STATE LIBRARY
QUEENSLAND

Caring for your collections:
Paper-based collections

This leaflet covers the care of unbound paper-based collections. Material in this category encompasses works of art on paper (e.g. prints, watercolours, charcoal, pastels, pen and ink and pencil drawings) and archival and family history material (e.g. certificates, newspapers, maps, letters, and land deeds).

Materials

There are many different types of materials used in the creation of paper-based collections however most objects consist of three basic components.

- **The paper support** - The essential ingredient in most paper is cellulose fibre. The quality of the support is one of the main factors of paper longevity. Objects created on paper made from 100% cotton fibre will last considerably longer than an item with a low cotton fibre content and higher percentage of wood pulp. Newspaper and paperbacks are examples of poor quality wood pulp paper.
- **The sizing medium** - Often the surface of paper is coated with gelatine, plant gums or starches to make the paper less porous and thus more suitable for use with media such as inks and watercolours. This process is known as sizing. Unsized paper (e.g. blotting paper and newspaper) is highly porous and absorbent and will cause media to bleed. Certain hardening agents such as alum (potassium aluminium sulphate) found in some gelatine sized papers have proven to be detrimental to paper stability.
- **The media -** The media used covers a wide range of materials. The most common materials for works of art on paper are acrylic emulsions, pencil, charcoal, pastels, watercolour, pen and ink, oil-based printing inks, and oil paint. In archival collections, you are more likely to come across pencil, felt pen, and biro as well as a variety of writing and printing inks. Iron gall ink was a common brown, black writing ink dating from medieval period through to the Second World War (1940s). It is a very acidic ink and over time can 'burn' through the paper support.

What causes damage?

- All materials used in creating works on paper are subject to some form of deterioration. Even the materials of the highest quality, organic and inorganic are susceptible to the effects of ageing. The long-term stability of an object relies greatly upon the inherent quality of the materials used in their creation. Along with control of environmental factors, the selection of good quality materials is the most effective way of ensuring maximum longevity of an object.
- The most stable type of paper is made of cotton, hemp, or linen fibres. Prior to the nineteenth century, all paper was handmade from cotton, hemp, linen, or mulberry fibres. Unfortunately, most paper used today is machine made from wood pulp with very limited to no cotton fibres. The lignin in wood pulp reacts easily with moisture, heat, and light causing the paper to become discoloured and brittle. Old paperbacks and newspapers provide graphic examples of material with high lignin content.
- The type of media used on paper can also affect its stability. Iron gall ink, a brown ink which was used prolifically for centuries, degrades quickly releasing sulphuric acid. As sulphuric acid is very corrosive, the paper support is eaten away particularly in areas where ink has been heavily applied. Many collections throughout the world contain

objects such as documents, ink drawings, and illuminated manuscripts in poor condition as a result of the deterioration of iron gall inks.

- Storage furniture, shelving, boxes, and other storage materials are also significant factors in the stability of collections. Inappropriate materials such as wood can produce harmful levels of acidity or emit volatile organic compounds (VOCs) such as formaldehyde and peroxides.
- The use of 'archival' quality enclosures is recommended. Unfortunately, there is no Australian standard for the sale of archival material and many enclosures and papers claiming to be archival or 'acid-free' are not safe for your collections.
- Materials are normally considered archival if their pH is neutral or slightly alkaline (i.e. pH 7 - 8.5). Ideally, board or paper should contain a very low level of lignin. Some material is chemically treated wood pulp, which has a high lignin content, but the pH may be within the desired range. This type of material should be used with caution as over time the lignin within the board will react with surrounding conditions and eventually become acidic. Always ask for specifications before buying, and if in doubt consult a conservator.

Heat and Moisture

- Extremes and fluctuations in temperature and relative humidity can cause significant damage to paper-based collections.
- Damp, humid conditions will cause paper to cockle (i.e. wrinkle) as well as encourage pest and mould activity. High temperatures accelerate chemical deterioration.
- If conditions are too dry, paper will become brittle and weak, causing tearing and cracking.

Light

- Light is another potential cause of damage to your paper-based collections. Light fades inks, dyes and pigments. It also speeds up chemical deterioration. The ultraviolet (UV) and intensity of visible light (LUX) are responsible for much of the damage. Sunlight and fluorescent lights are strong sources of UV and visible light.
- Watercolours and blueprints are particularly susceptible to light damage and should be displayed in dim areas free from direct sources of light.

Pests and Mould

- Mould, insects, and rodents can cause irreparable damage to your collections.
- Silverfish and cockroaches are particularly partial to paper-based objects. Silverfish can decimate whole areas of a paper object and only graze in other areas. They tend to concentrate on non-image areas of prints and watercolours. Cockroach damage is characterised by ragged chewed edges and faeces stains, which can permanently discolour the paper.
- Warm, humid, dirty conditions, darkness, and poor air circulation provide the ideal environment for mould and insect activity.

Atmospheric Pollutants

- Air pollution in the form of oxidant, acidic, and sulphating gases attack all components of paper collections causing dyes and pigments to fade and paper to become brittle. Nitrogen oxides and ozone cause considerable damage.

- Airborne particulate matter such as soot and ash particles from manufacturing processes may be greasy, abrasive, and chemically or biologically active. This can settle on objects causing staining and abrasion.
- Off-gassing from wood, wood-based products, paints, and varnishes can affect the stability of paper objects.

What you can do

The most important thing you can do to preserve your collections is to create a stable storage environment. There are a number of aspects involved in achieving this, including climate control, appropriate storage furniture, enclosures, and general collection maintenance procedures.

Storage environment

Temperature & humidity

- Institutions with large collections tend to focus on specific environmental set points (e.g. for paper-based collections it is usually 21°C (+/- 1 °) and 50% (+/- 5%) relative humidity (RH). Refer to the Australian Institute for Conservation of Cultural Materials (AICCM) Environmental Guidelines.
- Air-conditioning units capable of controlling humidity and able to run constantly are an effective way of minimising climatic fluctuations, but as most units are costly to install and maintain, they are often impractical for small collections. Damage can be caused by turning units on and off each day as it creates dramatic changes in conditions.
- Alternate solutions to climate control can be achieved with passive environmental techniques.
- In non-air-conditioned collections, the prevention of fluctuating conditions is more important than the maintenance of specific levels. If you can keep a room stable at a higher temperature and humidity level, it causes less damage than trying to maintain cooler conditions unsuccessfully.
- Locate collection storage and display areas away from outside walls to minimise the impact of radiant heat, extreme temperatures and RH fluctuations. This will also prevent exposure to direct light.
- Choose a well-insulated room away from sources of moisture, heat, and direct light (i.e. avoid kitchens, bathrooms, and areas near heating systems and water pipes).
- If you are unsure where the most stable climate in your house or institution is located, affordable equipment is available to measure temperature and relative humidity. If checked regularly, a standard thermometer and humidity indicator cards are the simplest and most economical way to monitor conditions. Humidity indicator cards are available from a number of conservation suppliers (refer to our guide *Suppliers and guide to selecting preservation materials*). This guide can be found on our website at this link - How to guides. There are also electronic hygrometer/thermometers available from electronic stores that have a minimum-maximum temperature/humidity memory. You can keep a weekly record of readings to log and observe seasonal trends. Climatic averages for your area can be obtained from the Bureau of Meteorology's website www.bom.gov.au.
- Effective ventilation within the storage area will assist in maintaining stable conditions by cooling the area and preventing stagnant air pockets. If ventilation is poor, there is a greater risk of insect and mould activity.

- Opening windows on good weather days will allow additional ventilation and may assist in cooling however the possibility of introducing additional airborne pollutants may occur.
- The use of fans can improve air movement.

Air Pollution

- Air quality within storage and display areas is another important factor in creating a stable environment.
- If air-conditioning is used, ensure there is provision of good air exchange in areas where collections are stored or used, with replacement air filtered and as clean as possible. Care should be taken to ensure that the air intake vents are not located near sources of heavy pollution such as loading docks where trucks idle.
- Air conditioning units should contain the appropriate filters for both gaseous and particulate pollutants.
- Check what pollutants are present in your area to ascertain the potential risks.
- Even without air-conditioning, simple steps can be taken to reduce the risk of pollution.
- Placing collections in storage boxes and plan cabinets will provide some physical protection from airborne pollutants.
- Eliminate or reduce internal sources of pollution such as photocopiers, certain types of construction materials, paints, sealants, cleaning compounds, furniture, and carpets.
- Ensure storage areas are regularly cleaned to prevent dust build-up.
- Good ventilation will prevent build-up of gaseous pollutants.

Light

- To prevent UV and visible light damage, material should be stored or displayed in areas away from direct light. Fluorescent tubes should be covered with UV-absorbing covers or ideally replaced with non-UV emitting tubes.
- Visible light levels for paper-based collections should be kept at a maximum 50 lux. This is particularly important if you are displaying material. Light damage is cumulative so avoid displaying material for long periods. If you do want to display an object for a prolonged time, it is advisable to duplicate and display a copy.
- The use of curtains or blinds can assist in minimising light levels.
- Be cautious when photocopying or scanning documents. Constant exposure to intense light levels can cause significant fading of inks. It is advisable to only copy an object once and then use the copy if further duplication required.

Pests and Mould

- Good housekeeping is essential for deterring mould and pest activity. Keep storage and display areas clean and uncluttered. Screening windows and doors will help keep out larger pests. The use of sticky traps will allow you to assess the extent and type of pest activity in your storage area, for further details refer to the *Pest management* guide. This guide can be found on our website at this link - How to guides.
- Implement an “Integrated Pest Management” (IPM) programme. This is the general term used for a pest management programme that focuses on preventive techniques to minimise food, moisture, and environmental conditions required for pest survival. The use of pesticides is minimal.
- Regularly check collections for early signs of infestation or mould activity particularly during wet, humid weather.

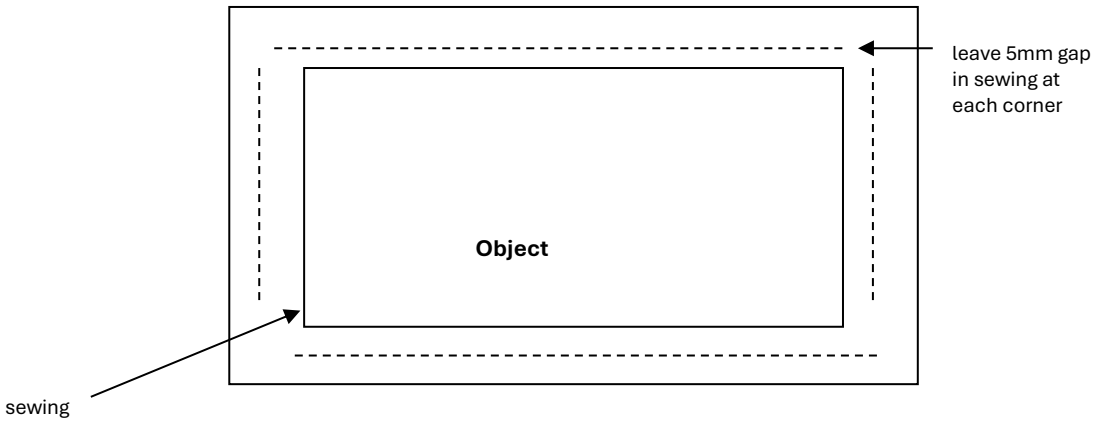
- If mould or pest activity is found, isolate area and follow the instructions outlined in our guide *Dealing with mould* or *Freezing water damaged and insect infested collections*. These guides can be found on our website at this link - How to guides.
- Eating and drinking in areas where collections are stored and displayed should be prohibited to prevent pests from being tempted by scraps.
- Floors, shelves, boxes, and cabinets should be cleaned on a regular basis as both pests and mould thrive in dusty, dirty environments.
- Avoid storing collection materials on the floor where they are more at risk to damage by insects, rodents, or water leaks.
- It is strongly recommended that organisations or individuals with collections, large or small, implement a disaster plan. This should cover all hazards, (e.g. water leaks, fire, and cyclones), that pose a reasonable threat to collections.

Storage Methods

- Once you have chosen a well-insulated, ventilated storage space and environment, it is important to ensure your objects are housed in safe storage enclosures.
- Proper storage can assist in keeping collections clean and dust free as well as providing insulation from ambient conditions. It's a good idea to provide several layers of protection to maximise this insulation.
- Firstly, place objects into individual enclosures then into good quality storage boxes, map cabinets, or frames. Caution must be used when selecting storage furniture as some materials such as wood can adversely affect materials.
- It is best to store objects flat. Folding will cause creasing and tearing. Vertical storage is not recommended unless works are appropriately supported, mounted or framed.
- ***Never laminate objects***. This process is damaging and irreversible.
- A safe alternative to laminating is to store objects in clear, chemically stable polyester mylar or polypropylene sleeves or in acid-free, lignin-free paper or board folders.
- PVC (polyvinylchloride) and low-grade polyethylene plastic sleeves are not suitable as they are poor quality and contain harmful additives. If plastic smells like plastic, then do not use it. Avoid plastic with UV filtering or anti-static agents.
- If you live in an area of high humidity, plastic enclosures are not recommended unless you can control humidity levels. Problems with moisture build-up and subsequent mould growth inside the enclosures can occur. Paper enclosures are more suitable as they allow sufficient airflow to prevent this problem.
- Polyester and plastic enclosures are not suitable for friable media such as pastel, charcoal, chalk, pencil, and gouache. These mediums can be lifted off their paper supports by the electrostatic charge produced by polyester.
- This type of friable media should be placed in a conservation grade mount or individual folder or box.
- Paper or board sleeves, folders, and envelopes can be made from of acid-free, lignin-free material.
- Ideally, artworks should be stored in 100% cellulose fibre mount board mats particularly if the object is to be displayed.
- Avoid storing objects in tea chests, trunks and tucked away in cupboards. This practice causes the build-up of harmful pollutants. The chances of insect and mould activity are also increased in poorly ventilated areas.

A simple encapsulation method:

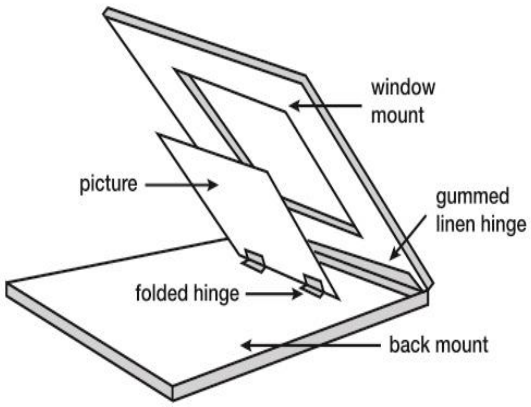
- Place two equally sized sheets of uncoated polyester (Mylar) together, cut slightly bigger than the work being encapsulated (approx. 2cm larger on all sides).
- If an object is fragile, it is a good idea to place a sheet of buffered (pH 8.5) archival paper or light card behind the object before encapsulating. This provides additional support.
- Keeping the sheets firmly together, punch sewing holes approximately 5mm in from the perimeter edges with an awl or large needle.
- Allowing 5mm gaps at each corner to allow air movement, hand sew the remaining edges using strong nylon or linen thread. If practical, sew three sides before inserting the object.
- By leaving one side unsewn (preferably a longer edge), you can create a sleeve that allows objects to be removed as required.
- If you have a strong needle on your sewing machine, the sleeve can also be sewn on the machine.

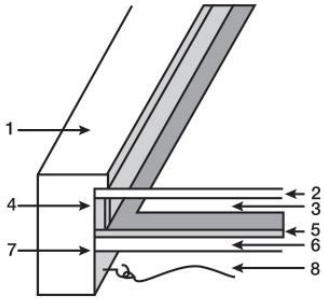


Conservation Framing

- If mounting flat paper objects such as watercolours, photographic prints, maps, and plans use archival quality mat board and protect the object with a window mat. A mat prevents direct contact with the glazing material (see diagram below, illustrating archival matting and framing structure).
- Use buffered 100% cotton fibre/rag museum board. Photographic material should be mounted on unbuffered board. Insist your framer use appropriate materials and techniques. Material should not be dry mounted as many adhesive sprays are acidic and can badly stain objects. The safest mounting option is to use archival (polyester or polypropylene) photo corners, or hinges made of Japanese paper attaching them with a dryish wheat starch paste.
- Glazing can be glass or acrylic. Glass is preferred for friable media such as pastel and charcoal, basic acrylic glazing creates static which can lift media from the paper. Museum grade, anti-static acrylic glazing is available at most good framers.
- Avoid using unseasoned wooden frames as they can produce peroxides.

- If practicable, copy or reproduce valuable or light sensitive material. Display duplicates and place the original material into appropriate storage enclosures.





1 frame
2 glassing
3 art
4 fillet
5 mat board
6 backing board
7 brad
8 wire and screw-eye

Handling

- Careless handling is one of the most common causes of damage to collections. For example, when moving a paper object, particularly if it is fragile or brittle, always support it from the bottom. It is a good idea to slide a piece of board underneath for extra support.
- Never eat or drink near your collection.
- Never write on objects with felt pens or biros. They can bleed, causing staining. Any inscriptions should be in soft pencil (e.g. 4B).
- Avoid the use of paper clips, rubber bands, adhesive tape, and Post-it® notes.
- Metallic clips can leave rust marks on the paper surface. Post-it® notes and sticky tape tend to leave a damaging adhesive residue.
- Always handle objects with clean hands or cotton or nitrile gloves. Make sure when wearing gloves that you can safely turn pages without it being too clumsy.
- If an object is going to be accessed regularly, it is advisable to make a copy instead of constantly handling the original. All copying processes will expose objects to handling and light. Duplication methods will depend on the type of object. Scanning and photocopying are most common. Guidelines for safe copying are available on request.

Useful Websites

- *AICCM Australian Institute for Conservation of Cultural Material* www.aiccm.org.au
- *AIC American Institute for Conservation* https://www.culturalheritage.org/
- Find a conservator in private practice through the Australian Institute for Conservation of Cultural Material (AICCM) https://www.aiccm.org.au/need-a-conservator

The procedures described here have been used by State Library of Queensland in the care of its collections and are considered suitable by State Library as described; however, State Library will not be responsible for damage to your collections should damage result from the use of these procedures

Need further information?

(07) 3840 7810 | http://www.slq.qld.gov.au/preservation

Queensland Government