

Caring for your collections: photographic collections

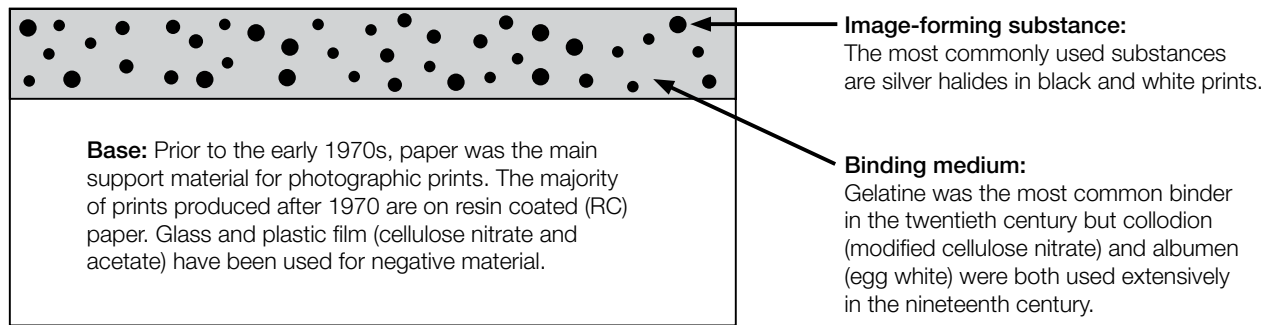
The twenty-first century marks an important turning point in the history of photography as traditional silver halide photography is rapidly replaced by digital photography. As photographic collections remain a fundamental part of our personal and collective memories, we need to understand them as physical objects and ensure we use and enjoy them in ways that do not contribute to their deterioration. The aim of this leaflet is to outline how photographic collections deteriorate and provide basic preventive methods to preserve collections for present and future generations to enjoy.

Understanding your collection

Understanding the basic structure of photographic material and why damage occurs is an important part of collection care. The first century of photography was characterised by a continual evolution of photographic processes. This has left a diverse legacy of photographic objects including chromogenic colour prints, negatives, and slides, black and white printing out paper (POP), developing out prints (DOP) and historical processes such as albumen prints and gelatine glass plate negatives. The correct identification of photographic processes can be challenging and expert advice may be required. There are a number of useful books and websites on this subject.

All photographs have a basic layered structure (see below) consisting of a binder layer containing the image forming substance on a support material such as paper or glass.

Structure of black and white image



Structure of chromogenic colour image

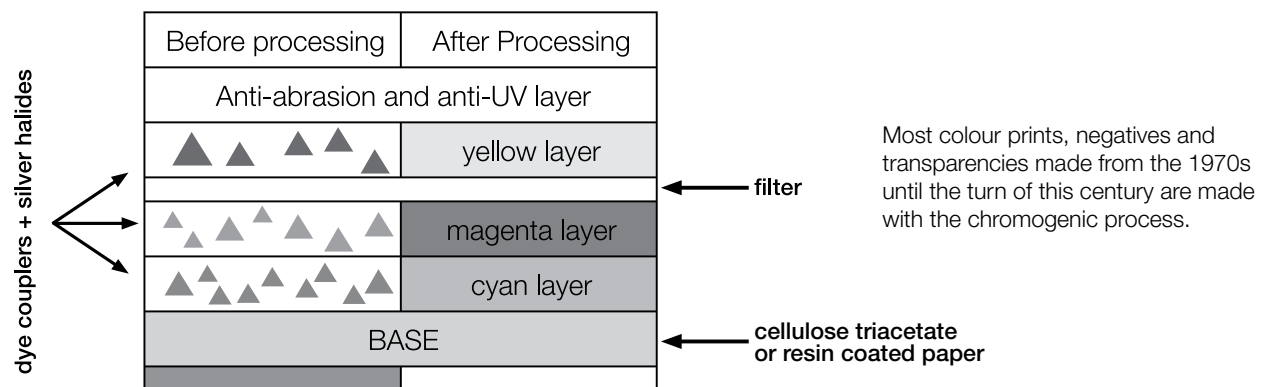
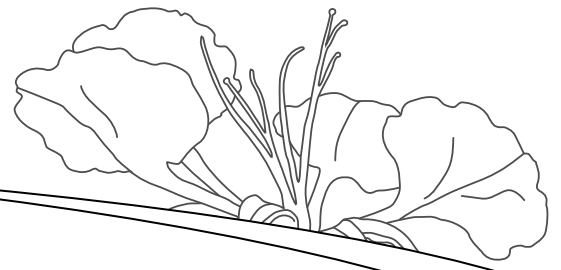


Image from *A Guide to the Preventative Conservation of Photograph Collections* (see further reading section)



How to identify and prevent deterioration

The permanence of photographic material is dependent upon the following: the stability of processed materials; post-processing treatment (lacquering, hand colouring, texturing, retouching); and storage, handling and environmental conditions. Although we cannot control processing and post-processing, we can control the storage environment and the way in which photographic material is used. This is most successfully achieved by creating three levels of protection:

- Level 1: Storage environment (temperature, humidity, air quality etc.).
- Level 2: Storage furniture (shelving, plan chests); and
- Level 3: Storage enclosures (sleeves, boxes, albums)

Storage environment

Maintenance of a stable storage environment is crucial to the longevity of photographic materials. The environmental factors that affect the preservation of photographic materials are relative humidity (RH), temperature; air quality; light; biological agents; and handling and housekeeping practices. These factors are often interrelated.

Temperature and Humidity

Extremes and fluctuations in humidity and temperature can cause considerable damage to photographic material. High relative humidity (above 60%) will encourage mould growth and insect activity. Gelatine emulsion can swell and stick to surrounding materials such as other photographs or its storage enclosure. High relative humidity combined with high temperature and air pollution can speed up chemical reactions such as silver "mirroring", an iridescent effect visible in dark areas of black and white images. Very low relative humidity (below 20%) can cause flaking of photographic emulsion and brittleness of paper supports and mounts. Dramatic fluctuations in humidity and temperature can cause structural damage such as warping of paper supports and cracking of binder layers.

To create a stable environment, minimise fluctuations in temperature and relative humidity by locating storage and display areas away from external walls and sources of heat and moisture such as kitchens and bathrooms. Ensure storage areas have good air movement, avoiding stagnant air pockets. The use of strategically positioned fans can assist with this. Be aware that significant daily fluctuations can occur when air conditioning units are switched on during the day and off at night. Create a buffer against ambient conditions by placing objects into storage boxes. Keep areas clean and regularly check for pest and mould activity.

The following is considered suitable conditions for most photographic material: relative humidity 30-35% and temperature between 16°C – 18°C. Cold storage (eg. 2°C/ 30% RH) is recommended for colour photographic material and film based material such as cellulose acetate and nitrate negatives. For storage of glass plate negatives, temperatures between 15-18°C are recommended. Relative humidity levels for glass should be maintained between 40-45%. Levels below 40% have been found to cause the formation of visible cracks, flaking, or fissures in the emulsion layer.

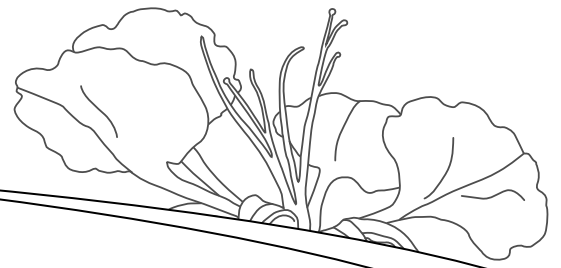
(Left) The damage occurring on this glass plate negative occurs when the gelatine emulsion swells and contracts in response to changes in humidity. The emulsion eventually lifts completely off the glass base causing large areas of image loss.



Light

Visible and ultraviolet light can cause irreversible damage to photographic objects. It affects the stability of the yellow, cyan and magenta dyes in chromogenic prints, negatives and slides. This type of light fading is characterised by a distinct colour shift. For example, if the cyan dye fades, the image appears too red. Chromogenic material made prior to the 1980s is particularly susceptible to dye fading. Certain historical processes such as cyanotypes and salted paper prints as well as coloured papers and some inks are also extremely sensitive to light damage. Properly processed black and white prints and negatives are less vulnerable and should be used for important photographic records. Light can also cause chemical reactions in wood pulp paper causing discolouration and brittleness. This is a major problem for paper-based processes such as albumen prints, which due to their thin paper support, are often housed in poor quality mounts or albums. Incandescent and photographic lamps can cause appreciable heat damage in the form of embrittlement, dehydration, and distortion.

The most effective way to protect your collections from light damage is to simply limit exposure to light. Avoid storing or displaying collections in areas of direct sunlight (eg. do not place near windows where sun shines in) or under artificial lighting and never leave on permanent display. Short display periods (eg. 3 months) are recommended. For permanent display, use duplicate prints then place the original in appropriate storage. Thermally insulated curtains or blinds can minimise direct sunlight and reduce some radiant heat. Keep incandescent and photographic lamps away from objects to prevent increase in surface temperature. Fluorescent tubes emit high levels of UV and should be covered with UV-absorbing sleeves or covers (remember to check the UV filtering as it loses its effectiveness) or replace with non UV-emitting tubes.



Air Quality

Airborne pollutants, such as oxidant, acidic and sulphating gases attack all components of photographs and cause silver images (eg. DOP, POP and albumen prints) to fade, and paper and board supports to become brittle. Sulphur dioxide, nitrogen oxides and ozone are among the worst offenders. Most outdoor air pollution is generated by combustion by-products from cars and industrial plants. Pollutants have a greater effect on objects when the humidity is above 35%.

The main source of indoor air pollutants are volatile organic compound (VOCs) such as formaldehyde and hydrogen peroxide from wood and wood products, paints, and varnishes; poor quality paper or plastic products; and fumes from common cleaning solvents. These pollutants can cause images to oxidise and fade.

Particulate matter such as greasy, abrasive soot and ash particles from industry can settle on shelves and collection materials and create dust that can abrade materials when handled.

To minimise pollutants keep collections boxed and away from pollutant sources. Keep storage areas clean. If air-conditioned, install gaseous and particulate filtration systems. Avoid shelves, cabinets and boxes made of wood and wood by-products. Powder coated steel or anodised aluminium shelving is recommended. Many commonly used items such as paint, cleaning solutions and photocopiers emit VOCs and should not be used near collections. (Further advice on storage furniture and VOCs is available from the Conservation Unit).

Processing

Poor processing, and insufficient drying times can cause inherent instability in prints and negatives. Choose your lab carefully and remember the cheapest and fastest is not necessarily the best. If possible request archival standard photographic processing and copying. Be aware that many labs now only produce digital prints even when supplied with chromogenic negatives.

Handling

Ignorance, neglect, and carelessness account for a significant percentage of damage to photographs. Examples of negligence include, repair of photographs with pressure-sensitive tape, marking original prints with ink or felt-tip pens, and exhibition of materials under inappropriate conditions. Carelessness includes rough handling during cataloguing, housing, and viewing; and damage to materials because of inadequate transport systems. Fingerprints contain harmful acidic oils that can cause permanent staining so remember to hold prints and negatives by extreme edges or use cotton gloves.

Storage Enclosures

Sleeves, albums and boxes can successfully protect objects from airborne particulates, physical abrasion and inappropriate handling if the correct materials and designs are selected. Outlined below are some guidelines to assist in this important task.

Materials and Design

It is necessary to consider the use of the object being housed as well as the design and chemical stability of the enclosure. Avoid albums that adhere the print directly to the album page e.g. magnetic/ self- adhesive albums. Select album styles that allow prints to be safely removed such as those with slide-in polyester or polypropylene pages (e.g. Albox polypropylene albums). If attaching prints to album pages or mountboard, use a reversible system such as polyester photo corners. Avoid sticking prints down with glue as overtime glue can become discoloured cause staining.

Be aware that many available photographic albums and sleeves are labelled 'archival', 'acid-free', and 'photo-safe' despite containing harmful components that can cause irreversible damage to prints. Purchase storage material through a reputable conservation supplier and always request product specifications. Ideally, enclosures should meet the International Standard 'Photographic Activity Test' (PAT). This is a test carried out to determine whether storage material causes fading or staining of silver based photographic images.

Never laminate photographs (or any valuable documents). The process is irreversible and damaging. Polyester sleeves provide a safe alternative. Instructions on how to make your own sleeves are available from the Conservation Unit.

VOCs

Acetic acid

Formaldehyde

Peroxides

Ozone

Sulphur by-products

Source

Wood, wood glue, paint

Adhesives, plywood, wood laminates (eg. MDF)

Wood, adhesives, oil paint

Electrical equipment, laser printers, photocopiers

Sulphur vulcanised rubber, wool, silk.

(Above) Some sources of indoor pollution.

Enclosure material selection:

Listed below are a few basic recommendations to aid selection of suitable materials. Ideally all material should meet the Photographic Activity Test (PAT).

Plastic:

Suitable: Uncoated polyester (trade names: 'Mylar D'); Uncoated polypropylene (trade name: 'PROMEG").

Not suitable: Polyvinyl chloride (PVC), low grade polyethylene, any plastic that looks hazy, has a plastic smell or contains additives such as anti-static agents.

NB: Do not use plastic if you live in an area of high humidity, paper enclosures are more suitable.

Paper and board:

Suitable: Paper, mount boards, sleeves, envelopes and boxes should be made of 100% unbuffered pure cotton cellulose (pH 7) which contains no sulphur, lignin, wood pulp, or alum-rosin sizing. Good quality (often described as "100% rag paper") artists' paper can be used to make enclosures. Must not be sized. Certain 'Canson' and 'Winsor & Newton' papers meet these criteria.

Not suitable: Black paper and board as it contains sulphur, which reacts with the silver in photographs; coloured paper and board as water soluble dyes may cause staining if wet; poor quality acidic wood pulp paper and board; glassine paper.



Avoid writing directly on photographs. If necessary, use a very soft pencil (e.g. an artist's pencil such as 4B), on the edge of the back of the print. Do not apply pressure as this can damage the photographic emulsion. Do not use pens or markers as they can bleed through and stain the front of photographs. Avoid the use of metal fasteners such as paper clips and staples as they can rust and stain prints. Rubber bands and post-it notes can also cause damage and should not be used.

(Left) Leave photographs in original albums. You may damage the prints by trying to remove them and compromise the integrity of the album as a historical record. Pages can be carefully scanned or photographed to create a digital copy.

(7571 Lavarack Family Album, John Oxley Library, State Library of Queensland)

Storage Methods

(NB. All options below assume that materials used meet the recommendations described above.)

Framed prints

- If purpose built frame storage is available, hang the framed photographs. If placing on floor, use Ethafoam blocks to cushion the frames, wrapping each frame in archival paper. Prints must be protected from light. Cover with heavy cloth if necessary.
- If hanging on a wall, avoid external walls and direct light (natural or artificial). Permanent display of original prints is not recommended. The use of a copy print is recommended for permanent display. This is particularly important for extra sensitive prints such as colour (chromogenic) and albumen prints (often incorrectly called "sepia prints").

Colour transparencies

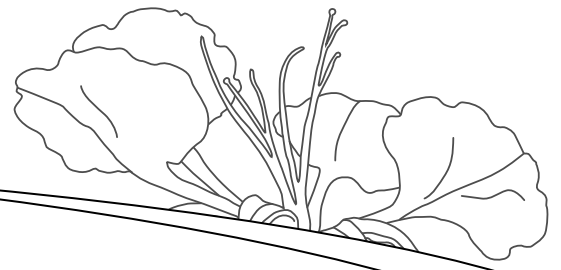
- Make duplicates of valuable slides and those displaying signs of fading or staining. Use the duplicates as working copies and carefully store the originals. Slides can also be scanned, only scan once as rescanning can cause fading.
- Slides should be housed in suitable plastic sleeves (uncoated polyester or polypropylene).
- In areas of high humidity, use paper based storage systems. A range of suitable slide storage boxes are available from conservation suppliers. Metal slide boxes can be used if in good condition. Never over pack, ensure there is space between each slide.
- If practical, store slides in appropriate cold storage to slow colour fading and image loss. (Further information is available from the Conservation Unit).

Cellulose acetate and nitrate negatives

- Cellulose acetate and nitrate negatives are chemically unstable, particularly when stored in poor storage conditions. Negatives should be correctly identified and inspected regularly for signs of deterioration. Negatives should be housed in enclosures made of buffered 100% cellulose paper. Deteriorated items should be duplicated before damage worsens and stored separately under very stable environmental conditions (cold storage) with good ventilation. Nitrate and acetate should be stored in separate locations.
- Storage at a stable low temperature (< 5°C) and low RH (35%RH) significantly reduces the rate of deterioration. If you have large numbers of nitrate negatives or film seek storage advice from your local fire brigade. Nitrate is flammable. (Further information is available from the Conservation Unit)

Photograph Albums

- Albums can be boxed or wrapped in archival paper. Heavily used albums or scrapbooks should be photographically reproduced or scanned to prevent continual use of the original.
- Interleaving with photographic safe tissue is sometimes necessary and should be done judiciously as it adds bulk to the album and places stress on the binding. Examples where album pages should be interleaved include the following: when photographs are glossy or easily abraded, or both: photographs have fixer stains; acidic processes such as platinum prints; photographs with tape or adhesive applied in such a way that it may come in contact with other items in the album; and if photographs are in contact with very acidic material such as newspaper, certain prints such as etchings and iron gall ink manuscript.



Glass Plate Negatives and Lantern Slides

- Store plates individually, in seamless paper enclosures (such as a 4-flap folder, diagram below). The plates should then be arranged vertically on their long edges in archival quality storage boxes, using 100% cellulose mount board to ensure plates are upright and to minimise plate movement during handling. Boxes should be clearly labelled "fragile/glass" and "heavy".
- Shelving with adequate strength is needed to hold the weight of the boxed glass plate negatives.
- Glass plate negatives and lantern slides should never be stacked; given their weight and fragility, the bottom plates will be susceptible to breakage.

Damaged Glass Plate Negatives

- Damaged plates should be stored in specialised housing (for further information, please contact the Conservation Unit). Advice should be sort from a photograph conservator.
- Never place anything on top of flaking or brittle emulsions.

Diagram for Four-Flap Enclosure

This simple storage enclosure is suitable for all types of photographic negatives and prints. Once placed in four-flaps, store vertically if in suitable boxing such as polypropylene or archival board storage boxes.

Materials:

- Unbuffered, acid-free (pH neutral), lignin-free and sulphur-free 100% cellulose paper or light board (e.g. alpha cellulose paper; many good quality artist's paper e.g. Arches "White Vellum" drawing paper). Ideally material used should have passed PAT test.
- For added protection and rigidity, sandwich negative or print between 2 pieces of photographic mount board.
- Bone folder for creasing, Stanley knife, steel ruler and cutting mat.

Object's Actual Size:
(all measurements in mm)

Object Length =
Object Width =
Object Depth =

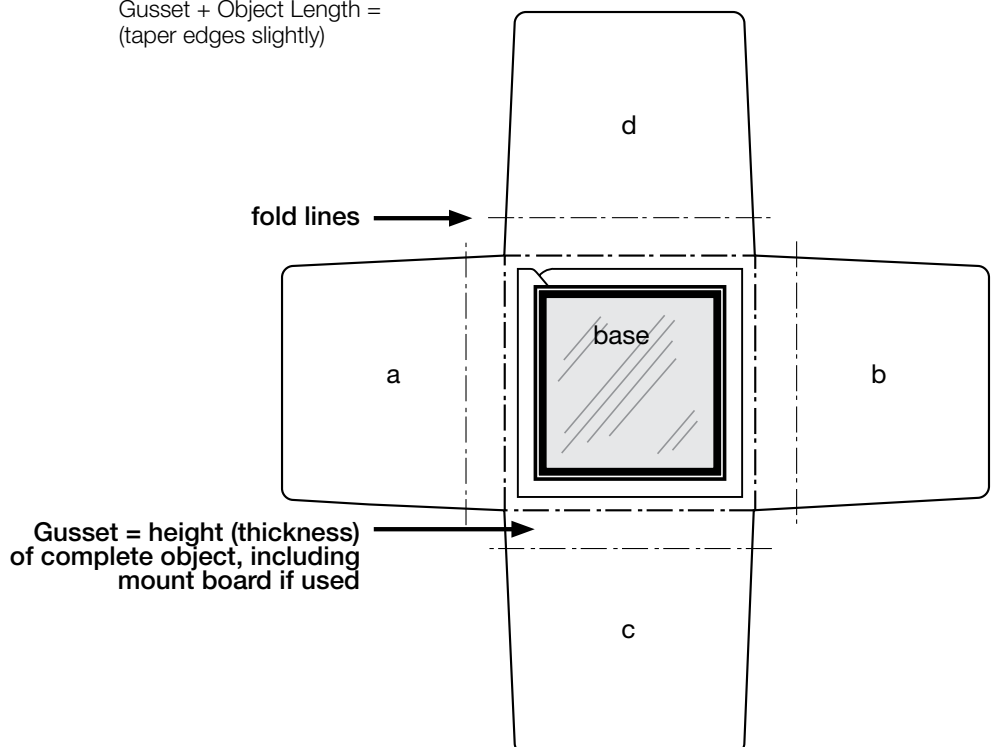
Base size:
Object Length + Width =

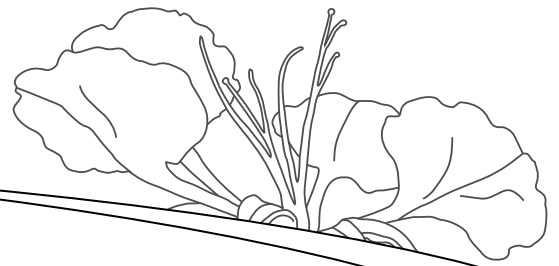
Flap A:
(Gusset + Object Width) – 3mm =
(taper edges slightly)

Flap B:
Gusset + Object Width =
(taper edges slightly)

Flap C & D:
Gusset + Object Length =
(taper edges slightly)

Gusset:
Object Depth =





Further Reading:

Lavédrine, Bertrand, *A Guide to the Preventive Conservation of Photograph Collections*, The Getty Conservation Institute, Los Angeles, 2003

Wilhelm, H., *The Permanence and Care of Colour Photographs*, Photographs Preservation Publishing Company, 1993 (free download on: http://www.wilhelm-research.com/book_toc.html). A little dated now but still contains some useful information.

Conservation OnLine (CoOL): Invaluable general conservation site providing excellent links to a number of sites on conservation of photographic material. <http://palimpsest.stanford.edu>

SEPIA (Safeguarding European Photographic Images for Access) – EU funded project focusing on preservation of photographic materials: <http://www.knaw.nl/ecpa/sepia/>

N.B. The State Library of Queensland makes no representation concerning the content of these sites, or the links they make to other sites.

Useful standards

ISO 18902: Imaging Materials – Processed Photographic films, plates and papers – Filing enclosures and storage containers

ISO 18911: Photography – Processed Safety Photographic Films – Storage Practices

ISO 18916 – Photography – Processed Photographic Materials – Photographic Activity Test for Enclosure Materials

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

Need further information?

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