

Training Workshop Notes

Preservation & Conservation of Local Museum Collections

Tasmania, April 2013

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INTRODUCTION

Preservation of collections is not as technical or difficult as some may imagine. Most actions are simple and inexpensive and can ensure the long term preservation of collection materials. The following pages detail general tips to help in the preservation of your collection materials.

THE STORAGE ENVIRONMENT

- **Collections should be kept in a clean cool place with low light levels** to ensure they last as long as possible
- **A comfortable temperature and humidity should be maintained.** 20°C and 50% RH for all paper based materials.
- **Light** speeds up the aging of paper by weakening the paper fibres and causing brittleness, discolouration and fading of media.
 - Close blinds in dedicated storage areas
 - Don't house items in direct sunlight
 - Turn lights off when not in an area
- **Food and Drink** should never come close to collection materials as they can stain paper and increase the risk of pest infestation.
- **Insects and rodents** such as silverfish, cockroaches and mice should be reported and dealt with as soon as they are discovered.
- **Water Leaks or other potential disasters** should be reported and dealt with as they are discovered.

HANDLING AND USE OF COLLECTION MATERIALS

- **Wash your hands frequently** as they should always be kept clean while touching and handling paper. Skin oils, perspiration and soiling will stain paper.
- **Discourage wet fingers for turning pages.** Old or brittle papers can be damaged or stained by even slight moisture.
- **Latex gloves** can be worn when handling fragile materials. These prevent staining by body oils and moisture.
- **Use a clean dedicated workspace:** Keep items flat on the work surface. Ensure plenty of clean workspace is available.
- **Use supports.** Rare, fragile and tightly bound collection items such as scrapbooks can be laid open on supports to reduce the risk of spine damage. Ensure plenty of supports are available for use.
- **Never use collection items as a writing surface.** Ensure your workspace can accommodate the collection material and your other work materials.
- **Always lift, never drag** items across surfaces.
- **Take care where materials are brittle or tightly packed.**
 - **Use both hands** and carry or move only one object at a time.

- **Only use pencils** when working with library materials. Pencil marks are reversible, inks are not.
- **Only use acid free materials** for marking or interleaving pages. Poor quality interleaving and slips can contribute to the long-term deterioration of collection items.
- **Never allow food and drink, vases of flowers, plants** and any other item that may decompose or attract insects or rodents near collection materials.
- **Always maintain a designated 'storage' area for collection materials whilst in use.** This will prevent collection materials becoming piled up on desks or mixed up with other working papers and files and reduce the risk of loss or damage.
- **Ensure security is maintained when dealing with clients.** Ensure bags are secured or not taken into study areas. Ensure clients are not left unsupervised.

- **Take care with dog-eared paper corners.** If the paper is brittle do not flatten them unnecessarily. If the paper is not brittle they can be opened flat with an appropriate thin spatula.

PHOTOCOPYING, DIGITISING AND SCANNING

Photocopying, digitising and scanning can be a major cause of damage to collection materials.

- **Don't press down too heavily** on the spines of bound items while photocopying.
- **Take extra care with old, brittle, large and heavy bound items.** Ensure pages are supported. Ask for assistance if items are large and awkward.
- **Assess each item for its condition before copying.** Some items may be too fragile to photocopy. Other copying options may need to be used.
- **Never use the document feeder to copy collection materials.** The risk of creasing, tearing and becoming stuck is very high.
- **Use copiers in a careful, slow manner** to ensure fragile sheets are not damaged.
- **Do not bend bindings and spines back in an effort to obtain a flat copy.** Bindings and spines can be easily damaged this way. Use other copying options if necessary
- **Take care with temperature build-up and length of exposure to high light levels** for light sensitive and fragile items.

STORAGE

- **Remove all unnecessary metal clips, fasteners, pins and staples.** Rust stains and holes will eventually result if these are left in place.
- **Metal clips can be replaced** with plastic clips or cotton string binders as well as acid free pockets and containers.
- **Rubber bands should also be removed** as they degrade and will cause tearing and staining.

- **Do not overfill or underfill storage boxes and containers.** Overfilling will cramp and crease papers and underfilling will allow sagging and bending.
- **Fillers made of acid free materials** can be used to fill partially used containers.
- **Items that have extra materials such as discs and pamphlets** with them should be housed in plastic bags or have some means of keeping them together.

BOOKS AND OTHER BOUND ITEMS

- **Bound items that are not oversize** can be supported upright on shelves by other books or bookends.
- **Bound items left leaning on shelves can become distorted and broken.** Ensure they are supported upright.
- **Oversize bound items and broadsheets** should be stored flat on shelves or in cabinets. Don't stack them too high.
- **House items in individual storage boxes.** These will support and protect collection materials and encourage careful use.
- **Don't overcrowd shelves and cabinets.** Materials should slide easily out of and into shelves, cabinets and boxes without force. Make space if they don't.
- **Take care with moving shelves, drawers and compactus.** Make sure material in moving units is not protruding, overfilled or likely to fall from shelves during movement.
- **Remove bound items from shelves drawers and boxes carefully.** Never remove them by pulling at the top of the spine. Spine tops are very fragile and can tear and break easily.
- **Wash your hands frequently.** Hands should **always** be kept clean and dry while touching paper. Both skin oil and perspiration stain paper. Cotton gloves can be used, but might be too clumsy to handle fragile material.
- **Wet fingers should not be used to turn pages**
- When working with any library materials **provide yourself with plenty of clean work space** and keep them on the table, not held in your hands. Rare or tightly bound books should be laid open on a book support.
- **Never** lean on books or documents for a writing surface. Use pencil when you are working with library materials.
- If essential notes, such as call numbers, need to be made in a book, use a soft lead pencil (e.g. HB or B).
- If pages of books and other items must be marked use acid-free paper strips available from Preservation Services. Do **not** fold the corners of pages or use printed, coloured or adhesive paper, such as "post-it" self-adhesive notes.

SCRAPBOOKS

Scrapbooks are generally a compilation of poor quality materials papers. (Papers, tapes, glues, pins, etc.) and need special care and handling to ensure their preservation.

- **Always store scrapbooks flat in individual boxes.** Boxes can be individually made to suit the dimensions of the scrapbook or generic boxes can be padded out with acid free tissue and/or Ethafoam blocks wrapped in acid free tissue.
- **Transport scrapbooks in their storage container** ensuring they are kept flat.
- **Where the scrapbook clippings are poor quality and are affecting materials on facing pages:** Acid free tissue interleaving should be used. Take care not to use too much interleaving as it may bulk out the pages too much and put pressure on the spine.

PAMPHLETS

- **Pamphlets can be easily lost on shelves because they are generally small.** Always house them in folders or boxes.
- **Place individual pamphlets in acid free pockets or bags, then into solid boxes on shelves.**
- **If placed in an open pamphlet box they can become sagged, squashed and crushed.** Fill any spaces around pamphlets with an inert material such as acid free tissue wrapped Styrofoam, bubble wrap plastic or acid free boards to prevent sagging and other damage.

SINGLE SHEET MATERIAL

- **Single sheet material is best stored flat in acid free folders or boxes** but may be stored upright in a folder or bag with appropriate support to prevent sagging.
- **If they are used and handled frequently** they should be housed in transparent pockets or folders to allow use without removal from their housing.
- **Use folders to transport single sheet material** and ensure it is kept flat unless it is supported within another container such as an archive box.

LARGE SHEET MATERIAL

- **Store large sheet material flat in acid free folders in shallow map cabinet drawers.** Do not over fill drawers as this can result in crushing as the drawer is opened or closed.

- **Do not fold any item**, as it will be weakened and eventually break along the fold line.
- **Extra large materials can be rolled but not tightly.** Roll in the outside of a 10cm diameter tube covered with acid free paper as a support.
- **Take care with unrolling rolled items.** Use appropriate weights to hold the open end down as you are unrolling.
- **Always transport large items supported in folders.** Ask for assistance where an item is too large or awkward to handle safely on your own.

SPECIFIC PRESERVATION ISSUES

Collections usually contain materials that may require more specific care and treatment. This section offers some advice to help with photographic materials, repair tapes, glues, and dealing with water damage.

THE PHOTOGRAPH ALBUM

Traditionally, the album has been the most popular way of organising and sorting personal collections of photographs and other memorabilia. Very often older family album collections which are passed down through several generations end up the worse for wear. They will have been subjected to inappropriate and excessive handling, accidental water stains, mould, insect damage, general dirt and dust. Even the type of album may be endangering the life of the photos in it.

If you have a collection of photos that you are planning to assemble in an album as part of your family history, here are some tips for good assembly and storage ensuring the album will be around for many years.

Some simple preservation tips

- Try to handle prints and negatives along the edges, with clean hands.
- Do not use paper clips, rubber bands, sticky tape, glues or rubber cement on your photographs.
- Try not to write on photographs; rather, put information on the enclosure or album page. Felt-tip pens and ball point pens should not be used because they may 'bleed' through and stain. If you have to write on a photo, use a soft (2B) pencil or a 'writes on anything' pencil (e.g. Chinagraph or All-Stabilo pencil) and pressing lightly, write on the back along the edge.
- Don't use albums with 'magnetic' pages (i.e. pages coated with a sticky adhesive with a removable plastic cover sheet). Over time the adhesive goes yellow and hardens, so the photo can't be taken out. The plastic cover sheet is also damaging, because it is made of a poor quality plastic (PVC or vinyl). As the plastic gets old it can stick to the front of the photo and also affect the colour of the photo.

- Good quality plastic enclosures are one of the best ways to keep photos in an album. The bound albums with pages of several slip-in sleeves are very good. Try to find out the type of plastic the sleeves are made of - it should only be polyethylene, polyester or polypropylene - again avoid PVC.
- Another acceptable method is to use good quality plastic sleeves in a ring-binder. There are commercially available A4-size sleeves, made of polypropylene or polyethylene, divided into 2 or 4 sections to accommodate most photo sizes (Bantex Photopockets are a good example). Try to use a binder not covered in vinyl.
- Bound albums with archival or good quality paper or card pages are also suitable. Photos are best held on the page with clear plastic or paper corners. If you must glue the photos in, use an opaque, white glue stick (e.g. UHU brand) to apply spots of adhesive on the back corners.

SAVING THE OLD PHOTOGRAPH ALBUM

Many old album collections that have been passed down through several generations have suffered damage, as much from handling as from the materials the albums are made from.

Problems inside your album can be caused by acidic paper pages, tape and various adhesives. If the pages are brown, dark yellow or break easily when folded it means they are very acidic (black pages are the same) and will continue to affect the photos. If possible, the photos should be removed and placed in a new, safer album.

The photos in your album may have been stuck to the pages using the wrong adhesives (e.g. animal glue, rubber cement, mucilage). Many adhesives harden and change colour, often staining the photos and making them very difficult to remove without causing damage. If it is not possible to remove them from the page easily don't attempt it. Consult a conservator for advice.

If the album itself is not particularly valuable or has no historical interest, the photos should be placed in albums with archival quality paper or card pages. If the photos can't be removed, the album could be unbound and the separate pages placed in polyethylene plastic sleeves in a new album system (as mentioned in the last issue). Remember, never use albums with PVC plastic pages.

If the album has a particularly fine binding, is of historical value or has valuable information written on the pages, you may wish to save the whole album as it is. It should be kept, wrapped in acid-free tissue, in a good quality box, in a cool, dry, dark place. If the paper pages are particularly acidic and brittle they should be interleaved with acid-free tissue or a thin polyester plastic sheet, taking care not to increase the thickness of the binding too much.

To protect your favourite photos you can have them copied. The originals can be stored in a safe place and the copies can be put in a separate album or on display.

A word of warning - if you take pages of photos (or the complete album) to a commercial photographer to get certain photos copied, be sure to specify that you don't want the photo removed from the page. Many photos have been irreparably torn and damaged by attempts to remove them by unqualified people.

REHOUSING GLASS NEGATIVES AND POSITIVES

The familiar plastic-based photographic negatives and slides we all know and use are a relatively recent development. Kodak introduced the first cellulose nitrate film sheet in 1903 and experimentation with different types of acetate and cellulose compounds continued to 1960 when the polyester film support now used was introduced. Prior to this, from about 1851, photographic emulsions were made on glass supports. Sizes ranged from large whole plate (6 1/2 " x 8 1/2") to the small quarter plate (3 1/4 x 4 1/4") although there were larger and smaller plates over the years. The very early negatives were made on the spot by pouring the emulsion layer on to the glass, allowing it to dry and then exposing it. By the turn of the century, though, the coated glass plates were being made in factories and bought by the boxful, much like photographic paper is bought today. The use of glass plates continued up to the 1920s.

Because of the nature of both the photographic emulsions and the glass, storage conditions are very important in preserving images on glass. Glass tends to become brittle as it ages and is very easily shattered or broken. The different types of emulsion layer vary but all may suffer from extremes of heat and humidity. Also, the glass plate does not expand or contract as the emulsions do, resulting in cracking, blistering and lifting. If left unattended, the image in this emulsion layer can be lost forever.

Glass negatives and positives may still in their original packaging materials such as acidic cardboard boxes and glassine envelopes with many exhibiting the natural problems of aged materials including breakages, losses and dirt.

The most important aspect of glass negative preservation is to ensure the image is retained and made accessible. Thus, wherever possible, the first step is to make a copy of the negative images either by digital imaging or on to polyester based black and white and colour transparency films. It may be more practical to re house the negatives before copying the images so they can be copied at a later date when time and funding permits.

Cleaning is not recommended except by a trained technician. However a light dusting with a very soft brush can be done where the image is stable. Do not apply moisture or wipe the surfaces. Wrap each glass negative individually in acid free non-buffered paper before being placing them in acid free, high quality storage boxes or polyethylene plastic containers.

STICKY TAPE

Adhesive tapes, or sticky tapes as they are so fondly known, have been in use as a quick and convenient repair strip since the 1920's. The world fell in love with them. Repairing torn papers was never so easy. They are now seen as one of the major sources of unsightly damage to important documents and require specialised conservation treatment to remove.

Adhesive tapes are made up of two components: a carrier which is usually paper, plastic, cloth or rubber and an adhesive which is either water or solvent based. Many modern adhesive tapes use pressure sensitive adhesives. When you apply pressure to the tape with your finger, a strong adhesive bond is formed.

Most tapes are made of poor quality materials which will deteriorate quickly. Paper carriers may become yellow and brittle causing the repair to break open again. Plastic carriers may shrink, yellow and become brittle. Rubber based carriers will oxidise, harden, crack and shrink.

Adhesives may yellow and stain documents. Pressure sensitive adhesives may lose their fluidity, harden and lose adhesion. Adhesives may also become more fluid at higher temperatures and leach into the paper surface causing that familiar translucence.

The first cellophane plastic tapes were produced in the 1920's and had a rubber cement based adhesive. Cellophane/rubber cement adhesive tapes are still available on the market today and should be avoided as a repair strip because of its poor ageing properties. If you have an old sticky taped document where the repairs have gone very brown and translucent, the adhesive has transferred into the paper and the carrier has fallen off or become very tacky you probably have a good example of what happens when this type of tape is used.

In the last 30 years acrylic 'magic' tapes have been available and marketed as a non-yellowing tape with good ageing properties suitable for long term repair of documents. The main problems with acrylic tapes are their unsightliness on important documents, and the non-reversibility of the acrylic adhesive. In other words they can't be easily removed, so once they're on that's it. If some of your important documents have a grey/white opaque tape holding them together you probably have acrylic tape.

Over the last five years more "document friendly" acrylic magic tapes have come onto the market. They appear to have less adhesiveness and can be more easily removed. However, the preservation jury is still out on whether these tapes will remain easily removable as they age.

There are some 'archival' quality adhesive tapes on the market today. While these reputedly have excellent ageing qualities and can be removed reasonably easily they

still have some major disadvantages: they are unsightly and can cover up important information.

So how can we avoid the temptation of using poor quality adhesive tapes on our important papers. Adhesive tapes are OK if they are used on something we wish to keep for only a few months, sticking a note on the milk bottles or wrapping a gift but as a rule, avoid using tape on anything you want to retain long term. The main thing to remember is not to use adhesive tapes to repair any paper item that you wish to keep permanently.

If you must use adhesive tapes on any paper item, try to place them in a position where they are not covering information. If a document has information on one side, tape the non-information side. Never use old yellowing tacky adhesive tapes. Discard them and use modern tapes with better ageing properties.

Good storage options such as pocketing documents in inert plastic sleeves and pockets with archival quality support boards. Use polyethylene plastics only. Never use polyvinyl chloride (PVC) plastics for storage of paper based materials. They have poor ageing properties and can damage paper and ink media over time. Where documents are damaged they may need to be supported with a good quality card. Always use non-acidic (archival quality) card. Most good stationery suppliers sell these materials.

If you use your important documents a lot you should copy them and use the copies instead of the originals, keeping the originals in good quality storage. The less you handle the originals, the longer they will survive.

There is no easy way to remove many adhesive tapes from paper documents so don't try. If you have an important item that needs adhesive tape removed, consult a conservator and see why they go AAAARRRGGGHHH!!

WHAT GLUES SHOULD I USE?

As there are so many types and brands of adhesive on the market today, it can be difficult and confusing trying to choose one that will not harm your artworks (prints, posters, watercolours), photographs, newspaper clippings, ephemera, etc. This article suggests some appropriate adhesives or other attachment methods for your valued paper items and some you should avoid at all cost.

Not recommended:

- Rubber cement - it is impossible to remove and will discolour and stain.
- Blu-Tack or other similar products - leave an oily stain or residue on paper in a short time and loses strength.
- PVA white glue (poly vinyl acetate) - impossible to remove and will stain.
- Animal glues - dry hard and brittle, with yellowing and staining. They are very difficult to remove.
- Gums, Mucilage (e.g. Clag) - difficult to remove and goes brittle and hard with age.
- Pressure-sensitive tapes (sticky tape, magic tape) - many yellow with time, stain badly and are very difficult to remove.

Recommended:

Recommended methods are those which do not damage or stain the item. Adhesives should be non-toxic and, ideally, should be reversible allowing easy removal.

- The best method is a non-adhesive one that uses plastic (Mylar polyester or polyethylene) sleeves. Insert the item into the sleeve with a paper backing sheet.
- Paper or Mylar corners can be used to hold items to pages; the corners are stuck to the backing page with double-sided acrylic tape or starch paste.
- Paste made from wheat or rice starch (not flour!) is the most highly recommended adhesive. Follow the recipe at the bottom of the page to make it, or you can buy a prepared wheat starch paste from archival suppliers. Another adhesive can be made from methylcellulose (CMC, Methocel) available in powder form from archival suppliers. Take care to follow the instructions supplied with the powder closely.
- Glue Sticks are lipstick tube like containers of acrylic paste and are reasonably safe in small amounts. Choose one that is white rather than clear. UHU is a suitable brand. They are OK for sticking items such as photos by the back corners to a paper page.
- Acid-free paper tapes with pressure-sensitive or heat-activated acrylic adhesives may be used for tears in paper and for hinging artworks to mounts. They are available from suppliers of archival products but may be expensive.

Avoid sticking any tape to the front or image area of any valuable item or artwork.

STARCH PASTE RECIPE

Put one tablespoon wheat starch (e.g. Silver Star Starch) into a small microwave-safe bowl and add 5 tablespoons distilled water. Microwave on High for 20 seconds, remove and stir thoroughly with plastic or wooden spoon. Repeat about 4 times until paste is thick and translucent (recipe based on 650W oven). Let paste stand to cool, then force it through a plastic sieve and store in a plastic container in the refrigerator. To use, dilute the paste with water. This makes a small amount for immediate use. It will keep for a few days in the fridge.

WATER DAMAGE - YOU CAN RECOVER

PART 1: RESPONSE

Paper based materials such as family papers, important documents and certificates, books, bibles, art works, stamp and other collections, photographs and personal records can be seriously damaged or lost when water damaged. But you can recover! Here are some tips that may help when disaster strikes your paper treasures at home.

- 1.** If possible stop the source of the leak. It may be as simple as closing a window or turning off a tap. If a leak is beyond your control, either try to protect material from further exposure or carefully move it.
- 2.** When you find wet material don't panic:
 - Carefully move it to a clean dry area but be very careful as wet paper items can be extremely fragile.
 - Make sure the area is away from direct sunlight as this can cause uneven drying. Allow fresh air flow or use fans to circulate the air. Never use warm air fans and blowers as this will raise humidity levels and increase the risk of mould growth.
 - Assess the situation and decide what material needs to be saved and what can be disposed of.
 - If the material can't be moved easily cover it with plastic sheeting to prevent further exposure.
- 3.** Some items may need specialist treatment: You should refer items with water soluble media, photo albums, stamp collections, art works and any other items that are very important to you to a paper conservator as soon as possible. A list of qualified conservators can be found in the Yellow Pages under *Antiques- Reproductions &/or Restorations* or *Art Conservation and restoration*. These experts can provide you with advice and treat the material.
- 4.** To reduce the risk of your paper based treasures being damaged by water, store them in an area away from windows, wet areas and plumbing. Don't store them on the floor, under the house, in the roof space or the garage/ garden shed. Protect them as much as possible with good packaging such as polyethylene plastic bags, watertight boxing or enclosed shelving.

WATER DAMAGE - YOU CAN RECOVER

PART 2: DRYING WET MATERIAL

So Murphy's Law has struck and your paper based treasures have been wet. What can you do to dry them before they go mouldy and will they be any good when they're dry? Here are some tips to help you get a reasonable result.

1. Know your limitations. Refer items with water soluble media, photo albums, stamp albums, and any other items that are very important to you to a paper conservator as soon as possible.
2. Most wet paper based items can be dried by a combination of air drying, interleaving with absorbent paper and mild pressing. Before you commence drying make sure you have the necessary space, equipment and supplies to do the job. You will need:
 - A clean flat space that can be dedicated to the task for as long as necessary.
 - Plenty of absorbent paper such as paper toweling or blotting paper.
 - A fan to circulate cool air during drying.
 - Sheets of glass or particle board to use as weights.
3. **Single sheet material** can be successfully air dried until they are just slightly damp and then press them lightly between several sheets of absorbent paper under a piece of glass or particle board (larger than the item you are drying). Change the absorbent paper every hour to promote drying.
4. **Books** can be successfully dried by the following methods:
 - Interleave every 10 pages with absorbent paper (any more interleaving than this may damage the binding). Change the absorbent paper, placing new sheets between different pages every hour to promote drying. Remember to be very careful when interleaving wet books.
 - Alternatively, if the book is strong enough, stand it upright and fan it open to air dry until it is only slightly damp. Drying can be assisted by using a fan.
 - As with single sheet items, when the book is just slightly damp lay it flat, interleave every ten pages with fresh absorbent paper and press it lightly under a weight to help it dry flat. Change the interleaving hourly between different pages to promote drying. If additional weight is necessary a house brick or equivalent weight can be used on top of the glass or board.
 - Care should be taken not to crush or distort book spines. This can be avoided by not over interleaving and by not pressing the spines. When pressing, allow the spine to protrude slightly from under the weight to prevent damage.
 - Books with glossy or coated papers that have stuck together are difficult to separate and should be referred to a conservator.
 - Don't try to dry a book by pressing out the water. This can cause the pages to stick together.
 - Avoid drying material in sunlight as this can cause yellowing, fading and uneven drying, damaging the structure.

PRESERVATION HOUSING OF PAPER BASED COLLECTION MATERIALS:

PROTECTIVE ENCLOSURES

Paper documents, photographs and books often require some form of support and protection to preserve them during storage, handling and transport. Protective enclosures such as pockets, wallets, folders, and boxes are key tools in the preservation of paper based collection material. They can be used as part of collection preservation strategies where conservation treatment is not possible, handling and access is a major factor, material is fragile, or where better housing of priority or conserved material is desirable.

This section offers some simple ideas and solutions in collection housing. Participants will receive hands-on training in making some simple paper and book enclosures.

Protective enclosures are generally used when an artifact is:

- Damaged
- Unable to support itself
- Brittle
- Valuable, unique
- High in collection priority
- Has been conserved
- Is handled a lot

Protective enclosures can include:

- Polyestire (Mylar, Melinex) encapsulates
- Polyestire pockets
- Envelopes
- Folders
- Wallets
- Boxes
- Mounts
- Sleeves

These can either be purchased as commercially made products or made to measure. The advantage of purchasing ready-made products is the time saving. However some materials are odd shapes and made to measure enclosures will help prevent slippage, sagging, abrasion, and other damages associated with ill fitting housing.

They are generally made out of an archival quality material that is inert or acid free.

These materials include:

- Polyethylene plastics including Mylar and Melinex, copy safe binder sleeves, and any other polyethylene bag, pocket or sleeve

- Polypropylene plastics: a denser, heavier type of plastic used for folders, wallets and boxes.
- Cardboard
- Papers
- Heavy card

Good quality protective enclosures encourage respect and better handling of collection materials. They can also protect materials from:

- Poor quality neighboring materials
- Loss of material (books with loose spines and covers, loose pages, broken bindings, etc.)
- Atmospheric pollutants
- Fluctuations in relative humidity and temperature
- Dust and dirt
- Insects
- Normal wear and tear
- Water
- Storage problems (crowded drawers, open storage, poor vertical support, etc.)

Polyestire Encapsulation

Polyestire encapsulation is the sandwiching of flat paper documents between 2 sheets of polyestire film (Mylar, Melinex) sealed on all sides.

The edges of the encapsulate are sealed either with double sided tape or by ultrasonic welding. Machine sewing can also be used to seal encapsulates.

Encapsulation provides physical support only and does not halt chemical deterioration of the paper.

To reduce deterioration of poor quality paper in the encapsulate collection material can be deacidified or alkaline treated by conservation staff prior, or a piece of alkaline buffered paper can be included (where there is information on one side of the material only).

There has been some speculation and testing recently on the deterioration of encapsulated poor quality collection material. Although there is some evidence that sealing an acidic item in an encapsulation can contribute to a speeding up of deterioration generally this is not the case where alkaline buffering material is included.

Some alternatives to encapsulation include:

- polyestire pocketing (similar to encapsulation but with a 3 sided seal allowing the material to be easily removed and replaced)
- Copysafe ring binder sleeves

- Oven bags (made of the same material as Mylar or Melinex but thinner)
- Polyethylene plastic bags (either zip lock or open topped)

Envelopes and Folders

Envelopes and folders are simply enclosures made of paper, card, or plastic from which collection material can be removed or replaced.

Archival quality envelopes and folders can either be purchased from the wide variety of commercially made types or made to measure and can accommodate material of varying thickness.

While not providing as much support as an encapsulate they offer protection during storage and handling.

Their non-transparent nature means that collection material cannot be seen inside them necessitating removal for access.

Boxes

Boxes normally used in preservation of paper based collection materials include:

- Phase boxes, so called because it is one phase in the conservation/preservation process for collections
- Manuscript boxes
- Solander boxes
- Tailor made corrugated card board boxes
- Slipcases

It is very important to use or make a box that is of appropriate dimensions to fit a collection item well.

- Not too loose so items slide around or are not supported correctly
- Not too tight so items are difficult to remove and replace

Mounts

Storage mounts usually consist of a hinged backing board and window mat as used in exhibition preparation.

They are often used to protect conserved art works during exhibition and then storage and use by researchers.

Mounts are a good way of supporting and protecting paper based art works while allowing them to be viewed. The basic mount consists of two parts:

- The backing board
- The window mat

Art works on paper can be attached to the backing board by:

- Hinging
- Polyestere photo corners
- Inlaying
- Mylar strips
- Archive text foldovers

When choosing a mounting and matting system for an art work on paper:

- Do not cover too much of the work with the window
- Select the most appropriate mounting system for the work.
- Use only archival quality products.

PRESERVING YOUR PHOTOGRAPHS

Photographs are something we all take for granted in our homes, until 20 years pass and we start to notice them fading, changing colour or getting buckled and torn.

These outcomes aren't inevitable, and this information sheet will help you extend the life of your photographs.

What are photographs?

Photographs are more complicated than most people realise. Colour prints can have 6 or 7 types of dyes and filters suspended in layers of emulsion. Black and white photographs have minutely divided grains of metal, generally silver, suspended in a binder.

There have been several different types of colour photographs used since the invention of colour photography. Only two are commonly available now. These are "chromogenic prints", which are the standard snap shot you get back from the 1 hour processing shop, and the other is "dye diffusion transfer" or "instant" prints, most commonly referred to as Polaroids (because Polaroid is the primary manufacturer).

Black and white processes dominated photography until colour took over, and the most common process by far is the silver/gelatin print. This is what most people have in a shoe box in the back of the cupboard. Other black and white processes that can be found in family collections in Australia are albumen prints (where the image is silver in an egg white binder) and gelatin printing out papers (these are like silver/gelatin prints, but the image becomes visible on exposure to light - it doesn't require chemical development).

Photographs made prior to the 1970's are on good quality paper, which means that the paper itself doesn't contribute to the deterioration of photographs. However, they are susceptible to physical damage like tears and insect attack. Modern colour and black

and white prints are produced on “resin coated” paper. This means that the paper has a very thin layer of polyethylene plastic on either side of it. The coating serves to speed up processing time, and it also makes the prints stronger, and less prone to severe physical damage.

Fading or discolouration of images is due to the chemical break down of the image forming materials. With black and white images, the microscopic grains of silver start to oxidise and corrode like the tarnishing of jewellery or cutlery. This changes the shape of the silver grains causing them to reflect light differently. In colour materials, the dye molecules can split and becoming colourless. When one of three basic dyes which render all the colours we see in a full colour print begins to fade, the print appears to have changed colour, often to orange tones. This is because the blue dye layer usually deteriorates first, taking all the blue tones out of the image.

How to care for photographs

It is the image forming materials which are the most susceptible to damage during the life of photographs. Fingerprints and poor storage introduce chemicals which will speed up any deterioration.

The paper supports can tear and crease, emulsions can stain, and fragile emulsions can be removed from the paper if wiped or rubbed.

Handling

When handling photographs you should:

- Have clean dry hands (with no creams or lotions on them),
- Wear cotton or latex-free disposable gloves if you like, but it is often difficult to pick up individual items with gloved fingers,
- Old emulsion layers are easily scratched so handle the prints by the edge, to avoid touching the image layer,
- Avoid handling fragile areas of the print, like dog-eared corners or tears,
- If the item is large and fragile (like a group portrait which has been rolled and squashed), support it on a piece of card larger than the item and handle the card, not the item,
- If you have been through your collection, and re housed it in plastic sleeves, leave the items in the sleeves while you are referring to them.
- Avoid prolonged exposure to sunlight. The high levels of ultraviolet radiation in sunlight fade photographs very rapidly

If you want to write on a photograph, use a soft graphite pencil, and write on the back of the print. A slightly blunt 2B pencil from your local newsagent is perfect. Place the prints face down on a firm surface and write gently to avoid pushing indentations into

the print. Pencil won't write on resin coated papers, so you will need to find a pen with a black pigment based ink – these inks are the most permanent.

If you have a photograph which is torn, don't be tempted to repair it with sticky tape. The tape will go yellow with age, stain the image and eventually fall off leaving you with a photo which is both stained and torn. Instead, put the photograph into a small plastic sleeve to keep all the pieces together. If you can, try and get the image copied so it isn't being used too much.

Storage enclosures

“Acid-free” does not necessarily mean “safe for photographs”. Photographs have different requirements to paper, so although acid-free materials are a good place to start they may not be the best thing you can buy. Papers and plastics that have proved safe for photographs can be expensive, and reputable suppliers of archival materials sell them (see Suppliers at the end of this leaflet), however, there are more affordable alternatives.

Things like clear plastic document sleeves available from stationary shops or newsagents and oven bags and zip lock sandwich bags from the supermarket are excellent alternatives. Food grade plastic containers also make storage boxes because they seal tightly enough to keep insects and water out.

The National Archives of Australia has a list of materials on their web site that have passed the Photographic Activity Test

http://www.naa.gov.au/recordkeeping/preservation/photographic_activity_test.html

This list includes plastic sleeves and bags that can be purchased from your local shops, as well as products made specifically for the archival storage of photographic material. If you are referring to your photographs a lot, use plastic enclosures that you can see through. If however, the photos will not be used it may be preferable to use paper sleeves, which allow better air circulation around the prints.

The choice of plastic to use is an important one. PVC plastic (polyvinyl chloride or just “vinyl”) should be avoided. This is the plastic that has that characteristic plastic smell and an oily quality to the surface. PVC will, over time, release vapours which are acidic and extremely damaging to photographs and paper documents. It can also cause some media, like photocopy toner, to soften.

“Good” plastics are polyethylene (HDPE and LDPE), polypropylene (PP) and polyester (PET). For archival storage, polyester is the most stable choice. Archival suppliers carry a range of products made out of these plastics especially for storing photos and documents. If you live in a humid climate, like tropical north Australia, the choice of enclosure is a difficult one.

Moisture levels can build up inside plastic sleeves, softening the emulsion layer and activating mould growth. Paper sleeves on the other hand will be attacked by insect pests like silverfish and cockroaches. The best compromise may be to file your collection

into a plastic crate with a tight fitting lid (to try and keep pests out), with sheets of paper in between each image to help absorb any moisture in the air inside the box. And keep your fingers crossed.

Storage environment

Temperature is the most important consideration for a storage area for photographs. The cooler the better, but cold temperatures often mean damp conditions, which need to be avoided. High temperature and humidity levels will cause photographs to deteriorate rapidly.

Avoid storing photographs in the attic, or the shed. Use an area inside the house that stays as cool as possible but doesn't get damp and mildewy. A space with no external walls is best – like a hall closet or linen cupboard. The advantage of this kind of space is that changes in temperature and humidity are less dramatic. This is because the surrounding rooms act as a buffer, avoiding the highs and lows reached in the other rooms. These kinds of cool, quiet places are also the home of insects. If you use these spaces, you should check every few months to be sure silverfish or other insects haven't moved into your collection. Silverfish will eat the cellulose of the paper support, and cockroaches will eat the gelatin emulsions. Avoid using moth balls or insect strips though, as these can cause photographs to deteriorate as well. Instead, store your collection in something that insects can't get into, like a box with a tight fitting lid, or zip lock plastic bags.

Duplication

If your photographs are becoming fragile, or you want to share your images among your family, it is a good idea to have the most important ones duplicated. This can mean having new photographs taken of the image, and printed on photographic paper, or scanned and printed through a computer.

Black and white film is the most stable media to choose, followed by colour slide film, then colour negative film.

If you choose to have your images copied photographically, you can have your black and white images copied onto black and white film, and colour onto colour slides, or you can copy all of your images onto colour slide film. This ensures that any warm brown tones in your black and white images are copied as a brown tone, not neutral black and white. If you are making colour prints from negatives, and even when you are getting your new photos printed, you should choose the most stable paper available, something like Fuji Crystal Archive if you can get it. Talk to the owner of the mini lab or camera shop about the best paper they can offer you.

Alternatively you may choose to scan the images on a computer. Many modern computer programs will help you correct any colour change and even electronically remove tears and stains. Images can be saved as files on your computer, printed out or burnt onto a CD for storage and distribution. Just be careful because electronic images in home computers and CD's aren't strictly speaking archival storage as the technology rapidly becomes obsolete and the long-term stability of the CD materials is not yet known.

Protecting and Handling Historical Photographs

Although a digital photograph may appear much the same as a 'traditional' photograph, the way it is made and the materials it is made from are quite different. Thus if you have a digital photograph then the information provided here should not be applied.

All photographs consist of an image layer on a base material. The image layer begins life in a light-sensitive form and when it is exposed to light a 'latent image' is created, this latent image is then made visible and stable by chemical development. For black & white photographs, the image usually consists of minute silver crystals suspended in gelatin. The majority of colour images comprise layers of organic dyes, also suspended in gelatin.

The gelatin can be coated onto paper to produce **prints**. Early prints were made on high quality, pure cellulose papers. Modern prints (from the 1970's onwards) are made on very thin paper with a polyethylene coating on either side, known as "resin coated", or RC, paper.

Gelatin emulsions can also be coated onto plastic films. This produces either **negatives** or **transparencies** depending on whether the tonal or colour values of the image are reversed or correct, respectively.

Negatives are viewed through transmitted light and are used to produce positive images on paper. They come in a range of sizes, the most common being, in rolls: 35 mm and 60 mm; and in sheets: 102 x 127 mm (4" x 5"). Today, almost all negatives produced are on film, but prior to c.1900, glass was used for the base.

Transparencies can be colour (e.g. 35mm slides) or black & white (e.g. glass lantern slides) and the tones or colours are right reading rather than reversed. They are viewed through transmitted light via a projector onto a screen. Colour transparencies can also be used to produce positive colour prints.

Types of materials

Since photography was invented in 1839, many materials have been used and experimented with in the pursuit of the perfect image.

The earliest processes used a silver coated copper plate with the image composed of silver and mercury (the *Daguerreotype*), or fine artists papers coated with light sensitive silver salts (the *Salted Paper Print*). Subsequent processes included the *Ambrotype* (a silver/collodion image on glass), the *Albumen* print (a silver/egg white image on paper), the *Collotype* (an ink image on paper made via a light sensitive step), the *Autochrome* (a silver/gelatin image viewed through a screen of red, green and blue dyed potato starch), *Chromogenic colour* images (where yellow, magenta and cyan dyes are formed in multiple gelatin layers during processing), and *instant prints* (such as Polaroids) where dyes are released from a negative layer and diffuse into a positive layer which is all contained in one integral image pack.

Thus it can be seen that photographs are varied, complex materials, quite distinct from documents. They also have their own particular preservation requirements.

DETERIORATION OF PHOTOGRAPHS

Photographs are highly prone to deterioration of various types. Deterioration can affect both the image layers and the support layers. The prime causes of deterioration in photographs are:

- *Poor processing*
If during processing the processing chemicals are not thoroughly washed out then over time the residual chemicals can cause damage to the photograph in the form of staining, darkening or lightening the image. There is little that can be done about this deterioration except to slow it down with correct storage and handling and also to produce a reference copy before the deterioration gets any worse.
- *Atmospheric pollutants*
With black & white images, the silver that comprises the dark areas of the image can corrode when exposed to pollutants. This changes the shape of the silver crystal, which causes the photograph to reflect light differently and therefore look different. Commonly they will start looking yellow/brown in colour giving the photo the classic “sepia” tone.
- *Fragility of the materials*
Glass supports can break if dropped or bumped and will deteriorate over time and become brittle.
- *Inherent instability*
There are a number of examples of this:
 - Certain early black and white images, for example albumen prints, are prone to image fade as they age.
 - Likewise many colour images can often be seen to change tone as they age, this is because one or more of the dyes that form the image becomes

colourless. For example, colour images from the 1970s often look decidedly orange. This is not because they have “turned” orange, but rather that the blue dye is starting to disappear, changing the colour balance of the image.

- The polyethylene layer in early resin coated papers may form a network of cracks over the front and back of the photo, which is irreversible.
- Decorative cardboard mounts and album pages can yellow with age and stain photographic paper. They can also break, taking the photograph with them.
- Certain historic film base materials are also inherently unstable, these are discussed below under the ‘Cellulose Nitrate and Cellulose Acetate Film’ heading.

In all such cases the progress of this deterioration can be sped up by inappropriate storage materials and conditions and slowed by choosing appropriate ones (see headings on ‘Handling and Care’, ‘Protective Packaging’, and ‘Storage Environment’)

- *Poor handling*
See below under the ‘Handling and Care of Photographs’ heading.
- *Poor storage materials*
See below under the ‘Protective Packaging’ heading.
- *Poor storage conditions (temperature, humidity and light)*
See below under the ‘storage environment’ heading.

Cellulose Nitrate and Cellulose Acetate Film

Nitrate and acetate films pose serious problems for people looking after collections containing photographic negatives.

Both types of film will deteriorate irreversibly over time and the only way to save the images they contain is to copy them before significant deterioration has occurred. Depending on storage conditions, major deterioration can begin after as little as 20 years. Deterioration can be significantly slowed by putting the film into cold storage, i.e. below 10°C, and this can buy time if it is not possible to copy the film immediately, for example if there is a large quantity of film to be copied.

Nitrate film was the first successful plastic film base and was used widely from its introduction in 1889 until the early 1950s. It has been used for movie film and still negatives.

Cellulose nitrate film in the early stages of deterioration gives off a distinct acrid smell, at the same time the film sheet will begin to deform and the surface will develop a greasy quality. In later stages dark yellow/brown staining develops, the film becomes

sticky, the image bleaches out and finally the film disintegrates. As the film deteriorates, it releases highly corrosive vapours (various nitrous oxides) that attack any objects nearby and constitute a health risk for users. The film is also highly flammable, particularly when packed at high density, for example a motion picture on a reel.

Cellulose acetate film or “Safety Film” was developed to replace the unstable nitrate film base. It came into dominance in the 1950s and is still used in some forms today. It has been used for movie film and still negatives. As acetate film deteriorates it releases acetic acid that gives it a vinegar smell (known as “Vinegar Syndrome”). As the deterioration has progressed the base starts to shrink which causes the emulsion layer to buckle and pop off the base. It can also develop bubbles under the emulsion layer and white crystalline deposits on the surface. Ultimately the film will weaken and crumble.

Ideally both nitrate and acetate negatives should be separated from other collection material, as the vapours they produce, particularly those from nitrate film, can damage other collection material. Also, given that nitrate film is also flammable, people storing large quantities of this film should ensure that it is stored in an area with adequate fire protection.

Handling and Care of Historic Photographs

Like all archival material, photographs need careful handling to protect them from damage. The following are basic rules that should be observed when handling photographic material:

- Paper bases can be creased, folded or torn even when they are in good condition, and are much more vulnerable when they become weak through exposure to moisture, pollution, mould or poor processing.
- Fingerprints will corrode the silver particles in black and white images and cause colour dyes to change colour. Therefore whenever possible photographic material should be handled and used whilst it is still in its protective enclosure. If it must be removed from its enclosure it should be handled with lint-free cotton gloves.
- When sorting through a collection, don't apply labels and identification stamps directly to photographic material. Identification should be on the packaging or a piece of archival paper slipped into a sleeve/envelope with the photograph. Pencil or an appropriate pigment pen can be used on the border of slides.
- If there is no alternative but to write on a photograph, use a soft (2B) graphite pencil on the back of the print. Write on a firm surface with light pressure to avoid pushing marks into the paper. Pencil does not write well on modern resin coated papers. In this case it is advisable to buy a pen with a pigment-based ink and label the print on the back, along one edge. Be sure the ink is dry before stacking prints, as ink that has transferred to the front of a photograph is very difficult to remove.
- Never use metal pins, staples, paper clips, rubber bands or adhesive tape with photographic materials. If the collection already has tapes and labels applied to it,

don't try and remove them, as this may cause damage to the material. Rubber bands and metal fasteners should be removed if it can be done safely.

- Photographic material should always be handled in a clean work environment and all viewing equipment should be well maintained.

Protective Packaging

The type of enclosure used for storing photographic material is dictated by the nature of the collection. If the material is going to be referred to regularly, clear plastic enclosures may be best, as they allow the photographs to be viewed without removing them from the sleeve. If the collection is static, and not referred to often, paper envelopes may be the best choice as they allow the collection to "breathe".

If plastic is the preferred option, polyester sleeves made specifically for photographic storage are the most stable choice. Polypropylene (PP) is also suitable and is more readily available to consumers. Polyvinyl chloride (PVC) sleeves and folders should never be used.

Paper envelopes should be made of material that is safe for use with photographic collections. "Acid-free" does not necessarily mean "photo-safe" – photographic collections require higher quality paper than paper-based collections.

The NAA carries out a test known as the Photographic Activity Test (PAT) to determine the suitability of materials for the storage of photographs. Information on the test, including a list of products that have passed the test can be found here [hotlink] http://www.naa.gov.au/recordkeeping/preservation/photographic_activity_test.html.

There is one important rule when choosing a photograph album – **Never use "magnetic" self-adhesive albums;** they can cause severe damage to your precious photographs.

If it is necessary to place photographs in a display album it is essential that the album be manufactured from materials that are safe, again the PAT is the best indicator of suitability and a number of albums have been tested by the NAA and found acceptable. Details of these products are also included in the table at the link given above.

Slides can be stored in the plastic boxes they come in from the processor. If these are lost, archival quality slide storage pages can be purchased from reputable photographic supply shops. Again these should have passed the PAT; details of those products tested by the NAA and found acceptable are also included in the table at the link given above.

Large format material should be stored flat in boxes, folders or drawers.

Storage environment

Ideally photographic collections should be stored at a low temperature and mid range relative humidity.

For a large collection of high historic value a dedicated storage area with reliable climate control (temperature and relative humidity) is recommended. Humidity should be controlled slightly on the dry side, at about 35%. The storage temperature should be maintained as low as possible, every degree lower than standard room temperature results in a considerable life extension for photographic material. If it can be achieved the temperature can be reduced to near freezing.

For people without the resources to achieve these conditions, or with small collections, the best that can be aimed for is a stable environment avoiding high temperature and humidity levels. A cupboard inside a building with no contact with external walls is good as it is buffered from daily temperature and humidity changes. Downstairs rather than upstairs is better, too, as it is usually cooler downstairs. Damp areas such as basements should also be avoided.

Storage and handling issues

It is a good general rule to keep storage and work areas clean and never have food or drink in them.

In the home environment:

- Keep light away from the collection.
- Inspect the collection regularly for insect damage.
- Have all the items in individual storage enclosures, then in boxes (or albums).
- Never store photographic material in the shed, attic or under the house.
- It is a good idea to store your negatives and your positives separately in case of a disaster. Floods and fires can completely destroy photographic material, so storing the negatives, for example, at a relative's house or your workplace may safeguard your collection.
- If you are scanning photographs, or creating digital images, make a copy CD and store it elsewhere as well.

For larger collections in agencies or institutions:

- The collection should all be in protective packaging to exclude light and dust.
- The lighting should be low UV emitting fluorescent tubes.
- The lighting should be switched off whenever the room is not in use.
- Never store photographic collections in warehouse type settings with no climate control. The temperature and humidity levels and fluctuations will be too extreme for the preservation of the collection.
- Inspect the storage area regularly for insects, water leaks, structural damage or other events that may threaten the collection.

Copying and Exhibition

For frequently used or significant material, it is a good idea to make reference copies. This means that the photograph can be used and copies shared without the original being over handled. It also means you have a digital scan or negative should anything happen to the original.

The scanning of photographic material on a flat bed scanner is a fairly safe procedure as it has been calculated that the light level from a single pass on a typical scanner equates to less than half an hour of exposure to ambient light levels*, of course multiple scans should be avoided if possible.

Original photographic material should only be exhibited under stringent environmental guidelines. Some photographic images are highly sensitive to light and can only be displayed in very low light levels. On the other hand copies can be mounted and displayed without concern, as they can always be replaced. For better accuracy, black and white images can be copied in colour to recreate the subtle tone of the original.

*Determination of light levels in a flat bed scanner using a gelatin-bromide photographic paper, Gandolfo, J-P and B Lavedrine.

Further Advice

Please contact your local [National Archives of Australia office](#) if you require further advice on protecting and handling your photographic material.

LONG TERM PRESERVATION FOR WORKS IN STORAGE AND ON DISPLAY

Environmental Conditions for Contemporary works of Art

Light

While being essential for the appreciation of any work of art, light has the potential to cause gradual and cumulative damage. This is especially the case for strong light i.e. direct sunlight or bright artificial lighting. Unless illumination levels are controlled light sensitive colours will fade and change and many organic materials will deteriorate, usually losing strength and becoming brittle.

While there are instruments that can gauge the tolerance of an artwork and can assess the strength of light in a given environment, these are impractical for use in the domestic display space. The use of some basic guidelines can be most helpful in the domestic environment to minimise the cumulative effect of light damage.

- Light should be of sufficient quality to give good colour rendition.
- Light levels should be low enough to ensure minimal, damage to collection material.
- Direct sunlight should not fall on an artwork.
- The harmful components of light such as infrared and ultraviolet radiation need to be controlled to low levels or completely eliminated. UV filtering glazing in frames, UV filtering window films and increased distance from light sources are good ways of achieving this.
- Temperature of light sources should be kept cool i.e. halogen lights can be quite hot. Increased distance from heat sources can achieve this.
- Lights should be mounted at a distance from the artwork sufficient to ensure that “hot spots” of strong light are avoided. Spotlights should be avoided



High light levels can fade many materials

Very susceptible	Costumes, tapestries, textiles, water colours, furniture, prints, drawings, stamps, manuscripts, miniatures, wallpaper, dyed leather, natural history exhibits, feathers, fur, etc.
Susceptible	Oil and tempera paintings, undyed leather, lacquer, wood, horn, bone, ivory (where surface colour is important)
Not susceptible	Metals, stone, ceramics, glass, jewellery

Quick reference list for works that are highly sensitive to light

Temperature

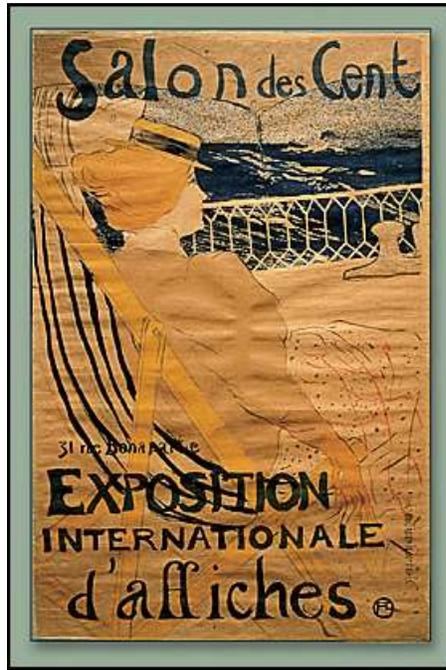
High temperature speeds the natural degradation processes in the materials that comprise a work of art. However, the absolute temperature is less important to an artwork than maintaining a near consistent temperature. It is the fluctuations that cause the most immediate damage to artworks. Some guidelines are detailed below:

- In the domestic environment, the ideal space for artwork is on an internal wall in a room that experiences fairly even temperatures throughout the day.
- Temperature sensitive artworks should be placed at least 2m from a heater, fireplace or radiator to ensure that the heat is diffused by the ambient temperature in the room.
- Works placed near windows will experience more temperature fluctuations than those at a distance of 2m or more from the window.

Relative Humidity

Moisture in the air in itself is generally not a major problem. Artworks acclimatise to their environment in a matter of weeks. However fluctuating humidity is one of the most common causes of problems for works in a domestic environment. Changes in humidity create dimensional and chemical changes in a wide variety of materials which can alter the appearance of a work and can hasten its degradation. Furthermore, fluctuating humidity can create good breeding environments for mould and pests. For domestic environments a few guidelines can help to control fluctuations in humidity:

- Display spaces near water sources like kitchens and bathrooms are not suitable for fine art
- Choosing a site where the temperature is fairly consistent will contribute to maintaining reasonably stable humidity conditions.
- Good general air flow will reduce the impact of humidity related problems such as mould growth and insect infestation.



Changes in relative humidity can cause dimensional changes in collection items

Dust and Air pollution

We are fortunate in Australia, that our artworks are not affected by air pollution issues that are such a problem in Europe. However, domestic smoke and dust still pose a threat to the long term preservation of works of art. Smoke can stain works. Air borne kitchen residues, residues from tobacco products, and general domestic dust products can settle and attach to the surfaces of artworks. Attached residues and dust can attract moisture creating zones of high humidity and idea breeding areas for pests and the growth of mould.

- Keep artworks away from kitchens or fireplaces
- Car exhaust can have profound effects on works of art, especially photographs. Avoid displaying fine art in or near the garage.
- Regular dusting with appropriate soft artist's brushes is one of the best ways to prevent dust problems.

Mould

The appropriate conditions for fungal growth vary from species to species. Fungus grows well if the following conditions are provided:

- Moisture availability
- Substrate pH
- Light
- Oxygen concentration

Nutrient source

- Appropriate temperature (some moulds will grow down to 0°C and some up to 45°C)
- Poor air circulation

Fungal growth can be reduced or eliminated by the control of moisture availability to a RH less than 65% through the use of air conditioning and dehumidifiers. Building maintenance to reduce possible leak sources such as leaking plumbing gutters, rising damp and sometimes salt problems can also reduce the possibility of fungal growth. The temperature gradient (usually but not always associated with poor air circulation) can cause local areas of high humidity, i.e. close to outer masonry walls. Microclimates can be created within a frame with the use of conditioned silica gel or a long-term oxygen scavenging system such as Ageless.

Insects

There are hundreds of thousands of insect species but only a few that attack cultural objects:

Moths

Two species of moths that can cause serious damage to collections are the case making clothes moth (*Tinea pellionella* L) and the webbing clothes moth (*Tineola bisselliella* Hum.). The adults of these species are creamy yellow in colour and are roughly the length of a grain of rice. They live for only a few days, long enough to reproduce and lay eggs on materials that will provide nourishment for the larvae. The moth larvae have a voracious appetite and cause much of the damage observed in collections.

Beetles (dermestid)

The common carpet beetle (*Anthrenus scrophulariae* L.), varied carpet beetle (*Anthrenus verbasci* L.) and the black carpet beetle (*Attagenus megatoma* F.) are three common dermestid species that attack collection material. The adult size is about 3 – 4mm in size. The hide beetle (*Dermestes maculatis* DeG.) and the larder beetle (*Dermestes lardarius* L.) are larger varieties of the same family. The dermestid larvae are covered with hair and less than 1mm long. Because they are so small they can get into the narrowest of openings in cabinets and boxes. The larvae moult several times, leaving behind their hairs and outer skin. This is usually the first evidence of their presence in collections. Adults are commonly found near windows as they attempt to leave the building to mate.



Dermestid larvae.

At only 1mm long they can get into narrow of openings in cabinets, frames and boxes.

- Improving ventilation and air movement
- Adding screens and barriers to windows and air gaps
- Framing and frame glazing

Careful selection and application of pesticides, when and as required and may include:

- Pyrethrins
- Powders
- fumigation
- Gasses
- Barriers
- Baits

GENERAL MAINTENANCE AND DAY TO DAY CARE OF CONTEMPORARY WORKS OF ART

Protective Treatment of Surfaces

Commercial or domestic cleaners and solutions should not be used on works of art. Many of these products contain unstable components that can permanently change the appearance of a work of art and cause degradation to the materials. Fire retardants should not be applied to works.

In general all attempts to clean or remove stains and marks should be avoided and not attempted unless a qualified conservator has been consulted.

A gentle brush with a soft, "artist-type" brush is acceptable. These are available from quality artist suppliers.

Hanging Recommendations

In a domestic environment a strong and supportive hanging systems are one of the most effective ways to reduce accidental damage.

- Two hanging points are recommended to minimise movement when an object is bumped and to ensure that the object will not fall if one hanging point fails.
- Hanging points to be placed as far apart as possible without being visible. We advise hanging points be positioned no more than 3cm inside than the edge of the object.
- Expensive hanging devices are not required. However, care should be taken to select robust hardware, that are suitable for the type of walls at the display location, especially for heavy items.
- Self adhesive dots, pressure sensitive tapes and blu-tac style adhesive putties are rarely suitable for domestic environments as temperature fluctuations and dust can cause the adhesive to fail or to transfer into the object itself.

Redecorating and Repainting the Display Space

When redecoration or repainting is required, it is advisable to remove artworks from the wall rather than risk accidental damage when moving furniture or paint spatters.

SAFE HANDLING

General Guidelines

Handling any work of art should only occur after careful inspection of the works condition. This is to ensure that weaknesses and potential risks of touching the objects are known to the handler and are avoided. Each work will require its own method for handling. Some guidelines however can be applied to the handling of all objects:

- Always support or transport works in boxes, tube, trays or crates.
- Prepare a clean space for the work at its destination. Set up a table or foam or carpet covered blocks to place the work on when you get to the end of the journey.
- Check your path to ensure there are no obstacles. Observe low doorways, stairs and corners to ensure there is sufficient space to maneuver both the work and the handler/s.
- Lift and move only one object at a time.
- Use a firm grip with both hands on either side of the work.
- Use two people where the dimensions and/or weight of works require it.
- Move slowly and mindfully.
- Use a trolley when moving an object more than a few meters.
- It can be helpful to have an observer to watch your progress and alert you of obstructions and clear passers-by in a thoroughfare.

Gloves

Gloves are used to protect objects from damage be it mechanical, such as scratches and abrasions, or chemical such as corrosion caused by oils and salts found on human skin. The decision “gloves or no gloves” comes as a result of understanding the nature of the each individual work and assessing the risks and possible deterioration caused by handling. For example a metal surface may be chemically damaged by handling it with bare hands while a pained surface with high impasto may “catch” on gloves causing mechanical damage.

General Guidelines:

- Always wash and dry hands thoroughly before handling objects.
- Always wear gloves when handling metal objects to prevent corrosion.
- Always wear gloves when handling unglazed ceramics to prevent staining.
- Cotton gloves are not recommended for slippery or large objects or those with a fragile surface textures.

- Rubber gloves are not recommended for handling any object. These may contain sulfides which can do damage to a wide range of materials and surfaces.
- Nitrile gloves can be used for a wide range of objects but there are some exceptions. It is best to remove gloves if any surface changes are observed.

MOVING AND TRANSPORTATION OF FINE ART

Preparation for Transport

In preparing a work for transport it is wise first to check all components and tighten any loose parts or fittings. Remove any dirt or mould before packing as these can become a problem once the packaging is sealed. Sites of damage can worsen during transport so it can be beneficial to undertake repairs and conservation treatments at this time.

Packing of a works of art for transport serves a number of purposes in protecting the work during transport.

1. Mediates impact and accidental damage.
2. Provides a barrier to prevent abrasion that can occur during the repetitive movements that occur in transport.
3. Buffers against vibrations that can cause damage to fragile surfaces.
4. Protects the work from water.
5. Shelters the work from light damage.
6. Keeps all parts of the work together.

General guidelines for packing:

- Wrap works individually so they do not touch and damage each other.
- When choosing packing materials look for materials that are clean, chemically inert, colour fast, shock-absorbing and light weight. Some examples are archival tissue, bubble wrap, polyethylene foams. Clean corrugated cardboard can be used to provide a firm outer layer to the packing. Avoid using newspaper.
- Packaging must be constructed to fit objects closely enough to prevent unnecessary movement but not so tight as to compress the work.
- Wooden transport boxes can be custom made to provide a secure transport case for items that are regularly moved.
- Where required, conditioning agents such as silica gel, Artsorb and activated charcoal can be included within the packaging to help maintain a suitable humidity.
- Label the packing material not the object itself.

A combination of good design and appropriate construction and packaging materials will help to achieve these objectives. An example of a successful packing set up follows:

- A waterproof exterior case or box.

- Between the outer layer and the object, a thermal insulation layer, shock absorbers, RH buffers and barriers to air movement is included.
- An internal layer around the object should function as a vapour barrier to minimise the amount of air contained with the object and help maintain the moisture equilibrium content of objects.
- All containers include labelling and handling signage and instructions for unpacking and repacking.

The environment in transportation: Carriers can offer a range of transportation environments. A securely strapped location in a climate controlled carrying space with some form of vibration reduction methods is ideal. When this cannot be offered, well thought-out packing can help to create the best possible environment for transport. Note that air travel is particularly stressful environment for works with very low relative humidity and temperatures in the hold of aircraft as low as -40 degrees.

The environment at destination: if shipping a work outside of its “normal” environmental conditions, pack the work in a manner that allows for gradual acclimatization to the new environment.



Custom made wooden packing boxes are used for items that are transported regularly.

Acclimatization on Unpacking

Most works of art are responsive to their environment as the materials react to changes in temperature and relative humidity. The environmental conditions in one location can be significantly different than another, e.g. Canberra to Darwin. Allowing a work to gradually “adapt” or acclimatize to its new location is essential to mediate the changes the materials will go through.

Notes on Handling Particular Types of Works

Framed Works

Frames are one of the best ways to protect a work as they provide a barrier against mechanical damage (e.g. accidental impact) and create a suitable microclimate by controlling the movement of air and moisture around the object. However, frames make works heavier to handle and can sometimes be smooth and slippery. Below are some guidelines for handling and moving framed works.

- Orient the work the right way up before attempting to relocate it.
- Prepare a place for the work at its destination.
- Lift and move only one object at a time.
- Use a firm grip with both hands on either side of the frame.
- Ensure there is someone to help you with heavy items.
- Use a trolley when moving an object more than a few meters.
- Place framed works face to face and back to back to ensure hanging fixtures on one object do not scratch the glazing on another.
- Place like sized frames together. Add a piece of clean board (e.g. cardboard) between different sized frames.

Paintings

Paintings can be very sensitive to movement and transportation. The inherent potential for damage in moving any work of art is complicated by the very fragile nature of a paint surface. Special care is needed in moving these works.

- If framed, check that the painting is secure in its frame.
- Be aware of decorative elements on frames. These can be fragile.
- If unframed, look for handling straps or suitable places to obtain a secure grasp that places no pressure on the paint surface or canvas.
- Observe the dimensions and the weight of the work to ensure you have sufficient space and help in lifting.
- If one person handles a small painting, hold it with the paint surface facing in, towards the body to protect the paint layer from glancing blows. The work should be held slightly away from your body to prevent abrasion by the handler.
- If two people are working together to move a painting, one person should stand at each side of the work. One hand placed near the bottom of the work, the other placed about two thirds of the way up the vertical edge.
- Where possible, transport and store a painting in the same orientation as it is normally hung.

Textiles

Because textiles are very family, everyday items, it is possible not to realize the special care required for handling them. Handling and movement of textiles should always be kept to a minimum. Below are some guidelines for handling and moving textile works.

- Hands should always be freshly cleaned with soap and warm water and thoroughly dried.
- Fingernails are to be short
- Nitrile gloves can be used and are especially helpful if the hands are rough.
- Remove watches and jewellery as these can snag on textiles.
- If a textile is too large to travel flat, rolling is a suitable option. Layers of archival tissue is placed along the entire length of the work. The textile is then rolled around support, e.g. a postal tube or PVC tubing, that is first prepared by covering with archival tissue or freshly cleaned calico. The work is then carefully rolled onto the tube ensuring even rolling with no tension.

Objects

It is tempting to use protruding parts, e.g. arms, handles and decorative additions to help lift and carry objects. However, these may have been broken in the past and may be unstable. Supports or storage boxes can be utilized to aid moving an object. "Feeling" the weight of an object before attempting to lift it can be helpful in planning a move.

Conclusion

A general understanding of the needs of works of art can go a long way to ensuring long term preservation in a domestic environment. However, there are occasions when a custodian or owner may choose to seek advice or reassurance on the care that they give their works. Conservators love to contribute in this care and we are available to ask questions or talk through ideas. Please do not hesitate to contact us if you feel you would like some advice.

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PRACTICAL SESSION

Encapsulation

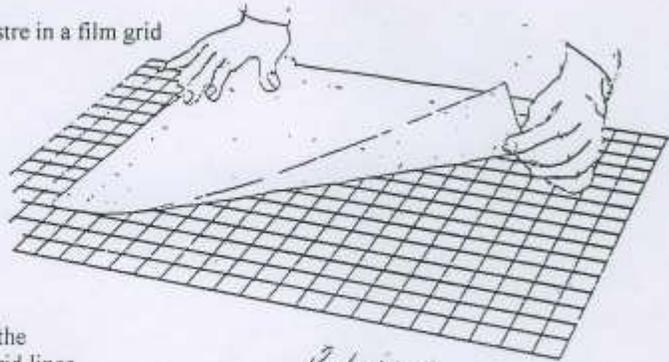
Materials Required	Tools required	Work sample
Polyestire Film (Mylar Type D) 300mm x 300mm	Utility knife (stanley knife or similar)	Any piece of paper up to 200mm x 200mm
Double sided tape (5mm wide)	Cutting board	
Blotting paper or reemay squares	Steel ruler	
	Anti-static dusting cloth	
	Weights	

Method:

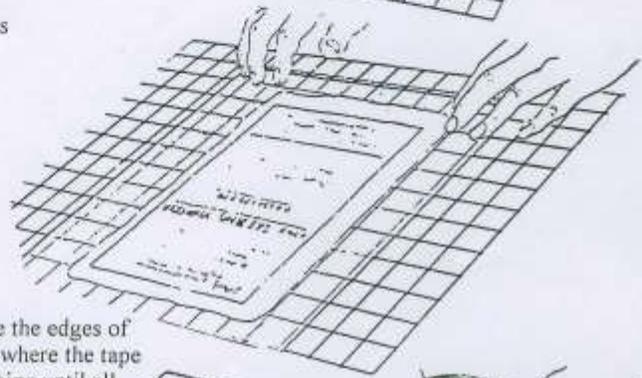
1. Clean your work space: dust the cutting board and polyestire film if necessary. Use a soft anti static cloth to dust the polyestire film to prevent scratching.
2. Place your work sample centrally on one piece of film.
3. Place a weight over a blotting paper or reemay square on the work sample. This will hold the work sample in place as you apply double-sided tape to the film around it.
4. **Carefully** lay strips of double-sided tape on the polyestire film on all sides of the work sample at least 3mm from its edges. Do not peel away the remaining release paper from the tape yet.
5. Make sure the second piece of polyestire film is still dust free and clean it again if necessary. Remove the weight and blotter/reemay being careful not to move the work sample. Place the film over the work sample in line with the lower film and replace the weight.
6. Check again that there is no foreign matter (hair, fibres, dust) under the top film.
7. Move the weight to one diagonal half on the work sample. Turn back the opposite corner of the top film and peel away the release paper from the two exposed double-sided tapes. (Use your tweezers to pick up the release papers).
8. Let the film fall back into place and smooth out from the centre to the edges with the anti static dusting cloth to remove any excess air and ensure good contact between the films and the tape.
9. Move the weight to the other diagonal half and repeat steps 7 and 8.
10. Remove the weight and trim the edges of the polyestire to leave a minimum of 5mm of film outside the tape.

Encapsulation Diagrams:

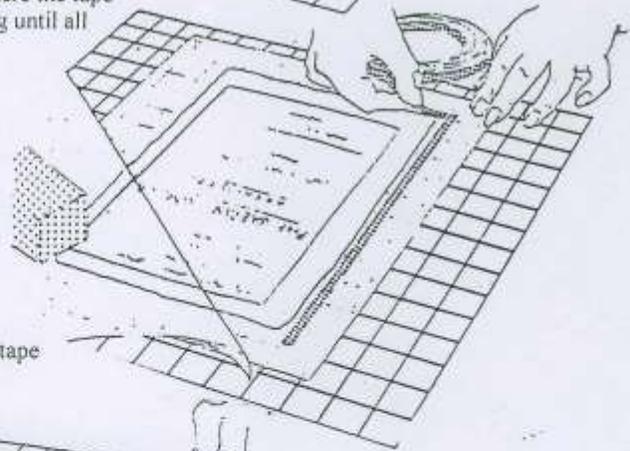
1. Place a piece of polyestere in a film grid



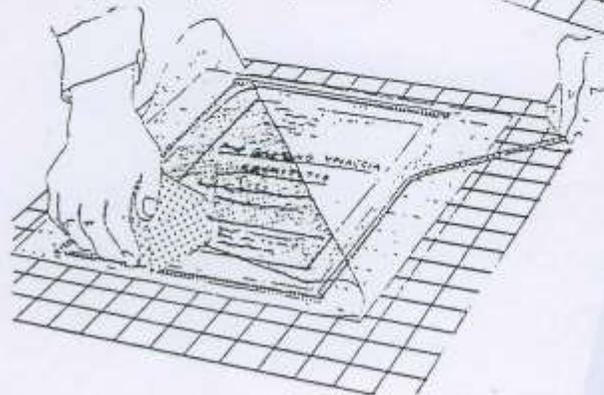
2. Position your work on the film parallel with the grid lines



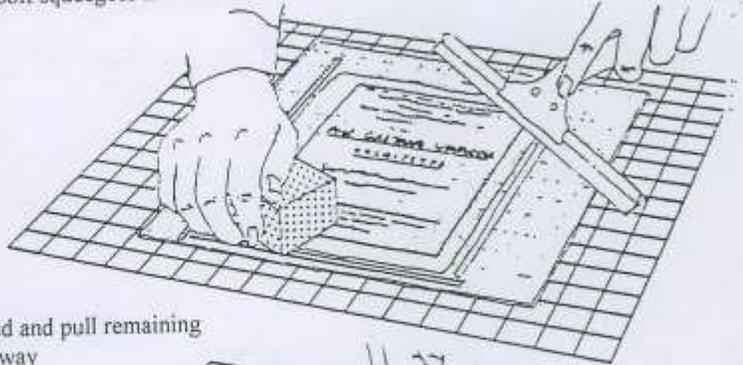
3. Place tape at least 3mm outside the edges of your work. Leave a small gap where the tape meets at corners. Continue taping until all edges have been taped



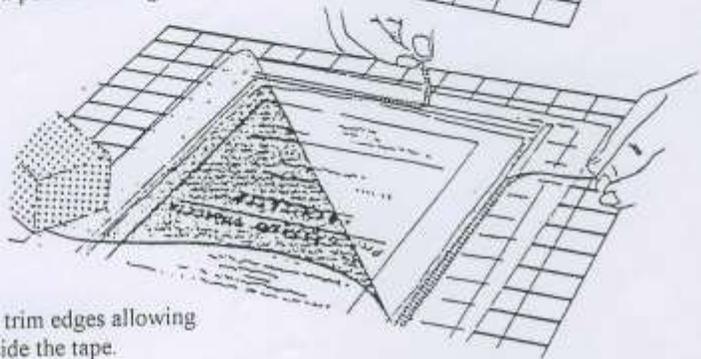
4. Pull tape release paper away from tape



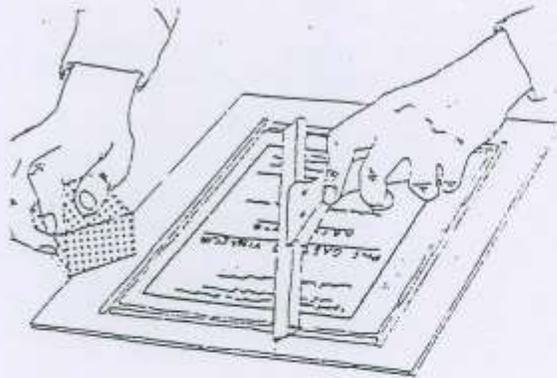
5. Place top covering film over the work and exposed tape. Seal that half of the encapsulate. Anti static cloths or soft squeegees are used to remove air.



6. Turn the work around and pull remaining tape release paper away



7. Seal as in diagram 5 and trim edges allowing a minimum of 5mm outside the tape.



Completed encapsulation



Folders (Four flap document folder)

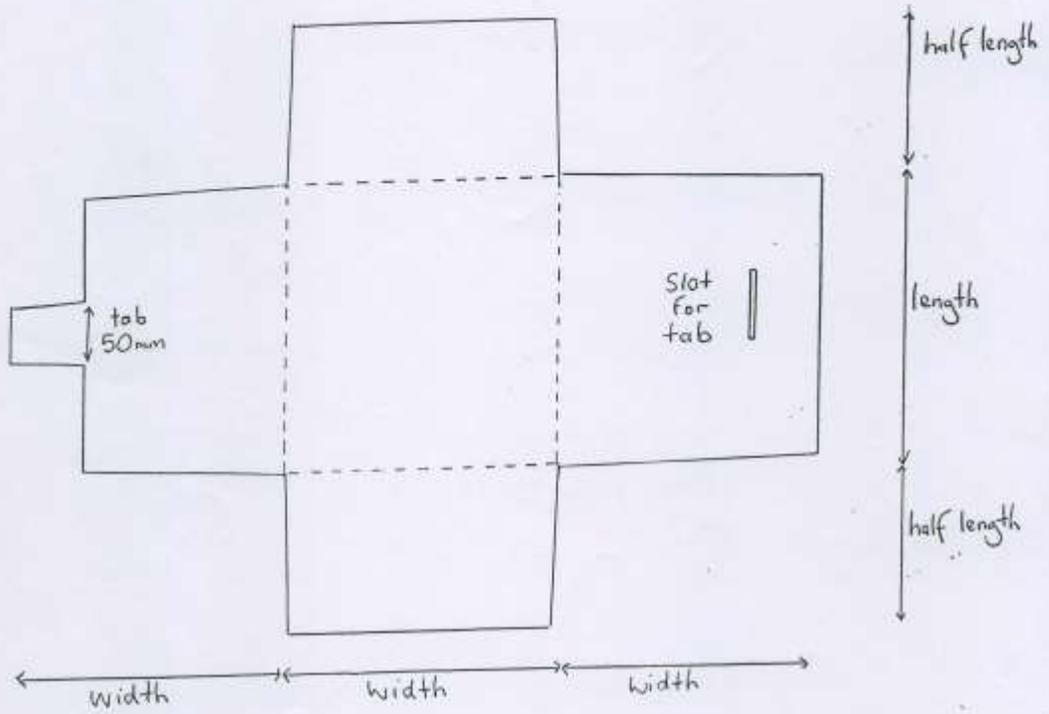
Materials Required	Tools required	Work sample
Acid free light card or heavy paper	Utility knife (stanley knife or similar)	Any piece of paper up to 200mm x 200mm
	Cutting board	
	Steel ruler	
	Set square	
	Pencil and eraser	
	Bone folder or similar	

Method:

1. Clean your work-space.
2. Measure the length, width and if necessary the thickness of the work sample to be enclosed. If the sample is not square, work from its outer dimensions to ensure the folder will be square and fit the work sample comfortably. Add 2mm to each measurement to allow for folding of the folder flaps.
3. Mark out the measurements as shown on the diagram and use a set square to square up all lines. This can also be done on a lined cutting mat if you have one
4. Cut along the solid lines with your metal ruler and utility knife. Fold on the dotted lines using a bone folder or similar to score first.
5. Trim a 3mm taper from the 4 flaps. This will enable the folder to close well.
6. With your folder fully assembled, mark the position of the tab on the underlying flap. Cut two slits 1mm apart to make a slot for the tab. Knick the slits at each end and remove the card to make a slot.

It is not entirely necessary to include a tab and slot in your folders. Good folders can also function well with 4 flaps only.

Four flap document folder diagram:



Manuscript folder/box

This is a variation on the 4-flap document folder. It includes depth (4 sides) to allow for either more items or a thick item such as a book. Steps are similar to the folder except that sides are included in the diagram. Care has to be taken to allow extra depth for the sides that have to fold over the bulk of the item plus some thicknesses of the folder flaps where necessary. Otherwise the box will not fold together well.

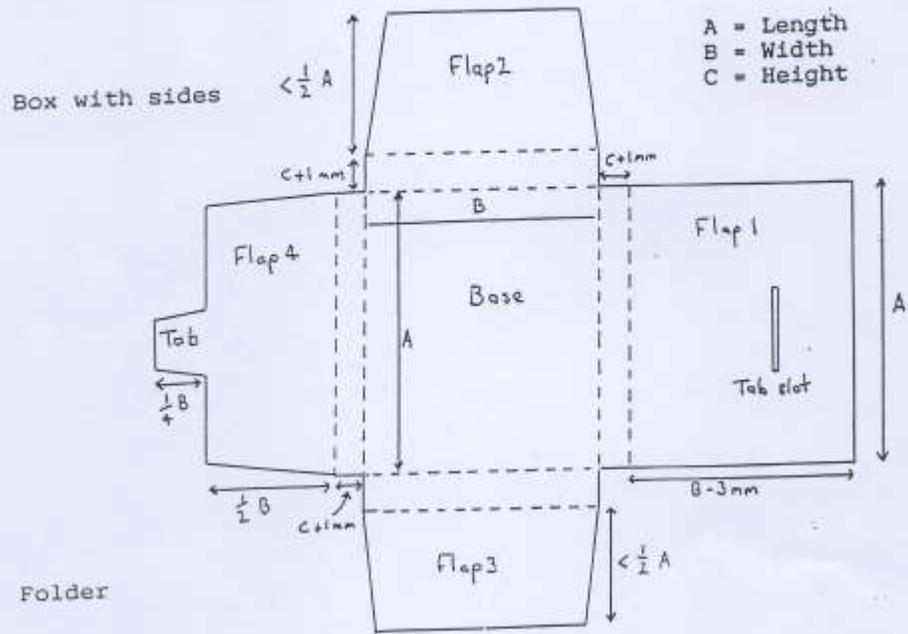
Materials Required	Tools required	Work sample
Acid free light card or heavy paper	Utility knife (stanley knife or similar)	Paperback book
	Cutting board	
	Steel ruler	
	Set square	
	Pencil and eraser	
	Bone folder or similar	

Method:

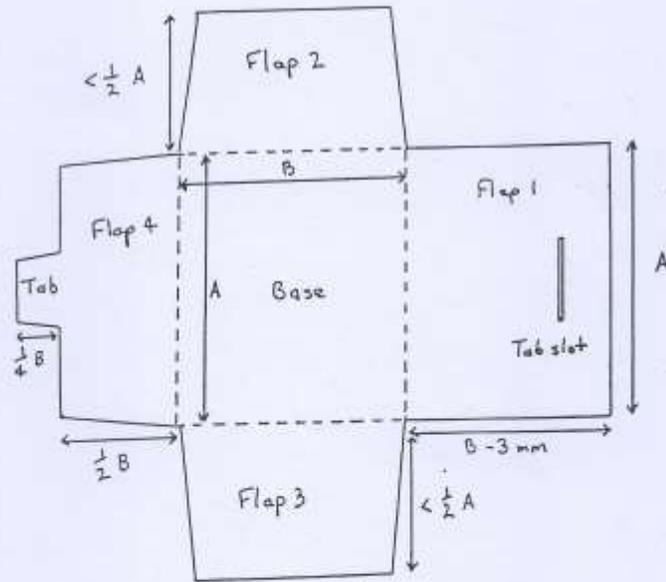
- 1 Clean your work-space.
- 2 Measure the length, width and the thickness of the work sample to be enclosed. If the sample is not square, work from its outer dimensions to ensure the folder will be square and fit the work sample comfortably. Add 2mm to each measurement to allow for folding of the folder flaps. Note the added depth dimensions of the sides where illustrated.
- 3 Mark out the measurements as shown on the diagram and use a set square to square up all lines. This can also be done on a lined cutting mat if you have one
- 4 Cut along the solid lines with your metal ruler and utility knife. Fold on the dotted lines using a bone folder or similar to score first.
- 5 Trim a 3mm taper from the 4 flaps. This will enable the folder to close well.
- 6 With your folder fully assembled, mark the position of the tab on the underlying flap. Cut two slits 1mm apart to make a slot for the tab. Knick the slits at each end and remove the card to make a slot.

It is not entirely necessary to include a tab and slot in your folders. Good folders can also function well with 4 flaps only.

Manuscript folder/box diagram:



Folder



Phase Box

This box is recommended for bulky heavy items such as a collection of documents or a book. A heavy archival board such as 20-point library board, grey-white board or archival multi use board should be used. It is a very economical way of making a good quality box as there is minimum wastage of board.

Materials Required	Tools required	Work sample
Heavy card or single wall corrugated board	Utility knife (stanley knife or similar)	Small book
Velcro strip or coins (adhesive backed)	Cutting board	
PVA Adhesive or hot-melt glue gun	Steel ruler, Set square	
	Pencil and eraser	
	Bone folder or similar	

Method:

Clean your work-space.

This box is made in two sections: the vertical section (1) and the horizontal section (2). See diagram over page.

Section 1: Measuring and Construction:

Allow the base to be the length (A) and width (B) of the work sample to be boxed.

For sides 1 and 2 measure the height (C) of the work sample. If you are using corrugated board add 4mm to each measurement to allow for folding of the box flaps.

Flaps 1 and 2 should measure the same as the base less 3mm from their lengths (A-3mm). Mark these measurements on the box board ensuring all lines are square.

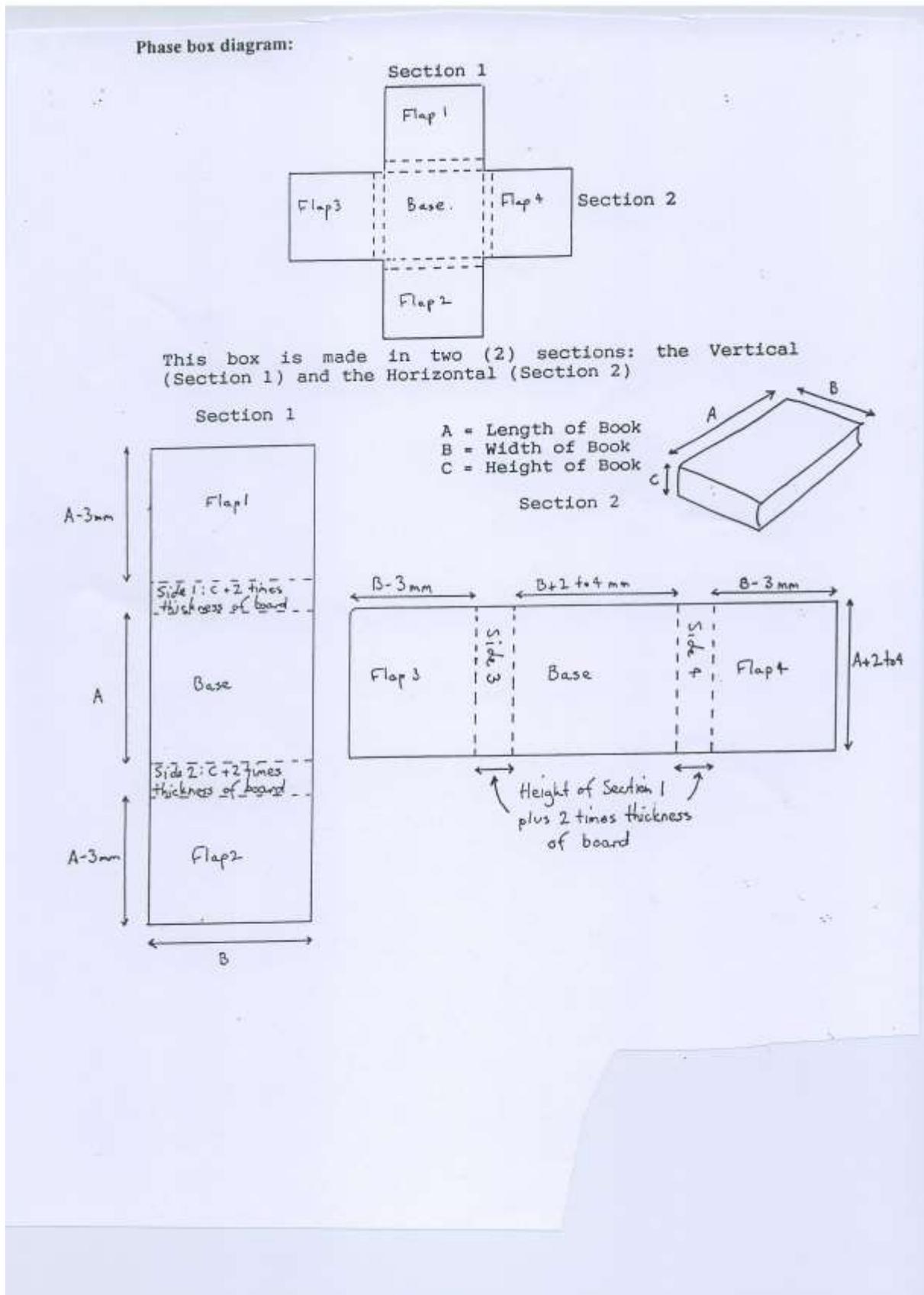
- 4 Construction: Cut along the ruled lines using a metal rule and a utility knife. Crease and fold inwards on the dotted lines using a bone folder or similar to score first.

Section 2: Measuring and Construction:

This section is measured and made to fit around the work sample and section 1.

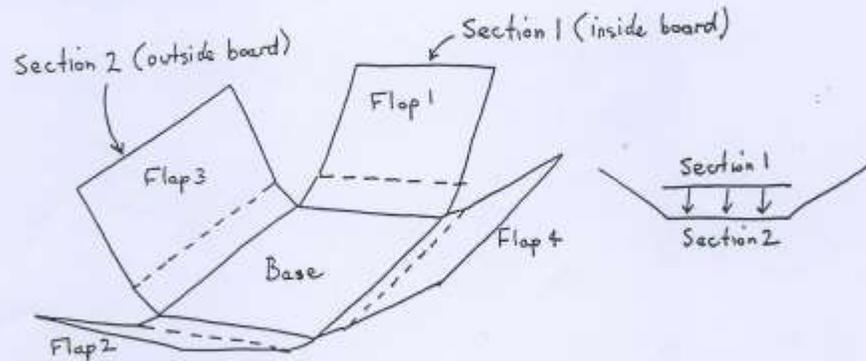
- 1 With Section 1 wrapped around the work sample: Allow the base to be the length (A) and width (B) of the work sample to be boxed.
- 2 For sides 3 and 4 measure the height (C) of the work sample plus Section 1 thickness. If you are using corrugated board add 4mm to each measurement to allow for folding of the box flaps.
- 3 Flaps 3 and 4 should measure the same as the base less 3mm from their lengths (A-3mm). Mark these measurements on the box board ensuring all lines are square.

- 4 Construction: Cut along the ruled lines using a metal rule and a utility knife. Crease and fold inwards on the dotted lines using a bone folder or similar to score first.



Overall Construction of the Phase Box Joining Section 1 and 2:

- 1 The base of section 1 is adhered to the base of section 2 with a strong adhesive such as PVA liquid adhesive or hot-melt PVA glue stick. Section 2 is the outside board. If using PVA liquid adhesive allow the joined sections to dry under weights to keep the box dimensionally flat.



- 2 The work sample is then placed in the box and flaps 1 and 2 are folded over. Then flaps 3 and 4 are folded over.



- 3 To secure the box fit Velcro coins under the outer corners of flap 4. Alternatively, the box can be tied with cotton tape. Where no adhesive has been used to join sections 1 and 2 the box can be tied together with cotton tape

