessioned as digital objects or have become digital objects through preservation reformatting, such as audio and video resources, in particular.

Preserving and managing the collections in a digital form should be integrated with the management of physical collections so that users can access the information in the most useable and sustainable form.

There are benefits to digital preservation that have current and long-term value.

This document stresses addressing the basic challenges of digital preservation that include:

— rapid growth amounting to a constant stream of digital information being created and managing large volumes of data so as to be able to access the information as needed;

— the need for more active, constant management of digital information relative to the more stable physical collections;

— the need for new and constantly changing skills to address the evolving information management and communications technology challenges;

— requirements for a different storage and delivery infrastructure including networks and electronic storage systems;

— new and constantly evolving technological change.

Few reference standards exist due to the rapidity of changes in technology and infrastructure. The preservation of digital information is related to the management of electronic records as standardized in ISO 15489 for electronic records management systems. In addition, ISO 16363 is useful for the concepts of digital repository storage.

The aim of digital preservation is to maintain the information for as long as required, in a form that is authentic and accessible to users.

7.5.2 Optical discs

Where the interior plastic surrounds, spokes and paper inserts are removed, optical discs may be stored in the manufacturers' hard plastic cases.

NOTE Plastic surrounds, spokes and non-archival-quality paper inserts can give off corrosive gases in storage.

Discs should be encased in a sleeve or self-sealing bag made of an inert material such as polypropylene but one disc should not press directly against another in storage.

This also applies to discs kept in other forms of container.

8 Treatments and reformatting

8.1 General

Items selected for exhibition or digitization, or with frequent use and in poor condition that need treatment for safe handling, may be treated by trained professionals.

Treatments that require professional training to be carried out safely include, but are not limited to, humidification and flattening, mending or repair, lining, leaf casting, delamination, tape removal, consolidation of pigments and any other interventions that have the risk of causing irreversible changes and losses. It should be noted that lamination is rarely practiced anymore due to the instability of materials and delamination if necessary is very difficult.

Conservation may be regulated by national or international standards (i.e. ICOM), guidelines and codes of practice.

The main purpose of a conservation treatment should be the stabilization of an item's condition. It may be appropriate to recommend no treatment be performed when non-intervention best serves to promote the preservation of an item.

All actions should be governed by an informed respect for each item, its unique character and use and cultural significance.

Conservation methods and materials used should preserve the unique characteristics of each item.

Methods and materials used in conservation treatment should be selected to the best of current knowledge based on scientific standards and research protocols.

The advantages of the materials and methods chosen should be balanced against their potential adverse effects on future examination, scientific investigation, treatment and function.

Conservation includes examination, scientific investigation and treatment and permanent documentation.

Examination of an item includes:

— identifying the materials and techniques;

— a condition assessment identifying the changes or damages, their nature and extent;

— assessing the origins and causes of the damage;

— determining the type and the extent of the intervention required for the stabilization of condition.

All statements made about the item should be made based on sound evidence, in particular, declarations of age, origin, or authenticity.

Before undertaking any examination or tests that may cause change to an item, the conservation professional should establish the necessity for such procedures. Prior consent should be obtained from the owner custodian, or agency before any material is removed from an item. Only the minimum required should be removed and when possible, the material removed should be retained.

Documentation of the location and process of testing or examination should be maintained with the item.

All conservation treatment should consider reversibility and be clearly identifiable.

While circumstances may limit the resources allocated to a particular conservation treatment, the quality of a conservation treatment should not be compromised.

All conservation treatment should be undertaken in a manner that minimizes personal risks and hazards and hazards to co-workers, the public and the environment.

8.2 Mould removal

All archives and libraries are faced at times with the need to address mould removal from archive and library collections whether from damage prior to accessioning or from water-based emergencies those impact the collections. Check national regulations regarding health and hazardous materials.

Past treatments have included the use of various chemicals, including ethylene oxide in a vacuum chamber now banned in many countries because of health concerns and heated thymol and paradichlorobenzine recognized as mostly ineffective. Chemicals used to kill mould would not protect the collections if returned to the same environment. Gamma radiation does not leave residual effects, but damages cellulose, if applied in effective concentration.

In the event of a mould outbreak, measures should be taken to quarantine the area and the collections both in place and avoid cross contamination during movement. The collections should be dry before treatment can begin. Note: Mould is not completely removed by this treatment.

The treatment of mouldy collections requires a fume hood, or safety cabinet or separate space, to avoid cross-contamination. Good ventilation and respiratory protection should be provided for the person treating the collections. Staff handling mouldy collections should wear HEPA face masks or respirators and rubber or nitrile/latex gloves.

A HEPA filter vacuum cleaner should be used to remove the inactive mould from the covers of the books. If no HEPA filter vacuum is available, electrostatic charged cleaning cloths may be used, but should be changed frequently and disposed of correctly so additional spores are not released into the air.

After vacuuming or wiping, the outside of the packaging or covers of the book can be wiped with ethyl alcohol to remove staining, but take care not to saturate the material.

Using bleach to remove mould stains is not recommended because bleach can cause the paper to deteriorate rapidly, especially in humid conditions.

The item should be equilibrated to a low enough RH to avoid mould growth after treatment.

8.3 Disinfestation of collections

Several methods have been used, with varying success and with pros and cons for each technique. Depending on the method selected, it is important to consult with specialists in both the preservation of archive and library collections and in the use of the pest eradication techniques.

If a determination is made that collections require eradication of pests, specialists should be consulted before decision and implementation of any treatments.

Currently cold/freezing temperature and low-oxygen environments are being used to kill harmful insects in archive and library collections. The advantages are that there are no residual chemicals and no disruption to cellulose. Tests continue on using freezing of all types of collections including parchment, photographs and magnetic tape collections.

The method for the use of low-oxygen treatment includes using a sealed package, vacuum extraction of oxygen, with or without oxygen-scavenging chemicals and at times heat is also used. For the timing and precautions needed for these treatments for the eradication of various species of pests more information is available in the professional preservation literature.

Gamma radiation has been used to deal with both insect and mould infestations. Gamma radiation has the advantage of leaving no residual effects, but studies have demonstrated damage to the cellulose.

Chemicals that have been used on archive and library collections include ethylene oxide (ETO), methyl bromide and formaldehyde. Most chemical fumigants require that the collections be enclosed, a vacuum chamber in the case of ETO and impermeable, plastic sheeting in other cases. Some of these techniques include health hazards both during treatment and may cause ongoing health concerns.

8.4 Deacidification of paper

Research has provided processes that can neutralize the acids in paper. These processes are called deacidification and have been carried out through both manual treatments and automated systems. Deacidification does not improve the flexibility of paper.

Mass deacidification should chemically stabilize paper without causing damaging to any component of the collections. Other requirements are the ability to treat a large volume of collections safely in a short time, with low per unit cost and low costs to the environment.

The effectiveness of mass deacidification systems can be determined by using ISO/TS 18344.

8.5 Paper strengthening

All archives and libraries have problems of brittle and fragile paper. Beyond reformatting so that the information content is saved, little can be done for entire brittle collections, including newsprint.

There are techniques that have been used traditionally to strengthen items on paper including lining and lamination. Paper splitting has been carried out, including both manual and mechanized processes in some places. It is more common now to add support through encapsulation (see A.1.9.2).

8.6 Binding

When considering archive and library collections, respect for the original form is important. Binding and rebinding library and archive collections can be considered in order to facilitate usage of books and documents or maintain their original format as bound volumes. However it is advisable to leave lose archive documents in their natural form of separate sheets. If binding is chosen as a method of preservation, edges of volumes or single sheet documents should be left untrimmed.

Original covers of bound documents and books should be kept whenever possible.

Some forms of binding can make digitization of the volumes difficult or impossible including over-sewing, narrow borders and very tight bindings.

8.7 Reformatting

8.7.1 General

It is advisable for a collections management program to include methods for safe reproduction of collections. There are many methodologies and techniques for reproduction of items depending on the original material type. It is advisable to consider how to handle archive and library materials safely during all reformatting processes.

Preservation planning and policy may determine criteria for reformatting including whether the reformatting is for preservation or access or both, whether whole series will be reformatted at the same time, costs for maintaining the copies, permanence of the media and preparation required for full capture.

Reformatting is the process of copying archive and library collections and is a major activity of any preservation program. Reformatting is carried out for both preservation and/or access purposes. It should be noted that the reformatted copy does not replace the original.

8.7.2 Digitization

Digitization or digital imaging creates a copy by scanning from an original document. A digital image can, like a photograph, accurately render the information and presentation of the original. Digital-imaging technology has been used widely since the 1990s as technical advances led to improved image capture, lower costs and increased accessibility around the globe and the advantages through the internet of providing global access.

As a preservation method for archive and library collections, digital imaging includes identifying, preparing, inspecting and indexing digital information to make it accessible beyond just the scan or imaging.

It is advisable to consider how to handle archive and library materials safely during the process of scanning.

The scanning apparatus may need to be reviewed so that it is appropriate for the collections to be scanned.

If there are microfilms of the collections, it is easier to create digital copies from the microfilm.

The digitization work plan may include:

— training technicians who will be scanning in the safe handling of items;

— examining and preparing items before scanning to stabilize vulnerable or fragile items including flattening, surface cleaning and repair of tears and losses when the risks might cause damage to the items and reduce the quality of scanned images;

— providing security to protect items from theft and unauthorized handling;

— developing a post-scan housing plan.

The widespread availability of digital images has at times stimulated greater interest in viewing original items and policies on the use of vulnerable or fragile items may need to be considered.

The methodology for preserving the digital archive and library resources is still being developed and is still undergoing testing and protocol definition.

Digital images are different from other electronic files. A digital image is sampled and mapped as a grid of dots or picture elements (pixels). The binary digits (bits) for each pixel are reduced to a mathematical representation that can be read by the computer to produce an analogue representation for display or printing. The quality of a digital image depends on the resolution.

Digital images cannot be searched or manipulated like alphanumeric text files such as ASCII. In order to use digital images to create text-searchable files, optical character recognition (OCR) programs should be used. The accuracy of such programs varies tremendously, depending on the attributes of the source documents and the digital images produced.

8.7.3 Digitized archive and library collections

Digitized collections have the advantage over the analogue originals in terms of access. The digital image may remain closer to the original, if appropriately managed, migrated, emulated and/or transformed from one generation to the next. The active management cycle is considered to be 18 months to three years. There are increased possibilities for image capture, image enhancement and greatly expanded access through network distribution. Digital technology has some potential for space and cost savings if collaborative and shared networks are considered.

The considerations in implementing programs that rely on digitized collections include:

— the rapid rate of change in the technologies on which the system will be based;

— transition costs, including specialized labour and equipment;

— costs of maintaining the original in storage and the new copies in electronic storage, particularly for archives;

— legal constraints, including copyright, particularly for libraries;

— ongoing programmatic need for technology review to trigger transformation, emulation, or migration and verification and testing of a trusted digital repository;

— the need for specifications and standards;

— for strong institutional acquisitions and contracting capabilities and vendor support and stability.

8.7.4 Photocopying

Photocopying technology was developed for commercial purposes. It has been used by archives and libraries to duplicate fragile items for additional use and to replace missing items in archive and library collections. Brittle paper may be replaced by preservation photocopying unless there are other copies available (for example, large sets or serials on microfilm, or reprints or new editions). Photocopy machines can produce accurate colour copies and produce grey-scale images that can be used for access copies of black and white photographs.

The photocopying process should conform to ISO 11798 that is for example, preservation photocopying uses a tested-quality of both machine and ink, maintained to produce images that will not smudge. The paper should be permanent and durable and generally acid free and buffered. The image should be the same size as the original and maintain the original layout with good registration.

A high quality photocopy can be used to produce surrogates or facsimile copies of original documents and photographs. These copies may be used for researchers/readers and for exhibition when the original item is too light-sensitive for display or too fragile for handling.

Some older photocopies have deteriorated rapidly due to unstable chemicals used in image production or poor-quality paper. Documents produced by older processes, including Thermofax, mimeograph and Ozalid wet process have become faded and may need to be re-photocopied with modern equipment and supplies.

It is advisable to consider how to handle archive and library materials safely during the process of photocopying. Photocopying can be used for loose pages and it is not generally advised for bound volumes and materials larger than the photocopy glass.

8.7.5 Microfilming

The microfilming technique includes both microfilm and microfiche. It was developed more than 100 years ago as a part of conventional photographic technology. Microfilm has generally been a stable copying technique if a polyester film base is used, if international standards are used for exposure and processing and if the microfilm is housed in stable protective enclosures and is stored under the appropriate conditions. The media stability is a key difference between microfilm and other reformatting techniques, particularly digital imaging.

Microfilm comes in roll form, but strips of film may be cut from rolls and maintained separately. Microfilm is available in 16 mm or 35 mm widths with 35 mm the norm for preservation filming. Microfiche replicates multiple individual pages on sheets of film in a grid.

Microform techniques include silver-gelatine, diazo and vesicular forms. Silver-gelatine is the only type recognized for preservation purposes. Wet-processed silver film is the only type that is recognized as archival-quality, as dry silver film is not fixed by chemical processing and washing.

Continuous-tone film techniques can produce grey tones not captured by the high-contrast film used for normal filming. Continuous tone can be produced by various methods. These include processing silver-gelatine film by varying exposure time and processing with a low-contrast.

Colour film is generally vulnerable to light fading.

It is advisable to consider how to handle archive and library materials safely during the process of microfilming.

Annex A
(informative)

Packaging enclosures and materials

A.1 Types of enclosure

A.1.1 General

The following types of enclosure may be used for long-term storage. Consider suitability for the contents and recommendations given.

Enclosures should conform to ISO 16245.

Adhesives should conform to A.2.2.

Boxes and cases of any design should:

a) not abrade the items during removal;

b) have a method of opening and closing that is simple and clearly apparent;

c) be labelled with information about the contents and the correct position for carrying and storage, i.e. whether flat or upright;

d) have a lining which is smooth and inert and does not present any risk to the contents.

A.1.2 Book box (for bound or unbound material)

A book box is a rigid construction customized to the individual needs of the contents; it can have a drop down spine or drop down front flap.

Enclosures for bound volumes should be cut so that the grain is parallel to the joint of the bound volume.

A book box should:

a) be designed to accommodate the exact shape of the bound volume so that it does not move when the box is moved, while allowing space for any projections on the binding (e.g. bosses, chains, clasps) and providing protection for any particular fragility of structure and a smooth lining material to protect fragile surfaces;

b) be designed to be strong enough to withstand a pressure of at least 20 kPa and protect the contents from damage;

c) place the closed volume under light overall pressure, particularly when enclosing parchment text-blocks and stiff-board parchment covers;

d) reveal the contents immediately when opened to encourage careful handling;

e) allow easy removal of an enclosed volume.

Where the volume has no boards, boards slightly larger than the text block may be tied in place to support the text block, pending conservation treatment.

The wrapping should enclose the volume completely and may be tied in place with soft cotton tape, tied so that damage to the contents is prevented.

Books stored upright in an open-sided book box may need to contain a text-block support.

A.1.3 Phase box (mainly for storing bound volumes)

A phase box is a semi-rigid enclosure made from one or two pieces of archival-quality folding boxboard. The board is cut and creased to the exact dimensions of its contents.

Depending on the method of construction, it may be necessary to secure it by means of thread and polyethylene washers on the outside fore edge.

The use of staples or wire-stitching in manufacture should be avoided, but where used they should be of non-corroding material and not come into contact with the box contents.

A.1.4 Slip case

A slip case is a rigid or semi-rigid one or two piece construction enclosing the contents and may be used for the storage of documents having rigid bindings.

A.1.5 Archive storage boxes

Archive storage boxes should conform to ISO 16245.

Boxes and lids should be of acid-free board of 2 mm thickness. Lids should be easy fitting.

Boxes and lids should be constructed in such a way that there are a minimum number of projecting edges that might damage the contents of the box or impede its withdrawal from, or replacement on, the shelf.

Wherever practicable, staples or wire-stitching should not be used. In cases where they are used, they should be made of non-corroding material, such as stainless steel.

A.1.6 Portfolio (for thinner bound volumes or unbound loose documents)

A portfolio is a customized cloth covered case having top and bottom boards of the equal size but slightly larger than their contents. It may or may not have flaps attached to the rear board.

Cloth ties may be on the fore edge only, or else on the fore edge, head and tail, in order to hold the contents more securely.

A.1.7 Two or four-flap enclosure

A two or four-flap enclosure is lightweight, can be made from a variety of archival-quality materials, though usually paper and may be in one or two pieces, but always with flaps enclosing the document.

Two or four-flap enclosures should conform to ISO 16245:2009, Clause 5.

The materials used should not present any risk to the document enclosed.

The enclosure may be secured using cord or archive tape.

A.1.8 Protection of rolled material on cylinders

Cylinders for rolled documents should be constructed either of acid-free and lignin-free board, or of acid-free board lined with a double layer of paper conforming to ISO 9706.

The length of the cylinder should be at least 100 mm longer than the width of the document rolled around it and the thickness, strength and diameter of the cylinder should be determined by the size and weight of the document. The diameter of the cylinder should be such that it allows the document to lie flat when unrolled.

The cylinder, with the document rolled around it, may be wrapped twice around with a layer of cloth which should be wide enough to overlap the edges of the cylinder and be tucked into the ends to exclude dust. This should be secured by tapes at least 25 mm wide.

Linen bags and paper conforming to ISO 9706 may also be used to wrap documents stored on cylinders.

Documents should not be placed inside cylinders.

Consideration should also be given to using square section boxes or tubes for rolled material; ideally each box should contain only one document.

A.1.9 Other methods of protection

A.1.9.1 Fascicules

Fascicules consist of a number of folded leaves sewn together through the fold to form a single section.

Fascicules may be used as a safe and efficient method for the protection and preservation of single leaf archive and library collections.

They may also be used for slightly larger documents, such as thin pamphlets or a series of leaves where it is vital for them to remain together.

Compensation guards should be included to match the combined thickness of the archive material to be protected. These should be either narrow strips of the same paper as the fascicule sheets folded in half, or hooked guards formed by a folded sheet that is slightly wider than the finished fascicule. Guards and full-sized sheets should alternate.

A cover made from a thin card or manila should be provided for each fascicule.

To obtain the best results, a narrow strip of Japanese tissue should be attached to the document with starch paste to act as a guard. Wherever practicable, it should be attached to the verso edge and cover no textual areas.

A number of completed fascicules may be boxed together for added protection.

The advantages of using fascicules are:

— there is minimum interference to the original document;

— they provide excellent physical protection;

— each document is separated and therefore protected;

— there is no, or minimal, finger contact with documents during use;

— extraction of documents for exhibition or reproduction is easy.

The disadvantages of using fascicules are:

— they temporarily change the original format of the document;

— they are not fully secured against theft.

A.1.9.2 Encapsulation

The process of encapsulation is the placement of a document, usually a single leaf, between two sheets of clear inert polyester material (see A.2.5) that is sealed or fastened around the edges using electromagnetic or ultrasonic welding techniques. No adhesives should be used to hold the document in place. It is preferable not to completely seal the edges by using spot welding or leaving at least one side open.

Single sheet encapsulation is most common but several encapsulated sheets can be assembled in book form.

A document should be assessed to see if it needs to be stabilized chemically before encapsulation. Professional judgement should be exercised in this respect.

The advantages of encapsulation are as follows:

— it is a method of protection with minimum interference to the original document; the integrity of a document is preserved;

— it provides support for fragile and delicate documents;

— it is a method of support that is quickly and easily reversed;

— it provides protection from abrasion and surface contact during storage and consultation;

— it provides some protection from contact with water or other contaminants in the event of a disaster.

The disadvantages of encapsulation are as follows:

— it adds weight and bulk to storage systems such as plan chest drawers;

— the study of some bibliographical features is temporarily denied;

— polyester abrades easily and so may require periodic re-encapsulation;

— the static charges generated by polyester can remove loose media including pastel, gouache, or charcoal.

A.1.9.3 Mounts

A mount is a rigid support for a document, which provides physical protection and may be used to present the document in an aesthetically pleasing manner.

Typically, a mount is made up of a window overlay hinged to a backing board. The document is attached to the backing board so that the window frames it. The window overlay may just cover the edges of the document or be cut slightly larger to reveal them.

Mounts may be used to provide protection to documents during storage, display, handling and transportation.

The advantages of mounting documents are as follows:

— it provides a rigid support and effective physical protection;

— it is an adaptable construction, which can be designed to meet a range of requirements;

— it is effective in protecting documents with vulnerable surfaces and media;

— it improves security as documents are fixed to the mount;

— it enhances the appearance of the document;

— it provides replacement of an inappropriate housing which may be the cause of deterioration;

— it reduces the need for physical contact during consultation.

The disadvantages of mounting documents are as follows:

— the methods of attachment to the mount normally involve physical intervention with the document;

— it changes the way in which a document is viewed, which may be at variance with its original context, purpose or meaning.

Mount boards should:

a) for short-term storage, be conservation board, comprising chemically purified wood pulp having a calcium carbonate buffer;

b) for long-term storage, be museum or rag board: a fibre board containing high-grade cotton fibres and cotton linters, having a calcium carbonate buffer;

c) for specialized applications (e.g. photographs), be cotton fibre board, unbuffered and sulfur free.

Other materials in contact with the document should be in accordance with the recommendations for materials employed during conservation treatment and packaging (7.2 and 7.3).

The mount should be constructed only from archival-quality specification materials.

A.2 Packaging materials

A.2.1 General

While in storage, collections can be at risk from a number of damaging agents. These can originate from the immediate environment, from the natural degradation processes of the documents themselves, or occasionally from the materials of which their storage containers are made. It is therefore important to choose appropriate packaging materials.

Many traditional archives and libraries use packaging materials, including textiles and wooden boxes that have been found to be acceptable and preferable for the local environment and collections. These traditional forms of packaging should be left intact.

A.2.2 Adhesives

Adhesives used in packaging used for collections should be acid-free and should not degrade over time.

The process of adhesive degradation can produce by-products that are harmful to the stored collections. Starch adhesives, as used in the conservation of paper documents, normally remain stable and do not degrade.

A.2.3 Board

Board should conform to ISO 16245:2009, 4.2.

Boards containing molecular sieves or other types of pollutant scavenger offer significant preservation advantages.

Board used for packaging photographic material should conform to ISO 18902:2013, 4.1.

NOTE Boards are widely employed in the storage of archives and books. They are used to build book boxes, to add rigidity to portfolios and other enclosures and to mount single sheets and oversize collections for flat storage.

A.2.4 Cloth and paper

A.2.4.1 Background

It is important to select acid-free and inert materials for the packaging of collections for long-term storage that do not degrade over time.

For most purposes (except for some photographs and other alkali-sensitive materials, see below), acid-free paper and board having an alkaline buffer are recommended.

Acid-free paper and board are naturally exposed to various acid-forming compounds as they age and gradually become acidic even if they were originally made with a neutral pH. The inclusion of a 2 % to 3 % alkaline reserve in this packaging material provides protection against any acidic decomposition products.

A housing with an alkaline buffer is especially important for the long-term survival of paper. As paper degrades naturally, various impurities within it (such as lignin) oxidize and produce acidic decomposition products, which increase the rate of deterioration of the paper cellulose.

Acid gases and pollutants from the atmosphere (such as oxides of nitrogen and sulfur dioxide) form nitric and sulphuric acid, while others (such as ozone, a powerful oxidizing agent) also contribute to the deterioration of paper.

Other damaging agents such as formaldehyde and acetic acid can be emitted by furniture or building materials and acids also migrate from adjacent materials.

Commercial products are available which, when used in storage enclosures, protect documents from the effects of these damaging agents.

Paper and paperboard can insulate enclosed collections from rapid changes in environmental conditions. Paperboard also acts as a sink, absorbing to some extent pollutant gases from the environment and those emanating from the documents themselves.

Molecular sieves or other types of pollutant scavenger can be incorporated into paperboard and other packaging materials at the manufacturing stage. These substances absorb and trap other chemical species and remove them, thereby complementing the absorption characteristics of the packaging material.

In the event of a water-related disaster, paperboard boxes absorb and hold large quantities of water and can protect the contents from becoming wet for fairly long periods of time.

Paper is used for archives storage in the form of folders, wallets, sleeves and as a wrapping material.

Further information regarding this can be found in ISO 16245.

The packaging of photographic collections presents different challenges. These collections have complex chemical structures and are particularly susceptible to degradation through contact with packaging materials that do not meet ISO 16245.

It is essential that paper and board used for their storage have a quality fibre composition and are processed to high standards with minimum residual chemicals. In particular, it is important that the packaging materials do not contain processing chemicals which include sulfur and sulfur compounds, because of the danger of tarnishing already mentioned.

The photographic blueprint or cyanotype and the contemporary dye transfer processes are sensitive to an alkaline environment, where discolouration can occur. It therefore seems sensible to use unbuffered enclosures for these collections until definitive information becomes available.

A.2.4.2 Cloth

Cloth for lining boxes should be acid-free, undyed, strong and durable.

Cloth for covering boxes should be coated with a non-migratory resinous substance, e.g. acrylic resin.

The surface should be non-friable with the surface fibres fully coated.

In the event that the cloth becomes wet it should not stick to adjacent documents, nor bleed colour.

A.2.4.3 Paper

Paper for packaging material in direct contact with documents should conform to ISO 16245:2009, 5.2.