



Preservation and Conservation (PAC) Programme Frequently Asked Questions

The PAC FAQ

Fourteen IFLA Preservation and Conservation (PAC) Centres are hosted by libraries around the world. These Centres hold a wide range of knowledge on regional and international issues in cultural heritage conservation and preservation.

The PAC Network connects preservation and conservation experts. It is a space to exchange ideas, information, knowledge and opinions – and it's a place to seek guidance.

Each year, every PAC Centres receives multiply requests or questions concerning preservation of our cultural heritage. Books, manuscripts, documents, photos, it's all a part of our history and the PAC Centres want to ensure it will as well be a part of our future

This document reflects the knowledge and expertise of the PAC Centres around the globe and covers the most common preservation and documentation questions and issues – both regional and international. Each question is answered with an explanation, best practise advice, and steps on how to best tackle preservation issues.

The document is created with respect for cultural differences both for preservation and respect for cultural norms that impact caring for collections, and the use of collections that may have religious or other uses particular to a culture.

The PAC Network

The IFLA Strategic Programme on Preservation and Conservation (PAC) was officially created during the IFLA annual conference in Nairobi in 1984 to focus efforts on issues of preservation and initiate worldwide cooperation for the preservation of library materials. The PAC programme was effectively launched in Vienna during the 1986 Conference on the Preservation of Library Materials co-organized by the Conference of the Directors of National Libraries, IFLA and UNESCO.

Each centre is independent and acts according to the priorities identified in its geographical and expertise area. It must comply with the objectives of PAC Strategic Programme and maintain cooperation with other Centres through various activities (publications, seminars, conferences, etc.).

The directors meet regularly for working sessions to define the orientations of the Strategic Programme. PAC has one major goal: to ensure that library and archive materials, published and unpublished, in all formats, will be preserved in accessible form for as long as possible according to the following principles:

- preservation is essential to the survival and development of culture and scholarship;
- international cooperation is a key principle;
- each country must accept responsibility for the preservation of its own publications.

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IFLA PAC Centre Australia

National Library of Australia

The IFLA PAC Centre for Oceania is based at the National Library of Australia's Preservation Services Branch. Preservation Services - made up of two sections, Preservation and Digital Preservation - works collaboratively with other branches across the Library to preserve, conserve and care for the Library's physical and digital collections.

A key objective of the Preservation Services Branch is to ensure meaningful access to digital and physical content over time.

Preservation Services staff are actively involved in a number of national and international Digital Preservation networks, sharing expertise and information and providing advice and assistance in response to queries.

The National Library of Australia is located in Canberra, Australia's capital city. The Library's role, as defined by the National Library Act 1960, is to ensure that documentary resources of national significance relating to Australia and the Australian people, as well as significant non-Australian library materials, are collected, preserved and made accessible either through the Library itself or through collaborative arrangements with other libraries and information providers.

Expertise

The Preservation Services Branch has 12 staff – the Director, 3 Digital Preservation Staff and 8 Preservation staff, with expertise in the following areas:

- Preservation and Digital Preservation policy and strategy development
- Strategic and Business Planning
- Risk Management
- Digital Preservation
- Preventive Conservation – framed as a strategic “backbone” supporting all preservation activities
 - Storage and housing methods and advice
 - Environmental monitoring and management
 - Pest Management
 - Care and Handling training
 - Collection Surveys and Preservation Needs Assessments
 - Lighting guidelines
 - Management of Hazards in Collections
 - Disaster preparedness and response management and training
- Exhibition preparation
- Preparation of material for digitisation
- Hands-on treatment

For more information go to the webpage: <http://www.nla.gov.au/>

Risk management as a priority for an efficient and effective preservation strategy

Q: What is risk management?

A: Risk management is the term used to describe the activities people and organisations undertake to identify, assess and treat the risks that could potentially affect their businesses or organisations.

Risk management is widely used by organisations around the world as part of their standard management practice. This is reflected in the fact that there is an overarching international standard for risk management *ISO 31000:2018, Risk management – Guidelines* (<https://www.iso.org/iso-31000-risk-management.html>). *This is supported by other international standards for risk management vocabulary and risk assessment techniques. A number of countries have other risk management standards for specific applications, e.g. in Australia there are a wide range of risk management standards for areas as diverse as legal practice, weed control, medical devices and information security to name just a few. It is a tried and tested system and has been adopted by libraries and other cultural organisations around the world.*

Q: Why is risk management useful in preservation?

A: There are a number of reasons risk management is helpful, including:

- It is systematic and is carried out based on an agreed framework that is established when you first start on risk management. This groundwork is very important to the effectiveness of your subsequent risk management processes. Because it is systematic everyone in your organisation can use the same criteria to assess risks and to determine their priority for treatment.
- Risk management can be applied to any organisation, event, project, type of work etc – so it can operate on many levels covering different circumstances – you just have to define the context in which you are operating and design the system to suit your organisation. So you can apply risk management to an exhibition, an event involving your collections or to the day to day operations of your library.
- It provides you with an agreed language to discuss and compare diverse risks that can impact your organisation such as risks to the health and safety of workers and the public, to collections, to organisational finances and organisational reputation.
- Including risks to collections in the broader organisational risk management framework brings the collections into consideration with all other organisational risks – this is where they should be because risks across an organisation can rarely be looked at in isolation. For example, risks to the building infrastructure or to finances are very likely to result in risks to collections, while risks to the collection have potential reputational and business continuity risks for collecting organisations.
- Because it is systematic and uses an agreed risk language within an organisation, risk management can help to calm discussions and lead to less emotionally charged descriptions of risk. This is a positive for clear forward planning. People get very emotional about collections given their immense importance to our sense of identity within our different

cultures, but managing risks to such important items is usually most efficient and effective when approached with a cool head.

Q: What is risk?

A: Risk is defined in ISO 31000:2018, *Risk management – Guidelines as the effect of uncertainty on objectives*. This is a very broad definition and so can cover a huge range of things that could happen and which could have only a minor impact through to things that could be devastating. This is why organisations decide what categories of risk they will focus on, what risks and what level of risk they are willing to live with and which risks they need to actively manage.

The same system that is used for risks, can be used to assess opportunities, which can be seen as positive risks.

Q: But isn't risk defined as *consequences x likelihood*?

A: Well not really. This definition is used sometimes but it is a bit misleading and does not help you to understand the risk. When identifying risks it is important to have a really good understanding of their source and what they might result in, for example “risk of fading and colour change due to exposure to UV radiation and high lighting levels”. This can help you determine the severity of the impact (consequences) and the likelihood of it occurring in the specific instance you are looking at, and then how you might treat that risk in a cost-effective way.

Determining the severity of the impact (consequences) and the likelihood of the risk being realised is the most common form of risk analysis. Consequences x likelihood can give you a risk rating which helps you to determine the priority of treating a risk as compared to others you have identified and analysed. This is vital for planning.

Q: What are the main risks that can affect collections?

A: The *Agents of Deterioration* framework is a very useful way of looking at the source of risks to collections, so useful in fact that this system of categorising risks to collections can be found on websites from all over the world. It was developed at the Canadian Conservation Institute (CCI) in the 1990s and has been expanded on and developed since then. The Canadian government website provides in-depth information on the agents of deterioration when you follow the individual links (<https://www.canada.ca/en/conservation-institute/services/agents-deterioration.html>). You may not need or want to go into this depth but there are other websites, such as the AIC wiki (http://www.conservation-wiki.com/wiki/Ten_Agents_of_Deterioration) and the Smithsonian National Postal Museum (<https://postalmuseum.si.edu/collections/preservation/agents-of-deterioration.html>) that provide really useful summaries of the “agents”.

The agents of deterioration are:

- Physical Forces – earthquakes through to handling collection items
- Thieves and Vandals
- Fire
- Water – flooding or small leaks
- Pests – insects, rodents and mould and in some cases birds and possums
- Pollutants
- Light and UV radiation
- Incorrect Temperature
- Incorrect Relative Humidity which could lead to mould growth if too high and to things drying out and becoming brittle if too low.
- Custodial Neglect & Dissociation - such as not documenting collections or failing to keep records up to date so items cannot be located

The *Agents of Deterioration* are a useful launching point for your thinking about the risks you might encounter in your situation. The relative importance of those risks and the way you treat them will be specific to your organisation. Remember that these agents may not be the only risks to your collections – if you don't have funding or your occupancy of your building is uncertain, the risks to the collection might be ones that are common to the organisation as a whole.

Q: So how does risk management relate to preservation strategies?

A: Risk Management and Preservation Strategies have much in common. Both seek to identify potential risks, assess their potential impact and likelihood of occurring and aim to have treatment strategies planned in advance to ensure that the response can be quick, efficient and hopefully effective. This is especially evident in disaster preparedness and response planning and other preventive programs. What risk management adds is the formalised assessment of the likelihood of something happening and the potential severity of the impact, which really helps sharpen the focus for short-, mid- and long-term preservation planning.

Other things that risk management and preservation planning have in common are:

- The need to tailor your systems to your specific circumstances.
- The importance of ongoing consultation and communication
- The necessity to monitor and review and revise as required to ensure the ongoing effectiveness of the work.
- Both benefit greatly from data gathering and building on experience.

If your organisation uses risk management as part of its overall management framework, basing your preservation planning and communications around risk can help to have collection issues considered alongside other corporate issues.

Q: Can risk management help to determine if a preservation strategy is effective and efficient?

A: Risk management is certainly one tool that can help you to assess the effectiveness of your preservation strategies. Risk management is not something that is done just once – to be truly effective and to have it embedded in your management approaches, risk management is continuous. This repeated work of risk management provides you with the opportunity to observe trends over time. If the trend is toward a lower risk rating for the same risk over time

because of the treatments/mitigations put in place, this is an indicator that your strategies are effective. However, it is not necessarily an indicator that they are cost-effective – this is something that you would need to determine taking into account the amount of staff/contractor and other resources required to achieve the change in the risk rating.

Risk management can be used with other mechanisms as well, for example, a trend over time toward a lower risk rating combined an improvement in condition or halting of deterioration of your collection would be a good qualitative indicator that the preservation strategies are effective.

Q: Can I use another organisation's risk management framework or preservation strategy?

A: You can use another organisation's risk management framework or preservation strategy as a reference and as a guide to how you might want to structure your own work, but your risk management framework and your preservation strategy will be most effective if they are designed for your specific needs, your physical environment, your political, social and cultural environment and your collection.

Q: Looking at the preservation literature, there seems to be a whole lot of different approaches. Which is best?

A: There are quite a few different approaches, and that is because people have developed different approaches to meet different needs. So the best approach will be the one that works for you. You may find that over time you use a number of different approaches for both risk management and preservation planning.

For example, at the National Library of Australia (NLA), risks to the collections are included in the risk categories that are part of the corporate risk framework. The collections are a major asset and so this is appropriate. The NLA's Enterprise Risk Management framework, policy and practices are based on the international standard, *ISO 31000:2018, Risk management – Guidelines*. In Preservation Services at the Library, we have also based our risk management on the standard, because we feel it is important that our preservation activities are using the same system and language as the wider Library. This is a strategic choice to ensure preservation strategy issues receive attention throughout the organisation. At the same time, we are using *QuiskScan* to get a snapshot of the vulnerabilities of the collection to assist in developing our Strategic Preventive Conservation Program. It will be used to help develop a risk profile for the collections as a whole. The *QuiskScan* (<https://www.tandfonline.com/doi/full/10.1080/19455224.2016.1152280>) was developed by conservation scientists at the Cultural Heritage Agency of the Netherlands and the British Museum.

Another method, based around the *Agents of Deterioration* (http://www.conservation-wiki.com/wiki/Ten_Agents_of_Deterioration) is the *Cultural property risk analysis model (CPRAM)*. This model was developed specifically for preservation/preventive conservation planning. This method is widely used in the cultural heritage sector and Robert Waller, who developed it, has provided training workshops in a number of different countries.

In all the examples listed above risk management and preservation strategic planning are strongly linked. You just need to determine the way you want to work, to either select or design the best approach for your needs.

Q: What resources are available to get us started with risk management and preservation planning?

A: There are a lot of resources available – not all of them can be listed here, so in addition to the selection of resources below, you can try an internet search for more.

ISO 31000:2018, *Risk management – Guidelines* (<https://www.iso.org/iso-31000-risk-management.html>)

New South Wales Department of State and Regional Development and the Global Risk Alliance Pty Ltd. 2005. [Risk Management Guide for Small Business](#), Sydney, 66pp.

- This is a really useful guide to stepping through the risk management process. Organisations in your country/area might have similar and more recent publications.

Collections Trust, *Benchmarks in Collections Care 2.0*,
<http://collectionstrust.org.uk/resource/benchmarks-in-collectionscare-2-0/>

- This is a great preservation needs assessment tool and helps you track progress with repeated use.

Birmingham Museums Trust, *Risk Awareness Profiling Tool* (raptonline),
<http://www.raptonline.org.uk/welcome>

Agnes W. Brokerhof and Anna E. Bülow, 'The QuiskScan—A Quick Risk Scan to Identify Values and Hazards in a Collection', *Journal of the Institute of Conservation* 39, no. 1 (2016): 18–28
<https://www.tandfonline.com/doi/full/10.1080/19455224.2016.1152280>

R.R. Waller, *Cultural Property Risk Analysis Model: Development and Application to Preventive Conservation at the Canadian Museum of Nature*, Göteborg Studies in Conservation 13 (Göteborg: Göteborg Acta Universitatis Gothoburgensis, 2003)

- This is available to download from <http://protectheritage.com/blog/ebook-download/>

Cordelia Rogerson and Paul Garside, 'Increasing the Profile and Influence of Conservation—An Unexpected Benefit of Risk Assessments', *Journal of the Institute of Conservation* 40, no.1 (2017):34–48

Agents of Deterioration: http://www.conservation-wiki.com/wiki/Ten_Agents_of_Deterioration
OR <https://www.canada.ca/en/conservation-institute/services/agents-deterioration.html>

Preservation planning for large collections http://www.slq.qld.gov.au/resources/preserving-collections/preservation_guides/preservation-planning-for-large-collections

Preparing a Preservation Plan: <https://www.nedcc.org/preservation101/session-1/1preparing-a-preservation-plan>

Effective Preventive Conservation in Different Climatic Zones

Q: When we talk about preventive conservation, what areas of collection management are we covering?

A: Preventive Conservation covers a very broad range of activities all aimed at preventing damage and loss to collections. Activities often included in the scope of preventive conservation are:

- High level assessments of the state of collections for planning purposes collections assessment
- More specific preservation needs assessments
- Environmental monitoring and management, i.e. monitoring and control of temperature and relative humidity
- Lighting guidelines and their implementation – principally for exhibitions and loans, but also for the management of general lighting levels and exposure to UV radiation
- Disaster response and recovery – often aligned with Business Continuity planning management
- Integrated Pest management
- Management of hazards in collections
- Identification and management of risks to collections
- Care and handling training for staff and people that use the collections
- Storage and housing planning and management
- Preventive conservation policy frameworks
- Rules and guidelines for collection use
- Exhibition and loan documentation
- Collection surveys and security

Q: Which of these will be most affected by the climatic zone in which the library is situated?

A: The areas of preventive conservation that will be most affected by different climatic zones will be:

- the management of temperature and relative humidity – clearly the issues you face will be markedly different between, for example tropical and arid environments.
- pest management – the climate will determine what pests you have to deal with and their life cycles.

Geographical location and climate will affect

- the management of exposure of collections to light and UV radiation, if you rely on natural lighting to any degree.

- disaster preparedness and response planning will be affected by both climate and geographical location.
- The nature and consequences of the natural disasters you might be exposed to, which will have very broad implications for the type of response you might have to plan for and the timing of a response. Saving lives will always come before rescuing collections and if conditions are unsafe as a result of flood, fire or earthquake, you may not be allowed into the area for quite some time. This needs to be factored into your planning.

A sound approach to identifying the scale of the potential problems you are facing, is to apply risk management methodology, with the first and most important step to understand the context you are operating in. For example, are you in an earthquake zone, will your building and your collection storage furniture withstand the intensity of tremors that experience and monitoring indicate that you can expect? If you are in close to the coast or on an island will rising sea levels affect your collections – if so in what time frame; are you in a tropical environment/arid environment or temperate? What seasonal variations do you experience?

Some of these questions are easy to answer but collecting data on past problems – such as leaks, storms, power failures and their causes and on changing environment and weather patterns will greatly assist you in future planning and help to give an overview of the degree to which climate might affect your preventive conservation needs.

Q: It is really difficult to meet the generally accepted environmental parameters for the care of collections in our climate, and with the resources we have – what do we do?

A: There are two parts to the answer to this:

Firstly, some background information on recent developments in this are:

There has been a lot of work done in recent times, focussing on environmental conditions for collections. The drivers for this work include:

- an increasing international focus on sustainability,
- the increasing cost of running HVAC systems to maintain environments within levels that have been widely accepted as an international standard, regardless of the climate in which they are operating. Many buildings have failed to meet the standards and ongoing attempts to do so are expensive and often futile.
- A re-examination of the context of the development of the standards. They were initially developed in the UK, for UK conditions and were not necessarily intended for the wide application that resulted from their publication.

Recent work has led to some new approaches that emphasise the stability of the environment rather than the need to remain within tight parameters.

- This approach emphasises managing the rate of change of temperature and relative humidity - ensuring fluctuations are not extreme and rapid.
- It also encourages a range of parameters that are suitable to the local conditions that also accommodate seasonal drift.

- It acknowledges the need to take into account the different requirements of different materials and object types - with composite objects made from a range of different materials, especially mixes of organic and inorganic materials, being potentially more vulnerable to damage from environmental extremes and fluctuations.

There is no one size fits all solution and while this might seem to make things more complex in some respects, it is an important advance that allows for a more practical, customised and achievable solutions.

It is important to note that there are some countries that are not fully accepting of these changes and the application of different environmental standards for inter-institutional loans is not fully resolved.

Useful resources:

In December 2018, the Australian Institute for the Conservation of Cultural Materials ratified the *AICCM Environmental Guidelines for Australian Cultural Heritage Collections*, which provides guidelines for Temperate and Subtropical / Tropical climates. Because of the range of climatic zones in Australia this is a useful example of the work being done to review environmental parameters. Their website also provides helpful references, some of which are provided below:

AICCM Environmental Guidelines: <https://bit.ly/2KrFsRC>

Environmental Guidelines - ICOM-CC and IIC Declaration (September 2014): <http://www.icom-cc.org/332/-icom-cc-documents/declaration-on-environmental-guidelines/#.XK5xPYVOLN9>

AIC Environmental Guidelines wiki: http://www.conservation-wiki.com/wiki/Environmental_Guidelines

Environmental sustainability - reducing museums' carbon footprint: <https://www.nationalmuseums.org.uk/what-we-do/contributing-sector/environmental-conditions/>

CCI Environmental Guidelines for Museums: <https://www.canada.ca/en/conservation-institute/services/preventive-conservation/environmental-guidelines-museums.html>

Getty Conservation Institute's Conservation Perspectives, Fall 2018 edition *Collection Environments*: http://www.getty.edu/conservation/publications_resources/newsletters/33_2/index.html

Heritage Collections Council Guidelines for Environmental Control in Cultural Institutions (2002) – although this was published some time ago it remains relevant today as it advocates passive environmental control and provides examples to illustrate the points being out forward: <https://bit.ly/2UqtR9Q>

Environmental Guidelines - an Australian Perspective: <https://www.tandfonline.com/doi/abs/10.1080/10344233.2018.1489455>

A Practical Guide for sustainable Climate Control and Lighting in Museums and Galleries: http://www.magsq.com.au/_dbase_upl/APracticalGuideforSustainableClimateControlandLightinginMuseumsandGalleriesRevisionFinalsm.pdf

The second part of the answer to the question *It is really difficult to meet the generally accepted environmental parameters for the care of collections in our climate, and with the resources we have – what do we do?* is:

Maybe you don't need to meet these parameters.

If your collection is well acclimatised to its environment, it could be adversely affected if it was to be moved into the so-called "ideal conditions". This has been known to happen with collection moves that do not allow for gradual acclimatisation to the new environment.

A cultural centre on an island in the Torres Strait – a tropical area of Australia – has one small gallery that has a controlled environment so that they are able to achieve conditions that lending institutions require. This allows them to stage small exhibitions that include loans from other collecting institutions. The remainder of the space does not have an HVAC system to control temperature and relative humidity, however it is extremely well ventilated with windows and doors oriented to optimise airflow. This works well for them as the space is also a focus for community activities and the main display area opens out to an outdoor performance and ceremonial area. This is a good example of how your operating context can determine whether you need to put resources into trying to meet these conditions, and of a practical way of to divide up spaces to meet a range of needs.

Q: Are there specific preventive conservation actions we should take in our particular climates?

A: There are texts available that provide guidance on specific issues and solutions for different climates, however, each organisation is different, and these can only really be seen as guides.

In essence, the most important approach is to know your context and your collection and take a planned approach to mitigating risks:

- Understand the materials in your collection
- Investigate and understand the problems you face and the types of deterioration that are affecting collections items. You may find that the main problems are, for example:
 - due to the poor state of the building or part of the building – e.g. a leaky roof, damp walls, cracked walls, inefficient HVAC systems,
 - inappropriate storage furniture,
 - lack of policy and guidance about use of the collection, or
 - characteristic deterioration of the materials in the collection.
- With a good understanding of the problem/s, you can prioritise them based on urgency and the degree of impact they are having on collection condition. Thus, allowing you to allocate resources – both funding and staffing – in a planned and logically sequential way.

There is no doubt that the types of preventive conservation issues you face will be affected by climate and geographical location, but these may not be the most significant factors affecting the collections. In fact, some libraries might find that advocacy and building awareness of the importance of the collections assists in increasing the resource base to mitigate risks to the collections.

IFLA PAC Centre Japan

National Diet Library, Japan

The PAC Centre Japan is hosted by the National Diet Library (NDL) located in Tokyo, Japan.

The NDL is the sole legal deposit library in Japan. It preserves a wealth of materials acquired through the years as national cultural properties and makes them available to the National Diet (parliament), the judicial and executive branches of the government, and the public. The Library's collections include more than 43 million items in total (as of March 2018) and it acquires about 0.8 million items every year.

Based on experience and knowledge, the PAC Regional Centre for Asia organises training programs, dispatches staff members as lecturers outside and inside Japan, holds events and provides manuals and information online to promote preservation and conservation not only in Japan, but also in other Asian countries.

The Centre's other activities include;

- Transmitting information through distributing, translating and contributing to the publications of IFLA/PAC;
- Receiving trainees from abroad;
- Promoting cooperation networks for preservation;
- Promoting IPM (Integrated Pest Management)

Expertise

The Preservation Division has years of experience in repairing various kinds of damaged paper materials from the vast collections of the NDL. The NDL is also very active in digitization of its collections and has digitized nearly 2.7 million items so far. In addition, after the Great East Japan Earthquake, the preservation staff has been gaining experience in conservation work on materials damaged by earthquakes, tsunami and floods, and giving support to libraries affected by disasters.

In the area of preservation and conservation, the NDL has particular strengths in:

- Paper conservation, especially conservation using traditional Japanese paper;
- Digitisation;
- Disaster preparedness, and salvage and treatment of damaged materials.

Information about the Centre's activities, including Japanese translations of the IFLA/PAC publications, are available on the website of the NDL:

<http://www.ndl.go.jp/en/preservation/index.html>

In case of disaster...having a disaster plan

This FAQ was prepared based on the IFLA Disaster Preparedness and Planning manual and the expertise acquired by the National Diet Library (NDL) and other libraries.

[IFLA Disaster Preparedness and Planning: A Brief Manual](#)

Q: Why is it necessary to prepare for disasters that might not even happen or to have a disaster plan for our own institution?

A: A disaster can strike anywhere at any time. Earthquakes, wildfires, and flooding caused by hurricanes, typhoons, or heavy rains are just a few examples of the kinds of natural disasters that affect institutions around the world. Additionally, there are man-made disasters, such as fire or water damage caused by human error or equipment failure. In the worst cases, sometimes losses are caused by war, armed conflicts, or terrorism. Very often, disasters cannot be prevented, but the risks can be mitigated if we take adequate measures in advance and exercise good judgment when a disaster strikes.

It is important to identify both the circumstances that are unique to your institution and the measures that can be taken in a variety of situations when planning how to minimize risks from disasters. Additionally, creating a disaster preparedness plan and sharing it with your stakeholders will help to gain their cooperation and understanding when action must be taken.

Q: What steps are needed for proper disaster management?

A: In many guidelines and manuals, disaster management is organized into the following phases: risk assessment, prevention and protection, preparedness, response, and recovery.

- **Risk assessment:** The first thing to do is to identify the risks that your institution faces from disasters and rank them according to their likelihood and potential severity. For many libraries, fire and water damage rank at the top of the kinds of incidents that are most likely to occur. Other risks will depend on the unique circumstance of your library. For example, earthquakes are a major concern in Japan, so the priority is high for aseismic countermeasures.
- **Prevention and Protection:** The IFLA manual states that “prevention is concerned with measures to prevent an event happening” and “protection is concerned with measures to limit the damage to collections if an event does happen.” It is important to consider what can be done to minimize damage and implement such measures as much as possible.
- **Preparedness:** There are many aspects of being ready to cope with a disaster, including creating a disaster plan, organizing a disaster response team, preparing the necessary equipment and supplies, and carrying out training sessions in which the necessary actions are simulated.
- **Response:** When a disaster actually strikes, your ability to take prompt and suitable actions in response will depend entirely on how well prepared you are.
- **Recovery:** The recovery phase is not complete until the library’s services, facilities, and collections have been returned to their normal condition. The length of time this takes will depend largely on the extent of damage suffered.

Q: What kind of risks and threats should I assess at my institution? Are there any useful references I should check?

A: Both the IFLA Manual and the ICA Guideline (See A12) have lists of the risks you should assess for your institution. Also, the American Institute for Conservation of Historic and Artistic Works (AIC) offers a risk prioritization worksheet and walk-through checklist that might be useful.

<https://www.culturalheritage.org/resources/emergencies/risk-evaluation-and-planning-program>

Many regional or local governments publish information on the types of risks an area faces and which can be referenced when assessing the risk from natural disasters and other external sources. In Japan, many municipal governments publish on their websites hazard maps that show the areas in a city most likely to be affected by a particular hazard and how severe the impact could be.

(Example) Koto City Flood Hazard Map

<https://www.city.koto.lg.jp/470601/machizukuri/kasenkoen/kasen/documents/englishmap.pdf>

Local historical documents and research publications that record the damage caused by past disasters or the history of land use are also useful sources of information.

Q: How should we prioritize measures for prevention and mitigation of disasters?

A: After completing your risk assessment, prioritize measures for areas that are weak. To protect against fires and floods, inspect all buildings as well as electrical and water distribution facilities regularly, and study the feasibility of installing waterproofing, fire detection, and fire extinguishing equipment. For more information, please see the chapter on *Prevention and Protection* in the IFLA manual and other guidelines.

Other useful measures include identifying external sources of disaster information and alerts and secure storage for your library's most valuable materials. For example, libraries located near rivers or other bodies of water that have identified a high risk of flooding should avoid storing library materials in lower levels. Remote storage and digitization or other media conversion are also viable options.

Q: What measures can we take to minimize the damage to collections from earthquakes?

A: In addition to the damage to buildings and facilities that they cause directly, earthquakes also cause fires, flooding, tsunamis, and other secondary disasters. Thus, a wide range of measures are necessary. But here are some suggestions for measures to prevent damage to library collections due to the collapse of a building or other damage to facilities. First, check the earthquake resistance of the building, and implement aseismic reinforcement or isolation. Bookshelves can be prevented from collapsing by fastening them to the floor, a wall, or to each other. Large books should be placed on bottom shelves, and fall prevention

bars or tape are effective on higher shelves. Just putting books all the way back on the shelf can also make a difference. Storing valuable materials in storage boxes helps reduce damage by water or falling. Applying shatterproof film to window glass and lighting equipment is also an effective approach.

Q: What elements should be included in a disaster plan?

A: Although the answer to this question will vary depending on the size of the institution and the type of disaster, the following elements are often included in disaster plans.

- Establish a disaster management team and define a chain of command, roles for team members, and contact information for both normal business hours and after hours.
- Organize your disaster action procedures by type of disaster and materials. Use a chart or other convenient and easy-to-understand format.
- Create a priority list of materials to be salvaged, including a layout plan of your stacks.
- Create a list of emergency tools, supplies, and their location.
- Train your staff regularly.
- Review and revise your plan regularly.

In addition, keep your emergency information well organized, including how to contact emergency services, external sources of support for relief and restoration of materials, and insurance.

Check the following site to see disaster plans prepared by other library's. See also A. 11 for templates of a disaster plan.

- Disaster Plans. CoOL (Conservation Online)
<http://cool.conservation-us.org/bytopic/disasters/plans/>

Q: What other measures can we take to prepare for disasters?

A: We recommend keeping items needed for quick response on hand so that they can be used immediately. Necessary categories include items to protect the safety and health of the salvage team, items for drying materials, items for moving affected materials to a safer place, items for preventing the spread of the damage, and items for recording the damage and salvage activities. The Annex of the IFLA Manual also contains a list of emergency supplies and equipment in, and there are many other disaster management plans available online.

Training raises awareness of disaster prevention for both staff and contractors and provides experience in how to respond to a disaster.

Preservation Directorate of the Library of Congress provides a good tool to identify scenarios by type and level of disaster.

- Library of Congress. A Preservation Planning Tool: Tabletop Planning Scenarios, Level of Collections Emergency.
<http://www.loc.gov/preservation/emergprep/plan/scenariosII.pdf>

Create a scenario that matches your organization's needs and train for it regularly. Check to be sure that fixed response procedures operate properly and revise them as necessary. Simulating recovery scenarios in advance is another useful approach that will help identify related organizations and sources of funding from which you can request assistance.

Q: What are the highest priorities when attempting to rescue a collection during an actual disaster?

A: Personal safety is always the highest priority. Once it has been confirmed that it is safe to work in and around the buildings, activities to prevent further damage and rescue materials can begin. Wet materials are given the highest priority for rescue. Care is especially necessary after large earthquakes, which are often followed by aftershocks that could cause further damage to buildings and facilities. If feasible, protect collections or move them to a safer place before a typhoon, a flood, or other anticipated disaster arrives. Also, please remember the importance of keeping a record of the disaster situation and the initial response.

Q: What is the most important thing in treatment of water-damaged materials?

A: Wet materials are likely to start to develop mould within 48 hours, so take quick action with that in mind. After measures to prevent further damage are in place, the next priority is to dry the wet materials. Determine priorities according to the size of the disaster and the type of materials. For example, it is sometimes possible to freeze paper documents for a while in order to stabilize their condition and gain time until it is possible to undertake a full-scale repair. Personnel performing the treatment should wear a mask, gloves, and other protective clothing, as necessary.

There is much information available on the Internet regarding the treatment of damaged paper materials as well as non-paper materials. See also A11.

- "What To Do When Collections Get Wet." Preservation Directorate, Library of Congress. <http://www.loc.gov/preservation/emergprep/dry.html>

Q: What points should be considered during recovery?

A: If your institution has a Business Continuity Plan (BCP), refer to it when deciding which services to restore first. Creating a concrete recovery plan and deciding your recovery procedures and conditions in advance will help ensure that things go smoothly. Estimate costs, consider available resources and external support, and prioritize what to do. Depending on the extent and severity of the damage, it might be difficult to repair all materials. Make decisions according to the value, necessity, and availability of alternative materials. If your institution does not have a conservator, seek advice from outside agencies and experts on the repair of damaged materials.

Q: What other resources about disaster preparedness are available?

A: The IFLA Manual has an extensive bibliography at the end. In addition, the following materials and sites are also useful.

Resources

Disaster management in general

- IFLA Disaster Preparedness and Planning: A Brief Manual
<https://www.ifla.org/publications/node/8068?og=32>
- ICA Study n°11: Guidelines on Disaster Prevention and Control in Archives. Author(s): Committee on Disaster Prevention. Date Added: 1 September 2011.
<https://www.ica.org/en/ica-study-n%C2%B011-guidelines-disaster-prevention-and-control-archives>
- NEDCC. *Preservation Leaflet. 3.3: Emergency Planning*.
<https://www.nedcc.org/free-resources/preservation-leaflets/3.-emergency-management/3.3-emergency-planning>
- ICCROM. Disaster Resilient Heritage. First Aid to Cultural Heritage. FAC Resources.
<https://www.iccrom.org/themes/disaster-resilient-heritage/first-aid-cultural-heritage-fac/fac-resources>
ICCROM manuals and links to reference information about emergency measures for cultural properties.

Risk assessment

- AIC(American Institute for Conservation of Historic and Artistic Works) Risk prioritization worksheet. Walk-through checklist.
<https://www.culturalheritage.org/resources/emergencies/risk-evaluation-and-planning-program>

Disaster plan

- Disaster Plans. CoOL (Conservation Online)
<http://cool.conservation-us.org/bytopic/disasters/plans/>
- California Preservation Program. "Library Disaster Plan."
<https://calpreservation.org/wp-content/uploads/2015/10/CPTF-Disaster-Plan-Generic-2003.doc>
- NEDCC. Preservation Leaflet 3.4: Worksheet for Outlining a Disaster Plan.
<https://www.nedcc.org/free-resources/preservation-leaflets/3.-emergency-management/3.4-worksheet-for-outlining-a-disaster-plan>
- Library of Congress. A Preservation Planning Tool: Tabletop Planning Scenarios, Level of Collections Emergency.
<http://www.loc.gov/preservation/emergprep/plan/scenariosII.pdf>

Collection rescue manual

- Library of Congress. Preservation Directorate. “What To Do When Collections Get Wet.”
<http://www.loc.gov/preservation/emergprep/dry.html>
- National Library of Australia. Collection Disaster Plan. Part 2: Disaster Actions.
<https://www.nla.gov.au/collection-disaster-plan/disaster-actions>

Section 8 is the procedure by disaster and Section 9 is the handling instructions by types of materials.
- NEDCC. Preservation Leaflet.
<https://www.nedcc.org/free-resources/preservation-leaflets/overview>

3.6 Emergency Salvage of Wet Books and Records

3.7 Emergency Salvage of Wet Photographs

3.8 Emergency Salvage of Moldy Books and Paper

3.12 Freezing and Drying Wet Books and Records
- National Diet Library. “Drying wet materials.”
http://www.ndl.go.jp/en/preservation/pdf/Drying_wet_materials.pdf
- Secretariat Office of the National Task Force for the Cultural Heritage Disaster Mitigation Network. “Manual for Cultural Heritage Disaster Risk Mitigation: Examples for Cleaning Soiled Paper Materials”.
https://www.youtube.com/watch?time_continue=55&v=lzmavZS7pu8

Paper conservation by using Japanese paper, *washi*

Q: What is *washi*?

A: *Washi*, or Japanese paper, can be made from the fibre of *kozo* (paper mulberry family), *mitsumata* (daphne family), or *gampi* (daphne family), but the most commonly used material is *kozo*. The traditional papermaking process for *kozo* starts by steaming bundles of *kozo* bark to remove the outer dark layer and often the intermediate green layer. The white inner bark is cooked in a mild alkaline solution such as wood ash or soda ash to remove lignin and other impurities. Strong alkali such as caustic soda were not traditionally used during this process. Next, the fibre is beaten by hand until it is fine enough to be dispersed in water with a small amount of a dispersion agent, *neri*, a mucilaginous substance from *tororo-aoi* (*abelmoschus manihot*) plants. Finally, the paper maker dips a flexible Japanese papermaking mould in the vat of fibres and water to form sheets of paper using a technique called *nagashizuki*.

Washi has been manufactured and used in Japan from more than 1000 years. In 2014, three kinds of *washi* were added to UNESCO's Representative List of the Intangible Cultural Heritage of Humanity: *sekishu-banshi*, *hon-minoshi*, and *hosokawa-shi*.

Nowadays there is no clear definition of what can or can't be called *washi*. It can be manufactured by machine or by hand, using a flexible Japanese mould or a fixed paper mould, with or without chemicals. Some kinds of *washi* contain imported *kozo* or wood pulp fibres.

Q: Why is *washi* widely used in conservation of library materials?

A: *Washi* made from traditional methods using traditional materials contains few impurities, is neutral or alkaline, slow to deteriorate, and suitable for long-term preservation. In addition, *kozo* fibres are about 1 cm in length, which makes *washi* strong and flexible and therefore a natural choice to repair rare materials. Very thin *washi* is nearly transparent, so even when pasted on the surface of a page, the text below remains readable. For conservation repairs starch paste is generally used to adhere *washi* as it can be removed cleanly simply by adding moisture, thereby returning the document to its pre-repair state if necessary. *Washi* comes in a wide range of types and thickness that can be used for a variety of repairs.

We do recommend completing a training in this technique before using *washi* for conservation of library materials.

Q: What kind of *washi* should be used to repair library materials?

A. It is important to take the manufacturing process and raw materials of *washi* into account, as the quality and characteristics of *washi* vary depending on them. Next, be sure to select *washi* that is well suited to the document in terms of quality, flexibility, thickness, colour, and texture. See A9 and article nos.1, 2, and 3 from A10 for additional information.

Q: Where is *washi* manufactured?

A: There are more than sixty washi-producing areas in Japan. Production facilities vary from small workshops where paper is made by hand to large factories that produce machine-made paper.

Q: What kinds of Japanese paper are there?

A: Many brands of washi are named after the area where they are produced, such as *ishikawa-shi*, *usumino-shi*, or *hosokawa-shi*. Ultra-thin washi is called *tengujo-shi*. Although sheet sizes vary considerably, 60 cm by 90 cm is the most common size, and some kinds of machine-made paper are shipped in roll form.

Traditionally, the thickness of washi is given using a Japanese unit of weight called a *monme*, which equals 3.75 grams. Recently, however, thicknesses are given as grams per square meter.

Q: What are some typical uses of washi in mending library materials?

A: There are many different uses for washi as seen below. Each of these repairs would require selecting a sheet of washi that is best suited to the application.

- Mending torn pages using wheat starch paste and washi
- Repairing a missing portion of a page by attaching a piece washi of the same shape and thickness.
- Reattaching separated pages or covers using washi as a hinge.
- Lining the back of a page with a sheet of washi to make it stronger.
- Repairing a page by leaf-casting using the raw materials for washi.

Q: What kinds of documents are suitable for repair using washi?

A: Although the condition of the document in question is the most important factor, washi is suitable for repairing almost any kind of library material. Excellent quality kozo fibre-based washi has can be used to mend machine made papers, Western hand-made papers, brittle papers, manuscripts, drawings and all types of paper-based materials. In libraries, washi is also used to repair cloth or leather book covers. For example, if a page with text is torn repairs can be made using extremely light weight washi tissue such as *tengujo-shi*. In bindings, washi has been used to reattach the boards to books. So, washi is used in variety of ways to conserve many different kinds of library materials.

Q: Can I repair documents using washi even if I am not a conservator?

A: The National Diet Library provides training courses for librarians on how to repair minor damages using washi. Please see the link to the course materials in A10. It is not advised to repair library material with washi without training, and complex conservation treatments using washi should only be undertaken by trained conservators.

Also, please pay attention to the following points when you use washi.

- Bear in mind the manufacturing processes and raw materials of the washi.
- Choose a type and thickness that matches the document to be repaired. See article nos. 1, 2, and 3 from A10 for additional information.

- Wheat starch paste is the recommended adhesive.
- Apply wheat starch paste of a suitable consistency and quantity.
- Allow repairs to dry completely by pressing them between boards and weights before performing any further work.

We recommend that you consult with a conservation specialist for the repair of rare books, severely deteriorated or damaged document, or other materials that require special handling.

Q: Where can I get washi?

A In addition to vendors in Japan, many vendors of preservation supplies worldwide now sell washi. You can easily find a vendor and place an order online. We strongly recommend that you deal only with reliable, proven vendors of preservation supplies. There are many kinds of washi available, produced with different manufacturing processes and raw materials. Always bear in mind factors such raw materials, production area, handmade or machine-made, thickness, colour, and texture when selecting washi for a particular purpose or document. Whenever possible, request a sample set from a vendor and make a selection after comparing a variety of selections.

Q: What resources are available for learning more about washi and paper conservation using washi?

A:

Resources for learning more about Japanese paper

1. “Japanese paper in action!: Conservation treatment using *Washi* (1)”. *National Diet Library Newsletter*. No.203, December 2015.
http://dl.ndl.go.jp/view/download/digidepo_11045360_po_NDL-Newsletter203_20306.pdf?contentNo=1&alternativeNo=
2. “Japanese paper in action!: Conservation treatment using *Washi* (2)”. *National Diet Library Newsletter*. No.204, February 2016.
http://www.ndl.go.jp/en/publication/ndl_newsletter/204/20407.html
3. Mizumura, Kubo and Moriki. “Japanese paper: History, development and use in Western paper conservation,” in *Adapt & Evolve 2015. East Asian Materials and Techniques in Western Conservation. Proceedings from the International Conference of the Icon Book & Paper Group, London 8-10 April 2015*, 43-59.
https://icon.org.uk/system/files/public/Publications/AandE15/4-ae15_mizumura_43-59.pdf
You can find more conference papers and other information on Japanese paper at the website of the “Book & Paper” group, Institute of Conservation (ICON) (UK).
<https://icon.org.uk/groups/book-paper>
4. Masuda. “World-wide Spread of Conservation Using Japanese Paper,” in ICA International Congress 2016, Seoul 5-10 September 2016.
http://www.archives.go.jp/english/news/pdf/ica2016_04.pdf

5. Song, Minah. "Evaluation of Conservation Quality Eastern Papers Regarding Materials and Process" in *Adapt & Evolve 2015. East Asian Materials and Techniques in Western Conservation. Proceedings from the International Conference of the Icon Book & Paper Group, London 8-10 April 2015*, 137-48.
https://icon.org.uk/system/files/public/Publications/AandE15/13-ae15_song_137-148.pdf

Resources for learning more about document conservation using washi

6. Conservation of Paper Materials: Minor Repair, National Diet Library
<http://www.ndl.go.jp/en/preservation/manual/index.html>
The National Diet Library provides manuals and video clips of a training course on minor repairs of library materials using Japanese paper both in Japanese and English.
7. AIC conservation WIKI "Book & Paper" group, AIC American Institute of Conservation(US)
https://www.conservation-wiki.com/wiki/Book_%26_Paper
8. "Book & Paper" group, Institute of Conservation (ICON) (UK).
<https://icon.org.uk/groups/book-paper>
9. ICCROM International Centre for the Study of the Preservation and Restoration of Cultural Property (Italy). "Japanese Paper Conservation"
<https://www.iccrom.org/>
10. Tokyo National Research Institute for Cultural Properties (TNRICP) (Japan). Japan Center for International Cooperation in Conservation
<http://www.tobunken.go.jp/~kokusen/en/index.html>

ICCROM and the TNRICP have jointly been organizing the International Course on Conservation of Japanese Paper every year since 1972

IFLA PAC Centre Korea

National Library of Korea

The IFLA PAC Korea Center was established in 2008 and hosted at National Library of Korea. The PAC Centre plays a major role in the scientific preservation and succession of national knowledge and information resource in and outside Korea.

IFLA PAC Korea Center devotes itself to supporting libraries and to researching on and developing preservation technologies for various resources, to develop into South Korea's leading preservation organization.

Expertise

IFLA PAC Korea Center is operated by the Preservation and Research Center at National Library of Korea and promotes systemized preservation/management schemes with professional manpower and equipment.

The PAC Center consists of preservation specialists and librarians who endeavor to create the optimal preservation environment for each type of resource, prevent damages, restore damaged resources, create and preserve microfilms, and research on the preservation of electronic materials such as optical storage devices (CD, DVD, etc).

The PAC Centre has a particular strength in choosing appropriate storage material.

Read more about the PAC Centre here: <http://www.nl.go.kr/iflapac/front/en/krcenter/intro.html>

Choosing appropriate storage material

Q: Why should I use proper storage materials?

A: Storage methods have a direct effect on the life span of material and the accessibility of information. Poor-quality storage enclosures can accelerate the deterioration of the material they are intended to protect.

Q: Are any commercial products okay to use?

A: Storage materials for general library collections should be lignin-free, sulfur-free, alkaline buffered, and have a high cellulosic content. Enclosures for photographic media are described below.. Archival-quality enclosures include boxes, envelopes, and folders. These items are available commercially in a range of shapes and sizes.

Q: What kind of storage are suitable for books?

A: Rare and valuable books can be housed custom-made boxes such as a drop-back or clam shell box. They have the advantage of being able to provide all round support and are more robust than other types of enclosures.

Phase-boxes and corrugated board boxes are cheaper alternatives, They can provide adequate protection, and are much quicker and simpler to construct.

Book-shoes are appropriate for books that require structural support while being displayed on shelves. Many libraries avoid slipcases because they often abrade the surface of the binding and damage the text-block when the book is slid in and out.

Commercially made, archival-quality boxes and four-flap folders come in a wide range of sizes and can be purchased in small and large quantities.

Q: How can I store my photograph collection?

A: Photograph storage materials should meet the specifications provided by the International Organization for Standardization (ISO). ISO Standard 18902:2013 and ISO 18916:2007 provide specifications on enclosure formats, papers, plastics, adhesives, and printing inks, and require that storage materials pass the Photographic Activity Test (PAT).

Once photographs have been properly housed in folders, sleeves, or envelopes, they may be stored upright or flat in drop-front boxes of archival quality.

Individual housings can reduce handling in many cases. For example, clear plastic 'L' sleeves (two sheets of polyester placed on top of one another and joined along two adjacent edges), with a piece of board behind the print for added support, have the advantage of allowing researchers to view the image without handling it, thus reducing the possibility of scratching or abrasion

Q: How can I preserve my scrapbooks?

A: Scrapbooks that are of special historic value in their original form should be individually boxed. Unbound ephemera can individually enclose to protect items and is stored in a way that will support them structurally. Be cautious grouping and sorting ephemera by size and type. Storing similar items together is often a good preservation strategy but may disrupt the arrangement and original order of a collection. Be sure to consult with the appropriate curators and subject experts.

Q: Can I use zip-lock bag to store small books?

A: If you can maintain proper environmental levels in your storage, you can use it temporarily. An improper environment can cause moisture to become trapped inside enclosures.

Polyethylene, polypropylene, or polyester (polyethylene terephthalate or PET) plastic zip bags without any additional slip or coating agents are considered stable. Avoid polyvinyl chloride (PVC) and other unknown plastics.

Q: How can I store large maps?

A: Large materials are best stored flat in plan chests or map cases. They can be placed individually in folders cut to fit the size of the drawer. If several items are placed in one folder, interleaving with acid-free tissue paper is desirable.

If they are not brittle or fragile, large maps can be rolled when flat storage is not possible. A tube several inches longer than the item being rolled and at least four inches in diameter (larger diameters are preferable) should be used. If the tube is not made of low-lignin, non-acidic materials, it should be wrapped in neutral or buffered paper or polyester film.

Q: What should I use to store documents?

A: Documents should be stored in archival quality file folders. Ideally, no more than ten to fifteen sheets should be placed in each folder. Folders should be placed in document-storage boxes. Documents and manuscripts can be unfolded for storage if it does not cause damage such as splitting, breaking, and tearing.

Q: Where can I get proper storage materials?

A: There are a wide variety of commercially available enclosures for library materials.

See Conservation Topics : Commercial Services and Suppliers etc. in Conservation on Line (<http://cool.conservation-us.org/bytopic/suppliers/>)

Reference

Edward P. Adcock, eds. 'IFLA Principle of Library for the Care and Handling of Library Materials'. International Preservation Issue Number One. Paris: IFLA PAC, Washington DR: CLIR, 1998

Useful resources

"Museum collection storage 2012" in Museum Handbook at NPS(National Park Service)

(<https://www.nps.gov/museum/publications/handbook.html>)

“Conservation guide” at State Library Victoria

(slv.vic.gov.au/conservation-guides)

“Storage and Handling” in Preservation Leaflets at North East Document Conservation Center

(<https://www.nedcc.org/free-resources/preservation-leaflets/overview>)

Collections Care: Library of Congress

<https://www.loc.gov/preservation/care/>

IFLA PAC Centre Sri Lanka

National Library and Documentation Services Board (NLDSB) of Sri Lanka

The IFLA PAC Centre was inaugurated in the National Library and Documentation Services Board (NLDSB), Sri Lanka on 5th August 2015.

The PAC Centre is involved with a number of activities. Each year the PAC Centre organises in collaboration with the Goethe Institute in Sri Lanka training workshops on conservation of library materials for librarians around the world. The PAC Centre is also involved in a several other projects, such as research studies on safeguarding intangible cultural heritage in Sri Lanka aligned with the UNESCO Intangible Cultural Heritage Programme. The PAC Centre also acts as the focal point of the UNESCO Memory of the World Programme (MoW) and has taken steps to nominate a number of collections of the Sri Lankan documentary cultural heritage to be included in the MoW Register.

The PAC Centre provides advisory services for libraries on conservation of library material. Many libraries in the country have solved their conservation problems through the advice of IFLA PAC centre of NLDSB.

Expertise

The IFLA PAC Centre started the production of a herbal oil called “Panhida Herbal Oil” for the conservation of palm leaf manuscripts. This oil is produced through a machine produced by the NLDSB. IFLA PAC Centre has established 131 library conservation centres in main public libraries throughout the island of Sri Lanka. These conservation centres are engaged in preserving the library materials in their libraries as well as in neighbouring libraries. NLDSB provided the necessary equipment for these centres and training for the staff of these centres.

One of the most common conservation problems in the region for book and paper is the pests and mould attacks, which are being addressed by the Centre. The IFLA PAC Centre has been conducting number of library pest control researches in order to develop pooper pest control strategy for libraries in the tropics.

Read more here: http://www.natlib.lk/home/ifla_pac.php

Traditional paper and manuscript preservation

Q: What are the traditional materials used for writing in Sri Lanka?

A: Traditionally, a metal stylus was used to write on Ola leaves or Palm leaves to create manuscripts.

Q: When did this tradition begin in Sri Lanka?

A: According to the historical records, the writing on palm leaves began in the 3rd century BCE. This tradition faded away in 18th century ACE, after the introduction of the printing press to the Sri Lanka by Colonial Dutch government.

Q: Are these manuscripts prepared using real tree leaves?

A: Yes, this traditional method of writing uses leaves from the *Corypha umbraculifera* (Ola) and *Borassus unbraculifera* (Palm) trees.

Q: What is the traditional method to prepare these manuscripts?

A: The leaves are cut from the tree and then the segments are separated. The middle rib is removed. Ola leaves are then rolled, dipped in water and boiled gently with unripe papaya pulp and pineapple leaves. This process softens them and makes the leaf fibre flexible.

The leaves are left in the sun to dry for several days. The processed leaves are stored in kitchen within the stove hood, where the wood smoke adds to the durability of the processed leaves.

Finally, the leaf is polished by running strips back and forth on a smooth cylinder of areca palm tree until a smooth surface is obtained. Now the leaf is ready be written upon.

Q: What instrument is used to write on the palm leaf manuscripts?

A: The traditional writing instrument is the metal tylus (Panhinda)

Q: What sort of contents would typically be written on palm leaf manuscripts in ancient Sri Lanka?

A: Palm leaf manuscripts were written on various subjects such as Buddhism, history, astrology, traditional medicine, traditional architecture, science and technology, traditional knowledge and practices, and other wide-ranging topics.

Q: What are some specific conservation problems that are typical of palm leaf manuscripts?

A: Typical challenges for conservation of these manuscripts include:

- Stains on the palm leaf
- Fungal or mould growth
- Insect damage
- Brittleness and cracking of leaves
- Leaves become stuck together.

Q: What are examples of treatments which can be used for conservation of Palm leaf manuscripts?

A: We have observed that some traditional and modern treatments normally used for paper-based material are effective. Treatment should be undertaken by a trained conservator.

Q: Can you explain what traditional treatments consist of?

A: The National Library of Sri Lanka uses a special oil made through the distillation of *Vateria copallifera* resins to treat the palm leaf manuscripts. This oil is mixed with charcoal powder and applied to the palm leaf surface by cotton cloth. Excess oil is then wiped away.

Mixed with black charcoal, the oil increases the contrast of the letters. In addition, the oil makes the palm leaf more flexible and is a known fungicide, anti-bacterial and deleterious to insects' larvae. this oil twice a year has been seen to minimise the deterioration process of palm leaf manuscripts.

Treating Fungal and Mould Infestation

Q: What are the signs of fungi or mould on paper?

A: Signs include visible damage caused by fungi like the discoloration of the paper and weakening of the paper structure. Mould stains paper irreversibly. The stains are often irregular shaped or round, and of different colours such as black, brown, green, yellow. Under magnification, mould can appear three-dimensional if it is still active.

Fungi increases the rate of deterioration in paper by breaking down the cellulose chains and accelerating the formation of acids. Often areas that have mould-damage will also take up water more slowly. Fungal growth on a can also decrease the integrity of the papers and other materials in the collection items.

Q: What are favourable conditions for fungal growth*?

A:

Optimum temperature	RH	Moisture content of material allowing spore germination
21°C-35°C	90%-100%	Above 10%

*These are also prime conditions for insects.

Q: What are the main species of fungi that grow on paper materials?

A: Common species of fungi that are seen to grow on paper include:

Aspergillus niger, *Aspergillus glaucus*, *Aspergillus flavus*, *Aspergillus restrictus*, *Alternaria sp.*, *Penicillium sp.*, *Curvularia sp.*, *Trichoderma sp.*, *Fusarium sp.*, and *Cladosporium sp.*

Q: Is the reddish-brown stain that can be found paper known as “foxing” a result of fungal growth?

A: Possibly. Foxing can be caused by multiple factors, including:

- inorganic factors like the presence of ferrous or ferric compounds.
- Paper being bleached by chlorine chemicals.
- Fungi.

Please note that foxing is not strictly regarded as a dangerous process for documents, therefore no further treatment is recommended.

Q: How does fungi decompose cellulose in paper materials?

A: Fungi can cause decomposition through the following processes:

Oxidation - Fungi oxidize cellulose to oxycellulose and turn it to soluble products which can be absorbed by the mycelium of the fungi.

Hydrolysis- The glucosides linkages between individual glucose units are: hydrolysed by the cellulases enzyme secreted by fungi.

Q: How do I remove fungi (mould and mildew) found on books?

A: To mitigate mould or fungi it is most important to put them in a dry environment and reduce the humidity in the air. All cleaning should trap the mould instead of spreading it to adjacent areas. After treatment, items should be kept in dry environments where the humidity and temperature can be controlled.

- Manually cleaning of dried spores with a soft-hair brush near a vacuum cleaner with a HEPA filter to trap the spores.
- Removal of active mould and mildew with a spray of 70% Ethyl alcohol or 70% isopropyl alcohol in water. Areas of inactive mould may be cleaned with this solution.
- Fumigation books using Thymol. This is not recommended as it has serious health and safety implications for anyone handling the books, such as staff and readers.

IFLA PAC Centre Qatar **Qatar National Library**

Qatar National Library acts as a steward of Qatar's national heritage by collecting, preserving and making available the country's recorded history. In its role as a research library with a preeminent heritage library, the Library fosters and promotes greater global insight into the history and culture of the Gulf region. The library is also a polyvalent and dynamic preservation and conservation department, which has been designated by IFLA as a regional PAC Centre for Arabic countries and Middle East in 2015. And also has a broader specialization in Preventive Conservation.

Expertise

Our IFLA PAC Regional Centre's role is to support the Libraries in the Arab region by understanding their needs and challenges in order to build their capacities and strengthen knowledge and information exchange, through a series of activities and initiatives to promote, disseminate and improve the practices in preservation and conservation. This includes:

- Supporting documentary heritage preservation in the Arab region
- Creating an international networks, social media platforms to share information and knowledge;
- Supporting and assisting Arab libraries in conservation issues;
- Producing and publishing information materials in Arabic and English;
- Developing better disasters plans preparedness;
- Organizing courses, workshops and meetings to raise awareness and building capacities

Translate and publish technical documents in Arabic in the field of Preventive conservation.

The center offers expertise and laboratories that are equipped with the most recent techniques and machines to handle any kind of activities in the following areas of expertise:

- Preventive conservation
- Paper and book Conservation
- Mass deacidification
- Scientific research on books and manuscripts materials
- Bio-deterioration analysis and treatment
- Arabic book codicology
- Intervention in case of disaster

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How to apply efficient preventive conservation strategies in your climate

Q: What is the physical relation between temperature and relative humidity?

A: Library materials are prone to damage caused by excessive water in its liquid or gaseous phase, due to the ability of organic components such as paper, parchment, boards and leather, to absorb moisture from the surrounding environment. When water is in its gaseous phase, its particles are present in the air in the form of water vapour, which is the component that makes air humid. When speaking about humidity we must differentiate between two different measurement units, **Absolute Humidity, and Relative Humidity.**

Absolute Humidity is the total mass of water vapour present in a given volume of air, it is usually expressed as grams per cubic meter of air (g/m^3). The calculation to determine absolute humidity does not take temperature into consideration. **Relative Humidity (RH)** is the ratio (expressed as a percentage) of the amount of water vapour held in a specific amount of air compared to how much water vapour that same amount of air could potentially hold at the same temperature when RH reaches 100% when the air is completely saturated with moisture before condensation occurs..

The relation between Relative Humidity (RH) and Temperature (T) is an inverse relation. If we take an example of a closed storage room with no change in the water vapour content (absolute humidity), increasing temperature will increase the capacity of air to hold more water vapour and therefore decreases the RH. Lowering the temperature will decrease the capacity of air to hold water vapour and RH will rise. This relation must be understood and taken into consideration when taking actions that alter indoor temperature such as introducing colder outdoor air, heating or cycling on-off the air conditioning in the library

To understand the relation better, take a look at Figure 1, which shows the psychrometric chart. If we look at the blue line, we see that when we have approximately 11 grams of water vapour in the air at a temperature of 20 °C the resulting RH is 60%. If temperature drops to around 12 °C RH reaches 100%, which means the air is fully saturated with water vapour and water will start to condense on surfaces. This saturation temperature is known as **Dew Point.**

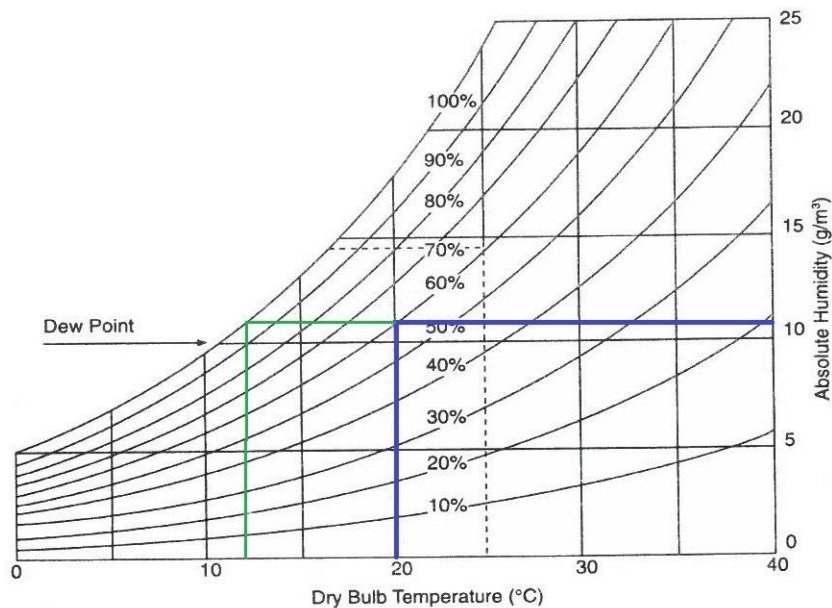


Figure 1: Psychrometric Chart

Q: What are the recommended temperature and relative humidity set points for library collections?

A: As a rule of thumb for most organic materials, the lower the temperature the better as the rate of deterioration slows in cooler environments. theoretically doubling the life of an object with every 5 °C decrease in storage temperature. Obviously, there are practical limits to the reduction of temperature therefore we compromise between the best conditions for library items and human comfort. Special environments such as targeted freezers or highly insulated storage rooms can be considered for collection formats that will suffer unacceptable damage without the use of extremely cold or freezing temperatures to slow their deterioration rate.

Library collections include a mix of composite materials, which complicates the choice of set-points for temperature and relative humidity. As there is no single ideal set point for all library materials. However, based on most experimentation, it is more or less safe to recommend a temperature range of 18 – 20 °C for most mixed collections provided that achieving this temperature range is practical considering the necessary natural and financial resources to achieve and maintain these conditions, does not result in excessive relative humidity in humid climates, and does not pose risk to the building envelope. For many years a target range of 45% – 50% RH was commonly recommended. In more recent years, research from many countries has looked at the consequence of an intentional relaxing relative humidity standards to accommodate seasonal fluctuation. Many libraries now identify the minimum and maximum safe RH levels for their collections which may widen the acceptable range while promoting more sustainable operations.

Many library materials can tolerate a wider range of RH. Cabinets and individual boxes provide some degree of buffering against short fluctuations depending upon the cabinet or box materials and how tightly it closes. For many library collection formats extended storage at extremely dry or humid conditions is more damaging than short fluctuations so long as the minimum or maximum RH is not extreme. Damage caused by the expansion and

shrinking of material due to RH fluctuation can be mitigated or lessened by housing strategies.

This is given usually for temperate countries and must be calculated cautiously in hot and humid areas. And it is always recommended to consult an expert on this matter.

Q: How can we maintain optimum conservation conditions for library collections in hot and humid areas?

A: External climate of a library building introduces most of the thermal energy and relative humidity to the building interior. This presents a huge challenge for conservators in hot and humid climates when planning and implementing environmental management plans for their collection, taking into consideration the comfort of the occupants. To maintain the optimum T and RH in your library, some air conditioning systems or heating, ventilation, and air conditioning (HVAC) units with no relative humidity control functions will not be able to control RH. As explained above, cooling through air conditioning without dehumidification or removing absolute moisture will result in an increase in RH which may be damaging to collections. If you have the financial and natural resources and staff to purchase, operate and maintain them specialized climate control units (CCU) which include humidification and dehumidification systems can be installed for optimum control. Such systems are different from the traditional AC and HVAC unit in their ability to control RH in addition to T, and can vary in size from small units used to control the environment inside a single showcase, or large unit that can control RH and T inside multiple showcases or a small storage space., Specialty equipment can be procured through companies who serve the museum and cultural heritage communities.

In case of power-outages or failure of air conditioning or climate control units, keep the windows and doors closed at all times to maintain T and RH. During this type of malfunction closing outdoor air intakes that feed air conditioning systems is often a good strategy to keep unconditioned and unfiltered air from entering the building, while During outages if possible maintain air circulation or natural ventilation between rooms to avoid pockets of stagnant air that can promote biological growth in humid conditions. Keep window blinds closed to reduce thermal load from the sun. Consider if it is possible and worth the risks of handling to relocated sensitive materials to a more controlled and stable environments if the malfunction cannot be resolved for an extended time period and/or the conditions in the impacted space are extreme.

If the library building is not equipped with air conditioning units and does not have the resources to purchase any climate control equipment determine the natural climate within the building and assess the risks to specific collections. First, it is important to implement a thorough plan to classify the collection based on the type of materials they are composed of (e.g. newspapers, posters, parchment, photographs), to evaluate the condition of items, and identify known risks. When resources are limited focus first on immediate risks such as high RH levels that promote germination of biological growth.

When planning the storage and display of library materials it is important to not place shelves near an exterior wall or window. Leave some space between the wall and the shelves to avoid condensation or other exaggerated risks. Do not place high value items or sensitive items at the bottom shelves near the floor to prevent damage should water enter the space Place the most sensitive materials in rooms without exterior walls if possible, or

avoid placing sensitive materials on shelves near exterior walls. Avoid storing materials in damp basements or hot attics. Perform periodic condition check for the materials. Isolate items that show signs of damage that can spread to other materials.

The next step is to understand the library building and monitor the environmental conditions in each room/area. After analysing and understanding the building a number of measures can be taken to control the environmental conditions including but not limited to: controlling air circulation and exchange (this will help control T and RH, it will also reduce the risk of biological deterioration), installing window blinds or curtains to block sun, insulating external walls, insulating window glass, installing exhaust fans, weather-stripping doors and windows, keeping doors and windows closed, roof insulation. Consider the use of ceiling fans to circulate air. Minimize the use of water for cleaning storage and display areas to avoid puddles which could damage collections or raise RH in the space

Q: What are the different methods for measuring and monitoring temperature and relative humidity? (a question that will introduce each method, traditional, mechanical devices, digital data loggers)

A: There are different types of instruments to measure temperature and relative humidity, ranging from simple thermometers and hygrometers to sophisticated environmental monitoring data loggers. Regardless of what equipment you use look for a devices with high accuracy since the data that you collect will help you understand the building environment and develop environmental control plans. When setting up a measuring or monitoring system, it is important to make sure that the units are calibrated before use. Learn how often the units must be calibrated, and perform the calibration according to the manufacturer’s instructions.

It is important to monitor temperature and RH within the storage room or exhibit space as data collected from sensors within an air conditioning system or dehumidifier may not reflect conditions in the collection space.

Some of those measuring and monitoring instruments are:

- 1- **Bulb Thermometers:** This is a low budget option to measure temperature and keep an eye on temperature readings throughout the day.
- 2- **Electronic Thermometers:** Those can be more practical than the traditional bulb thermometers as they can be smaller in size and easier to read when for example they are placed inside a showcase.
- 3- **Psychrometer:** also known as sling psychrometer or “wet and dry bulb hygrometer”. Is a hygrometer that uses two thermometers, one dry (dry bulb) and one covered in a fabric saturated with distilled water (wet bulb). Air is passed over both thermometers, either by a fan or by swinging the instrument, as in a sling psychrometer. A psychrometric chart can then be used to calculate humidity by using the dry and wet bulb temperatures. This is the simplest hygrometer yet very accurate and easy to use.
- 4- **Humidity Indicator Cards:** a card with moisture-sensitive chemical that will change colour when the indicated relative humidity is reached. These cards can be used to give a general sense of environment but do not provide precise information. Tracking trends or change in RH with these cards is very hard to do.

- 5- **Hygrometers:** Such as the dial hygrometers or electronic hygrometers, different options can be found in the market but as mentioned before, it is very important to use a hygrometer with high accuracy. There is also the option of thermo-hygrometer, which is good to take spot readings of temperature and relative humidity. There is a wide variety of options for such instruments and this can be useful for display cases monitoring.
- 6- **Data loggers:** are electronic devices that records temperature and relative humidity data over time. This is the best option to keep track of your environmental data over time without having to check it and record it manually. There are different options of data loggers available in the market: 1) standalone data loggers, which you will have to connect to a computer to download and view the data. 2) Wireless data loggers that are connected to a computer via radio signal or via WI-FI that allows you to view and download the data real-time without having to move the device.

Q: What are the different types of damage caused by inadequate/incorrect and/or fluctuating temperatures and relative humidity?

A: Different types of damage can occur to the library collection as a result of inadequate T and RH, which can be listed under three main categories Physical, chemical, and biological.

1- Physical:

The library collection is mostly made of organic materials such as paper, parchment, leather, textiles, those materials are hygroscopic, meaning that they absorb moisture. When RH is high these materials will adsorb the moisture from the surrounding air causing them to expand, when RH drops, the moisture content within the structure of the materials will evaporate causing them to shrink. Physical damage occurs mostly from the repeated fluctuations of T and RH which causes dimensional changes resulting in damage such as warping of paper, breaking of fibres, flaking of ink, cracked emulsions on photographs, and dislocating components of a book as a result of the different rate of expansion and contraction and different physical strength

Chemical:

Chemical damage is caused by chemical reactions within the material which are influenced by, temperature, humidity, reactive pollutants and light. One major form of chemical damage is the acidification of papers made from mechanical wood pulp. In hot and humid climates, High T and RH increases the risk of chemical damage due to increasing reaction rates.

2- Biological:

High T and RH creates suitable conditions for bio-deterioration, mould growth and most insect pests are active in temperatures above 25 °C and RH of around 65%. The time of exposure to inappropriate T and RH is also important as this will determine the time of germination in micro-biological deterioration causes

Q: Do we need to take the buffering effect of books and archival materials into consideration when designing the set points of temperature and relative humidity within the library spaces?

A: Buffering effect of hygroscopic materials (i.e. most materials in library collections) must always be taken into consideration when planning for design set points of climate control units or even when planning to store those materials in separate showcases or moisture-proof boxes to create a micro-climate for items that requires specific storage conditions and/or are infected and need to be isolated.

Materials such as paper of books and gelatine of photographs are hygroscopic objects, which means they adsorb and/or desorb water vapour. These materials take longer time in the evaporation of their water (desorption) than the adsorption.

When studying the environmental conditions in a library it is worth considering that each book has, in normal conditions, approximately 10% of his weight of water content. When considering a large number of books which may be in a closed room, hundreds or maybe thousands, a significant portion of their volume is water (in liquid form but temporarily fixed within the cellulose matrix). This 10% of water is not all free to desorb in case or dry environment, but it represents a huge mass of water which buffer and react with the climate condition inside the room. This mass of water plays a role in buffering the atmosphere. At such point we arrive to a paradoxical situation where actually the books and their water content has a greater effect on the environment than other factors.

For example, a room of 200 m³, may have 6000 books which contain around 500 liters of water (8.5 grams of water at 20 °C and 50% RH). Even if a part of this water could be desorbed, not being fixed permanently to the cellulose, it is a substantial mass in respect to the 8.5 grams of water vapour present in the air (at 20 °C and 50% of RH). The heritage professional can share information about the composition of library materials with engineers who calculate loads when designing climate control systems.

Q: What about audio-visual materials collection?

A: Most audio-visual materials usually require low T and RH in their storage (<10 °C and 40% RH) since they are often more vulnerable to damage caused by incorrect temperature and humidity than older materials. Coloured photographs, films, and magnetic media can show significant signs of decay in less than a human life time, which is a very short time period compared to books and manuscripts that survived for hundreds of years. Audio-visual materials are also subject to physical, chemical, and biological deterioration. High temperature and relative humidity can cause physical damage such as: deformation, fractures, and blocking damage. Chemical damage caused by acid-hydrolysis, and biological damages caused by mould.

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IFLA PAC Centre Russia

Library for Foreign Literature, Moscow, Russian Federation

IFLA PAC Regional Centre for the CIS and Eastern Europe is located in the M.I.Rudomino All-Russian State Library for Foreign Literature, which is one of the largest libraries in Russia. Its holdings stand at approximately 5 million items in 147 languages and focus primarily on the humanities, especially books in foreign languages. The mission of the Library has always been twofold. It has performed traditional library services, and at the same time it has aimed to encourage cross-cultural dialogue to bridge the gap between nations and cultures.

The Library has a great collection of rare books that consists of more than 52,000 items. It includes rare and unique books from the 16th to the 20th centuries, including 11 incunabula.

In 1997, at the 63rd General conference of IFLA in Copenhagen (Denmark), The Executive Bureau decided to establish IFLA PAC Regional Centre at the M.I.Rudomino All-Russian State Library for Foreign Literature.

Expertise

The Centre cooperates with libraries, museums and archives in the various regions of Russia, CIS countries and Eastern Europe. A variety of professional events are held annually, including the School of Restorer at the All-Russia Annual conference of the Russian Library Association (RLA), at the annual conference “Book Monuments in the Aspect of Preservation,” and workshops with the participation of foreign specialists.

The most important reason for conducting these events is to promote and share the expertise of leading preservation and research organizations and to encourage professional exchange between them, creating a professional international network.

The PAC Centre is also actively working on developing and establishing international partnerships with IFLA PAC Centers located in other regions.

Topics that reflect the IFLA PAC Regional Centre for the CIS and Eastern Europe expertise and knowledge:

- Scientific research of books;
- Bookbinding: role, construction and conservation;
- Preservation of cultural heritage and new professional partnerships.

Further information about the Centre’s activities is available on the website of the Library for Foreign Literature (<https://libfl.ru/>).

Scientific research of books

Q: What kind of scientific research can be done on books and why do we need it?

A: The book is a complex object, which encompasses both aesthetic beauty and cultural significance, and also it has physical-chemical components. Based on this, theoretical study can be carried out related to its provenance, existence, cultural and historical aspects, and scientific research related to the materials that are used. Speaking about the physical-chemical components, one can investigate what materials the book is made of, what processes occur in it, the current state, and also its prospective future. The results of such studies are important both for understanding the origin of the book, its history, further storage, conservation, restoration and exhibition.

Q: What research can be conducted in your institution and what resources are needed for this?

A: First of all, it is necessary to conduct an examination of the physical state of a book and the conditions of its repository. This is a basic requirement, though the ability to conduct other studies strongly depends on the availability of funding, human resources and financial capabilities.

Bookbinding: role, construction and conservation

Q: What is the role of book binding?

A: The role of binding is both for decoration and for protection. The binding not only connects the pages within, but also protects them from physical damage.

Q: What types of book-bindings exist? What are the various types of construction, materials?

A: The typology of book-bindings is varied and extensive. Specialists from different countries, speaking different languages and working with different collections, create different taxonomies and, accordingly, the names differ. There are differences between systems depending on their geographical, cultural and linguistic remoteness. Knowledge of various systems provides an advantage.

Depending on the time period and location, books were created using various materials. The most common types of coverings for bindings were leather and fabric, also wooden boards, paper, and other materials. Traditionally, the cover could be richly decorated in accordance with the style of the time, using expensive materials: precious metals, precious gems and others. However, there are exceptions of no less interest. Including, for example, re-using documents from other sources as binding materials.

Q: What types of damage are most common to book-bindings?

A: The main factors that cause damage to book-bindings are the natural aging of materials, improper storage conditions and bad handling. Proper storage conditions for books protect against physical-chemical and biological threats, as well as slow down the natural aging of materials, but it is impossible to stop it. Improper handling of the book, such as removing

from the shelf by pulling the spine, improper opening of the book, contamination of the binding and others, are related to human factors and are addressed by raising people's awareness.

Q: What are some examples of the conservation of book-bindings?

A: One of the simplest ways to preserve book-bindings is to mechanically clean them from dust and dirt, as well as to make the protective enclosure to house them in. The need for more serious activities is determined individually. Depending on the intended use of the book, its uniqueness, and its condition prior to conservation, the conservators and curators decide together on the necessity of carrying out certain actions. In order to preserve the original binding, conservation intervention should be minimal.

IFLA PAC Centre Kazakhstan
National Library of the Republic of Kazakhstan

The IFLA PAC Regional Center for Central Asia officially began operations with the signing of the first treaty in 2008. The PAC Centre covers countries such as Kazakhstan, Uzbekistan, Kyrgyzstan, Tajikistan and Turkmenistan.

The PAC Centre provides services including restoration, conservation and binding in 3 functional areas: 1. Laboratory of scientific preservation of documents; 2. Restoration and binding area; 3. School for the conservation and restoration of written documents.

Expertise

The PAC Centre in Kazakhstan offers a number of activities and training carried out by invited leading restorers and specialists of the field. Every year specialists from libraries, archives and museums in Kazakhstan are invited to the PAC Centre to for training to improve their skills. Employees of the National Libraries of the region are invited to attend as well. The PAC Centre has furthermore hosted events for the IFLA Preservation & Conservation Centre with great success.

Though the PAC Centre covers a wide range of areas in the field of preservation and conservation, the Centre holds a particular knowledge and expertise in restoration, conservation and binding specializes in the biological and physico-chemical stabilization of library documents. A visual inspection of the storage premises of the funds is systematically carried out by the PAC Centre. As a result of which biovarious documents are selected and sent to the laboratory for purification and biostabilization. Then the documents are subjected to physico-chemical stabilization of documents.

Document storage mode

Physical-chemical and biological stabilization of library documents

Q: Stabilization of documents - what is it? Stabilization of paper documents in relation to biological and physical-chemical factors.

A: Under the storage mode is the creation and maintenance of optimal microclimatic storage conditions of documents. It is ensured by the observance of norms and basic storage parameters, the choice of means and the carrying out of measures to maintain factors favorable for ensuring the safety of documents.

The durability of documents depends on the quality of the environment. The mode of storage of documents ensures the maintenance of certain (normative) conditions of light, temperature, humidity and sanitary-hygienic regimes. The air quality in the document storage rooms is checked regularly. Concentration of harmful impurities in the air of the document storage room must comply with sanitary standards.

Q: Biological damage to documents and measures to prevent them.

A: Regulatory storage conditions such as temperature and humidity, light and sanitary and hygienic regimes affect the long-term preservation and protect documents from many damages. Failure to comply with regulatory conditions leads to the deterioration and aging of documents. In the book storage rooms, the air temperature is constantly maintained: (18 ± 2) C and relative humidity: (55% ± 5%). For documents made entirely on parchment and leather, relative air humidity: 60% ± 5%. Recent standards allow for some change between the minimum and maximum of these settings, such as seasonal changes, granted this change occurs slowly.

Free air circulation should be carried out in the storage facility, eliminating the formation of stagnant zones.

The illumination rate on the surface of documents during storage is not more than 75 lx, when exposed at the time of inspection - not more than 150 lx. Light sources should provide optical radiation with a wavelength of at least 400 and not more than 760 nm. Documents stored in the dark or under ambient light. Do not illuminate documents in direct sunlight.

Q: Microorganisms. Microscopic mushrooms. The manifestation of fungi on the documents, their viability in the composition of the old damage. Mycological examination of damaged documents.

A: The effect of temperature, air humidity and light is significantly reflected in the safety and durability of documents. The material basis of most documents is harmful, both elevated and reduced values of these parameters. The higher the temperature, the faster the paper, glue, cardboard, fabrics, leather, film, etc., age. The processes of decay occur in them more intensively, the materials dry up, become brittle. Excessive humidity is no less harmful: the material basis of the document swells, its strength decreases, favorable conditions for mold and other microorganisms are created. Temperature and humidity drops are especially undesirable: they cause deformation of the material basis of the document, destroy its

structure. In damp conditions, the harmful effects on documents of chemical impurities present in the air are more pronounced.

Light speeds up the process of natural aging of materials. Its exposure is manifested in yellowing, browning, decrease in strength and elasticity, the appearance of brittleness of materials; in extinction, i.e. the decrease in the richness of the color of texts up to their complete disappearance, in the fading ("burning out") of the binding materials. The effect of light is exacerbated by the presence on the surface of documents and inside the structure of materials by outsiders sensitive to light. These include not only the various contaminants that fell on the documents during storage and use, but also some bleaching and coloring substances incorporated into the composition of materials during their manufacture. These substances absorb light and act as catalysts. The speed of damage to materials under the action of light also depends on the spectral characteristics of the light flux. Sunlight contains waves in three areas: ultraviolet, visible, and infrared. The shorter the length of the light wave - the more damage it causes to library materials. Under the action of the long waves of the infrared light region, materials, when heated, lose moisture; the result is drying, shrinkage, deformation, loss of elasticity and strength. However, the effect of ultraviolet radiation is more dangerous, since it has high photochemical activity and has a much greater destructive effect on documents. The ultraviolet component should be 20-30 microwatts per lumen. The elimination of ultraviolet radiation reduces the rate of destruction of documents from 2 to 10 times. Unsafe effect on materials and the third component of sunlight - visible radiation. Illumination should normally be 75 lux.

Natural light poses the greatest danger to documents: even scattered sunlight contains a large amount of ultraviolet radiation. If special glazing, filtering or diffusing sunlight, is not used for glazing, windows are covered with fabric shutters or blinds. Keepers must ensure that they are always closed. A similar effect has a long artificial light. Fluorescent lamps are especially dangerous because they create a high level of ultraviolet radiation (up to 30% of the light flux). The most harmless illumination is provided by incandescent lamps; they are convenient in operation, but they have low luminous efficiency and short service life. They also do pose a risk of a risk raising temperature.

Light exposure has a cumulative property: the same degree of damage can be the result of both intense, but short-term exposure, and less intense, but prolonged. If the document is irradiated with a light intensity of 150 lux daily for 9 hours, then it will collapse completely after 9 years, and if with a light intensity of 50 lux, it will be only after 65 years.

There are regulatory requirements not only for lamp types, but also for their installation. The distance from the luminaires to the nearest document should be at least 0.5 m. Lamps should be mounted in closed canopies, in order not only to ensure uniform diffused light, but also to ensure fire safety. Illumination in storages is measured using luxmeters. For safe lighting, use lamps with a filter that protects against ultraviolet radiation and absorb heat, or fiber-optic lighting systems.

Q: Conditions leading to the growth of fungi. Preventive actions. Ensuring microbiological safety of documents.

A: The air of modern cities is polluted with various gases, smoke and dust, which penetrate into the bookstores negatively affect the safety of documents. Pollutants are gaseous and aerosol. Gaseous pollutants (oxides of sulfur, nitrogen, ozone) catalyze dangerous chemical

reactions that lead to the formation of acids in materials, especially in paper and leather. Sulfur oxide destroys paper, causes discoloration of some pigments, when combined with water forms sulfuric acid, which interacts with the moisture of the atmosphere and oxygen in the air, turns into sulfuric acid. Sulfuric acid in the air, settling on objects, affects the book fund, actively destroying it. Sulfur and ammonium compounds detrimental effect on many dyes, sulfur gases for cotton and linen papers are also very harmful. Aerosol contaminants, fine particulate matter suspended in the air, coming into contact with the surface of the books, form a layer of dirt that is sometimes impossible to remove, and also smears and abrades the surface of the books. The harmful effects of dust increase with the presence of soot and burned out particles. If dust accumulates even at normal humidity, spores of mold fungi and bacteria may develop.

At the present time (if the capacity of the libraries allows), measurements are being carried out to determine the harmful substances in the composition of the air of the vaults. And when they are detected, measures are taken to remove harmful pollutants, and the premises are cleaned. In order to ensure the safety of funds, free air circulation should be carried out in the vaults, excluding the formation of stagnant zones. Frequency of air exchange in 1 hour: inflow - 1.0; exhaust hood - 1.0. In rooms adapted for storage, but not equipped with air conditioning systems or forced-air ventilation, air parameters are normalized by rational ventilation and the use of technical means, guided by the indications of instrumentation. If possible, it is very beneficial to keep the storage rooms in superpressure.

Q: Bio-resistance, protection from damage and disinfection of documents. Emergency measures in case of accidents.

A: Sanitary and hygienic regime is carried out to maintain. It is a condition that excludes the possibility of mold, insects, rodents, dust. In the case of windows, it is not a problem to make sure that you can use it. It is necessary to carry out a systematic wet cleaning in the storage rooms. Dusting of shelving, cabinets, storage facilities carried out; floors, baseboards, windowsills, basements of racks are treated with water antiseptic solutions. Selection of the water and air condition of the heating season. Disinfecting stations and quarantine services. When cleaning or sanitizing water and antiseptic solutions should not fall on the documents.

Q: Insects, especially habitats in book storages. Species composition. Protection of library collections from insects.

A: Sanitary norms of concentrations of harmful impurities in the air of the document storage rooms are as follows:

	Max. single, mg / m ³	Daily average, mg / m ³
Sulfur oxide SO ₂	0.500	0.05
Nitric oxide NO ₂	0.085	0.04
Chlorine	0.100	0.03
Dust	0,500	0,15
Soot	0.150	0.05
Suspended solids	0.500	0.05

Q: Preventive measures. Surveys of book storages. Disinfection. Damage to rodents.

A: The effect of dust on the safety of documents is enormous. Dust is one of the most aggressive factors. It enters the storehouse from the outside and is accumulated in the room due to the abrasion of various materials. Dust is suspended in the air or solid particles deposited on the surface. More than 80% of particles with a long fiber form (paper fibers, cotton, wool, silk, etc.) are stored in library vaults. The duration of their stay in the air depends on the shape and size of the dust particles.

Many types of dust are hygroscopic and, being on the surface of materials, increase their moisture content. Large amounts of spores of fungi and other microorganisms settle on specks of dust (a direct relationship has been established between the dustiness of documents and their contamination with microorganisms). With local high moisture content of materials, microorganisms begin to develop, and some types of dust can serve as a nutrient substrate for them. The hygroscopicity of dust also increases the corrosive properties of salts (for example, sodium chloride, which is found in human epithelium), accelerates the hydrolysis reaction and the release of acids.

Mineral dust, especially soot, whitewash, is dangerous because of its abrasive effect, since, penetrating between the fibers of the paper, solids cut through its fibers. With a long stay on the surface of the documents, the dust condenses (caking); removing it is very difficult. Paper and lightweight binding materials get a gray tint that spoils the appearance of documents.

Q: Stabilisation of documents by blocking metal ions with complexing compounds.

A: Sanitary and hygienic regime includes hygienic processing, entomological and mycological supervision of the state of book monuments. Mycological supervision (control) - measures to identify mold fungi on documents and in storage rooms in order to prevent the destruction of documents. One of the ways to ensure the preservation of documents is the prevention of biological damage on the books. The most common destructors of paper are microscopic fungi. Their appearance is always associated with a violation of the microclimate in the storage: an increase in humidity and a decrease in air temperature. Already with a short-term increase in the relative humidity of the air over 70-80% or with an abrupt change in air temperature, when condensation forms on the surface of documents, the sprouting of microscopic fungi spores and their further development is possible when normal storage is restored. Microscopic fungi have a mobile metabolic system. Moisture in the material basis of the document they need to germinate a dispute, and they are able to provide all the conditions for further development on their own.

Currently, there are more than 200 species of fungi found in book storages, of which about 40 species are permanent inhabitants. They are the most dangerous for documents, since they produce enzymes that destroy cellulose and cause severe damage to the paper. Such mushrooms can destroy up to 50% of cellulose in paper in two months. It is not only paper that is affected by mushrooms, but also cardboard, leather, glue, threads, fabric. The main way to prevent damage to documents by mold fungi is to maintain an optimal microclimate, which eliminates the emergence of spores, but preserves favorable conditions for storing paper. Such conditions are created at a temperature of 16-20 ° C and a humidity of 40-60%.

Q: Determination of pH and neutralization of acidity weakly alkaline compositions.

A: The main requirement for temperature and humidity storage of documents is to maintain its consistency. Deviation of temperature and relative humidity is unacceptable even for a short period of time, unless the changes occur slowly.

It is necessary to ensure that the storage mode is the same in the entire volume of the room. Sometimes, in poorly ventilated book storages, zones of stagnant air are formed, especially in the corners of the room, near the outer walls. The climate of these areas is characterized by increased air humidity and, accordingly, increased moisture content in the materials. Microbiological monitoring of air in library rooms should be carried out twice a year, and more often if necessary. Indicators of the state of air in this case are the quantitative and species composition of microorganisms. It is known that microorganisms in the air are on particles of dust, in droplets of water, carried by air currents during ventilation, getting from outside on clothes, shoes and things of visitors. Air contamination depends on various factors: weather and climatic conditions, time of year and many others. It is proved that the largest number of microorganisms in the air flow is observed in the spring-summer period, decreasing in winter. Warm and humid weather leads to an increase in the relative humidity of the air, which contributes to the settling of the spores and an increase in the concentration of viable microorganisms.

The mass of spores or particles of mycelium due to swelling increases, and precipitation occurs faster. Fungal and bacterial communities can develop on books similarly to the community of destructors in natural conditions. Colonization and biodegradation of books implies the mandatory participation of cellulolytic organisms, since only these species can use cellulose as a nutrient substrate and translate it into low molecular weight and inorganic forms available for other microorganisms. It is known from the literature that various microscopic fungi play a key role in the biodegradation of cellulose. Therefore, special attention should be given to this group of microorganisms when analyzing the air of book storages. If after 1 h of exposure by the sedimentation method, the number of grown colonies of fungi on a Petri dish does not exceed 10, the storage microbiological state is considered satisfactory. In addition, it is considered satisfactory condition of the room, in which the number of microorganisms in the air is not more than 300-500 CFU / m³, the excess indicates the need for processing and taking preventive measures.

Q: Stabilization of documents in relation to fungi infections by the method of treatment with anti-fungi compounds.

A: Damage to library documents can be caused by insects. The main pests are: kozheed beetle (it feeds on skin, wool, animal glue), bread grinder (animal and flour glue), silver fish (starch), in addition, cockroaches, skin louse, moth. Insects affect not only books, but also wooden racks, parts of buildings. Bird nests are often the sites of insect infestations. It is not the insects themselves that do the direct harm, but their larvae that are difficult to detect during the inspection. Indicators of insect infestation are the presence of dead insects, larvae skins, cocoons and cobwebs, the presence of holes in the roots, heaps of brown "flour" on the shelves.

Preventing insect contamination of the book depository: 1. Fully exclude food from entering the book depository. Places of public catering should be placed in rooms isolated from the book depository. Do not deposit or eat food in storage. 2. The windows of the book depository opened for airing should be with protective nets. 3. It is prohibited to keep flowers in and near the book depository. 4. Do not allow nesting of birds on library buildings and feeding them in the yard. 5. Regularly carefully clean the book depository, clean the books from dust, do not store books in packs, stacks, do not block the aisles with foreign

objects. 6. All used books in the library should be disinfected. 7. If there are no permanent jobs in book storage, then insect repellents are used.

From ancient times, manuscripts and books were defended by smearing papyrus with cedar oil, putting leaves and flowers of smelling plants between sheets of books, sprinkling bookshelves with mustard, black pepper, alum. When pests are found in book storage, the damaged specimens are first of all removed and the pest control is disinfected. Disinsection is carried out mechanically (clean the premises with a vacuum cleaner, brush) and chemically (the floor and walls are treated with insecticides recommended for domestic purposes). On the documents they should not fall. Disinsection of significant document arrays is performed with paradichlorobenzene vapor in the chamber. Other countries may use a non-pollutant technique, such as an anoxic treatment system.

From the larvae inside the books get rid of by introducing into the holes with a pipette or syringe of any insecticide. The mass destruction of insects in the book depository is carried out by the sanitary-disinfection services of the city. Rodent Control (Rodent Control) The harm caused by rodents to the book fund is irreparable. A distinct sign of the presence of rodents is corroded edges or paper surface. The most effective way to fight is the extermination of rodents in the entire library building by the sanitary epidemiological station, sealing cracks and passages. Entomological control is carried out by examining the funds twice a year, more often if necessary, by carefully inspecting the premises of the vaults and selectively or continuously viewing documents.

Q: Stabilisation of documents on the skin and parchment in relation to physical-chemical and biological factors.

A: The placement and storage of documents are based on the maximum utilization of the storage cubic capacity and should be combined with the possibilities of differentiated storage of the fund depending on the value, usage characteristics and type of stored material.

Shelves are placed perpendicular to the window-carrying walls, the aisles between the shelves are 0.75 m, the main aisles are 1.2 m, and the walkways around the walls are 0.45 m wide if the wall has a heat source of 0.6 m. Documents on the shelves are stored vertically on lower section, but when the storage is full, it is possible to place books on the shelves on the side cut upwards, except for books with a large number of pages or printed on paper with a large mass of square meter (such as coated), the gap between the upper edge of the book and the next rack should not be more than 2 cm. On a shelf documents should be so that you can freely borrow a book for the lateral panels of binding, but in any case, not at the root. Horizontally stored only large format publications (more than 41 cm). Newspapers are stored in a horizontal position no more than 6-7 roots in a pile. Documents in paper covers, without binding, such as leaflets are also stored horizontally in folders or boxes.

Batch processing materials, scrolls, sheet material, as well as damaged documents are stored in containers of appropriate shape and size. Ideally, wrapping paper and containers should be made of acid-free materials and bandaged with soft tape. Any container for placing library documents must be well dried beforehand. Stored material and the container must be kept in the same conditions for 3-4 weeks to establish a balance of humidity. Folders serve as a good mechanical protection when handling sheet materials. To protect the extreme sheets from damage, it is advisable to wrap the contents of the folder with thick paper. Folders and boxes cannot be overfilled, cannot be placed in one box materials that

differ significantly in size. Sheets cannot be folded into a tube, fold. If in the process of cleaning or handling a document, part of it is torn off, then it is placed in a separate envelope, on which the cipher and the name of the document are marked. Documents of large sizes (maps, drawings, prints, etc.) should be stored in special furniture with shallow drawers. Illustrated materials with a rich colorful coating is better to store shifting sheets of waxed paper. Dust jackets often not only protect the binding, but also are of artistic value, or contain information that complements the book, so they can be mounted into a book. It is necessary to exclude the placement of books on windowsills, on the floor and other places not intended for storage. Do not store books in stacks. Documents on durable paper from cotton and linen fibers, from sulphate pulp should not be combined with those made on paper containing wood pulp (degradation products initiate the destruction of documents on durable paper). To accommodate film and photo documents, closed metal thermostatic cabinets are used in standard plastic (excluding PVC) or metal containers.

Improper transportation of books can cause great damage. When moving documents inside the library, they use trolleys, conveyors, lifts, while it is necessary to ensure that the documents do not get inside the mechanism, do not hang from the edges. When moving documents outside the library, proper packaging and packaging is necessary. Best of all are special canvas bags, trunks, and suitcases. They transport books in packs of no more than 5 kg, wrapped in thick paper (kraft paper), with padded strips of cardboard in the places where the strings pass. When being transported in a car, it is necessary to cover the packs with a tarpaulin, there should be a protective flooring on the floor, the machine should not be used to transport products (especially flour and meat).

Q: Physical and chemical cleaning of paper documents.

A: Particular attention should be paid to exhibitions and showcases when exposing genuine materials. When preparing exhibitions during exposure, materials may be damaged due to improper installation, fixing of inscriptions on exhibits, deformation due to other conditions of temperature and humidity, and enhanced lighting. The inscriptions are made on paper and pressed against strips of organic or silicate glass. Do not use office clips to fasten the inscriptions. It should not be installed near windows, lamps, heat sources, exhibition should be protected with cloth or filters of green or orange-yellow tones. Particularly carefully, the conditions of the light regime must be observed when storing and displaying rare and valuable editions. If possible, it is advisable to store these documents in acid-free cardboard containers. Avoid frequent and prolonged exposure of these materials. Frequent photo, micro, and photocopying leads to irreversible changes: drying out of the paper, yellowing and fading. The norm of illumination on the surface of documents during exposure at the time of inspection, it is desirable not to exceed 150 lux.

IFLA PAC Centre Poland

National Library of Poland

The IFLA PAC Centre for digital preservation is hosted at National Library of Poland. It was established in 2016.

The PAC Centre builds on expertise of National Library of Poland which in 2010 has been designated the National Competence Centre for digitization of library materials by the Polish Ministry of Culture. The digital repository National Library of Poland archives both the born-digital materials deposited in the Library as Legal Deposit, as well as materials created in mass-digitization efforts carried out by various institutions.

The IFLA PAC Centre supports the needs of libraries concerning digital preservation and digital sustainability and also assists in the safeguarding of digital cultural heritage. The Centre for digital preservation uses expertise of the National Library based Institute for Conservation of Library Collections dealing in conservation of physical collections.

The expertise of the Centre allows for sharing knowledge in the following fields:

- preparation of material for digitization,
- technical conditions of digitization,
- carrying out the (mass) digitization,
- long term preservation of digital collections,
- sustainability of digital data.

Storing Digital Information for a Long Time

Q: Why do we store information?

A: Traditional libraries or archives keep books and documents for obvious reasons, namely, to access information stored in them – be it texts, graphics or sound. The objective of keeping digital information is precisely the same: one wants to be able to access it in the future.

Q: For how long do we want to store information?

A: The timing depends on the type of information. Generally, legal provisions determine time required for storing many types of documents, e.g. employee, financial or medical records.

Normally, they are to be preserved for several years to several decades. Cultural goods are usually kept for a long time in order to save them for future generations. Some documents are even meant to be kept perpetually (such as mortgage, land survey documents or vital records). In the case of digital information, similar time periods will most likely apply.

Q: What material is stored?

A: It is worthwhile noting that in order to store information recorded on traditional carriers we must keep those carriers. For instance, we keep documents on paper, photographs (negatives and positives, photographs on glass, paper and tape), audio discs, magnetic tape on spools and cassettes, featuring sound and/or images.

When digital information is regarded, in theory a similar approach could be taken, i.e. digital carriers with saved information, such as floppy discs and magnetic discs, CD-ROMs, semiconductor memories, just like traditional carriers – they can be kept on a shelf and read when particular information is needed. The experience of recent decades has shown, however, that information stored in such a way may be easily, and relatively quickly, lost.

Q: How long can information be stored using traditional carriers?

A: Old paper documents, manuscripts and books could be kept for several centuries or even longer without any special efforts. For this reason, one has come to expect that all documents could be stored in a similar way. However, new paper documents and other types of documents have proven to be less durable. In many cases, we have observed that carriers undergo a process of degradation, which entails the risk of losing the possibility to read information from documents.

One example is the so-called acid paper. It was manufactured starting from mid-19th century and used for printing newspapers and books – now however, publications on such a paper are falling apart. Degradation affects also traditional photographic materials and magnetic audio and visual tapes. In case of the former, the damage is caused by materials applied for their manufacturing initially. Some tapes after several years or several decades cannot be read anymore because the magnetic layer is detached from the underlay.

Apart from such radical form of degradation that renders reading impossible, gradual deterioration of quality of audio or film material can be observed, which takes the form of noise, greying photos or changed colours. Some of the processes may be slowed down by securing proper storage conditions, e.g. low temperature storage – this however increases the costs of storage.

Q: How can one secure information on traditional carriers?

A: One of the methods of protecting documents which may be subject to degradation is copying. The point is not to copy them physically but to create duplicates that will maintain the information contained in original documents. An additional advantage is when a copy takes up less space than the original and is as precise as possible.

These two objectives tend to be contrary to each other so in practice one needs to strike a certain compromise. Microfilms were a successful form of such copies, insofar as they were based on materials of much higher durability than traditional ones.

Digital copies however have been deemed to be more convenient even though the durability of digital recording on utilized carriers is limited. A big advantage of digital copies consists in the possibility to manipulate them in an easy manner, and in particular to make further copies, compare them with others etc.

Q: What digital information is stored?

A: At libraries and archives, one encounters various types of digital information. These include copies, such as photos or scans, of physical documents stored at cultural institutions. A copy may be created in order to secure an endangered document, and to make the information stored by it available to others (irrespective of whether a document is endangered or not).

The other type are digital objects that are not copies of stored documents as they do not have a physical prototype but were created as digital objects in the first place. They are actually referred to as “born digital” data. Such objects may be new books or journals. They may contain bibliographic descriptions or textual documents for archiving, such as emails. Also, they may include digital audio or video recordings or data, e.g. various types of measurements taken with proper devices.

Audio and video recordings may be commercial products manufactured on many copies; alternatively, they may also be unique. For instance, measurement data, due to their nature, normally are such creations. Losing an object representing the first type may be reversible, after all one may have another copy made of a physical object. However, if a unique digital object is lost, the loss may be irreversible.

Q: What carriers can be used to store digital information?

A: One should differentiate between storing collections of carriers that form resources of libraries and archives and may be kept just like books, for example on shelves in special containers to protect them from dust and saving data “on the fly” on computer systems.

Digital carriers stored as resources of libraries and archives include magnetic tapes, CD-ROMs, DVDs and their modern counterparts: recordable CDs, DVDs, Blu-rays. Moreover, this group includes typical memory drives, such as magnetic discs and solid-state drives (SSDs), as well as flash drives.

Widespread digital carriers for storing information on computer systems include semiconductor memories and magnetic discs or their arrays. Moreover, professional magnetic discs and tape drives are available on the market, including whole sets of such carriers handled by robots.

Q: Is digital information endangered mainly by carrier degradation?

A: When storing analogue information, the life cycle of such information is limited by the life cycle of a relevant carrier; it is also endangered by carrier degradation. Digital information, on the other hand, may be damaged at an earlier point. Therefore, one must take into account potential threats which digital information is subject to, as well as perspectives regarding individual types of carriers.

Obviously, the same digital information may be saved on various carriers, including those based on physical recording mechanisms. Such carriers take advantage of two physical conditions, i.e. magnetic material is magnetized in one of two directions, whereas a semiconductor capacitor is either charged or not. Such two conditions are marked with 0 or 1, i.e. two values of a binary digit, called a bit. Normally groups of bits are applied, for instance to save alphabet characters. Typically, eight-bit groups (called bytes) are used, as well as groups with 16, 32 or 64 bits and more. Such a division into multi-bit groups is of a conventional nature, and they are entered as a series of zeroes and ones.

Putting the physical aspect aside, i.e. whether magnetic, optic or other form of recording is applied, one should focus on digital information itself. It may be described on two levels.

At the first, technical one, one will only see bits, i.e. sequences of zeros and ones. At the other, in the same sequence, one may differentiate bit groups and information assigned to them. A bridge between these two is an agreement on how information is assigned to bit groups. Of course, there may be many potential methods and when reading, the same interpretation means must be applied at the point of recording to ensure correct reading. This is where formats, standards, and their conscious and knowledgeable application come in.

Q: Will stored information be subject to changes?

A: Any changes of stored information are undesirable. Still, one needs to be aware of the fact that independent of what physical mechanisms form the basis for a given type of memory, in every case the recording may become damaged.

Let's assume than a change affected one bit. The saved and the read sequence will not be the same anymore. Such information will be read differently. From the formal perspective, we will speak of a loss of original information in such cases. Moreover, we may overlook this fact at the point of reading.

Of course, one bit is just a tiny part against the backdrop of thousands or millions of bits used to save digital data. One may come to the conclusion that such an insignificant change should only lead to negligible distortion of information. This holds true in many cases for analogue data, e.g. a change in polarity of a small part of a magnetic data carrier if it's a sound recording would probably only give rise to a small crack when the recording is played. One could speak of information distortion in this case rather than loss thereof. Digital

recording shows a different sensitivity to potential changes, whereby the effect depends on the format in which the information is saved. In certain parts, a change of one bit may lead to negligible consequences, but it may happen that consequences will be grave – the worst scenario is that a change of one bit may render the playing of a file impossible. This would mean that all the information is lost. Let's keep this at the back of our heads that sometimes we can't play a file because of such changes.

One may ask general questions with respect to such changes, putting aside the issue of carrier type. It is worthwhile having answers to such questions. Moreover, one should know how long such changes could occur on individual types of carriers and what reasons could cause them.

We have already indicated what consequences a change of one bit might have. Obviously if any single bit could change, then such a change could easily affect also a greater number of bits. And such a scenario should be also taken into account.

Q: How can one protect information?

A: First of all, we should have a damage detection mechanism in place. This can be achieved in a way similar to account numbering applied by banks, where a checksum in the beginning of a number will prevent certain errors – it makes it possible to verify whether an account number is correct. Similar checksums may be applied to data saving. E.g. by a parity bit. For each data part, bits will be calculated and a bit amounting to one will be added in the case of an odd number of bits and a zero when it is even. As a result of this procedure, the number of bits in a given part plus the additional one will be always even and should stay this way at the point of reading.

Some means of protection are more potent as they allow for correcting certain errors. This is done by adding excessive bits in order to detect errors and correct them. Consequently, one must save more data. Selection of a proper solution is normally made by a device or software producer. On its basis the manufacturer may claim a longer period of reliable operation of a device.

There are more complex information protection systems as well, e.g. based on additional protection drives. By the way, the easiest manner of protecting data is to save a mirror on the other drive out of a set of two. However, normally such solutions are used to protect ongoing work and not to archived data.

Q: How can data be protected against loss due to carrier malfunction?

A: The basic solution is to back up the data. However, this is just the first step as one needs to determine how and how frequently the original should be compared with the backup copy or copies. And what should be done when they differ. Moreover, one must provide secure storage conditions for carriers, adjusted to a given type of carrier. The optimum solution is when one stores copies in a distant location from originals, so that if a certain threat (such as theft, fire or earthquake) occurs at one location, the other will not be subject to it. Some feel the most secure practice is to store data in three distant places.

Even at home or at your office, when you use USB drives or CD-RWs for backing up your data, it is smart to develop certain procedures of handling them. In particular, one should

define how frequently the data should be compared. Then it is worthwhile adhering to such procedures.

Q: What is the expected durability of digital data recorded on typical carriers?

A: As a durability measure of data saved on magnetic discs, one may refer to the guarantee period indicated by carrier manufacturers. In the case of regular hard disk drives, it is normally 3 years, whereas if they are of top quality, the period will be 5 years. This period applies to daily operated drives and not necessarily to drives that are stored for three or five years on a shelf. After all, a daily utilized drive may refresh the data, which is not possible in the case of those on a shelf. For magnetic recording, one may safely assume that the durability will be about two years. Anyway, in the case of valuable data, one should not expect to store them on magnetic discs. And if so, one would need to rewrite such data from time to time, using similar or different carriers. The same rule applies to storing CDs, DVDs, and Blu-rays.

Initially, recordable CD-RWs seemed to be a particularly durable and secure carrier. Optimists estimated that they would last for 20 to 30 years. However, real life has proven otherwise. Manufacturers introduced discs of variable quality on the market, some of those would not endure even one year.

In general terms, optical discs suffer from light exposure. Some manufacturers have offered discs whose reflective coating is made of gold to prevent oxidizing, claiming such CDs could endure up to 300 years; in the case of DVDs the claimed lifespan was 100 years. There were some drawbacks to them as well though, demonstrated by internal instructions of American archives not to use such discs for archiving purposes but only for data transfer.

The third popular carrier type are semiconductor memories. Typically, producers guarantee that their longevity is two, three or five years. In some cases, producers go so far as to give a lifetime warranty. Interestingly, this implies that such memories have no defects in material and workmanship. It does not mean that no reading errors will occur. Note that such declarations are based on tests regarding the number of errors that actually occurred at the point of testing. Surely, if a recorded semiconductor memory is stored for many years, data will be lost due to the disappearance of electrical charge in memory cells.

Another solution includes producing COM microfiches and microfilms from the digitised files. These are much longer lasting than the digitised files, and if needed, can themselves be easily digitised again

Q: What are basic conclusions regarding storing digital data?

A: Digital information carriers used at present will cause data loss after some time – and, importantly, this is not a lot of time.

Backing data up will reduce the danger of losing data and is necessary, but it will not prolong the lifespan of data recording. Users who wish to store digital information for a longer time must adopt an active approach to it. For instance, they need to refresh the recording or transfer data to new carriers at regular intervals.

Irrespective of producers attempting to develop long-lasting memories, one must act in a systematic manner in order to gain high certainty that the information we store will last for a long time and will be readable in the future.

Q: What is long-term storage?

A: A systemic approach to digital data storage and archiving has been developed after some incidents of irreversible loss of valuable data that were stored in a conventional way and not refreshed on time. In the face of such events, concepts and models have been developed in order to determine optimum operation of digital repositories, so that the data can be stored for a long time. Taking into account a perspective of long-term data storage, one considered aspects that were ignored in the past. Namely, we have to regard both actual changes and those which can be foreseen for the future that could prevent reading or interpreting such data.

These days, computer manufacturers keep changing their devices, sometimes forcing us to take up their new products. This happens for example when certain older technologies are no longer supported, like in the case of old types of cassettes for data archiving. Moreover, new formats for data recording are emerging. Take countless formats of graphic data as well as formats applied in text editors. This makes it difficult reading files saved in formats which are no longer widespread. One is faced with the necessity of converting such files into new formats. But this implies costs, especially if one has to take into account copyrights of such formats. Therefore, it is advisable to use open formats, but this in turn may require yet another conversion from a restricted to an open format. Another big question is whether data may be stored separately from metadata or is it safer to store them together.

Q: What is the difference between long-term data storage from data archiving?

A: More specifically, one should distinguish between data storage and data archiving. The former emphasizes the information itself, whereas the latter poses additional requirements, the aim of which is to give confidence as to the information which may be read after a long period of time.

Long-term storage describes a situation when a user intends to store information longer than the lifespan of contemporary technologies (of carriers, devices and formats), and longer than one generation. Such information will be read by persons with a different background than those who saved it.

In contrast, the following requirements should be fulfilled for long-term archiving:

- Information durability (this requirement is difficult to meet looking at the properties of carriers and changing technologies);
- Verifiability of proper storage;
- Information integrity (completeness and confidence that no modifications have been introduced);
- Authenticity (conformity with actual content with the declared one, e.g. as regards metadata);
- Availability (possibility of searching and finding desired resources);

- Interpretability (ensuring e.g. dictionaries and ontologies used at the point of creating metadata or bibliographic descriptions; more widely speaking this requirement refers to respecting standards);
- Confidentiality (guarantee that such data will be made available only to authorized persons or entities).

Q: Are there any standards applying to long-term storage and archiving?

A: To guarantee the possibility of correct interpretation of archived resources, it is necessary to conform with standards regarding the contents of such an archive, as regards data formats and metadata as well as with standards describing the structure of the archive and procedures in place. If there are no detailed standards in place, procedures should be documented.

One of the most widespread standards is the Open Archival Information System (OAIS), which lays down a reference model for digital archives. Also, there are various standards determining the structure of archive packages as well as of metadata.

IFLA PAC Centre North America

Library of Congress Preservation Directorate, United States

The PAC North America covers Canada and the United States and is hosted by the Library of Congress Preservation Directorate in Washington DC. The Library of Congress' mission is to engage, inspire, and inform Congress and the American people with a universal and enduring source of knowledge and creativity. To this end the Library collects materials and accepts researchers from around the world.

Expertise

The Preservation Directorate supports the Library's mission through the core work of its five divisions: Binding & Collections Care (BCCD); Collections Management (CMD); Conservation (CD); Preservation Reformatting (PRD); and Preservation Research and Testing (PRTD) through binding, collections storage and loan management, conservation treatment, mass deacidification, reformatting, research and testing, security and inventory control, and educating staff and users.

In the area of national and international cooperation, the IFLA PAC North America provides preservation training and disaster response support nationally through the NHR (National Heritage Responders) and internationally through programs administered by the US Department of State, including the Ambassadors' Fund for Cultural Preservation and the Cultural Heritage Coordinating Committee. Preservation also hosts a variety of competitive internships and fellowships that accept international applicants to advance research and provide training in preservation and conservation. The Directorate provides preservation information from its website on a wide variety of issues from disaster to housing to specifications for products.

In particular the PAC will provide FAQs for disaster recovery in English and Spanish, storage and environment in English. This is for temperate climate zone.

For more information: <https://www.loc.gov/librarians/preservation/>

Iron gall ink

Q: What is iron gall ink?

A: Iron-gall ink dates from antiquity and was the primary writing ink used throughout the Western world from the 12th century until the beginning of the 20th century. From the 15th century onward it gained in popularity as an artistic medium. Iron-gall ink was made with four basic ingredients: iron sulphate, tannins, water, and a gum binder. The ink forms when iron sulphate and tannins are combined with water to produce a coloured solution with a very acidic pH. Upon drying on a paper or parchment support, the ink gradually oxidises, creating a water-insoluble pigmented complex that darkens from a purple-grey colour to a deep, indelible black. The quality of historical inks depended on the quality and the proportions of the ingredients, both of which varied greatly in recipes. Naturally occurring impurities could unintentionally alter the appearance and the properties of the ink. Prior to the 19th century, additives, such as logwood and indigo, were used to enhance or alter the ink colour, and after the mid-19th century, these were gradually replaced with aniline dyes. Other additives included gums and adhesives for gloss; acids to slow precipitation of solids; humectants, such as glycerine, to slow drying; and alcohol to inhibit mould growth and prevent freezing.

Q: What materials and collections contain iron gall ink?

A: Iron gall ink was used to create a myriad of written and artistic works. Before the introduction of the printing press in Europe, manuscripts in all academic disciplines were written with iron gall ink. It was used by governments and businessmen for official records and to create personal letters, diaries, and ephemera. Maps were drawn with it, and European artists used it for preliminary and finished sketches. In addition, iron gall ink documents were produced to further European commercial and imperial interests in Africa, Asia, the Americas and Oceania. As a result documents, manuscripts, maps and art works are found in libraries, archives and museums around the world.

Q: What are the preservation concerns with iron gall ink?

A: The formulation of the ink

The deterioration of parchment and paper by iron gall ink is a result of oxidation and hydrolysis reactions, promoted by excess iron, from iron salts and the acidic nature of the ink. This deterioration is referred to as ink corrosion. The extent of ink corrosion varies for paper and parchment, due to differences in their fibre composition, thickness, and their chemical properties. Some of the signs of ink corrosion are:

- a gradual change in the ink colour from black to brown
- the brown discoloration and gradual embrittlement of supports;
- friability or cracking of inked lines
- loss of inked areas of the support
- the spread of the degradation reactions to adjacent materials.

Uncontrolled environmental conditions:

- High humidity promotes acid hydrolysis reactions, leading to embrittlement of the paper associated with a decrease in pH. It also encourages the movement of iron ions into non-inked areas of the support, creating additional sites for oxidation.
- Fluctuating or cycling humidity with elevated temperature compounds the deterioration of both ink and paper, and may result in flaking and losses of the ink layer on parchment.

Other deleterious factors:

- A bad formulation of the ink leading to fading
- Historical efforts to enhance fading inks leading to eventual loss of ink legibility
- Previous restoration or conservation treatments, especially the use of water alone.

Q: What efforts have been made to address preservation of iron gall ink?

A: Early efforts to address iron gall ink corrosion focused on reinforcement and repair, such as silking, which the Vatican developed in the late nineteenth century, and cellulose acetate lamination, which was adopted in the U.S. starting in the 1930s. As the field of book and paper conservation was established, interventive treatments like washing and alkalinisation became standard practice in many institutions by the 1970s and 1980s.

Conservation research science centres in Europe have led multiple international efforts to research iron gall ink and address its preservation over the last twenty years. One of the main contributors has been the Netherlands Cultural Heritage Agency (RCE), along with European Union-funded partnerships, like InkCor, and related projects in Austria, France, Germany, Slovenia, the U.S., and Canada among others. Conservators and scientists have collaborated on numerous initiatives including

- the development of tools for examination, identification, and imaging of iron gall ink
- investigations into the molecular structure of the ink molecule
- survey and risk assessment tools to manage preservation of collections
- research into housing materials and environmental storage conditions
- studying treatments for iron-gall ink, in particular of the ‘phytate treatment’ to slow ink corrosion reactions, and repair techniques.

Q: How can the condition of iron gall ink be assessed?

A: Assessment of condition of iron gall ink begins by documenting the physical appearance of the ink. Visual assessment and degree of damage are used to evaluate the condition of ink and support, as the preservation requirements of both must be considered together. Observation with the naked eye and under magnification yield important information about the two main preservation concerns for iron gall ink, ink corrosion and fading.

One of the simplest tools for surveying iron gall ink collections and determining basic information about condition is the Condition Rating System (CRS) for iron gall ink, a

classification system with four condition categories that are selected based on the appearance and handling characteristics of artefacts.

<https://www.scribd.com/document/27703598/Condition-rating-for-paper-objects-with-iron-gall-ink-ICN-info-1>

More in-depth assessment requires the use of examination forms that are specific to iron gall ink. Conservators determine the treatment needs of artefacts by thorough systematic evaluation of various characteristics of the ink and support guided by such forms or templates. Examples of forms and additional information can be found at:

<http://cool.conservation-us.org/coolaic/sg/bpg/annual/v27/bp27-20.pdf>

https://irongallink.org/igi_index2b0f.html and http://www.cac-accr.ca/wp-content/uploads/2018/12/Vol37_doc2.pdf

Q: What strategies exist for the preservation of iron gall ink collections?

A: There are three main strategies for preserving iron gall ink collections.

- Providing stable environmental conditions for iron gall ink collections is fundamental to preserving them. In the past, consistent temperature and relative humidity of 21°C (70° F) and 50% RH were considered ideal environmental conditions to preserve collections. More recently, for paper- or parchment- based collections containing iron gall ink, cool temperatures and RH at 30 to 40% have been recommended. However, providing stable conditions which can be achieved reliably by the institution is a better preservation strategy than aiming for values that cannot be realized or maintained over the long term. A resource for managing the collections environment is time-weighted preservation index technology (TWPI), developed by the Image Permanence Institute (IPI) at the Rochester Institute of Technology in the United States.
<https://www.imagepermanenceinstitute.org/environmental/research/preservation-metrics>
- Proper housing for collections containing iron-gall ink is necessary as it can mitigate some aspects of damage and deterioration. A housing, such as a box can protect collections from damage by environmental elements, such as water, dust, light. Boxes also act as a buffer between collections and environmental conditions, slowing the effects of humidity and temperature extremes. Housings for works containing stable iron gall ink do not differ fundamentally from other paper- and parchment-based materials, and should be manufactured from chemically stable materials, free of lignin and bleaching residues, and alkaline-buffered (pH greater than 7.5).
- Safe handling to provide access to iron gall ink documents. The choice of correct housing materials can make collection items more accessible as they can provide support to fragile documents. Training staff and researchers in proper handling procedures will minimise damage to iron gall ink collections.
- Interventive treatment can have significant implications for the preservation of iron gall ink artefacts but it is best to contact a conservator experienced in the treatment of iron gall ink. Iron gall ink is sensitive to water and certain components in the inks may also be sensitive to other solvents. In addition, water alone and repairs with water-based adhesives can promote corrosion. A conservator will be able to advise whether treatment is necessary, to weigh the benefits of treatment against the risks, and to guide the decision-making process.

Q: How can you address iron gall ink preservation in your institution?

A: A well-developed preservation plan is the best method to institute strategies to minimise the risk to the longevity of iron-gall ink collections. Risk is assessed by reviewing the impact of temperature, relative humidity, light and other environmental factors, surveying the physical condition of the collection; ascertaining the research, monetary or legal value of the collection, and how often it will be used. Resulting plans may focus on preservation management, including passive preservation measures, such as environmental conditions, or on conservation strategies, such as interventive treatment. Tools for risk assessment include the Image Permanence Institute's Preservation Metrics and Time Weighted Preservation Index (TWPI), and, specifically tailored to iron gall ink, the Ink Corrosion Prognosis – Computer Simulation, available through the Iron Gall Ink website, <https://irongallink.org/>. The software tool estimates the risk of ink corrosion on specific objects, based on uploaded images and basic information, such as age, and anticipated environmental conditions and handling.

Q: What exhibition and display conditions are recommended for items containing iron gall ink?

A: The following are a few recommendations for the displaying iron gall ink artefacts:

- Light exposure should be limited to 3 to 5 foot-candles, or approximately 30 to 50 lux depending on the intensity of the ink. All ultra violet radiation should be screened out. A currently accepted recommendation for the exhibition of iron gall ink artefacts is once every 5 years at the above light exposure for 6 months.
- Controlling RH and temperature
- Creating passive sealed microenvironments that are unaffected by the gallery environment. The recommended microenvironment for a single document or artwork is a sealed package comprising appropriate matting materials, a silica gel sheet pre-conditioned to 40%RH, a polypropylene corrugated board, and glazing with either UV-filtering acrylic or glazing. The package may be framed for display.

Q: Where can you find more information about iron gall ink?

A:

n.d. Birgit Reissland, Frank Ligterink, Claire Phan-Tan-Luu. "Ink Corrosion: Object Characteristics"

<https://www.youtube.com/watch?v=0ocmFw9D--c>

n.d. Yale University Library. "Inks and Pigments." Traveling Scriptorium – A Teaching Kit by the Yale University Library. <https://travelingscriptorium.library.yale.edu/inks-and-pigments/>

2013. Yale University Library. "Iron Gall Ink." Traveling Scriptorium – A Teaching Kit by the Yale University Library. <https://travelingscriptorium.library.yale.edu/2013/03/21/iron-gall-ink/>

2012. Sherry Guild, Season Tse and Maria Trojan-Bedynski. "Technical Note on Treatment Options for Iron Gall Ink on Paper with a Focus on Calcium Phytate." *Journal of the Canadian Association for Conservation (J.CAC)*, vol. 37 (2012): 17-21. http://www.cac-accr.ca/wp-content/uploads/2018/12/Vol37_doc2.pdf

2011. Rijksdienst voor het Cultureel Erfgoed. Ministerie van Onderwijs, Cultuur en Wetenschap. Ink Corrosion Prognosis – A new perspective. The Iron Gall Ink Website. https://irongallink.org/igi_index68c8.html

2010. Frank Ligterink, Birgit Reißland, Norbert Ligterink and Claire Phan-Tan-Luu. “Ink Corrosion Prognosis – Why?” The Iron Gall Ink Website. https://irongallink.org/igi_index2a7d.html

2009. Véronique Rouchon, Julie Stordiau-Pallot, Blandine Durocher and Eleonora Pellizzi. “The Water Sensitivity of Iron Gall Ink and its Risk Assessment.” *Studies in Conservation*, vol. 54, no. 4: pp. 236-254. <https://www.iiconservation.org/node/1200>

2008. Sylvia Albro, Julie L. Biggs, Claire Dekle, Mary Elizabeth Haude, Cyntia Karnes and Yasmeen Khan. “Developing Guidelines for Iron-Gall Ink Treatment at the Library of Congress.” in *The Book and Paper Group Annual* no. 27 (2008): pp. 129-165. Washington, D.C.: Book and Paper Group, American Institute for Conservation of Historic and Artistic Works

PDF at <https://cool.conservation-us.org/coolaic/sg/bpg/annual/v27/bp27-20.pdf>

2008. Season Tse and Robert Waller. “Developing a risk assessment model for iron gall ink on paper.”

ICOM Committee for Conservation, ICOM-CC, 15th Triennial Conference New Delhi, 22-26 September 2008: preprints New Delhi, India pp. 301-309

ISBN 9788184243444

<http://www.bcin.ca/bcin/detail.app;jsessionid=00E102EDB7DC00C80CC528F7D1C59D0?id=392203&lang=fr&asq=csg=&csa=&ps=100&pId=655>

2006. *Iron gall Inks: on Manufacture, Characterisation, Degradation and Stabilisation*, edited by Jana Kolar and Matija Strlič. Ljubljana: National and University Library of Slovenia.

2002. Birgit Reißland and Margaret W. Cowan. “The Light Sensitivity of Iron Gall Inks.” *Works of Art on Paper: books, documents and photographs: techniques and conservation: contributions to the Baltimore Congress, 2-6 September 2002*, edited by Vincent Daniels, Alan Donnithorne and Perry Smith. London, United Kingdom, International Institute for Conservation of Historic and Artistic Works. London, United Kingdom, pp. 180-184.

ISBN 0-9500525-7-4

2002. *The broad spectrum: studies in the materials, techniques, and conservation of colour on paper*, edited by Harriet Stratis and Britt Salvesen. London: Archetype Publications, 2002.

2000. *The Iron Gall Ink Meeting: 4th & 5th September 2000, the University of Northumbria, Newcastle upon Tyne: post prints*, edited by A. Jean E. Brown. Newcastle upon Tyne: Conservation of Fine Arts Programme, University of Northumbria.

ISBN 9780954116507

Environment and Exhibit

n.d. Image Permanence Institute, Rochester Institute of Technology, Environmental Management, Overview Statement

<https://www.imagepermanenceinstitute.org/environmental/overview>

n.d. Image Permanence Institute, Rochester Institute of Technology, Environmental Management, Preservation Metrics

<https://www.imagepermanenceinstitute.org/environmental/research/preservation-metrics>

n.d. Image Permanence Institute, Rochester Institute of Technology, *IPI's Guide to Sustainable Preservation Practices for Managing Storage Environments*

n.d. Image Permanence Institute, Rochester Institute of Technology, *IPI's Methodology for Implementing Sustainable Energy-Saving Strategies for Collections Environments*

Print or

PDF at <https://www.imagepermanenceinstitute.org/resources/publications/ipi-methodology-guidebook>

2011. Season Tse, Luci Ciperia and Carolyn Leckie. "Microfade Testing to Support Exhibit Decisions: The Catherine Parr Traill Scrapbooks." *Collection Forum* 25: pp. 92-106.

PDF

https://www.researchgate.net/publication/268512670_Microfade_Testing_to_Support_Exhibit_Decisions_The_Catherine_Parr_Traill_Scrapbooks

[1995]. James M. Reilly, Douglas W. Nishimura, and Edward Zinn. *New Tools for Preservation: Assessing Long-Term Environmental Effects on Library and Archives Collections*. Washington, DC: Commission on Preservation

& Access

ISBN 1887334467

1993. Catherine Nicholson. "What Exhibits Can Do To Your Collection," *Restaurator*, vol. 13, no. 3: p. 103.

Collection reproduction for preservation

Q: What is collection reproduction?

- A: Collection reproduction, also known as reformatting, uses standardized photographic reproduction techniques to create a facsimile of a collection item. Most collection reproduction at present is through digital means, and is called digitization or digitalization.
- Reformatted surrogates provide patrons access to a given item's intellectual content without handling the physical item, a risk which may expose it to further damage.
 - Collection reproduction is also a common collection management method to conserve shelf space, especially for high-volume publications such as newspapers. Digital and microform objects require significantly lower storage expenditures than the physical original, allowing collection managers to send reformatted physical items offsite or withdraw them from the collection without significantly limiting access.
 - Collection reproduction can take place in-house with internal employees using institutionally owned equipment or external vendors can provide reformatting services on a contract basis.
 - A collection reproduction program works most effectively when it collaborates openly with collection care specialists and collection management specialists. Items often require treatment prior to reformatting, and will often require enclosures to stabilize the item for offsite storage following the reformatting process.
 - Planning and implementing a collection reproduction program further depends on an awareness of institutional needs and capabilities. Administering discrete reformatting projects is possible with vendor support and grant funding, while larger organizations with extensive collections may require large, annually renewing contracts and/or an established in-house program to manage many concurrent work streams.

IFLA. *Digital Library Futures: User perspectives and institutional strategies*.

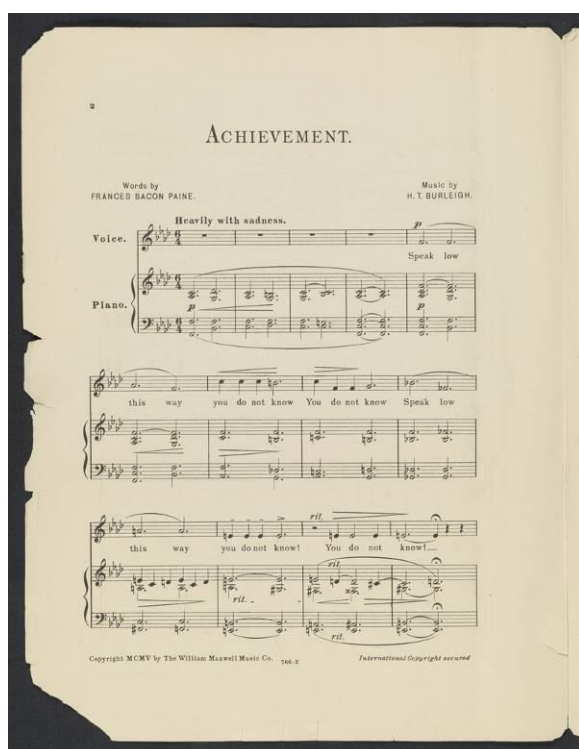
<https://www.ifla.org/publications/ifla-publications-series-146?og=2431>

IFLA/UNESCO. Manifesto for digital libraries. <https://www.ifla.org/publications/ifla-unesco-manifesto-for-digital-libraries?og=2431>

Q: How do I select candidates for collection reproduction?

- A: Formalizing a reformatting workflow in a written policy provides a standardized selection process by which curators, collection managers, preservation officers, and other digital collection development stakeholders can have input in the proposal and selection process. An institution seeking to develop a permanent reformatting program would benefit significantly from a formalized workflow. The following are effective starting points for selection:
- Focus reformatting resources on items with the highest preservation needs and items that will benefit patrons the most. This is often determined based on item use data.
 - Prioritize reformatting collection items that best fit within your institutions mission statement and collection scope.

- Collections can benefit from reformatting items in danger of loss due to rapid degradation, such as brittle books, newspapers, and periodicals printed on ephemeral wood pulp paper.
- Frequently requested items or rare items are additional areas of concern, especially where the condition, materials, and/or shape of the items make them fragile to handle. Collection reproduction can ensure that items that ought not to be handled by patrons can have alternative access methods, and that the intellectual content of such items are preserved even if the physical item must be withdrawn.
- Collection inventories and condition assessments, including random sample surveys, are a data-oriented way to identify problem areas in collections, aiding the selection process.
- In addition, organize your efforts toward items of the same physical type and size (e.g. a collection of similarly sized photographs or bound volumes).
- As digital reformatting programs mature, many institutions choose to establish systematic ways in which patrons can contribute to the selection process by nominating items through a “scan-on-demand” workflow. Scan-on-demand programs are effective to contribute to both preservation and access missions when implemented in tandem with other selection criteria. In some cases, institutions choose to use scan-on-demand programs as a means of cost recovery.
- Always review rights concerns before selecting an item for reformatting, including reviewing the item’s copyright status.



Brittle materials make effective candidates for collection reproduction to preserve their intellectual content and limit damage due to handling.

Ooghe, Bart & Moreels, Dries. “Analysing selection for digitisation: Current practices and common incentives.” D-Lib. <http://www.dlib.org/dlib/september09/ooghe/09ooghe.html>

NEDCC. "Preservation and selection for digitization." <https://www.nedcc.org/free-resources/preservation-leaflets/6.-reformatting/6.6-preservation-and-selection-for-digitization>

CARLI. "Selection for digitization: Factors to consider." https://www.carli.illinois.edu/sites/files/digital_collections/documentation/Selection-of-materials_20120221.pdf

OCLC. "Shifting Gears: Gearing Up to Get into the Flow." <https://www.oclc.org/content/dam/research/publications/library/2007/2007-02.pdf>

Digital Preservation Coalition. <https://dpconline.org/our-work/dpeg-home>

Q: What are the major collection reproduction methods and media?

A:

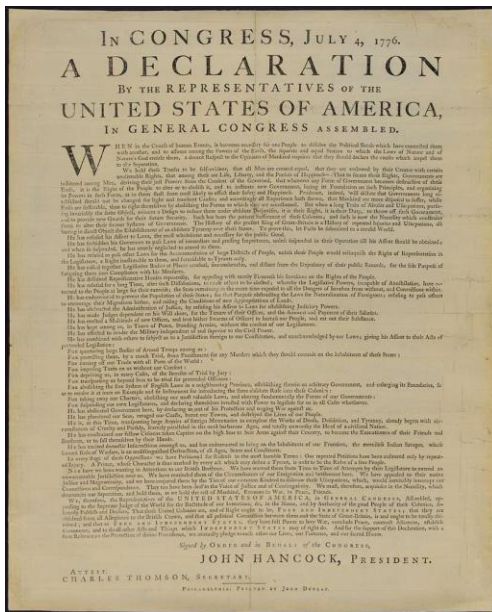
- **Digital reformatting** has quickly risen to become the most common means of reproduction due to its access benefits and the advantages of optical character recognition software. In most institutions, reformatting programs are entirely digital scanning.
- One of the most common reformatting methods of the past century was **microform**, including microfiche (flat sheets of film images) and the more common microfilm (rolls of film images), each of which requires magnification equipment for access.
- Today, institutions with large collections of microfilm are digitizing microfilm frames for elevated access.
- If copyright restricts the public electronic presentation of digital facsimiles, contractors can print physical **preservation photocopies** to keep as service copies. Effective preservation photocopying adheres to preservation standards, such as the use of non-acidic materials and high-quality binding, to be an effective means of collection reproduction.
- Even though microfilm is in the decline, many institutions maintain large-scale microfilming operations into the 2020s. Proponents argue that it is often cheaper to produce and maintain microfilm. Although microfilm is notably less accessible to patrons than digitally reformatted works, many institutions continue to use it as a preservation and space-saving strategy, given that a properly stored roll of microfilm can survive for more than 500 years. See the FAQ "Should I microfilm items?" below.



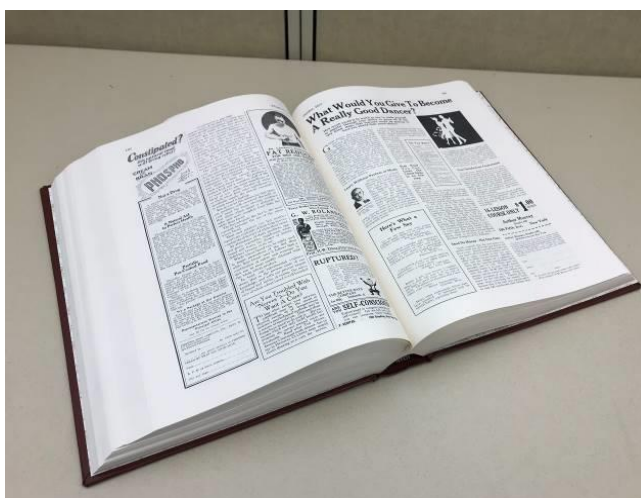
A microfilm reel.



Microfiche, a less common counterpart to microfilm, is printed on flat sheets of film.



A digital facsimile of the first printing of the United States Declaration of Independence.



A preservation photocopy of a periodical.

Q: How do I set up a digital reformatting program?

- Funding: Many grant opportunities exist for cultural heritage digital reformatting projects for numerous sizes and types of institutions. **Notifications of Funding Opportunities** appear annually from government institutions and nongovernmental organizations, often with the aim of promoting projects aimed at reformatting collections relevant to national or cultural identities.
- Administration: Contracting reformatting work to external vendors can be effective for discrete reformatting projects. When reformatting goals extend beyond a few collections to many sustained work streams, an in-house reformatting program or a combination of in-house and vendor operations may be ideal. Even a fully vendor-led reformatting program will require devoting in-house staff time to maintaining the contract and performing quality control for projects.
- Technical specifications: Consult relevant technical guidelines for benchmarks when performing quality control or planning a scanning project. General technical guidelines for technical guidelines can be found in IFLA's "Guidelines for digital projects" (p. 17). Technical documentation such as the US Federal Agencies Digital Guidelines Initiative (FADGI) or the Dutch Metamorfoze guidelines are examples of authoritative resources (see list of resources below).
- Metadata: Metadata needs vary by institution and project, but you must plan to capture beyond simply descriptive metadata. Additional types of potentially relevant metadata include administrative, rights, technical, structural, and preservation metadata, among others. FADGI guidelines are a reference point for planning the types and granularity of metadata capture necessary.
- Access and preservation: See additional FAQs addressing access and preservation needs for digital surrogates.



Standard scanning equipment for bound books.



Manuscript scanning.

IFLA. “Guidelines for digitization projects.” <https://www.ifla.org/files/assets/preservation-and-conservation/publications/digitization-projects-guidelines.pdf>

NISO. “A framework of guidance for building good digital collections.”
<https://www.niso.org/sites/default/files/2017-08/framework3.pdf>

Bibliothèque nationale de France. “Charte documentaire de la numérisation des collections de la Bibliothèque nationale de France.” https://www.bnf.fr/sites/default/files/2019-03/charte_documentaire_numerisation_collections.pdf

OCLC. “Guiding digital success.”

https://www.oclc.org/content/dam/oclc/contentdm/guiding_digital_success_handout.pdf

IFLA. “Guidelines for setting up a digital unification project.”

<https://www.ifla.org/publications/node/92435>

FADGI guidelines.

http://www.digitizationguidelines.gov/guidelines/FADGI%20Federal%20%20Agencies%20Digital%20Guidelines%20Initiative-2016%20Final_rev1.pdf

Metamorfoze guidelines.

https://www.metamorfoze.nl/sites/default/files/publicatie_documenten/Metamorfoze_Preservation_Imaging_Guidelines_1.0.pdf

International Association of Sound and Audiovisual Archives. Special and Technical Publications. <https://www.iasa-web.org/iasa-special-and-technical-publications>

Q: How do I present digital surrogates?

A: Despite digital reformatting’s effectiveness as a preservation and access strategy, digital assets are useless if they are inaccessible. Securely presenting digital surrogates to patrons requires careful consideration of license agreements and copyright law.

- One of the most important aspects of managing digital content is the digital repository. Many large organizations develop and manage their own institutional repositories, such as Gallica, the national digital library of France, or Sedici, the institutional repository of the National University of La Plata. Those with fewer resources or smaller scaled collections, however, may participate in alternatively administered repositories. These options include nonprofit open access repositories, such as Indonesia’s Neliti, or the United States’ Internet

Archive and HathiTrust, as well as consortial repositories such as the Digital Archive of the Georgian Library Association and Calisphere.

- Planning for OCR implementation is a major part of making scanned images function as full-text documents for scholarly use. OCR requires specialized software and familiarity with text encoding to implement.
- Copyright is a major consideration when choosing what to present and how. For an expanded perspective on copyright issues in several countries see the World Intellectual Property Organization’s “Study on copyright limitations and exceptions for libraries and archives” (p. 50). Carefully consult your country’s copyright code (usually available on the website of your government’s copyright office) to ensure institutional policy does not run afoul. Works published in the United States more than 95 years ago, for example, are in the public domain and the law permits open access on any website. Additionally, archival holdings may have specific reformatting and presentation guidelines stipulated in the donor agreement.
- In some cases, institutions choose to present rights-restricted material using internally developed web-based platforms that permit only on-site access.

University of Illinois. “An Introduction to OCR.” <https://guides.library.illinois.edu/OCR/intro>

Gallica. <https://gallica.bnf.fr/accueil/en/content/accueil-en?mode=desktop>

Sedici. <http://sedici.unlp.edu.ar/>

Neliti. <https://www.neliti.com/>

Internet Archive. <https://archive.org/>

HathiTrust. <https://www.hathitrust.org/>

Digital Archive of Georgian Library Association. <http://dspace.gela.org.ge/>

Calisphere. <https://calisphere.org/>

World Intellectual Property Organization. “Study on copyright limitations and exceptions for libraries and archives.”

https://www.wipo.int/edocs/mdocs/copyright/en/sccr_17/sccr_17_2.pdf

Q: How do I preserve digital surrogates?

A: Establishing an infrastructure and workflows that support digital reformatting does not end with purchasing scanning equipment, hiring technicians, or finding a scanning vendor. Digital preservation is a significant and necessary cost of building a digital collection. The most important issues include:

- Implementing quality review of digital surrogates.
- Identifying or purchasing data storage spaces.
- Identifying or building a preservation repository, including identifying and implementing software to manage digital assets.
- Developing a digital preservation workflow that ensures multiple properly packaged copies, including an archival master image, a production master image, and an access image for each frame.
- Identifying benchmark file sizes, file types, and compression.
- Developing naming conventions for all digital assets.
- Ensuring preservation, technical, and structural metadata are properly captured. This includes tracking information about the makeup of your digital assets, where they are stored, and how they are stored. Metadata such as checksums ensure that your files do not undergo unexpected change or corruption.

NCDRC. "Digital Preservation Best Practices and Guidelines."

<http://digitalpreservation.ncdcr.gov/>

NC. "Preservation Metadata for Digital Objects."

<http://digitalpreservation.ncdcr.gov/pmdo2013final.pdf>

CARLI. "Guidelines for the creation of digital collections."

https://www.carli.illinois.edu/sites/files/digital_collections/documentation/guidelines_for_t ext.pdf

UK National Archives. "Digitisation at The National Archives."

<https://nationalarchives.gov.uk/documents/information-management/digitisation-at-the-national-archives.pdf>

Q: Can I digitally reformat items under copyright?

A: Each country governs copyright differently. Complicating matters, each country enforces other countries' copyright laws differently. Items published in your own country that are in the public domain according to your country's copyright laws are the safest candidates for reformatting and online presentation. Beyond these works, it is ideal to consult a lawyer when formulating reformatting policy. Other rights restrictions aside from copyright may limit your institution's ability to digitally reformat, or limit digital surrogates' presentation to patrons. Donated materials, for example, may stipulate reformatting or access permissions in the donor agreement, especially in the case of archival materials in general or personal papers in particular. If agreements between donors and your institution are unclear on the question of reformatting, it is ideal to consult a lawyer before embarking on an archival reformatting project.

Besek, June M. "Copyright Issues Relevant to the Creation of a Digital Archive: A Preliminary Assessment." <https://clir.wordpress.clir.org/wp-content/uploads/sites/6/pub112.pdf>

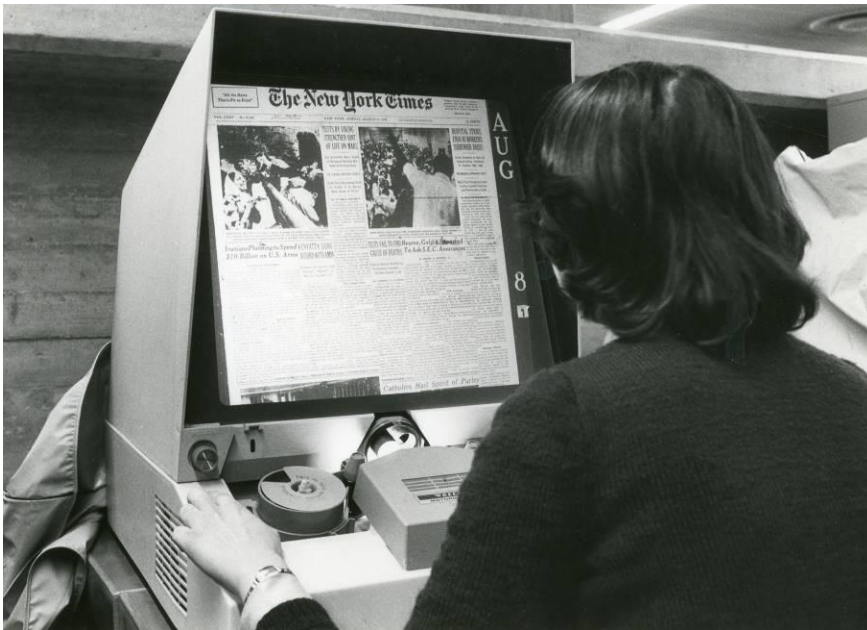
Q: Should I microfilm items?

A: While microform programs are rarely preferred over digital reformatting today, some institutions continue to advocate for microfilming. Microfilm may be a viable option if:

- Your institution's primary goal is preservation of the items' intellectual content.
- Expected access to reformatted collections is likely to be infrequent.
- The project in question encompasses a large quantity of items at risk for degradation, such as newspapers.
- The items in question are in the public domain.
- Shelf space is limited.
- Resources for digital preservation are limited.
- Your institution is equipped to maintain a proper storage environment for microfilm.



Microfilm in storage.



Microfilm readers have been used for decades to view magnified microfilm images.

Oversized materials

Q: Why are oversized materials more vulnerable to damage?

A: Large format objects such as maps, posters and broadsides are difficult to handle and store. From the time they were first created these objects were often folded, rolled, or hung to save space. These folds are often weak to the point of breaking particularly if the object has been handled repeatedly. Sometimes objects are rolled too tightly which places stress on the paper and leads to breakage or damage to media. Hanging subjects the object to threats such as light and dust.

The edges of the materials also may suffer from edge tears if the object was stored in a smaller folder or on a shelf where the edges extended unprotected. This type of damage is more likely to be seen on papers that have deteriorated and become brittle over time.



Oversized materials are vulnerable to damage when improper rolling causes creases. Unprotected rolls are vulnerable to edge damage. Oversized materials that have been folded to fit within a portfolio or folder may be damaged

Q: How to assess oversized objects or collections

A: It can be overwhelming to assess the condition and needs of oversized materials. You can start by asking basic questions to identify risks and prioritize storage and handling improvements

- Are oversized object(s) protected from exposure to threats such as light, dust, and water leaks?
- Are there shelves, flat files or cabinet that can accommodate the size of the objects?
- Can the object(s) be safely handled and consulted
 - Are there tables or counters large enough to accommodate the size of the object(s)
 - Does the object(s) need to be unfolded or unrolled? If so can this be done safely without causing further damage?
 - Are there enough people available to assist with handling oversized object(s)?
 - Have staff had training in how to handle oversized materials?

Q: What are suggested storage strategies for housing oversized objects?

A: Flat Storage

- Flat storage in flat files or in boxes on large shelves is ideal if space and furnishings exist
- Flat storage minimizes handling of brittle material
- Objects can be placed in individual paper or polyester folders
- A rigid board can be placed below large and fragile objects to avoid slumping and stress

Precautions when using flat storage

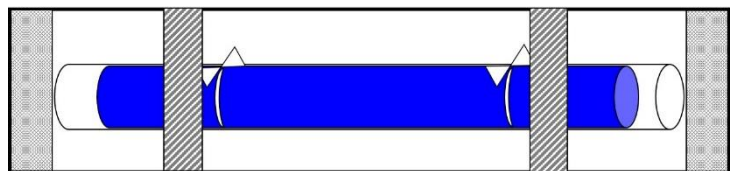
- Oversized objects should be protected on shelves and in flat file drawers. Objects that are not protected in folders or encapsulations can shift against one another in the drawers leading to media abrasion and damage to fragile paper. Multiple objects may be able to be stored within a single folder depending upon the thickness of the object, the condition of the support and the stability of its media.
- Folders and boxes should be slightly larger than the objects within to avoid edge damage. Folders containing the oversized items should be cut to the size of the box or drawer in which it is stored.
- Oversized objects can be placed in flat storage boxes. Do not overfill the boxes as heavy boxes are vulnerable to damage at the corners. Heavy boxes can pose a significant ergonomic challenge for staff.

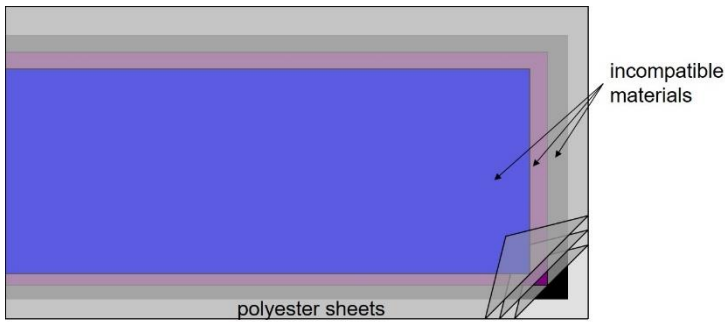


Oversized objects protected in polyester folders. The reading room table at right is large enough to support the object.

Rolled Storage

- If space is limited this is an efficient storage option for oversized materials in good condition that are flexible enough to be rolled, especially if they will not be used frequently.
- Rolled objects can be stored in boxes, tubes or at minimum wrapped in polyester sheeting.
- Objects should be rolled around a core that is large enough in diameter to not place stress on the support or media. The core should extend beyond the length of the documents to protect the edges and allow room for handling.
- The core of the housing can be created of acid free cardboard tubing, heavy acid free paper rolled into a tube or rolled polyester. Propping the tube up on each end will alleviate stress on the objects protecting them from further damage.
- Cotton twill tape can be used to secure rolled objects. Labels can be attached to this tape.
- Some materials, particularly some architectural reproduction types should be separated from adjacent objects. Polyester sheeting can be used to segregate objects within a single box.





Polyester sheeting can be rolled around the object to provide protection or used to segregate incompatible materials. Rolled objects can be placed in boxes with cushions to protect the ends of the roll. The rolls can be lifted using foam blocks cut into u-shapes or with circular cut outs to minimize sagging and reduce pressure on the object

Q: What is the suggested way for handling oversized objects?

A:

- When moving large paper items, use a rigid, flat support that is larger than the object. Always hold mats and folders flat.
- Flip a large object safely, by placing it between two boards (or in a folder) so that the item is fully supported on both sides while turning.
- Use two people for moving or turning very large objects. Use a cart if moving the object more than a few steps. Very large, flexible items can be transported on a cart with a u-shaped insert that supports the object in a gentle curve; stiff items can be moved on an A-frame cart if they are fully supported and restrained while tilted to avoid slumping.
- Move one object or folder at a time, using two hands.
- Do not pull an object or folder out of the middle of a stack or lift several large folders at once.
- Handle folded paper objects carefully; the folds may be weak and handling may result in damage.
- Keep rolled objects horizontal; do not place them on end for storage, transport or access.
- Label containers well to encourage proper use of items, for example: fragile, keep flat, this side up, heavy – use two people, etc. Photographic labels can minimize the need for unrolling and handling objects, and can also be used to point out delicate areas.



Above: two people place oversized print on a rigid support board when removing from map case drawer.

Above right: large oversized item protected by rigid board on A-frame.

Right: Large floppy items can be damaged if not properly supported

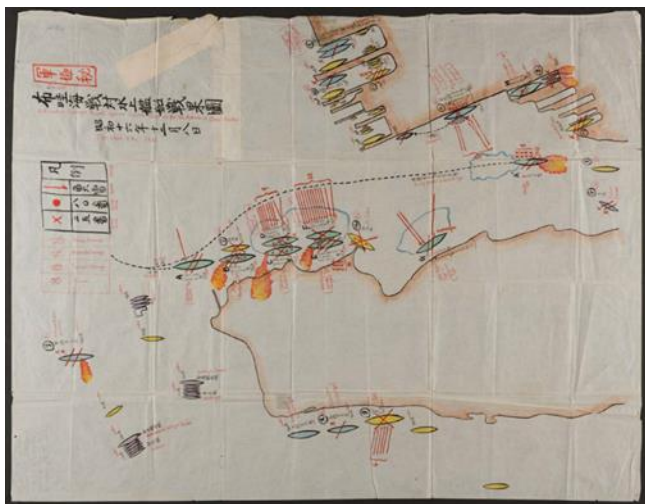
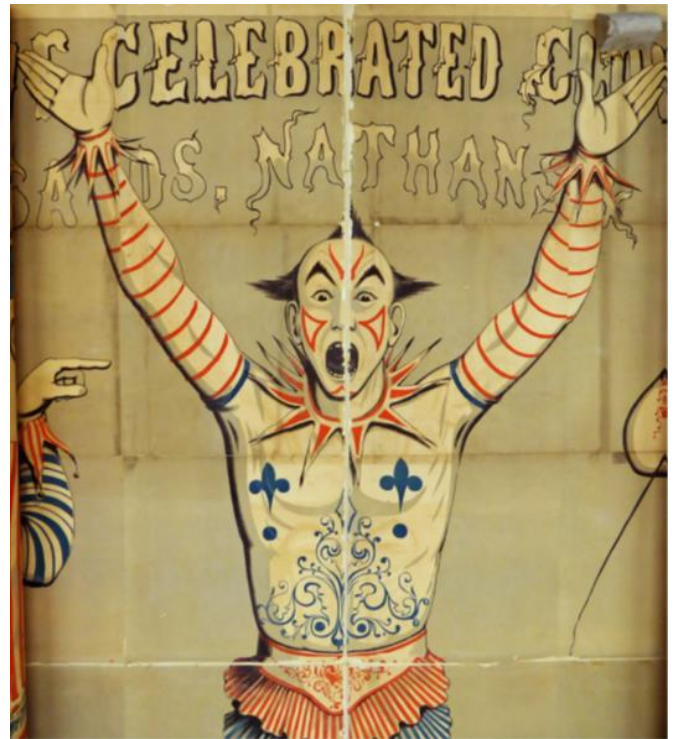


Q: Previous treatment approaches that may impact the condition of oversized materials

A: In the past, backings or linings of heavy paper or cloth have been applied with a variety of adhesives to large paper objects such as maps and oversized posters printed in separate sheets. In more recent times conservators have used thinner tissue linings adhered with starch paste. Trained conservation staff should assess the condition of lined objects, or decide whether to remove or apply linings as every treatment step requires expert consideration based on the condition of the object’s paper support and media.

In many instances tears have been joined using western paper, Asian tissue, fabric strips or pressure sensitive tape. Assessment of these mends should be undertaken by trained conservation staff. Removing old mends can result in substantial damage to an object and therefore should only be performed by trained conservation staff.

New mends should only be applied after careful assessment of the object and applied by trained staff. Mending can cause significant long term damage if incorrectly applied.



Oversized maps and posters may have been taped or lined to join pieces or segments. Only trained conservators should assess condition, develop strategies and execute interventive treatment procedures.

Additional Resources

<https://www.nedcc.org/free-resources/preservation-leaflets/4.-storage-and-handling/4.9-storage-solutions-for-oversized-paper-artifacts>

Some of the following solutions were developed for rolled textile storage but could be adapted for rolled paper objects.

<http://stashc.com/the-publication/containers-2/boxes/creating-a-custom-enclosure-for-oversized-rolled-graphic-recordings/>

<http://stashc.com/the-publication/storage-furniture/racking-systems/adaptive-re-use-of-wood-material-for-hanging-long-and-thin-objects-on-less-utilized-spaces/>

<http://stashc.com/the-publication/supports/tubes/hanging-rolled-textiles-on-underutilized-spaces/>

<http://stashc.com/the-publication/storage-furniture/racking-systems/a-textile-hanging-system-composed-of-readily-available-hardware-materials/>

IFLA PAC Centre Trinidad and Tobago

The National Library and Information System Authority of Trinidad and Tobago (NALIS)

The organisation was established by the NALIS Act No. 18 of 1998 to administer the development and coordination of library and information services in Trinidad and Tobago. Preserving heritage information has always been a core mandate of NALIS.

With the Heritage Library, 24 public libraries (in Trinidad), 4 mobile libraries -- with visits to 140 locations, 4 libraries in correctional institutions and 2 community libraries, NALIS makes library and information service easily accessible to members of the public. Additionally, NALIS has entered into arrangements to provide professional services to 66 special libraries located in government ministries and state agencies, 33 secondary schools, 483 primary schools and 25 ECCE centres. Library services are also provided through the organisation's website at www.nalis.gov.tt and its social media sites.

Expertise

- NALIS has been a sitting member of the **Trinidad and Tobago National Committee of the UNESCO Memory of the World Programme** since its first meeting in 2007. NALIS houses two collections which have been inscribed on the regional and international Memory of the World Registers.
- The Heritage Library helps NALIS fulfil its goal of acquiring, promoting and preserving national heritage information. The **Preservation and Conservation (PAC) Laboratory**, a unit of the Heritage Library, was officially commissioned in July 2013 to help preserve collections to posterity. The PAC Laboratory provides a range of services covering preservation, conservation and consultancy.
- NALIS offers **Preservation Training Outreach** via exhibitions, workshops, lectures and heirloom preservation clinics to raise awareness of the importance of preservation and conservation.
- NALIS provides **Preservation Technical Assistance and Advice** to local and regional institutions, which gain guidance on the long-term care of their library and archival collections.

More about the PAC Centre at NALIS here: <https://www.nalis.gov.tt/Libraries/Heritage-Library/Preservation-and-Conservation-PAC-Laboratory>

Mould and Insects

MOULD

Q: What is mould?

A: Moulds are neither plants nor animals, but fungi which live on and derive their food from dead or living organic matter. There are several species of moulds. They feed on the surface on which they grow (substrate), by secreting digestive enzymes to break down organic compounds into the necessary nutrients for absorption.

Q: How can I distinguish between mould and dust?

A: The fuzzy appearance of heavy dust can often be mistaken as mould. Unlike dust, which tends to rest just on the surface, mould grows into surface of the item. Gravity will cause dust to mostly accumulate on the top of a horizontal surface. If you see a fuzzy spot on the underside of an item, it is more than likely mould rather than dust. Another tell-tale sign is the characteristic musty or earthy smell of mould. Only a microbiological test can conclusively confirm the presence of mould.

Q: What damage can mould cause to my library/archival collection?

A: The digestive enzymes secreted by mould to breakdown their substrate can be very damaging to items of a library/archival collection. Paper, cloth and leather can be irreversibly weakened and stained by mould. Mould can also pose a major health risk to library staff and users.

Q: Can my health be affected by handling mouldy library/archival items?

A: The reactions to mould can vary from person to person and depends on the species of mould, amount of mould, exposure time and an individual's susceptibility to mould. Individuals with allergies, respiratory problems or reduced immune systems should not handle mouldy items. The health effects for even healthy individuals can range from irritation, allergic reaction, toxic response and infection. Take the necessary steps to limit exposure to mould. Effective personal protective equipment (PPE) should be worn when handling mouldy library/archival items.

Q: Are gloves and a dust mask enough protection against mould?

A: For a small-scale mould contamination, the following is recommended as the minimum personal protection:

- For respiratory protection use a N95 or N100 (FFP2 or FFP3 rating) disposable particulate respirator
- Protect your hands with close-fitting vinyl or nitrile gloves
- Wear safety goggles to protect your eyes

For more extensive contamination, full-face respirators and protective clothing with head and boot coverings (e.g. Tyvek® suit) are needed to provide additional protection.

Consult with a health and safety expert for guidance on selecting appropriate PPE.

Q: Is cleaning enough to prevent mould growth in my library/archival collection?

A: Mould is everywhere. It is impossible to completely remove mould spores from our collections.

The most effective strategy is to implement environmental conditions which inhibit mould growth. This strategy can include:

- Reducing mould spores: Limit the amount of spores entering by closing windows and using air-conditioning and filtration.
- Controlling nutrient sources: Dust contains both mould spores and nutrients. So it is important to clean and maintain the collection. An effective housekeeping programme ensures that collections and the surrounding space are regularly cleaned.
- Controlling Moisture: The risk of mould growth on collection items increases from extended exposure to high relative humidity (RH) and depends on the how much water vapour items absorb. Ensure that the dehumidification controls of any air conditioning units keep the RH to below 60%.
- Air Circulation: Maintaining good air circulation helps eliminate pockets of moist stagnant air. Increased air flow also reduces the quantities of mould spores landing on collection items.
- Temperature: Lower temperatures (with low RH) will benefit collections.

Q: Are Lysol®, bleach and other household cleaning agents effective in cleaning mould on books and documents?

A: Though these household cleaning agents are good for sanitizing solid surfaces, they are not recommended for treating library/archival collections. These chemicals can be damaging to the inks, paper, textiles and leather contained in our collections. One effective way to remove inactive dry mould from the surface of the collection item is by vacuuming. Use a vacuum outfitted with a HEPA filter and accessories to prevent recirculation of the mould spores and particles. This best done outdoors or in a fume hood/cupboard designed to capture the mould spores and fragments.

INSECTS

Q: What type of insects are harmful to our library/archival collections?

A: A variety of insects and other pests attack binding materials, adhesives and other substances in library/archival collections. Though some insects feast on the cellulose fibre of paper and board, most are attracted to the added compounds like the adhesives and starches. The most common of insects which attack library/archival materials in a tropical region are:

- Drugstore beetles (often called bookworms, this tiny reddish-brown beetle produces a yellow larva which eats through board and paper);
- Termites (which eat all cellulosic materials beyond wood including paper, binding cloth and board);
- Silverfish; and
- Cockroaches (which both favour starch and items containing starch).

Q: What are the signs of an insect infestation?

A: Early detection of insect presence allows for effective remedial action in safeguarding a library/archive collection. Look for the following signs of insect activity:

- Dead or alive insects;
- Insect parts, wings or frass (droppings, which often matches the colour of the collection item being eaten); and
- Holes, chewing or grazing marks on collection items.

Q: How do I treat with an insect infestation in my library/archive?

A: When an insect infestation is discovered the following steps are recommended:

- Isolate and bag any infested items. This serves to quarantine the items so that other materials of the library/archive will not be affected.
- Decide on a method to treat and clean the infested items. Chemical pesticides or fumigants can cause irreversible damage to collection items. Remnants of the chemicals after treatment can be toxic to persons accessing collection items and spaces. Alternatives to chemical fumigation are considered in Q. 12.
- The items must be monitored after they are treated to ensure that the insects have been eliminated.
- The environmental conditions must be improved by implementing an Integrated Pest Management programme. See Q. 11 for information about IPM strategies.

Q: Are bug traps enough for preventing an infestation in my library/archive?

A: The best defence against pests is to monitor and change the conditions which encourage them to flourish. We can make our library/archive collections pest-free by engaging in activities which create inhospitable conditions for them. While using sticky traps can be useful for monitoring insect presence, it is not a standalone method for controlling and preventing an infestation. These must be used in conjunction with an Integrated Pest

Management programme. Consider implementing the following IPM strategies at your library/archive:

- Improve the building exterior: All windows and doors should be tightly sealed. Doors should not be propped open regularly. Openings around pipes, drains and holes for electrical/telephone cables should be sealed.
- Improve climate control: Insects thrive in temperatures between 20-30°C and in humidity levels between 60-80%RH. Maintain a cool and dry climate to help control insects.
- Check water sources: Regularly inspect pipes and other sources of water in restrooms, kitchens and around air-conditioning equipment. Wrap pipes or vents which 'sweat' with insulating material. Under and around refrigerators and appliances that combine heat and moisture should be regularly cleaned.
- Control food sources: Keep food consumption and preparation areas separate from collection areas. Clean up should be done immediately. All food should be stored in tightly sealed containers or refrigerated. Trash should be removed from the building daily.
- Ensure regular housekeeping: Collection areas should be cleaned routinely and thoroughly. Dust provides an ideal habitat and food source for insects. Regular cleaning and inspection also allows you to look for signs of insect activity.

1. Is it safe to use a bug spray/insecticide to treat my infested library/archival collection?

Traditional chemical insecticides can cause irreversible damage to library/archival items. Remnants of the chemicals after treatment can be toxic to persons accessing collection items and spaces. Given the health and environmental risks of using toxic fumigants, several libraries and archives have considered the following alternatives:

- Freezing: Most paper-based items can be safely frozen. This allows the insects contained in the collection items to be exposed to sub-zero temperatures at which their bodily fluids crystallize. A household or commercial freezer able to maintain a low temperature of -20°C can be used for this process. See (Raphael, 1994) for details of the freezing procedure.
- Modified atmospheres: This insect extermination method replaces the air around the infested item with various inert gases, such as nitrogen, carbon dioxide, or argon. This creates an anoxic (low oxygen) environment which kills insects by suffocation and dehydration over a period of days. See (Burke, 1999) for guidelines on creating anoxic microenvironments.

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IFLA PAC Centre China
The National Library of China

According to the suggestion of the IFLA-PAC China Center, National Library of China began to research and prepare for the China Center in 2003. In 2004, with the approval of the Ministry of Culture, the "China PAC Center" was officially established in National Library of China. The current director of the center is Zhang Zhiqing, the deputy director of the National Library of China.

The main tasks of the China Center are: to improve the public's awareness of the preservation and conservation of books, to establish a communication network, to translate the professional documents of the IFLA-PAC, to participate in the conference of the IFLA-PAC, and to prepare for organizing international conferences in the field of preservation and conservation as conditions permit, to advocate and promote the applying of standards (mainly permanent paper, digitization, microfilming, etc.).

Expertise

- Preservation and conservation of paper-based documents
- Preservation and conservation research
- Development of standards

Microfilming and digitisation

Q: Which department within the China PAC Center is responsible for microfilming?

A: The China National Microfilming Center for Library Resources (CNMCLR) was established in 1985. Its main responsibilities are to formulate the micrographics program of national public libraries, to organize and coordinate the rescue of ancient and other documents in need of long-term preservation and conservation in national public libraries, and to carry out micrographics reproduction, preservation and protection management of the documents in NLC.

CNMCLR has done a lot for the rescue of the precious heritage of China and the promotion of Chinese culture, and it has made remarkable achievements in document rescue program. Since its establishment, CNMCLR has set up 23 microfilm stations, providing hundreds of micro devices to dozens of libraries and thousands of miniatures for free, moreover, more than 2,000 professional and technical personnel were trained in various ways.

Meanwhile, a group of document collating and editing personnel and microfiche technical backbone was cultivated, which has greatly improved the overall level of microfiche technical application in Chinese public libraries. By 2018, CNMCLR had repaired a total of 187,808 kinds of documents, including 32,177 rare ancient books with 18.62 million pages, 5,402 ordinary ancient books with 2.63 million pages, 15,232 periodicals with 18.49 million pages, 2,812 newspapers with 21.31 million pages, and 132,185 Minguo books with 14.92 million pages, with a total of more than 75 million pages.

Q: What is the work concept of the CNMCLR?

A: Based on the principle of "co-construction and sharing", CNMCLR has led more than 20 provincial public libraries to carry out the rescue program of precious documents. To achieve the purpose of document protection and resource sharing, CNMCLR coordinates a great many libraries for resources supplement with other member libraries.

On the one hand, the repeated rescue of documents is avoided through the joint construction of each library, which not only reduces the damage to precious documents, but also saves a lot of resources. On the other hand, each library can share the rescued documents and jointly provide services for users through the sharing of each library on the CNMCLR platform using the microfiche or microfilm document digitization as the medium.

Q: What is Digital microfilming?

With the rapid development of digital technology, literature repair is experiencing new opportunities. Facing the respective advantages of microfilming and digital technology in document rescue, CNMCLR actively explores the transformation and utilization of microfilming technology and digital technology, and puts forward the idea of "digital microfilming" to vigorously develop the technology of conversion between microfilming and digital documents.

The CNMCLR is unique in technical level and processing standards in terms of microform digitization, conversion of digital resources to microfiche, microform shooting and microform copy.

Q: What is the work process for document microfilming?

A: Document microfilming is an important means of document repair and utilization. Its main steps include:

- Traditional microfilming

Traditional microfilming is always an important means of literature repair. Based on microfilming technology, those rare books, ancient books, and other documents can be appropriately saved and kept for a long time. It mainly includes sorting, shooting, processing, film copying and other links.

- Conversion from digital resources to microfilm

By using the digital conversion technology, a great many of special and precious documents and digital resources collected by public libraries and other institutions have been transformed into microfiche for the purpose of long-term preservation. Thanks to the convenience and connectivity of digital conversion technology, heterogeneous backup of digital and paper documents could be operated effectively and efficiently.

- Microfilm digitization

In order to promote the regenerative application of literature rescue results and benefit the society with excellent traditional cultural resources, relying on the national key cultural engineering projects including Preservation & Conservation of Ancient Books, Minguo Documents Preservation, Digital Library Promotion Project, and using the advanced microfilm digital reduction equipment, CNMCLR is able to digitize the 35mm and 16mm films of various types such as archives, ancient books, newspapers and journals.

- Document collection development

Based on the resources collection, CNMCLR has carried out the special collation of ancient books and the Republic of China documents, and has established the working procedure from topic selection, collation and editing to publication and distribution, providing to publishing industry a batch of informative and precious topics that are related to ancient books and Minguo literature, highly-valued and praised by the academic community at home and abroad.

Q: By what process does the CNMCLR coordinate inter-library cooperation in collection reproduction for preservation?

A: In order to maintain the consistency between library's document preservation and development planning and the overall goal programming of CNMCLR, we carried out nationwide special surveys of the libraries' literature collections, and conduct literature rescue work through overall planning. The CNMCLR fully respects the wishes of each library by letting them select the type of literature according to its own collection resources preference, and then report to CNMCLR for approval before moving to the next step.

In order to avoid unnecessary tasks, CNMCLR will eliminate the duplicate literature and make the annual digitisation plan of each library through comparison and screening, according to the type of literature resources of each library.

Q: Why should collection reproduction for preservation combine microfilming and digital archiving?

A: Since its establishment in 1985, CNMCLR has been using traditional microfilm as the principal document rescue measure, forming an organizational structure, standards, technical force and talent reserve. However, with the rapid development of science and technology, the long-term preservation of digital resources has gradually become a major concern.

With the help of digital archiving technology, the original or regenerated digital images can be converted to microfiche, so that the advantages of long-term preservation of microfiche and those of convenience of digital information can be deeply combined, so as to achieve long-term preservation and heterogeneous preservation of digital documents.

Up to now, a number of public libraries have been carrying out the work of converting digital resources into microfiche through digital archiving under the leadership of the CNMCLR. In 2019, the total amount of microfilming and digital archiving resources construction in CNMCLR is more than 2.2 million. At present, the documents being repaired by CNMCLR cover many fields, such as rare ancient books, Minguo documents, and documents after the founding People's Republic of China. By combining microfilming with digital archiving, the way to construct microform document resources becomes more abundant and diversified.

Q: How can a literature service structure combine access and discovery with preservation?

A: At the same time when devoting effort to digitisation for document conservation, CNMCLR is also actively developing and utilizing microform. By digitalizing the microfiche of the NLC's rare books, Minguo books and periodicals, CNMCLR has been providing more convenient access for readers to browse online.

According to the catalogue of microfilm documents that have been photographed, CNMCLR has completed the full bibliographic data production of more than 30,000 rare books, more than 10,000 journals and more than 2000 newspapers, established a bibliographic database of rare books, journals and newspapers, and has successively published The Catalogue of Chinese Newspaper Microforms from 1861 to 1949, The Catalogue of Chinese Journal Microforms from 1833 to 1949, and The Joint Catalogue of Microforms in National-wide Public Libraries.

Furthermore, CNMCLR has photocopied the microfilmed documents into more than 300 series of books, which are well received by academic community, library field and teaching and research units at home and abroad.

Q: How does CNMCLR implement a system that guarantees personnel training and technical support?

A: To ensure it is possible for each member library to complete necessary literature microfilming work, the CNMCLR purchases microfilming products in a centralized way every year and allocates them according to the needs and plans of each library.

To train the staff of both the Document Rescue Cooperation Units and internal staff, and to continuing improving the technical ability and professional skill level of the employees, CNMCLR offers on-site guidance, telephone support, and training courses at least once a year.

The CNMCLR provides technical support for each member library. When any member library confronts technical problems that cannot be solved independently, CNMCLR will arrange professional technical personnel to help the member library solve the problems by telephone or through on-site guidance.

CNMCLR is responsible for equipment maintenance and repair. In order to adapt to the new situation of the literature repair work, CNMCLR continuously organizes technical interventions to transform and innovate the existing equipment.

Q: How does CNMCLR protect the master negative after rare and endangered documents and books have been microfilmed?

A: The National Original Films Storage is managed by CNMCLR, and a large number of miniature original films of rare and endangered documents are preserved here. In order to protect these precious cultural heritages of China, the staff first inspected the appearance and packaging, clear dust and dirt, examine readability, chemical residue and water content of the miniature original films, and the qualified items will be stored in the National Original Films Storage. The original films and the copies are stored in separate locations.

The National Original Films Storage is located far away from harmful gas sources, water supply and drainage pipes, and set up in an exclusive, self-contained area. It is equipped with independent air conditioning system, temperature and humidity monitoring system, air purification and ventilation system.

The requirements for insect and vermin prevention of the warehouse condition shall comply with the relevant provisions of JGJ 38-1999 Code for Design of Library Buildings. The temperature and humidity of the warehouse shall comply with the relevant provisions of GB / T 15737-2014 Development. and Preservation of Silver Gelatine Microforms by Microphotography.

Specially assigned staff manage the storage in accordance with the Management Measures for the National Original Films Storage of the CNMCLR, and regular spot check and inspection are conducted to effectively guarantee the safety of the National Original Films Storage.

Q: What are some examples of the role CNMCLR plays in the preservation and protection of precious ancient books and documents of the Republic of China?

A: Document repair

By 2018, a total of 187,808 kinds of documents were rescued, including 32,177 kinds of rare ancient books, 18.62 million pages, 5,402 kinds of ordinary ancient books, 2.63 million pages, 15,232 kinds of periodicals, 18.49 million pages, 2,812 kinds of newspapers, 21.31 million pages, 132,185 kinds of Minguo books, 14.92 million pages, more than 75 million pages in total. Now that at least 20% of the repaired documents that cannot be read directly deal to the aging of paper and the damage of the carrier. Therefore, the carrier form of the microform should be used to preserve the document information completely.

Collection development and access

By 2018, CNMCLR has completed the microfilm digitization work of 17,000 kinds and more than 9 million pages of rare books microfilms, 4,000 kinds and 9 million pages of journal microfilms, 96,000 kinds and more than 20 million pages of Minguo book microfilms. At the same time, CNMCLR has carried on the construction of Minguo bibliography database. By 2018, nearly 30,000 kinds Minguo bibliography data of member libraries have been constructed, and the database is currently under internal trial operation.

Document organization and utilization

In 2015, The Joint Catalogue of Microforms in National-wide Public Libraries was compiled and published by the member libraries of CNMCLR, including more than 140,000 kinds of documents microfilms produced in various forms by June 2013, with more than 30,000 kinds of ancient books and 85,000 kinds of Minguo books. Meanwhile, through the Revolutionary Literature and Minguo Documents Preservation Project and other related programs, CNMCLR has cooperated with other institutions, to photocopy and publish microfilms of various kinds of ancient books and Minguo documents. Up to now, the number microfilms has reached more than 300 kinds (series), which have been unanimously recognized by the academic community and society.

Q: What are some methods of providing access to microfilms to the public and why is it valuable?

A: By providing remote access to microfilm digitization achievements.

- Based on the digitization of microfilms, NLC has established a number of databases for readers to browse and consult online, such as the digital Rare Book database (Chinese Ancient Book Resource database), Minguo Book database, and Minguo Journal database. The microfilm digital resources photographed by NLC account for more than half of the published resources of the Digital Library of Chinese ancient books built by the Center for Preservation & Conservation of Ancient Books. Microfilm digitization ensures that readers can get a user-friendly access to all kinds of valuable documents remotely in a more conveniently way.

By offering a free microfilm reading room that is open to the public.

- The microfilm reading room opens to the public free-of-charge for every reader to browse microfilms. The microfilms or microfiches collection range includes all kinds of rare books, common ancient books, local records, Minguo documents, as well as foreign doctoral dissertation, Japanese government publications, declassified materials of the British and American government, early works of missionaries to China, publications published by the west involved China before 1850, dictionaries and biographies. Microfilms constitute a multi-level service system that not only focusing on domestic and foreign scholars' research and learning, but also devotes to the cultivation of readers' common knowledge.

By offering photocopy publishing for the academic field and the public

- Over the years, CNMCLR deeply research, select literature topics, and actively explore a variety of publishing cooperation models with publishers. Every year, CNMCLR innovates and continuously promotes a number of ancient books and Minguo documents photocopying publishing plans, and it has achieved the effect of serialization, standardization and branding. In the academic and publishing circles, photocopy books with the participation of CNMCLR have become an important kind of publication that

have been unanimously praised and widely recognized, and have become an indispensable object in the academic and social fields in terms research and reading.

Reference services for professional scholars and institutions

- Relying on the resource and technical advantages accumulated over many years, CNMCLR is unique in literature consultation and provision. It has provided a large number of microfilms, digital and paper-based precious literature for libraries, research institutions and ordinary readers at home and abroad, which effectively complemented the collection of libraries, and provided valuable reference resources for research institutions.

Q: How does CNMCLR communicate and cooperate with domestic and foreign units ?

A: While carrying out the rescue, preservation, development and utilization program, CNMCLR also actively implements resource sharing and provides collaborative services to university libraries, scientific research institute libraries and archives at all levels, and constantly explores and establishes cooperation mechanisms.

Furthermore, relying on the China association of document imaging, CNMCLR has undertaken a lot of social work and organized experts and scholars to Taiwan for many times with the Society of Chinese Archives to promote cross-strait archival and microphotograph academic exchange. Peers in Taiwan actively paid return visits, which strengthened the contact and communication in the microphotograph field; at the same time, the investigation and visit of microphotograph technology and learning and training at home and abroad, has created a good social atmosphere for the development of China's microfilming enterprise.

Q: How does CNMCLR work on standardisation to improve the working level of microfilming?

A: The China National Standardization for Documentary Imaging Technology Committee is responsible for the centralized management of standardisation technology in the field of microphotography technology and electronic image technology in China.

CNMCLR has served as the secretariat unit since the establishment of the China National Standardization for Documentary Imaging Technology Committee for more than 30 years ago. In this role, CNMCLR has organized and coordinated members and experts in different fields such as archives, government agencies, enterprises and institutions, colleges and universities to develop standardization work.

At present, 76 national standards have been officially issued, playing a positive role in improving the standardization level of China's microfilming technology. At the same time, as the domestic counterpart of ISO/TC 171 Document Management Applications, China National Standardization for Documentary Imaging Technology Committee visited Europe, America, Japan and other countries and regions for many times to participate in the annual meeting of ISO / TC 171, and participated in the preparation and revision of international standards.

Q: What is the content range of collected microforms at the National Library of China?

A: The National Library of China builds microfiche collections by means of microfiche photography, whose content covers rare books, common ancient books, Minguo

documents, newspapers on early ages of People's Republic of China, modern newspapers, periodicals, and more. The collection is rich in content and comprehensive in variety.

In addition, microform materials are also constructed by means of outsourcing, including Chinese newspapers and magazines, Minguo books, Japanese government publications, materials declassified by the British and American governments and early works of missionaries coming to China, publications involved China published by the west before 1850, dictionaries and biographies.