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Guide to Collections Care

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GAYLORD ARCHIVAL®

Preserve Today. Share Tomorrow.

Gaylord Archival's commitment to the care of collections dates back more than 120 years. Our company was founded on the creation of a transparent adhesive parchment paper, developed by brothers Henry and Willis Gaylord in 1896, which was discovered to have a wide range of applications for conservation, including paper repair. In the 1920s, the publication of our first newsletter, Gaylord's Triangle, and the Bookcraft® Book Repair Guide provided helpful tips for storage and simple, cost-effective techniques for the care of collections.

When the field of preservation expanded during the 1980s, we responded with a line of archival products. In 1992, Gaylord Archival issued its first Archival Catalog, followed by its innovative series of Pathfinders. Written by conservators, these illustrated guides earned a reputation for reliable information on the care and storage of paper, photographs, textiles and books.

This Guide to Collections Care continues Gaylord Archival's commitment to providing its users with the reliable information they need to preserve their treasures. Conservators have updated the information from our original Pathfinders and combined all five booklets into this one easy guide.

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Introduction

Documents, manuscripts, prints, drawings, pamphlets, periodicals, newspapers, postcards, and ephemera are typically made of paper—an organic substance that is vulnerable to deterioration over time.

All paper will deteriorate if mistreated or stored improperly. Some types of paper are particularly vulnerable—for example, the acidic wood-pulp paper that was produced throughout much of the 19th and 20th centuries. Unlike earlier papers, which were made of higher-quality fibers (commonly called rag papers), wood-pulp papers contain natural impurities and byproducts of the manufacturing process that break down to form acids in the presence of heat, light, and moisture in the air. Pollutants in the air and/or direct contact with poor-quality storage enclosures also cause discoloration and embrittlement of paper.

There are a number of steps that can be taken to preserve vulnerable paper collections. These include providing a cool, dry, clean, dark, and stable environment; protecting collections from disaster; handling collections carefully; choosing appropriate storage furniture; and using protective storage enclosures. Storage enclosures lessen the effects of fluctuations in temperature and humidity and provide protection against abrasion and handling, but they must be strong, durable, and chemically stable so that they do not damage the materials they enclose.

The goal of this section is to provide the background information necessary to select the most appropriate storage systems for flat paper (storage of photographs is addressed in a later section of this publication). It is oriented toward collectors, artists, archivists, and librarians who are new to the field of preservation. No introduction, however, can provide all the answers. For further information, consult the readings in Section 5. If your collections are extensive, in poor condition, or include works of art, it would be advisable to consult a professional conservator. The American Institute for Conservation of Historic and Artistic Works (AIC) provides an online "Find a Conservator" tool (at conservation-us.org) that provides the names of conservators in your region.

The information in this section reflects our current understanding of the storage requirements for paper. It will be revised as new information and products become available.

Archival Storage of Paper

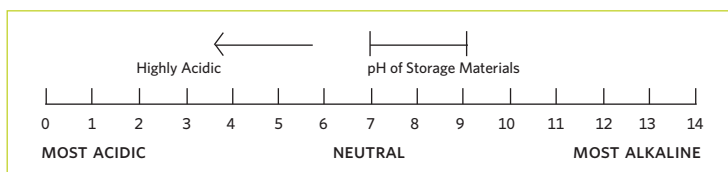
Selecting Storage Materials

To provide long-term protection, storage containers and enclosures should be made of materials that are strong, durable, and chemically stable. Enclosures and boxes should be tailored to the size, condition, and anticipated use of the objects being enclosed.

TERMINOLOGY

The terms “archival” and “archival quality” are often used to describe storage products, but these are non-technical terms that do not, of themselves, convey any specifics about the suitability of these products for use in preservation. It is important to evaluate the specific characteristics of each product and to choose the appropriate type of product for the item to be stored. For storage materials made from paper and/or board, these characteristics include (but are not limited to) acidity, alkalinity, the presence of lignin, fiber type, and adhesives used. Note that different characteristics apply to plastic storage materials, which will be considered separately.

Acidity and alkalinity are measured by pH using a logarithmic scale of 0-14. The pH of storage materials made from paper and board should ideally be in the 7.0-8.5 range.



Paper to be used for storage enclosures should be **acid-free**. Acid-free storage materials have a pH of 7.0 or higher. It is important to realize that although acid-free materials are not acidic when they are produced, they can become acidic over time. This can be due to internal impurities introduced in manufacturing or to external impurities such as pollutants, which degrade to produce acids.

For this reason, an **alkaline reserve or buffer** is often added to paper or board during manufacture to neutralize acids that may be produced over time. This alkaline reserve is usually 2-3% calcium or magnesium carbonate. Most paper collections will require buffered enclosures. While an alkaline buffer in storage enclosures is generally desirable, there are a few types of collections that are sensitive to alkaline materials and should therefore be stored in pH-neutral enclosures, not alkaline. These include blueprints and diazo reproductions, works of art with pigments that react to high pH, albums and collages with wool or silk components, and other items that contain animal proteins. Some photographs and textiles may be alkaline-sensitive; see later sections of this publication for more information on these materials.

Storage materials for paper objects should also be **lignin-free**. Lignin is a natural component of the cell walls of plants and trees. If it is not removed during manufacture, it can react with light and heat to produce acids and darken paper. Lignin-free actually means low-lignin; lignin-free materials usually have a maximum of 1% lignin.

Other components of paper or board enclosures that should be considered when determining their suitability for long-term preservation include fiber type and adhesives used in the enclosures. While cotton fiber makes the most chemically stable paper and board, it is possible to make high-quality paper and board from wood pulp by using a chemical process that removes impurities (the resulting pulp is usually termed chemical wood pulp or purified wood pulp). Groundwood pulp (also known as mechanical wood pulp), on the other hand, is always of poor quality and cannot be used to make suitable enclosures. In addition, adhesives used in enclosures must not discolor, deteriorate, or fail, and they should not discolor or damage adjacent materials.

The *American National Standard for Permanence of Paper for Publications and Documents in Libraries and Archives* (referenced on page 50) provides specifications for paper that will last several hundred years under normal use. This standard is intended for publishers and paper manufacturers but can also be useful in evaluating paper enclosures.

TYPES OF ENCLOSURES

Boxes: The boxboard used for most document boxes is 60 mils or points (pts.) thick (there are 1000 points in an inch, so 60 pts. is .060 inches thick). Lighter weight stock (40 pt.) is sometimes used for small boxes. Boxes suitable for long-term storage of paper items are available in several types of board, all of which are acid-free, lignin-free and buffered with a pH of 8.0-9.0. Boxes are also available with a polyester film laminate coating (Gaylord Archival® DocuDry™) to resist water damage. All boxes should be sturdy enough to support the contents and have reinforced corners and snug covers that prevent soil and pollutants from entering.

Folder Stock: Acid-free folders of various sizes are available in both buffered and unbuffered stock. The typical weight is 10 pt. with heavier weights available for oversized maps and prints.

Interleaving Material: Interleaving sheets are sometimes used to protect paper objects in storage. Tissue, glassine, various types of paper and clear polyester film can be used for this purpose. Acid-free tissue is available with or without an alkaline buffer, as is paper. Glassine is a smooth translucent paper that is not abrasive and can generally be used with friable (i.e., easily crumbled) media such as pastel or charcoal, but it is not very stable. Glassine is acid-free and unbuffered and should be replaced periodically if used. If polyester film is used for interleaving, it should meet the criteria for safety noted below, and it should not be used for items with friable media because of its electrostatic charge.

Mat Board: When matting and framing works of art on paper, conservation mounting/matting board (either a 100% cotton rag board or a purified wood pulp board) must be used both for the backboard and the window mat. For most materials, mat board should be acid-free, alkaline buffered, and lignin-free—with the exception of the alkaline-sensitive materials mentioned on page 3. For these materials, an unbuffered 100% cotton rag board is available. Mat board is available in two-, four- and eight-ply thickness. The heavier weights are recommended for oversized documents that need additional support. For hinges used to attach works of art to the backboard, Japanese paper (which is lightweight, lignin-free, and long-fibered) and a starch-based paste are recommended.

Plastic: Clear plastic enclosures are particularly useful for objects that receive continual handling, are too brittle to be handled unprotected, or like postcards, must be browsed to view the images. As noted above, artwork with friable media such as charcoal or pastel should never be placed in plastic because static electricity can lift the image from its support. Remember that plastic enclosures provide no protection from light. All items in clear plastic enclosures should be placed in boxes for long-term storage.

Polyester, polypropylene and polyethylene are the three types of plastic that are suitable for storage of paper objects. They should be uncoated and free of additives. Uncoated archival polyester is recommended because it is very stable. It is used for various types of envelopes, sleeves and folders. Polyester also comes in rolls or precut sheets and is available in thicknesses of 1-5 mil; 2-3 mil is used for average-sized documents, while oversized prints and maps need the extra support of 4-5 mil. Polypropylene is commonly used for containers. Polyethylene is highly flexible but not as clear; it is used for sleeves and bags. Polyvinyl chloride (PVC) enclosures, sometimes referred to as vinyl, are not acceptable for use because they are very unstable.

Documents may also be encapsulated between sheets of polyester using double-sided tape with a ¼" margin between the document and the tape. However, current research indicates that acidic paper deteriorates more rapidly if sealed in polyester. It is advisable to place sheets of buffered paper behind the documents before putting them in polyester or to consult a conservator about having them deacidified. An alternative to encapsulation, especially suitable for oversized documents, is a folder with a polyester cover sheet.



Standards for Materials

While there is no one standard that specifically governs storage materials for paper objects, there are several standards that provide helpful information for evaluating individual products. These include the *American National Standard for Permanence of Paper for Publications and Documents in Libraries and Archives*, ANSI/NISO Z39.48-1992 (R2009) and *Imaging materials—Processed imaging materials—Photographic activity test for enclosure materials*, ISO 18916:2007. The Photographic Activity Test (PAT) is a standardized test that is used to determine whether enclosure materials are safe to use with silver image photographs. It is discussed further in the section on storage of photographs.

Responsibility for adherence to standards rests with the suppliers. Gaylord Archival products are manufactured to the most recent national preservation standards. The company purchases or manufactures materials to standards published by the American National Standards Institute (ANSI), the National Information Standards Institute (NISO), and the International Organization for Standardization (ISO) when available or to industry-wide standards established by national institutions such as the National Archives and Records Administration and the Library of Congress Preservation Directorate. Specification information is available from Gaylord Archival on request.



Preparing Collections

Once you have selected the appropriate storage materials, the documents and other paper items should be prepared for storage. Always follow proper handling procedures when working with collections. Using white cotton gloves will protect items from dirt and oils on your hands. Do not eat or drink around collections. When moving paper documents or artworks, particularly brittle items, support the item carefully from below.

1. Remove extraneous materials, such as paper clips, rubber bands, wrapping material, old folders and any other material that is not pertinent. If foreign matter (such as pressed flowers) must be saved as artifactual evidence, place it in a separate enclosure.

2. Unfold and flatten papers wherever possible without causing damage to the folds.

Remove letters from envelopes. If the paper is brittle or inflexible, it may need to be humidified before unfolding. Consult a conservator for proper procedures. Prints, drawings, and extremely fragile or valuable items should be treated by a conservator. Once materials have been unfolded, remove surface soil with a soft brush.

3. Isolate newsprint because it is highly acidic and will stain adjacent paper. Newspaper clippings can be replaced with photocopies on alkaline paper or placed into a separate envelope. Fax copies are similarly unstable and should be reproduced or isolated.

4. Note any badly damaged items, place them in individual folders, and set them aside for professional conservation treatment. Do not undertake any “first aid” unless you have received training and are qualified to do so.

5. If it is necessary to place identifying information on the object itself, use a No. 2 pencil and write on the verso or in the lower right margin. Repeat the identification on storage

folders and envelopes in pencil or by applying labels. Never use ballpoint or felt-tip pens that might stain or bleed. Never apply labels directly to a document or work of art; labels are intended for boxes, folders and other enclosures.

6. To the extent possible, store objects of similar size and weight together. If heavy or bulky items are stored with lighter ones, damage can occur from uneven pressure.

7. Label boxes with adequate information about their contents. This curtails unnecessary browsing and rifling through the documents.



Selecting Storage Furniture

Once paper objects have been placed in enclosures and boxes, they must be stored in non-damaging furniture. Wood storage furniture is not recommended because it can emit acids and other harmful substances. It is possible to use a sealant on wood furniture, but this will not provide complete protection, and the sealant itself may emit damaging vapors. Even if wood shelves and drawers have been sealed, they must be lined with a barrier material, such as Marvelseal®, for additional protection. See “Storage Furniture: A Brief Review of Current Options” in the NEDCC Preservation Leaflets referenced on page 49 for more information.

Metal furniture with a baked enamel coating is acceptable for preservation purposes, but powder-coated steel or anodized aluminum furniture is preferred. As with enclosures, the choice of furniture will depend on the budget and the types of materials in the collection.

Regardless of the type of furniture, it should be appropriate for the types of collections to be stored in it. Open shelving is best for air circulation, although closed cabinets are sometimes needed for security purposes. Shelves should be adjustable, and collections should not protrude off the shelves or be crowded together. The lowest shelf should be 4–6 inches off the floor to reduce the chance of damage from flooding. Specialized furniture that will allow over-size items to be stored flat (e.g., map cases or shelving for oversize boxes) should be used.



The Storage Environment

A cool, dry and stable storage environment is crucial to the long-term preservation of paper collections. Heat and moisture accelerate the chemical reactions that cause paper to deteriorate, and high moisture levels can result in mold growth. Research has shown that lower temperatures and a lower relative humidity will greatly extend the usable life of paper collections.

Maintaining a stable environment is also very important. While boxes and storage enclosures can provide some protection against short-term environmental fluctuations, they will not protect collections against long-term changes in environmental conditions. Over time, climate fluctuations can cause paper to expand and contract, leading to distortion and weakening of the paper. Research has shown that large and frequent fluctuations, such as those that occur at night and on weekends if climate control systems are turned off or settings are altered, greatly accelerate paper deterioration.

There is no national standard for environmental conditions, but the National Information Standards Organization (NISO) has issued a technical report entitled *Environmental Guidelines for the Storage of Paper Records* (referenced on page 50), which gives suggested values for temperature and relative humidity for storage of paper records in libraries and archives. This report recommends a temperature no higher than 70°F and a relative humidity somewhere between 30% and 50% that can be maintained consistently.

Some practical suggestions for keeping the environment moderate and stable include: using portable dehumidifiers and air conditioning units in summer to lower humidity; lowering heat levels in winter to prevent humidity from becoming extremely low; and avoiding storage of collections in basements or attics where climate extremes tend to occur.

It is a good idea to monitor the climate in storage areas to ensure that it remains moderate and stable. Monitoring instruments ranging from humidity indicator cards to hygrothermographs and data loggers are available. See the NEDCC Preservation Leaflets (referenced on page 49) for more information on choosing an appropriate monitor and implementing an environmental monitoring program.



Case Studies

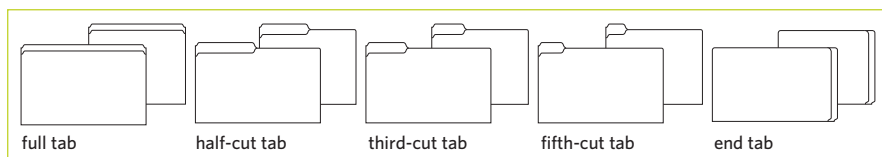
Selecting specific enclosures and boxes requires careful consideration. Physical condition, size of collection, anticipated use, and budget all play a part in the final choice. The second half of this section will present several case studies to show how products available from Gaylord Archival can be used to solve the storage needs of paper collections.

Case Study I: Documents

Scope: Documents, Manuscripts and Papers (letter or legal size)

A Select appropriate primary enclosures that will protect the contents and allow them to be removed for use without damage. The size should be larger than the unfolded sheets so that edges don't protrude and become damaged.

1. *Papers that are strong, flexible and of similar size can be placed directly into acid-free folders.* The number of items per folder depends upon the thickness of the paper, the condition of the paper and the nature of the document. For example, a single folder can be used to house one valuable print, 10-15 older manuscripts or 50 modern office records. Providing adequate protection is the primary concern. Folders come with and without reinforced tabs, in letter and legal sizes, with full, half, third, fifth cut or end tabs.



2. *Papers that are acidic, fragile, brittle, or torn need additional support and protection before placing them in folders.* Options for protection include:



- » *File folder inserts or slings* - Insert the item into a paper folder, file folder insert, or envelope sling before placing it into a folder. Paper folders can also be used to group papers instead of using staples or paper clips, which can be damaging.



- » *Individual polyester enclosures* - These provide fragile or small items with protection from handling while retaining visibility.
- » *Interleaving with 20 lb. buffered paper* - This protects documents from adjacent material and provides support during handling, especially for oversized documents. Objects can be removed from folders by lifting the larger interleaving sheets beneath them. Use interleaving paper, envelopes or folders to separate valuable documents from highly acidic materials such as newsprint or replace newspaper clippings with photocopies on alkaline paper.

3. *Paper envelopes can also be used to organize collections.* Short- or long-side opening envelopes can house groups of papers or thin pamphlets on sturdy paper. Envelopes must be large enough for items to be easily inserted and removed without abrading the edges. If fragile papers or pamphlets are to be stored in an envelope, they must first be placed in a paper folder or envelope sling. Be aware that envelopes containing paper collections should not be interfiled with book collections, because envelopes do not provide sufficient support for the items stored inside. If pamphlets or groups of documents must be shelved with books rather than in boxes, the items should be placed in pamphlet binders (see Case Study iv, page 11).



Fragile papers or pamphlets need the added protection of a paper folder or sling before being inserted into an envelope or folder.

4. *Groups of items can be placed into larger enclosures,* depending on the size of the collection, where it will be stored and how it will be used. Expanding folders are good for interim storage of collections that are growing rapidly, such as children's artwork or active correspondence.



B Place folders and envelopes in sturdy boxes. Storage boxes should be strong, have reinforced corners and match the size of the enclosures. To the extent possible, store items of similar size and weight together. Heavy or bulky items can damage lighter items stored in the same box.

1. *Upright storage in document cases is generally recommended for archival collections.* All folders in a box should be the same size, and they should fit the size of the box. Folders must be adequately supported so that documents don't sag and become distorted.

If there are not enough folders to fill a box, use an adjustable spacer to hold the folders upright and prevent them from slipping or sagging.

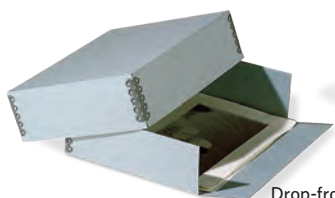


Folders should fill the box comfortably so that individual folders can be easily removed.

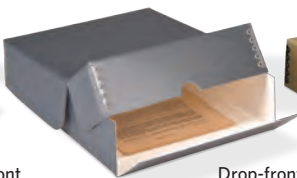


Adjustable document spacers can be purchased and fitted to your boxes. Dividers are also available to support and organize folders.

2. *Flat storage in drop-front storage boxes is sometimes appropriate, but also has some disadvantages.* It gives overall support, prevents damage from slumping, and protects edges of brittle documents—but documents on the bottom of the box can be distorted by pressure from the items above, particularly if items in the box are different sizes and weights. If flat boxes are used, they should have drop-front construction to make safe removal of folders easier. They should be stacked no more than two high.



Drop-front



Drop-front with hinged lid



3. *Another acceptable storage alternative for paper documents is storage in a file cabinet with hanging folders.* Acid- and lignin-free buffered hanging folders are available. Depending on how many items are in each folder, one or more folders may be placed in each hanging folder.



C Large collections of office records should be stored in record storage cartons. These are available in buffered and unbuffered board. The unbuffered cartons should be used only for short-term storage. Cartons must be strong and easy to transport.



Case Study II: Oversized Documents

Scope: *Documents, Papers, Maps, Posters and Ephemera (larger than legal size)*

A Select primary enclosures that provide adequate support. Folders are available in large sizes and should be made of heavier 10 or 20 pt. folder stock (instead of 7 or 10 pt.). Likewise, 4 mil polyester film or a combination of 2-3 mil for the front sheet and 5 mil for the back sheet should be used if oversized documents must be encapsulated.



Sheets should be sorted and grouped by size, if possible. Place no more than 10-12 sheets into a folder. See page 4 for advice about interleaving, which is recommended to support fragile oversized items. Remember that certain types of oversized documents (e.g., blueprints and diazo reproductions) will need unbuffered rather than buffered folders because of their sensitivity to alkalinity. If you buy both types of folders, be sure they are clearly labeled and staff knows when to use each type.



Storage/display folders with polyester cover sheets allow the contents to be viewed without damage and provide a backing of buffered material. These are more expensive, but worth the investment if the oversized items are fragile, valuable, or handled frequently. Remember, however, that these should not be used for artwork with friable media that may be lifted off the support by the plastic.

B For small collections, folders may be stored flat in drop-front storage boxes. Because of their weight, boxes should be stored no more than two high. Another option is the Ackley Filing System, which consists of corrugated boxes, file folders, L-sleeves and box labels and is designed for horizontal or vertical storage of large documents.

C Large collections of oversized maps, posters, and architectural drawings are best stored inside folders in metal flat files. Shallow drawers 1½ inches deep are preferable so that the folders on the bottom are not crushed. See page 6 for general information about storage furniture. As with storage in boxes, folders should be sized to fit the drawer, and all folders should be the same size.

D Use rolled storage when items are too large for flat files, as long as the items are flexible enough to withstand rolling and unrolling. Although flat storage is always preferable, it is not always possible. Rolled storage is a better alternative than sectioning maps or creasing drawings.



Use an acid-free tube that has a diameter of 3" or more and is several inches longer than the largest item being rolled. Depending upon their size and condition, 1-6 items can be wrapped around the outside of a tube with interleaving between individual items. The image should face the inside so that it is not exposed to light. The rolled document should be wrapped on the outside with acid-free paper or polyester wider than the document and secured with flat unbleached cotton tying tape (min. 5/16" wide). If the item is a blueprint, the wrapping paper or tissue should be unbuffered. A roll storage box will provide added protection.

Case Study III: Works of Art

Scope: *The storage of prints and drawings is outside the scope of this pamphlet. If your collection includes such work, your storage needs should be reviewed by a conservator. In the interim, separate the items and follow these guidelines.*

A Store artwork flat. If possible, place each item in its own folder or place interleaving paper between each work of art to protect the surface. Remember that artwork with friable media such as charcoal or pastel should never be placed in plastic because static electricity can lift the image from its support. Place folders in clamshell or drop-front storage boxes.

B For long-term storage of prints and drawings, conservators recommend window mats. These should be stored flat in reinforced boxes. For a description of procedures, see the AIC brochure *Matting and Framing for Art and Artifacts on Paper* (referenced on page 50) and *How to Do Your Own Matting and Hinging* in the NEDCC Preservation Leaflets (all are referenced on page 49).

C Matted artwork requires sturdy boxes that can support the extra weight of the mats. Their inner depth should be only 1½ or 2 inches, again to keep the weight manageable.



Case Study IV: Pamphlets

Scope: *Single Signature Pamphlets and Small Booklets*

A Pamphlet binders with four-flap inner enclosures provide maximum protection from abrasion when items are inserted and removed. Most pamphlet binders can be stored upright, provided there is adequate support from adjacent volumes.



B Envelopes may also be used for pamphlets, but fragile pamphlets require the protection of a paper folder or envelope sling before being placed into the envelope. Choose envelopes that are large enough to allow the pamphlet to be inserted and removed without damage. See page 8 for descriptions of envelopes and inner folders. If items in envelopes need to be shelved with books, use envelope storage binders or pocket binders to provide support.

C If envelope storage binders are not used, envelopes should be stored in boxes. Use an adjustable spacer for partially filled boxes. Pamphlet boxes with flip tops provide upright storage. Average sized pamphlets can also be treated like documents and placed in file folders in pamphlet boxes. This treatment is typically used when the pamphlets are part of a larger archival collection.



D Open pamphlet files are suitable for temporary storage only. They allow easy retrieval but do not provide adequate mechanical support for long-term storage, nor do they protect items from light and fluctuations in the environment.

Case Study V: Periodicals & Newspapers

Scope: Unbound Periodicals & Newspapers

A Collections of periodicals and newspapers should be stored flat in sturdy boxes because of their size and weight. The box depth should be shallower for contents that are heavy. When in good condition, issues can be placed directly into boxes. Polyester sleeves are available in large format sizes for newspapers and will provide long-term protection in flat storage. Adjustable spacers should be used to avoid slippage and sagging.

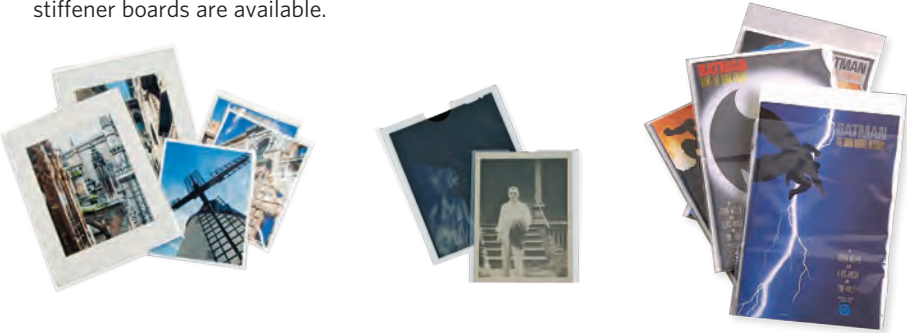


B Single issues of average size may be treated as pamphlets (page 11).

C Thin and fragile items require additional protection. They should be inserted into folders and envelopes before being put into boxes. See pages 7-8 for information about selecting folders and envelopes.



D Polyethylene bags provide temporary protection, especially when the items are subjected to excessive handling. Collectors and dealers may find these particularly useful. However, given the evidence that acidic paper appears to deteriorate more rapidly when encapsulated, it is not advisable to use sealed bags for permanent storage of acidic materials. If comic books must be stored so that they can be viewed, polyethylene envelopes with buffered stiffener boards are available.



E Open pamphlet files may be used for short-term storage of periodicals in good condition. The files allow easy retrieval, but they do not provide adequate support for long-term storage, nor do they protect periodicals without enclosures from light and dust.



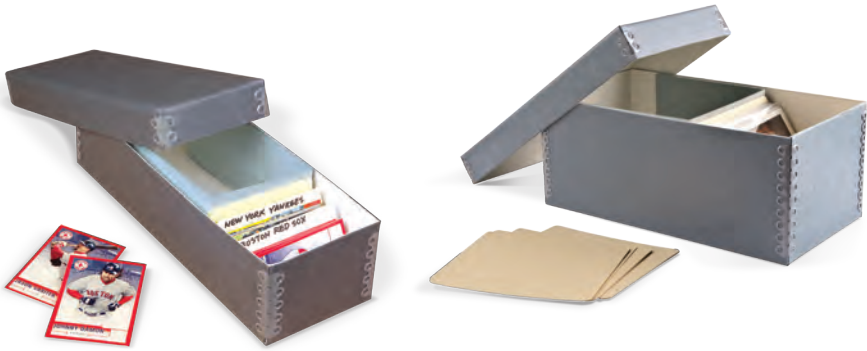
Case Study VI: Ephemera

Scope: Collections of paper ephemera provide the greatest challenge of all. Often size varies, the paper stock is poor, and people want to see the object itself. Common ephemera include postcards, greeting cards, brochures, and stereo views.

A Collections of ephemera can be stored according to the recommendations for archival documents and pamphlets (see Case Studies I and IV). Before being placed in folders, fragile or small items should be placed in paper folders, envelope slings, or individual polyester enclosures for protection. Polyester enclosures are useful for any items that will be frequently handled. Where possible, ephemera should be sorted and stored by type and size to prevent damage due to differing sizes and weights.



B Collections of materials in a single format can be stored in polyester envelopes in appropriately sized boxes.



C Albums and scrapbooks made of stable materials are another alternative for ephemera collections, especially for private collectors. A variety of 3-ring albums with plastic album pages and scrapbooks and scrapbook pages made from non-damaging materials are available.



Never attach ephemera with pressure-sensitive tapes, rubber cement, or damaging glues. Individual items can be attached to acid-free or buffered mounting paper using photo corners.

When objects have been mounted onto pages, they can be placed into polyester page protectors (sealed on one side), polyester sheet pockets (sealed on three sides), or polypropylene sheet protectors (sealed on three sides). Alternatively, polypropylene pages with various sizes of individual pockets are available; these are designed for popular sizes of photographs but may also be appropriate for small ephemera. If an ephemera collection includes photographs, remember that any enclosures or pages that are to be used with photographs must pass the Photographic Activity Test.

Case Study VII: Books and Other Bound Materials

Scope: Valuable and fragile books and other bound materials that require protection.

Book bindings are intended to protect the textblock, but sometimes the bindings themselves are so fragile or valuable that the books themselves require protective enclosures. Examples include: rare books that need additional protection against environmental pollution and light; fragile books that cannot stand upright on a bookshelf without sustaining damage; brittle books with loose pages; and damaged books that need temporary protection until a conservator can review and treat them. As more and more libraries rely on off-site storage, sturdy enclosures are also needed to protect items in transit.

Following are several options for protecting books and other bound materials. Ideally, enclosures should be custom-fit so that the items are not damaged by being jostled in the boxes. If a custom-made box is not possible, acid-free tissue paper can be used to fill the box around the volume.

A Custom-sized rare book boxes provide maximum protection. Gaylord Archival carries a selection ranging from prescored folder stock enclosures for lightweight books to sets of acid-free corrugated board that can be scored to create rare book boxes that are custom fit for larger or heavier books. A third alternative is a premade rare book clamshell storage box that comes with a supply of unbuffered tissue to wrap the book and title labels for the outside of the box.



B Tying and wrapping are less expensive options. These are short-term solutions for items that need repair or treatment by a conservator. They also provide protection for less valuable items that are being sent to off-site storage. Wrap book in acid-free tissue or wrapping paper and tie with cloth pull fasteners or cloth tying tape.

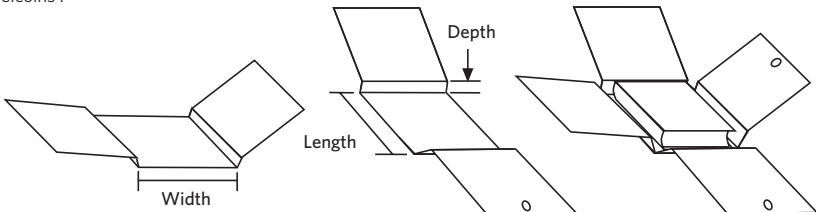


HOW TO CONSTRUCT RARE BOOK BOXES

1. Select board of appropriate width, crease with scoring wheel, fold over book, and attach VELCRO® Brand Velcoins®.

2. Select board of appropriate height.

3. Place second board around book and attach VELCRO® Brand Velcoins®.



C Phase boxes are the traditional storage containers for library books. Directions for making them are readily available online. Gaylord Archival provides all the materials required to make phase boxes, including 60 pt. board, washers and rivets.



D Book jackets provide effective protection for book covers that are either valuable or vulnerable. Examples include books with modern dust jackets in private collections, bindings that would be damaged by fingerprints, and deteriorated leather bindings with "red rot*" that could spread to adjacent books. Custom-sized polyester jackets can be made for hardcover books from archival polyester. Do not use glue to attach the jacket cover to your book. If you use tape to attach the covers, apply from cover to cover. Do not apply tape to the bookbinding itself.

MAKING POLYESTER BOOK JACKETS

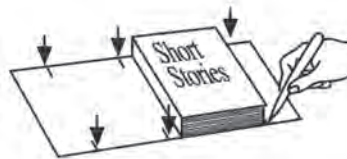
1. Cut a strip of archival polyester film to height of textblock and three times textblock width plus book's thickness.



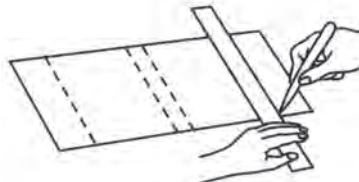
2. Wrap the film around book so that ends are even.



3. Using bone or nonstick folder, crease marks along fore-edge of book covers. Make crease marks at edge of spine, making sure polyester film does not shift on book.



4. On a cutting mat or other soft surface, line ruler up with dent marks and use folder to crease polyester film, making sure creases are parallel. Fold along lines using folder to ensure fold is sharp.



**Red rot is a disintegration of leather into a red powder. Gaylord Archival carries the product Cellugel that consolidates the rotted leather so that the deteriorating book cover may safely be handled without danger of breathing the loose leather dust or soiling hands and clothes. However, it is recommended that you consult with a professional conservator on the proper use of Cellugel. In the interim, cover with an archival polyester book jacket cover, as described above, or isolate the book in a separate rare book storage box.*

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Introduction

Photographs are found throughout our museums, libraries, historical societies, archives, and homes. Often taken for granted, photographs are actually fragile and easily damaged. Fading, stains, distortion, and other physical changes are signs of their deterioration. Unfortunately, deterioration is often the result of the inherent instability of certain photographic processes and materials—cellulose acetate negatives, nitrate negatives, and color slides and prints, for example. While the nature of our collections may be outside our control, deterioration can also be initiated or hastened by poor storage conditions and display techniques, which are our responsibility. The goal of this section is to provide the preliminary background information necessary to select appropriate storage materials for photographic collections. People with small personal collections may find this pamphlet adequate for their needs. Professional photographers, curators, archivists, and dealers will need to read further if they are to develop appropriate preservation programs. Fortunately, a number of excellent books are now available and are listed in Section 5 on pages 50-51.

No amount of reading, however, can provide all the answers if your collections are extensive, in poor condition, or include valuable works of art and rare examples of early photographic processes. Professional photographic conservators have the technical expertise to assess the condition of photographs and make recommendations for their storage and treatment. The American Institute for Conservation (at conservation-us.org) can provide the names of conservators in your region as part of their referral service.

This section reflects our current understanding of the storage requirements of photographs. It will be revised as new information and products become available. Unless noted otherwise, the items illustrated in this section are available from Gaylord Archival. Call 1-800-448-6160 or visit Gaylord.com for a free catalog.

Archival Storage of Photographic Materials

Selecting Materials

Storing your collections in appropriate envelopes, sleeves, albums, and boxes is fundamental to their preservation. These enclosures make photographs last longer because they protect against light, dust, handling, air pollutants, and rapid fluctuations in temperature and humidity. They must be made of materials that are strong, durable, and chemically stable if they are to provide long-term protection.

Suitable materials for the storage of photographs and negatives are now available, but buyers should use judgment and select a supplier who specializes in products for archival use. Suppliers' claims of "archival quality" in their catalogs and advertisements should be substantiated by product descriptions and test results that provide adequate technical information. Materials that come in contact with photographs should pass the Photographic Activity Test (PAT), ISO 18916, an accelerated aging test that verifies that they are non-damaging to sensitive photographic materials.



Look for this icon when selecting paper storage products for photographs and negatives from Gaylord Archival.

Paper: Since poor-quality folders and envelopes can hasten the deterioration of photographs and negatives, it is essential that paper be free of acidic compounds such as those found in alum-rosin sizing and unpurified wood pulp. It is also important that the paper and boards used to store photographs have very low levels of lignin (less than 1%) because lignin can cause staining and fading.

Acidity and alkalinity are measured by pH, using a logarithmic scale of 0–14, where 7.0 is neutral. Paper should not have a pH below 7.0. In most cases, choose a paper that has a pH of 7.5 to 9.0 and an alkaline reserve of 2–3% calcium carbonate, which will neutralize acid contaminants that come in contact with the paper. Some photographic processes, however, will react to alkaline environments. For these materials, unbuffered paper with pH 7.0 to 8.5 is best for envelopes and folders.

All papers used to store photographs should pass the Photographic Activity Test. Nitrate and cellulose acetate film should be stored in buffered paper. Unbuffered paper should be used for cyanotypes, including architectural blueprints and dye transfer prints. The current ANSI Standard recommends buffered paper for most black and white and color photographs and negatives.

Paper has advantages for storing photographic materials. Its opacity protects images from light and provides a surface for written information. Its porosity prevents the accumulation of moisture or harmful gases. However, items must be removed from paper enclosures to be seen, increasing the chance of mishandling and abrasion.

Paper Enclosures: Enclosures should protect items from dust and handling and provide physical support. Envelopes should be sealed on the edge with an inert adhesive. Adhesive-free paper enclosures, including folders and four-flap enclosures, are available.

Glassine: Although it has been the traditional material for storing negatives and for interleaving, glassine is no longer recommended for use with photographic materials. Buffering causes glassine to lose its translucency, and the thin unbuffered paper quickly absorbs environmental acids and moisture.

Interleaving Paper: A soft, smooth paper can be used to interleave photographic prints that are not placed in individual sleeves and to protect the surface of matted prints. Interleaving paper provides a barrier against dust and abrasion during storage and use.

Board: Like paper, board can be manufactured to be free of acids. The board used for most archival storage boxes is 60 points (60 mil) thick or 40 points thick.

Storage boxes made of barrier board should be sturdy enough to support their contents and have reinforced corners. Snug lids will prevent dust and pollutants from entering. Boxes are available in a range of styles, which are illustrated in the Case Studies at the end of this section.

Mat Board: When matting and framing photographs, use conservation board of cotton fiber or purified wood pulp. These boards are available in two-, four- and eight-ply thicknesses. The heavier weights are recommended for oversized photographs that need extra support.

Plastic: Clear plastic enclosures are particularly useful for photographs and negatives that receive continual handling and viewing. Plastics must be chemically stable, free of additives and abrasive surface coatings.

Plastics manufactured for commercial packaging, for example, often contain additives that react with oxygen and light to produce harmful chemical compounds that can damage photographic materials. Unfortunately, it is difficult to distinguish plastics with additives or surface coatings by look or touch. The best guarantee of quality is to purchase enclosures from a recognized supplier of archival materials.

Three types of plastics for long-term storage:

1. **Polyester:** Archival polyester (often referred to by brand names Melinex® and Mylar®) meets the requirements of long-term storage of photographic materials. Clear, smooth, and rigid, polyester gives support while letting users see the image.
2. **Polypropylene:** Untreated (uncoated) polypropylene is an acceptable low cost alternative to polyester. It is less rigid but is clear and can be used for photographic materials that do not need the greater support provided by polyester; or where the greater cost of polyester cannot be justified. Avoid polypropylene that has a surface coating applied.
3. **Polyethylene:** The softest of the plastics and the least clear. High-density polyethylene is translucent, like glassine, and its smooth surface is the least likely to cause surface abrasion. Like polypropylene, it is a lower cost alternative to polyester, where the clarity and rigidity of polyester is not needed.

Vinyl pages and some “magnetic photo albums” are unacceptable for the storage of photographs. Sheets and enclosures made of polyvinyl chloride (also called PVC or vinyl) are recognizable by their oily feel and smell. They release chemicals that react with photographic materials to cause staining and deterioration. Many older style “magnetic albums” have poor-quality backing pages coated with a tacky adhesive that may cause discoloration and make it difficult to remove photographs in the future. Cellulose triacetate is not recommended for long-term storage because it becomes distorted and can cause surface abrasion.

Plastic Enclosures: Several types of enclosures, made from the three safe plastics, are available. Unlike paper, plastic allows users to view the image without removing it. Ultrasonic or heat-sealed seams eliminate problems from adhesives, and the plastic protects the image from moisture and pollutants. Some of the most common enclosure types are folders, envelopes, sleeves, and storage pages for three-ring binders. These will be described in more detail in the Case Studies beginning on page 21.



Standards & Testing

The American National Standards Institute (ANSI) and the International Organization for Standardization (ISO) have developed technical standards for photographic materials, processing, and storage. These include:

1. *Processed Imaging Materials—Albums, Framing and Storage Materials*, ISO 18902:2013
2. *Processed Safety Photographic Films—Storage Practices*, ISO 18911:2010
3. *Processed Photographic Materials—Photographic Activity Test*, ISO 18916:2007
4. *Polyester-Base Magnetic Tape—Storage Practice*, ISO 18923:2000
5. *Optical Disc Media—Storage*, ISO 18925:2013

Adherence to standards rests with the supplier. Gaylord Archival's products are manufactured to the most current standards established by ANSI and ISO, and to the specifications of institutions such as the National Archives and Records Administration and the Library of Congress Preservation Directorate. Information and specifications about their products are available from Gaylord Archival.

For quality assurance, Gaylord Archival maintains an independent testing program. Samples of photographic storage materials are periodically sent to the Image Permanence Institute in Rochester, New York, where the Photographic Activity Test is administered. Tested materials include box board, album pages, envelopes, and folders. Results are available on request.



Preparing Collections

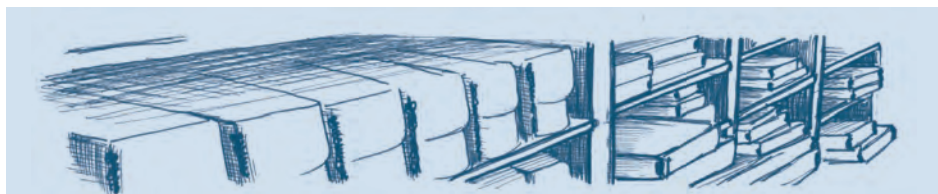
Before selecting storage materials, you will want to evaluate your collection from several points of view. For the family collection, this may be as simple as sorting photographs on the dining room table. For the large institution, a survey may be required.

FOLLOW THESE STEPS BEFORE SELECTING STORAGE MATERIALS

- 1. Assess the value of your collection.** Are the photographs unique? Do negatives exist to make duplicates? Are the prints valuable as works of art or as historical documents? These answers will help set priorities and budgets.
- 2. Create an inventory.** List the types of formats, sizes, and quantities of items in your collection so that you can select appropriate types and amounts of storage materials.
- 3. Anticipate the use the collection will receive.** Who will use the photographs? How often? Heavily used collections will need extra protection, especially if materials are to be handled without supervision.
- 4. Obtain copies of unique or important images.** Good quality copy prints are useful for display, for added security, and for sharing with others. Larger portrait studios and photography shops can provide copy services for reasonable rates.

FOLLOW THESE GUIDELINES AS YOU PREPARE YOUR COLLECTION FOR STORAGE

- 1. Handle prints and negatives along the edges**, preferably wearing white cotton gloves. Dirt, dust, and oils from your fingers can cause permanent damage.
- 2. Remove photographs and negatives from poor-quality enclosures** if it is possible to do so without causing damage. Remember to keep all information from the old pages. If prints are dry mounted or glued to old album pages and mats, do not attempt to do the work yourself. Place the entire page in a folder or plastic sleeve.
- 3. Remove extraneous materials** such as paper clips, rubber bands, old clippings, and notes. If important, these can be placed in envelopes and stored separately. Newspaper clippings should be photocopied onto alkaline paper.
- 4. Note any badly damaged items**, place them within individual folders, and set them aside for professional conservation treatment. Do not undertake any “first aid,” and never use pressure-sensitive tapes or glues to mend photographs. It is far better to make a copy of the print and store the damaged original.
- 5. Whenever possible, place identifying information on the enclosures** rather than on the photographs themselves. Use a No. 2 pencil, Pigma® pen, or actinic ink on paper, and a film-marking pen on plastic. Felt tipped pens and ball point pens should never be used because the ink can bleed through and stain the photograph. Use labels with a stable adhesive on boxes and folders.
- 6. If it is necessary to have identification on the photograph itself, write brief notations lightly on the back with a lead pencil (No. 2 or softer).** If the surface of resin coated paper does not accept pencil, use a blue photo marking pencil or a film marking pen to write on the back edge of the print.



The Storage Environment

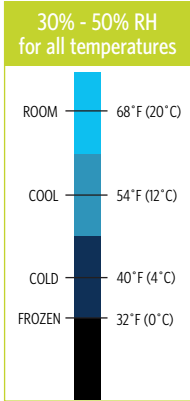
Once photographs have been placed in enclosures, they should be stored in an environment that is dark, cool, and dry. Research has proven that high humidity and temperatures will accelerate deterioration in films and prints. Silver images (black and white photographs) are affected primarily by humidity and contaminants from poor-quality enclosures or air pollution. Color photographs are sensitive to light, heat, and humidity. Light is such a threat to color prints that it is best to have a second copy (kept in the dark) of any color prints that are displayed for long periods. Prolonged damp conditions (relative humidity over 65%) can lead to mold growth on photographs. Fluctuations in temperature and humidity may cause yellowing or staining to digital prints, as well as color bleeding. Ozone and other pollutants may cause image deterioration, particularly with dye images on micro-porous coating. Protect optical discs from scratches, abrasions, dust, and pollutants. Corrosion of the metallic surface and mold growth may occur on discs due to high humidity.

Achieving an acceptable environment is critical if photographs are to survive. For families, this means removing photographs from damp basements and overheated attics. A shelf in a dark closet on the main floor is often the best location available in a home. When storage conditions are less than ideal, it becomes even more important to provide enclosures and boxes that buffer the photographs from the deleterious effects of the environment.

Institutions must ensure more extensive environmental controls. The International Organization of Standardization (ISO) provides up-to-date information concerning the care and handling of photographs. Since photographs, including negatives, are made with various materials, it is difficult to provide uniform storage recommendations for all formats. The Image Permanence Institute has created a *Storage Guide for Acetate Film* (SGAF), based on

the recommendations from the ISO. This guide provides the ISO standards and also includes a simplified version to assist in the long-term preservation. For the simplified version, reference to cool and cold for this context can be translated as: 54°F (12°C) and 40°F (4°C), respectively.

The Four Room Temperature Categories



In this context, ROOM, COOL and COLD are characterized by one "anchor-point" temperature. FROZEN applies to temperatures of 32°F (0°C) and below.

Risk Factors for Storage Environments

HEAT	HUMIDITY
Yellowing Cracking Delamination	Bleed Blocking Ferrotyping Mold Cracking Delamination

Photographic film: black-and-white and color

Maximum temperature depends on maximum RH.
Simplified: cold with maximum 50% RH.

Black-and-white prints

Maximum temperature 64°F (18°C) for maximum 50% RH.
Simplified: cool with maximum 50% RH.

Color prints

Maximum temperature depends on maximum RH.
27°F (-3°C) maximum temperature for maximum 50% RH.
36°F (2°C) maximum temperature for maximum 40% RH.
Simplified: cold with maximum 50% RH.

Digitally printed materials

Maximum temperature depends on the digital print type. See the *IPI Guide to Preservation of Digitally-Printed Photographs* for detailed information.
Simplified: cold with maximum 50% RH.

Optical discs

70°F (21°C) for maximum 50% RH.
Simplified: cool and cold considered optimum. Frozen not recommended because of concerns about layer separation.



Case Studies

Selecting specific envelopes, albums, and boxes requires careful consideration. Physical condition, size of collection, anticipated use, and budget all play a part in developing a strategy. Section 2 presents several case studies to show how the products available from Gaylord Archival can be used to store photographic prints and negatives. If the photographs are part of a larger archival collection, consult Section 1: Archival Storage of Paper for additional information.

Case Study I: Photographs – Unmounted

Scope: Standard Size Unmounted Photographic Prints (black & white and color).

A Select appropriate primary enclosures made of chemically stable and durable materials that will protect the photographs and not cause damage. All storage materials should pass the Photo Activity Test. Unless the prints have little value or are consulted infrequently, it is best to place each print into an individual enclosure.

1. *Photographs that are viewed often may be placed in plastic enclosures that allow the image to be readily seen.* Because of its rigidity, polyester provides better support for prints that are fragile or on thin paper. However, it should be avoided for prints with flaking emulsion that could be lifted by static electricity. Very fragile prints may need the additional support of acid-free board.



2. *Photographs may be placed directly into paper enclosures.* Enclosures come in a range of styles. Avoid envelopes with center seams and select those with seams along the bottom and side, sealed with a stable adhesive.



3. *If the photographs are going to be boxed without enclosures, place interleaving paper between the prints.*

B Place sleeves or envelopes in folders or boxes that are made of paper or board that is acid-free, has a low lignin content, and passes the Photographic Activity Test. It is best to group photographs of similar sizes together in standard sized enclosures so that they provide even support for each other.

1. *Storage boxes should be strong, have reinforced corners, and match the size of the prints.* A range of styles are available, depending upon the size and condition of the prints. For digital prints, to avoid pressure in a stack situation, place only a few prints in archival boxes or folders.



2. *Acid-free hanging folders may be used for active collections that are consulted frequently.* Because they do not provide the additional protection against light and the environment that boxing does, hanging folders are not recommended for long-term archival storage.

3. *Prints stored in plastic sheet protectors can also be placed in 3-ring binders. See Case Study III for details. As with hanging files, binders do not provide the protection of boxes and should not be used for fragile or rare prints.*

Case Study II: Mounted and Matted Photographs

Scope: *Photographic prints mounted on board and unframed photographic prints in window mats.*

Many libraries have collections of photographs that were glued to cardboard for display, study, and teaching. Albumen prints and other types of nineteenth century photographs were also mounted. Today these acidic mounts are often brittle and cracked along the edges but cannot be removed without seriously damaging the prints. It is necessary, therefore, to store the prints in such a manner as to prevent any further deterioration.

At the same time, photographers continue to choose dry mounting as the display technique for their work. Conservators do not recommend dry mounting original art because the process is irreversible, even when museum-quality board and heat-activated acrylic adhesives are used. However, collectors and museums still acquire prints that have been dry mounted and need to store these prints safely.

Matting and framing are the preferred methods for displaying and storing valuable photographs. Prints are attached to an acid-free conservation board via a reversible hinge and then covered with a window mat custom cut to display the photograph or print. Detailed descriptions of appropriate matting and framing techniques appear in *The Life of a Photograph* and *The Permanence and Care of Color Photographs* (see reference, page 51).

A Select appropriate materials to protect the surface of the prints and provide adequate physical support for the mounts.

1. *If the mounted prints are consulted frequently, place them in polyester sleeves. If the mounts are sound and sturdy, you may use a lighter weight plastic like polypropylene sleeves or polyethylene thumb-cut envelopes.*



2. *If the board is acidic and breaking, place the mount in a 4 mil polyester envelope with a piece of lignin-free board, slightly larger than the mount, behind it for support.*
3. *If the mounted photographs are not used often or are not worth investing in sleeves, place interleaving paper over the surface of each print before boxing.*

B Store mounted and matted photographs flat in acid-free boxes.

1. *Place mounted photographs in boxes that closely fit the size of the mounts.*



2. *Matted photographs require sturdy boxes that can support the extra weight of the mat board.* Their inner depth should be only 1½ to 2 inches to keep the weight manageable.



Case Study III: Photographs in Albums

Scope: *Standard and custom size unmounted photographic prints (black and white, color, digital).*

Albums are the traditional format for organizing and preserving personal collections of photographs and memorabilia. Unfortunately, the papers and glues used in the past were usually acidic. Many “magnetic albums” have adhesives on poor-quality backing pages that may cause prints to discolor and stick. Today, it is possible to purchase albums that will preserve your photographs for generations to come. Gaylord Archival offers a range of options.

A Select an appropriately sized album made of chemically stable, durable materials.

Do not use any damaging glues or tapes to attach materials to the pages. Photo corners are a preferred alternative.

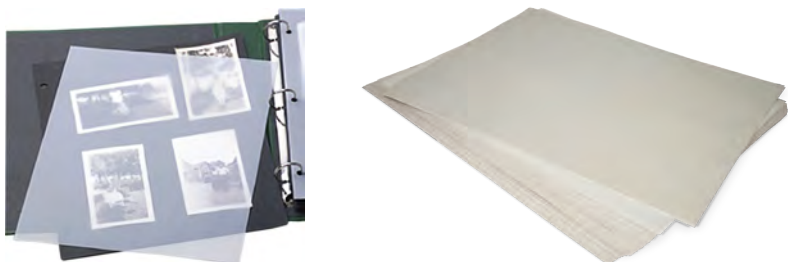
1. *If your photographs are standard sizes, the most cost effective method is to place the prints in polypropylene sheets with pockets that correspond to print size.*



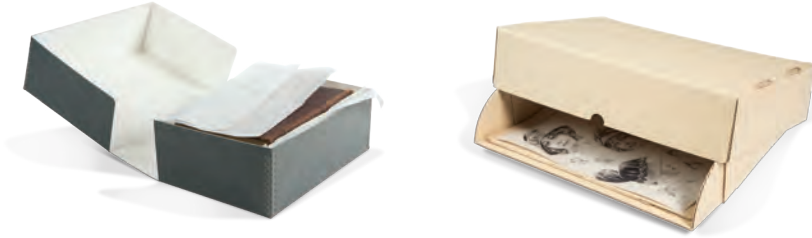
2. *If you like a traditional look, select an album with mounting pages and polyester protectors.* The paper should be pH neutral and thick enough to support the weight of the photographs.

B If you have an older album that you want to preserve intact, place it in an alkaline/buffered box and store it flat. This is the best alternative if the prints cannot be removed without damage or you don't want to lose the annotations or original appearance. A box will protect the album from light and dust and lessen the effects of pollution and handling.

1. *If photographs face each other or if the album includes unstable material like newsprint, place interleaving sheets between the pages as a barrier.* Buffered interleaving papers are available. Interleaving does, however, add bulk and should not be used if it strains the binding.



2. *If the album is not used often and funding is limited, an inexpensive solution is to wrap it in alkaline/buffered paper and store it flat.*
3. *If the album size corresponds to a standard size document storage box, place it in a clamshell or drop-front box so that the album can be removed without damage.*



4. *Boxes should fit properly.* If a premade box is not available in an appropriate size, Gaylord Archival can create custom boxes to your specifications. All materials, especially the inner box linings, should be alkaline and buffered. This option is typically reserved for rare and valuable books.

Case Study IV: Other Formats

Scope: *Cartes de Visite, Cabinet Cards and Stereo Cards.*

During the second half of the nineteenth century, professional photographers produced a range of mounted photographs in smaller formats for the general public. Gaylord Archival has developed polyester sleeves and boxes to fit the sizes of the most popular formats: Cartes de Visite, Cabinet Cards and Stereo Cards. It is best to place these items in enclosures that are specially made to size rather than to put them in oversized enclosures where they may shift or fall out, causing abrasion and damage. For more details about the chemistry and preservation of these historical materials, consult *Care and Identification of 19th-Century Photographic Prints* (page 51).

A Place mounted photographs in polyester sleeves to protect the image surface. Use self-locking polyester sleeves for Cartes de Visite and Cabinet Cards; polyester sleeves with the two long sides sealed for Stereoscopic Cards.



B Place sleeved cards in boxes made of low-lignin alkaline buffered board. Use Deep Lid Storage Boxes for Cartes de Visite and Flip-Top and Shallow-Lid Storage Boxes for Cabinet Cards. Stereo Boxes have a slant-back design that makes it easier to view the stereoscopic images.



Case Study V: Negatives

Scope: *Film Negatives (Black & White and Color) and Glass Plate Negatives.*

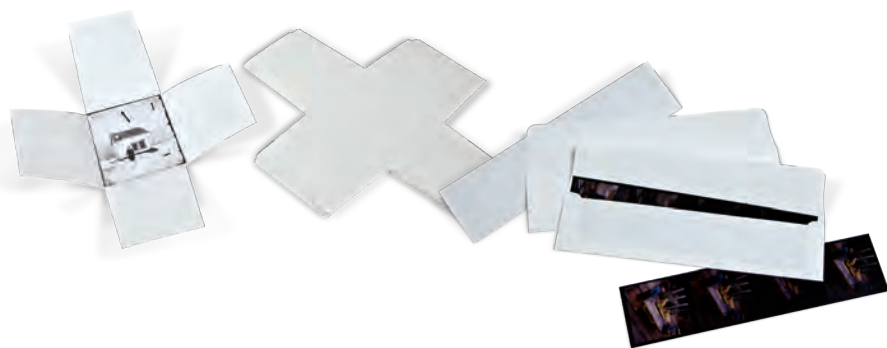
Glass negatives were popular from 1855 until the 1920s, and flexible plastic films were introduced around 1890. Nearly all films manufactured before the 1930s—and some made as late as 1950—have a highly flammable base of cellulose nitrate. Any film marked “Safety Film” is not nitrate and is nonflammable; it has a base made of cellulose acetate or polyester plastic. Most safety films (both color and black & white) have an acetate base, although the use of polyester has been increasing since the 1960s. Currently, polyester is used primarily for large-format negatives (4 x 5 inches, etc.), while 35mm and 120mm roll film are usually on an acetate base.

An important issue for film preservation is the inherent chemical stability of the plastic base. Nitrate and acetate are prone to decompose, release odors, and become crinkled, sticky, and generally unusable. When stored in warm (or worse, warm and humid) conditions, the plastic base will deteriorate rapidly. In comparison, polyester film base is much more stable.

Because of their instability, nitrate and cellulose acetate should be placed in alkaline buffered paper envelopes and sleeves for long-term archival storage. Plastic enclosures can prevent the byproducts of decomposition from escaping and cause these films to deteriorate more rapidly. If negatives show signs of deterioration, they should be duplicated onto stable polyester film. Cold storage with low or moderate relative humidity is recommended for the long-term storage of original cellulose acetate and cellulose nitrate negatives to retard further deterioration. It is especially important that cellulose nitrate be stored in a controlled environment with adequate ventilation because of the film’s instability and flammability. Cold storage is also recommended for color film.

See the *IPi Storage Guide for Acetate Film*, *Ritzenthaler’s Photographs: Archival Care and Management*, and *Wilhelm’s Permanence and Care of Color Photographs* (page 51) for details.

A Select paper enclosures that match the size of your negatives. Strips of 35mm and 120mm film are placed in sleeves and larger format negatives are placed in individual envelopes. Both are available in buffered and unbuffered paper. Four-Flap Negative Enclosures eliminate all adhesives and the flaps provide additional support for prints.



B Plastic enclosures come in a wide range of styles and materials. They are particularly useful for collections that are used frequently because the images may be viewed without removing the negatives.



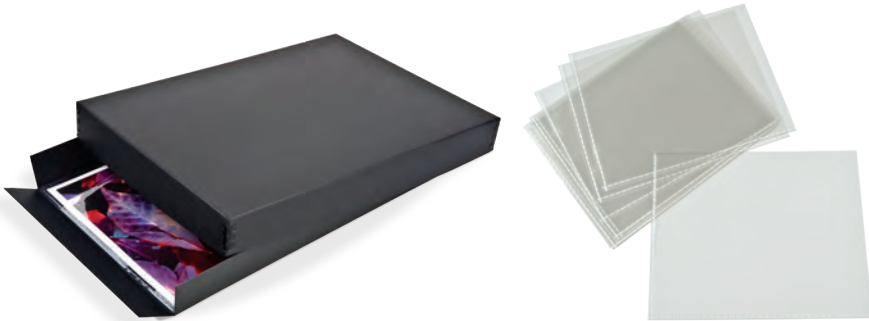
- C Plastic enclosures can be inserted into paper envelopes.** This allows you to record cataloging information on the paper envelope.
- D Once in enclosures, negatives may be placed in boxes, binders, or hanging folders.**
- E Glass negatives are extremely vulnerable to damage and require additional support.** Use Four-Flap Enclosures that are double-creased. Store enclosures vertically in sturdy Shallow Lid Storage Boxes sized to fit.



Case Study VI: Digitally Printed Materials

Scope: *Digital Photographs.*

Digitally printed materials have become a common source of graphic documentation and include documents, books, posters, and both amateur and professional photographs, to name a few. Some of the most common processes used to create digital prints are: inkjet, dye sublimation and electrophotographic. Generally, the color for digital prints is made up of dyes or pigmented inks (the latter being the most stable). The paper support may be a plain (uncoated) paper or have a swellable polymer coating (which protects the image from the environment) or a microporous coating (which has a faster drying time). Because of the wide variety of products available, it is important to note that the sensitivities of digitally printed photographs to damage depends largely on the products used in the printing process and, as such, is highly variable.



For storage, select appropriate primary enclosures made of chemically stable and durable materials that will protect the photographs and not cause damage. Individual enclosures are recommended. Any paper enclosures should be acid-free, lignin-free, and buffered. All storage materials should pass the Photo Activity Test. Gaylord Archival has several products specifically designed for storage of digital prints. For primary enclosures, 8 mil polypropylene presentation pockets are available and polyester L-sleeves will hold large format digital prints. Digital print boxes are available with or without a drop-front design.

Case Study VII: Optical Discs

Scope: *CDs and DVDs*

There are various formats of optical discs, the most popular is the compact disc (CD) and the digital versatile disc (DVD). Optical discs can be divided into two categories. One type—audio compact disc (CD-A), DVD-ROM's and CD-ROM's (Read Only Memory), which are stamped from molds—is used for the publishing media and intended for mass production. The other type consists of writable discs on which the user can record individual data. There are two types

of writable discs: those that cannot be modified after recording (CD-R, DVD-R) and rewritable discs (CD-RW, DVD-RW), which can be modified after initial recording.

The structure of optical discs consists of complex layers. Discs are generally composed of three layers: a transparent polycarbonate plastic wafer, a reflective aluminum or gold layer, and a protective coating. Both recordable CD's (CD-R's), and magneto-optical (MO) discs include an additional laser-sensitive coating. The even more complex structure of DVD's is made of two CD's bonded together.

Improper handling may cause rapid deterioration of CD's. Scratches can interfere with reading, particularly if they are around the circumference of the disc. During storage, environmental conditions play a considerable role in the media longevity. Because of the internal stresses which are caused during the fabrication of optical discs, rapid environmental changes can cause similar effects such as cracks and delamination of the layers. ISO standard 18925:2013 specifies storage conditions for optical discs. These include avoiding temperature and relative humidity extremes and maintaining stable temperature and RH conditions. As with traditional materials, storing these discs in a dry, cool environment slows the degradation mechanisms. Pollutants may cause corrosion of the metallic reflective surface. The longevity of the CD-R depends on the CD itself (type of dye, metal layer, etc.) but also on the quality of the recording, which may differ from one CD burner to another. At least once every five years, the collection should be inspected for physical appearance and legibility.

A CD's and DVD's can be stored in polypropylene album pages for a safe, visible, and organized storage. Polypropylene CD Storage Pages are designed to hold CD's in a standard 3-ring binder or album.



B Place optical discs in individual Tyvek® sleeves. These inert, nonabrasive, antistatic Tyvek® CD holders are also mold and tear resistant. Polypropylene CD Sleeves have a soft, black nonwoven polypropylene interior and can hold 2 CD's.



C Never write on optical discs or stick labels on the surface. Instead use foil-back labels on the sleeve to identify contents.

D Optical discs may also be stored in translucent, polypropylene cases. Insert literature or labels inside for quick identification.



E Always store optical discs vertically. Place sleeved or cased discs in boxes to protect them from dust and dirt. Use either a flip-top or a shallow lid for easy access.



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Introduction

The term "textile" covers a wide range of objects made of fiber—historic dress, flags, samplers, quilts and tapestries—as well as costume accessories such as handkerchiefs, hats and gloves. Due to their utilitarian nature, most textiles survive by chance. Some are cherished and carefully packed away, while others are displayed. Many, however, are used daily, washed frequently, and eventually discarded. Today we treasure historic textiles because they document art, craftsmanship, and have a very immediate connection with people of the past. We also save contemporary textiles for their beauty or their significance in our lives.

Unfortunately, textiles are among the most fragile of all artifacts. They are easily damaged by insects, mold, handling, and exposure to light, heat, and humidity. As with all art and artifacts, preservation begins with proper storage, whether the textiles are family heirlooms or part of collections in museums, historical societies, or archives.

The goal of this section is to provide the background information needed to select appropriate storage materials for textiles. If your collections are small and in good condition, this may be all the information you need. However, if you would like to know more about textiles and their preservation, Section 5 will guide you to further readings. If your collections are extensive, in poor condition, or have significant value, it would be advisable to consult a textile conservator. The American Institute for Conservation (conservation-us.org) provides a free referral service that will give you the names of textile conservators in your region.

This section reflects our current understanding of storage requirements for textiles. It will be revised as new information and products become available. Unless noted otherwise, all of the items illustrated in this section are available from Gaylord Archival. For a free catalog, visit Gaylord.com.

Archival Storage of Textiles

Selecting Materials

Before selecting storage materials, you should evaluate your collection for the types of fabrics, the sizes of the textiles, and their condition. It is also important to assess the storage space that you have available. Although flat storage is ideal for some textiles because it minimizes damaging folds, space constraints may limit the size of the boxes or storage systems that you select. For guidance on storage of a large or valuable collection, consult a textile conservator.

Many materials used for household storage will damage textiles, including regular tissue paper, cardboard, and wood. These materials are acidic and will hasten the deterioration of fabric, especially in historic textiles. Paper-based storage materials for your collection should be acid-free; other materials should be inert and have good aging properties.

Paper-based Products: Acid-free materials are either buffered (they contain a reserve of alkaline material) or unbuffered. Buffered papers and boards should be in contact only with textiles made of plant-based fibers, such as undyed cotton or linen. All other textiles and their dyes may be damaged by this contact and should be stored using unbuffered materials. If you are unsure of the fabric, or if there are mixed fibers and/or blends, choose unbuffered materials. In uncontrolled environments, paper and cardboard can also help to buffer changes in relative humidity.

Acid-free Tissue: Gaylord Archival acid-free tissue is a lightweight (.001 mil thick) paper that can be used to wrap textiles or pad three-dimensional forms. Buffered tissue has more body because it contains calcium carbonate, which is added as a buffer to give it a pH of 8.5. Abaca is an unbuffered tissue that is particularly soft and suitable for interleaving fragile silks or padding. Choose tissue according to the qualities suitable for your textiles (body vs. softness, surface texture) and the type of fabrics you will be storing.

Box Board: Acid-free boxes are recommended for storage of some textiles. Board can be solid (made of the same material throughout); laminated (sheets of heavy pressed fiber adhered together); or corrugated (one or more sheets of fluted paper glued between sheets of flat paper). Metal corners are used to reinforce solid board boxes; corrugated board is dimensionally stable and does not require this reinforcement.

Acid-free board can also be either buffered or unbuffered. Always line a box, whatever its material, with acid-free tissue before placing a textile inside.

Cloth: Undyed cotton fabric can be used in place of paper products. The fabric should be washed in a neutral detergent (not soap), then run through another cycle without detergent and dried. Cotton muslin is unsized and tightly woven, which makes it suitable for interleaving, outer wrappings, garment bags or coverings for padded hangers. Do not use muslin in contact with very fragile silks or other textiles that are easily abraded.

Synthetic Materials: Synthetic materials should be used with care for textile storage. Some of these materials are inert and may be used safely, but others will cause damage to the textiles. Wrapping or containing textiles in any plastic film or container can cause moisture condensation and promote mold growth and is not recommended. Dry cleaners' bags are particularly unsuitable for storage of textiles because they cause yellowing and damage to textiles.

Some materials can be safely used for padding or lining boxes. Polyethylene foam such as Volara® provides excellent drawer padding or box lining for accessories. Tyvek® is a spun-bonded olefin that is inert, pH neutral, nonabrasive and durable. It can be used to make garment bags or furniture covers. Polyester fiber batting can be used for padding; always use either needle-punched or heat-set batting, never resin-set. Always cover batting with muslin to prevent the textile from attracting polyester fibers.

Other synthetic materials can be used to seal unsuitable storage materials such as wood, preventing off gassing of acids and other volatile compounds. Marvelseal® and archival polyester are often used for this purpose. Isolate textiles from these materials with acid-free tissue to protect them from sharp edges, static, and soiling.



Preparing Collections

Because textile collections are so varied in size and scope, and individual items can be extremely fragile, it is important to follow strict guidelines when preparing your collection for storage.

Handling: When handling your collection, plan your actions so as to minimize movement of the textiles. Any flexing or strain causes damage to textiles, although it may not be immediately discernible. See pages 85-90 in *Conservation Concerns* (Section 5, page 51) for an excellent discussion on condition of textiles.

Textiles easily pick up soil and oils, so be sure hands and all surfaces are scrupulously clean. Cotton or latex gloves can be worn when handling textiles, but be sure to take them off when performing other activities to avoid picking up dirt. Replace gloves when they become soiled. Do not smoke, eat, drink, or use pens and markers near textiles. Remove jewelry and watches that might snag textiles.

Be sure your work surface is large enough to fully support your textiles. Place all textiles on acid-free tissue on the work surface, and use the tissue to rotate or move the textile. Support textiles on acid-free cardboard when moving them from one place to another. Larger, rolled textiles can be moved on their tubes.

Cleaning: Most textiles can be safely surface cleaned by vacuuming; do this before storing textiles and after removing them from display. For all but the most robust rugs or tapestries, vacuum the textile at low suction through an upholstery screen. If your vacuum does not have adjustable suction, use your fingers to keep the nozzle elevated slightly to reduce suction.

For wet or dry cleaning of historic or valuable textiles, consult a textile conservator. Cleaning is a delicate process that can cause substantial damage and should be performed by an experienced and trained conservator.

Modern christening gowns and other new textiles of cotton, linen, or synthetic blends in good condition may be carefully hand washed. Use a pure detergent (not soap, which causes yellowing) and distilled water. Modern wedding gowns or christening gowns should be cleaned immediately after wearing because soil and stains become more difficult to remove as they age. Most wedding gowns will require dry cleaning. Use a reputable dry cleaner and request fresh or filtered solvent.

Repair: If your textile or garment is new, a skilled seamstress may be able to make the required repairs. Historic or valuable textiles, however, should be examined by a conservator who has the experience and expertise to evaluate condition and recommend appropriate treatment. The American Institution for Conservation (conservation-us.org) offers a free referral service and will give you the names of textile conservators in your region.

Labeling: Identification information should be placed on the storage container so textiles are not unwrapped and handled needlessly. Boxes, tubes, or other supports can be labeled in pencil. Avoid the use of pens or markers around any textile. Sew-on tapes made of cotton twill can generally be used safely. Consult a textile conservator when establishing labeling procedures for a historic or valuable textile collection.



Selecting Storage Furniture

Before planning a storage installation, it is advisable to consult a textile conservator about configuration and materials. The size and type of furniture needed is determined by the type and number of textiles to be stored. Powder-coated steel storage cabinets are currently considered the best choice for textile storage. Wood and wood products, including cedar chests, are unsuitable for textile storage because they create an acidic environment. See pages 23-28 in *Conservation Concerns* for more details about wood and other materials. The NEDCC Preservation Leaflets also have excellent information about the choice of storage furniture.

If wood or otherwise unsuitable cabinetry must be used, it must be completely sealed on all interior surfaces with an appropriate barrier material or coating.



The Storage Environment

While a textile is in storage it should be protected from damage caused by exposure to light, dust, fluctuating or extreme temperatures and humidity, harmful storage materials, mold, insects, and animal pests.

Temperature & Relative Humidity: Textiles should be stored in an environment that is consistently cool and has a moderate humidity. Attics and basements are not suitable locations for storage of textiles because of their extremes of temperature and humidity. High temperatures speed deterioration and high humidity encourages insect and mold activity. Conversely, a low relative humidity contributes to the desiccation and embrittlement of fibers.

Cold storage is beneficial for textiles because deterioration is slowed and insects are less active. However, many storage areas have other uses and the climate also has to accommodate human comfort levels. The ideal climate is generally considered to be 65-70°F and 50% relative humidity with minimal fluctuations in both. For more detailed recommendations, see the publications in Further Reading.

If necessary, portable humidifiers or dehumidifiers can help maintain a stable RH so long as they are kept clean and are routinely monitored. This equipment must run 24 hours a day.

Light: Light is particularly damaging to textiles because it causes fading of dyes and deterioration of fibers. Its effects are cumulative and irreversible. Textiles should not be exposed to light while they are in storage; protect them with blackout covers or by storage in boxes or closed cabinets. When exposure to light is necessary for examination or display, filter all light sources to remove ultraviolet wavelengths and keep illumination levels as low as possible.

Recommendations for the exhibition and display of textiles are outside the scope of this section, but several of the publications listed on pages 51-52 contain suggestions for minimizing the risk of exhibition.

Pest Management: There are two main types of insect pests that can damage textiles: clothes moths (webbing or casemaking) and dermestids (carpet beetles). Wool is the preferred food for both of these pests, although they will eat other materials if they are soiled or to get to an attractive material. These insects prefer a warm, humid and dark environment. The best way to prevent infestation is to provide an inhospitable environment: keep textiles

in a cool, dry location. Light exposure and air circulation resulting from periodic inspection will also discourage insects.

Vacuum your textiles before putting them in storage to remove particulate soil that can attract insects (see “Cleaning” on page 32). Do not use mothballs, moth flakes or other chemicals to prevent infestation; they are hazardous to your health and can harm your textiles. Cedar chests and herbal preventatives are generally ineffective.

Monitor your storage area for insect activity by placing sticky traps in strategic locations. Several of the references on pages 51-52 have more information on pest monitoring. If you find evidence of insect activity in your traps or in your collection, isolate any affected textiles in a polyethylene bag and consult a textile conservator.

Rodents can also damage textiles; they don't eat the fabrics but will shred them to make nests. Protect your collection by storing it securely in boxes or cabinets, and monitor rodent activity with appropriate sticky traps.



Case Studies

Selecting specific interleaving paper, boxes, cloth, and storage systems requires care. Physical condition, size of collection, anticipated use, and budget all play a part. The second half of this section presents several case studies to show how products available from Gaylord Archival can be used to store a range of textiles.

Case Study I: Small Flat Textiles

Flat storage for small flat textiles such as embroideries and handkerchiefs is ideal because it places no strain on the object. Whenever possible, select a box or drawer large enough to store the textile without folding.

A Storing a single textile in a box.

1. Choose the type and size of box that best fits your textile.
2. Select an appropriate lining material:
 - Buffered tissue for undyed cellulosic fibers
 - Unbuffered tissue for silk, wool and all dyed textiles, or mixed or unknown fibers
 - Washed cotton sheeting
3. Lay the lining across the bottom and sides of the box. Place the textile in the box.
4. Fold the lining over the textile. Label the box.



B Storing more than one textile in a box.

If space constraints make it impossible to store only one textile in a box, follow steps A1-3 above, placing the heaviest item on the bottom. Place acid-free tissue between each item and fold the lining material over the top textile.

C Storing fragile textiles.

Small, very fragile textiles such as archaeological fragments should be protected by a special storage mount. This mount consists of a piece of acid-free board covered with polyester felt and washed cotton fabric, with a window mat hinged to one side of the support board. The mat should be larger than the textile and made of material that is thicker than the textile. The textile is placed on a piece of acid-free tissue on the mount and covered with another piece of tissue before the mat is closed. These mounts can be stacked inside a box or drawer.

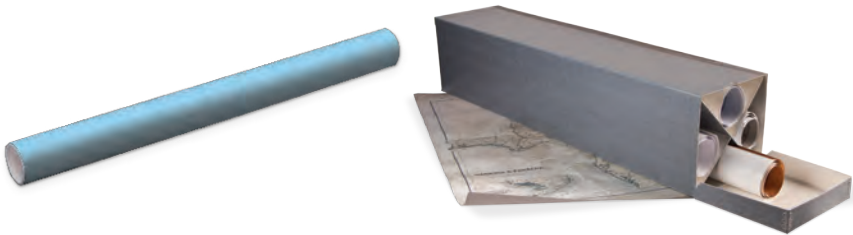


Case Study II: Large Flat Textiles

Roll storage is generally the best method for large flat textiles such as quilts, carpets, shawls, and table linens because it prevents creasing and provides complete support. Painted textiles such as flags should be stored flat whenever possible; they should never be stored folded in a box. Folded storage in a box or drawer may be necessary for some textiles because they are not flat enough to roll, or they have bulky surface decoration.

A Rolled storage.

1. *Select an archival quality storage tube that has a diameter of at least 3" or larger for heavier textiles such as rugs. The tube should be 6-8" longer than width of the textile.*



2. *Cover the tube with acid-free tissue, tucking the ends into the ends of the tube. Cut another piece of tissue slightly shorter than the length of the tube, and roll this onto the tube leaving the last 6-8" free.*
3. *Most textiles should be rolled in the warp direction, and rugs or other pile textiles must be rolled with the nap. See page 41 in *Preserving Textiles* (Section 5, page 52) for a drawing that illustrates this. Place one end of the textile on the loose acid-free tissue; make sure the textile is straight and free of creases. In most cases it is best to place the textile facedown so that the obverse of the textile is on the outside of the roll.*
4. *Begin rolling the tube, picking up the end of the textile with the tissue. Be sure that the textile rolls without creases and that it is as straight as possible. In most cases it is not advisable to interleave with tissue as you roll, but do this for fragmented textiles or those with sharp surface decoration. A textile that has a lining will be difficult to roll smoothly; avoid creasing the textile itself but creases in the lining are inevitable.*

5. Cover the rolled textile with acid-free tissue or washed muslin and tie cotton twill tape around the covering beyond the ends of the textile. For larger textiles, loosely tie twill tape around the middle of the tube, being careful not to compress the textile.



6. Label the rolled textile. Write the accession number on the tube with pencil, write the accession number on the cotton twill tape ties with a permanent marking pen, and sew a piece of tape with identification information onto the muslin. If several textiles are unrolled for study, it will be easy to match them with the correct storage materials.
7. If possible, suspend the tube on brackets or a dowel. This will eliminate the pressure on the textile caused by storing the tube on a shelf.

B Boxes

1. Select a box that is large enough to minimize folds for your textile.
2. Select an appropriate lining material—acid-free tissue or washed cotton sheeting—and line the box with this material.



3. Place the textile on a clean flat surface and fold it to fit the box, using as few folds as possible. Pad all folds with rolled acid-free tissue or tubes of polyester batting covered with washed muslin or stockinette.



4. Place the textile in the box, fold the lining material over the top of the textile and close the box.
5. Label the box with information about the textiles stored inside of it.

Case Study III: Garments

Garments present challenges for storage because they are three-dimensional. Storage in boxes or drawers avoids the strain of hanging storage, but results in creasing of the garment. In general, if a costume is suitable for hanging this is the preferred method. Costumes that are unsuitable include those in poor condition, those with heavy beading or other decoration, garments cut on the bias, and any garment that is weak or insubstantial in the shoulder area. The publications listed on pages 51-52 will give you more detailed information. However, we recommend that you consult a textile conservator before storing a collection of valuable, historic costumes.

A Hangers

Costumes that are hung for storage should always be on padded hangers. A hanger with a wide shoulder can be covered with polyester felt or batting and then with washed cotton fabric or stockinette. Additional support can be added in the form of twill tapes stitched into waistbands or other strategic locations and then tied to the neck of the hanger. Some skirts and pants can be stored hanging using commercial skirt hangers padded with muslin-covered batting. Garments can be further protected from dust and light by covering with a cotton muslin or Tyvek® garment bag. Do not crowd hanging garments, as this can cause creasing.

More information on hanging storage and directions for making padded hangers and garment bags can be found in *Preserving Textiles* (Section 5, page 52), *Caring for Your Collections* (Section 5, page 50) and cci Note 13/5 "Hanging Storage for Costumes."



B Boxes

1. *Large costume storage boxes come in a variety of sizes. If possible, select a box that is longer than your garment.*



2. *Line the box with acid-free tissue or washed cotton fabric.*
3. *With the garment on a flat surface, arrange the various parts, such as sleeves, in a natural position. Skirts should be arranged with vertical folds placed so that the fabric is not strained. Try to make as few folds as possible to make the garment fit the box. If the garment is longer than the box it will be necessary to fold it crosswise to fit. Position this fold in a location that will cause the least strain on the fabric. Using acid-free tissue or tubes of polyester batting covered with washed cotton fabric or stockinette, pad all of the folds in the garment. In most cases sleeves should not be padded, as it can be damaging to insert and remove the padding.*
4. *Gently lay the textile in the box and fold the lining over the top. If possible, avoid stacking garments in a box to minimize creasing.*

Case Study IV: Costume Accessories

Costume accessories can be composites of various materials, including plastics, so it is best to select an unbuffered tissue to isolate and wrap individual items. The boxes may be buffered or unbuffered but should always be lined with acid-free tissue or washed cotton fabric.

A Fans

Unless a collection is in constant use, most fans should be wrapped in acid-free tissue and stored in partitioned archival boxes. Consult a textile conservator if the fan is fragile or has painted decoration.

B Gloves

Store gloves flat in archival boxes, interleaved with acid-free tissue.



C Shoes

Shoes can be stored in archival boxes, on shelves or in drawers. Pad them with archival tissue for support. Delicate or fragile shoes should have a padding designed by a textile conservator. Store shoes upright; taller shoes and boots can be stored on their sides. If a shoe has ribbons or flaps that are unsupported, they can be secured with loose twill tape ties.



D Hats

Hats can be stored in archival boxes or in cabinets. The hat should be supported so that it does not rest on its brim and the weight of the hat is not borne by the crown; there are several possible methods of providing support. The hat can be padded with acid-free tissue, or a support can be made from acid-free corrugated board or some other archival material, padded with polyester batting, and covered with acid-free tissue. In general, cotton fabric is not suitable for padding or wrapping historic hats.



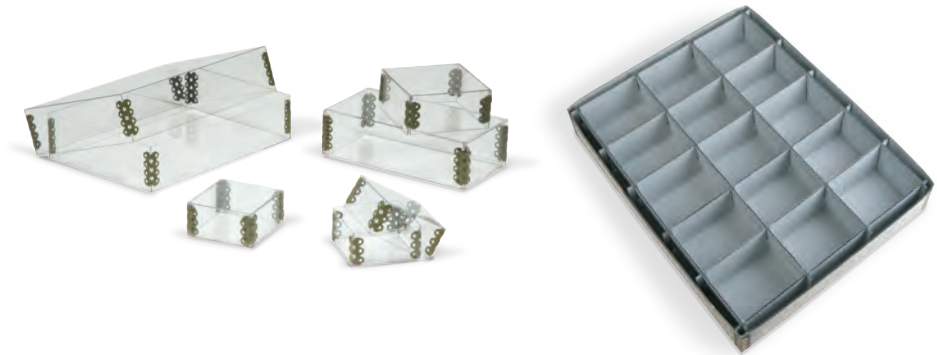
E Handbags

Handbags can be constructed of cloth, tapestry or other fabric. They can also be a combination of leather and fabric. Many handbags are made of synthetic materials—from bakelite to vinyl—or other natural materials such as straw, wicker, or tortoise shell. Loosely stuff the handbag with acid-free tissue to retain its shape. If the handbag has exterior decorations, such as shells, beads, or sequins, it should be gently wrapped in acid-free tissue to prevent any snagging or accidental loss. An individual archival box or an archival storage carton with trays and compartments for individual bags is recommended. Be sure to line the compartment with acid-free tissue.



F Jewelry

While jewelry is technically not a fabric or textile, it often accompanies a costume and is therefore appropriate to discuss here. Jewelry can be placed in small artifact boxes or in divided trays or cartons. Wrap each piece individually in acid-free tissue, or to be able to see the piece without handling it, you may also use padding covered with acid-free tissue to create a well for the object. Do not place jewelry in loose batting that can get caught in the prongs or tangled between the gemstones and settings. Silver jewelry can be stored in a pouch made of Pacific Silvercloth to prevent tarnishing.



Section 4

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Introduction

Books are meant to be handled, but their very use causes damage. Poor storage conditions and acidic paper also contribute to their deterioration. Even new publications printed on acid-free paper fall apart because of poor-quality adhesive bindings. Misguided repair has also damaged books. Stiff repair tapes, yellowed cellophane tapes, over-trimming, and poor rebinding have all destroyed original paper and bindings. For libraries and archives, shrinking budgets for replacement and increased demand for access brought on by use of online catalogs only compound the problem. Fortunately, alternatives now exist.

The goal of this section is to provide background information for those about to begin or improve the repair of their book collections. Although it is oriented toward librarians and archivists setting up basic repair programs, others will also find it useful. Collectors and private individuals need the same basic tools, supplies, equipment, and manuals—even if working on a small scale.

The treatment of rare books, leather bindings, and special collections material is outside the scope of this section. It is advisable to consult a professional bookbinder or book conservator if your collections include these materials. Section 5: Resources provides contact information for the Guild of Book Workers, whose Membership Directory lists bookbinders by geographic regions, and the American Institute for Conservation, which provides a free referral service to conservators in your area. See Section 1, Case Study VII, for information on proper storage and handling of rare books and bound materials.

The information in this section reflects our current knowledge regarding the setup of a book repair program. It will be revised as new information and products become available. Unless otherwise noted, all of the items illustrated in this section are available from Gaylord Archival. Call 1-800-448-6160 for a free catalog or visit us online at Gaylord.com.

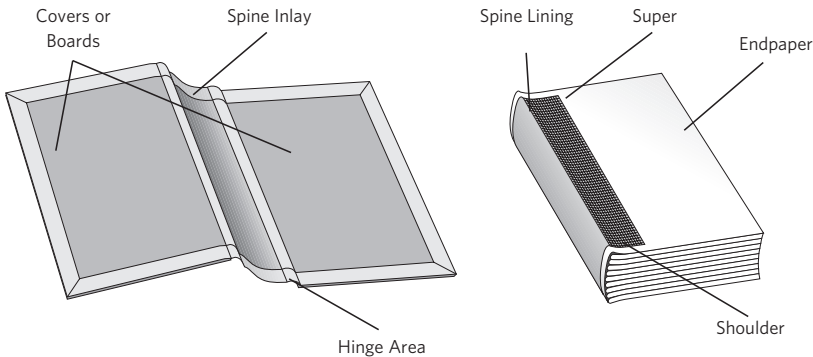
An Introduction to Book Repair

Defining Book Repair

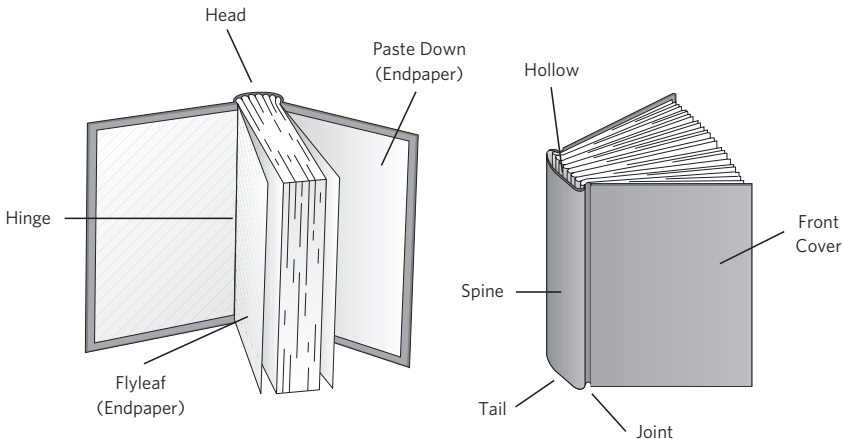
Book repair is remedial. It corrects damage that has occurred because of poor manufacture, use, abuse, and/or aging. For the purposes of this publication, we are restricting its definition to the repair of bindings and text blocks of modern books in general collections. These are typically case bindings with covers made of cloth or paper over boards.

PARTS OF A BOOK

A typical case bound book has two components:

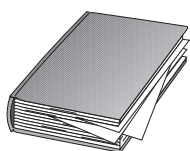


1. *The Case*, made up of front and back boards (covers) and a stiff spine liner (spine inlay), covered by cloth or sturdy paper.
2. *The Text Block (contents)*, made up of pages sewn or glued together. A folded sheet of paper (endpaper) is glued to the shoulder of the first and last page of the text block. The spine is lined with an open weave cloth that extends onto the endpapers. The spine is strengthened further with a paper lining. The text block is attached to the case by gluing the endpaper and super to the boards. The spine inlay is not glued to the spine lining of the text block. This creates a hollow that allows the binding to flex and open easily. The hinge area (called the joint on the outside of the case) takes most of the strain of use and is typically the first area to show signs of damage.

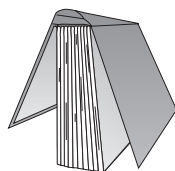


TYPES OF BOOK DAMAGE

Damage occurs most often in three areas: the text block (torn or soiled pages, detached pages, missing pages), the case (warped, soiled or abraded covers; torn headcaps, detached spines), and the attachment of text block to the case (loose hinges, broken hinges, detached covers). One book can have several types of damage.



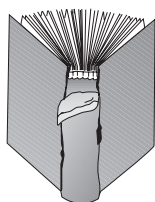
Detached Pages



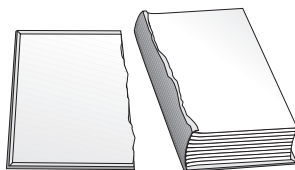
Loose Hinges



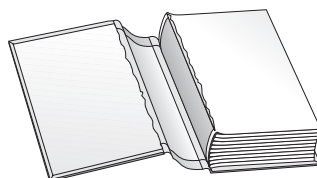
Torn Cover



Detached Spine



Detached Cover



Detached Case

SELECTING CANDIDATES FOR REPAIR

Book repair should be an integral part of library and archive operations. To make decision-making as efficient as possible, establish routines for sorting and evaluating damaged books. The following are general guidelines. Libraries or archives will set their own criteria and assign staffing responsibilities. Collectors will also benefit from seeing the scope—and limitations—of book repair. Many of the general principles outlined below apply when selecting books for purchase or for repair.

Catch damage early: Work with staff to identify volumes with minor damage such as loose pages or loose hinges before they become major problems. It takes less time and money to do a minor repair than a more extensive repair. Encourage patrons to note damage when an item is returned rather than do it themselves. “Homemade” repairs are usually damaging and difficult to reverse.

Sort damaged books into categories:

Books to be repaired: Volumes with torn or loose pages, worn spines and covers, loose hinges, detached covers, or other minor damage. The paper should be flexible and not brittle.

Books to be rebound by the library binder: Volumes with a larger number of detached pages, badly damaged covers, and major damage that cannot be repaired in the library. The selection of books for rebinding depends upon local factors such as budget and the importance of the book to the collection. Only books with flexible paper can be rebound.

Books to be replaced or reformatted: Volumes that are brittle, yellowed, or have extensive losses. Depending upon library policy and availability, these may be replaced with a new copy, reprint, microfilm, or preservation photocopy.

Books to be discarded: Volumes that do not warrant the time or expense to repair or rebind. These may include books with missing pages, out-of-date information, or lack of relevance to the collection.

Books to be reviewed for conservation or boxing: If a volume has historic, monetary, or artifactual value, set it aside for treatment by a conservator or hand bookbinder. Some libraries and archives have established a date cut-off—1900 for example—for review by a bibliographer before treatment. It is better to box or wrap a valuable volume than treat it incorrectly. See Section 1, Case Study vii, for further information on storage of rare books and bound materials.

Batch candidates for repair: Once the damaged books have been identified, sort them into the categories of repair.

Select repair materials that are chemically stable and non-damaging: Avoid materials such as acidic papers and book repair tapes. For examples of acceptable materials, see the Supplies on pages 46-47.

Use techniques that are structurally sound: Consult the manuals on page 52 and obtain training to execute repairs that will contribute to the long-term stability and preservation of your collection.

Work systematically: Most manuals recommend working on 5-10 volumes at a time for maximum efficiency. Precutting supplies will expedite this process. Examine the text block and do any paper mends before proceeding to the binding.

Maintain quality control: Work should be neat, accurate, and sound. Book repair is no place for sloppy craftsmanship. When new staff are assigned to repair, they should be trained by an experienced person and given manuals for reference. Their work should be reviewed periodically to be certain they understand both principles and techniques of book repair.



SETTING UP A WORKSPACE

If you anticipate doing repair on a regular basis, set aside a designated area with ample space for both work and storage. This space should provide access to a sink, adequate ventilation, and good lighting. Before investing in large equipment such as a cutter or presses, you should have a clear idea of the type of work that you will be doing, both now and in the future. Visit other workshops that have comparable programs.

Workbench or Tables: Each person should have a workbench equivalent to the size of a large desk (2½ x 6 ft.). The best height is between 36 and 40 inches so that the person can work comfortably while standing. A low-cost alternative is a work table raised on wooden blocks, provided the table is sturdy and stable. The work surface should be easy to clean; Formica or a wood surface treated with polyurethane are good choices. It is convenient to have a set of shelves beneath the bench to hold paper and other materials.

Stools or Chairs: Stools or chairs should be available for each worker. They should be 6-12" lower than the bench. Wooden stools are the least expensive alternative, but you may want to purchase a cushioned chair with back support if the person is to work for long periods of time.

Lighting: Good lighting is essential for doing book repair. A high-intensity lamp provides task lighting to supplement overhead lighting. Be sure to purchase a model that uses a minimum of 100 watts to give strong lighting.

Storage: You will need storage for repair materials and supplies. Itemize the amounts and sizes of paper, board, and cloth that you will be using and plan accordingly. Open metal shelving is an inexpensive alternative, but you may want to use flat files (map cases) to protect sheets of Japanese paper or endpaper stock. Peg boards, jars, shelves and containers can all be used to keep tools close at hand. The manuals by Greenfield and Lavender (page 52) contain good illustrations of workbenches and storage units.

Selecting Tools, Equipment & Supplies

SMALL TOOLS

The following tools are recommended for general use in book repair. You may need additional tools for specialized treatments.



AWL

A small, sharp tool; used for making holes when sewing in pamphlet bindings or preparing endpapers and signatures for sewing.



BONE FOLDER

Smooth, flat tool with rounded or pointed ends; used to crease paper, to rub down paper and cloth after gluing, and to set the joints when repairing bindings.



BRUSHES

- **GLUE BRUSHES:** round bristle glue brushes for applying adhesive to broad areas.
- **SMALL ARTIST'S BRUSHES:** for mending paper and hinging, applying adhesive in small places.
- **DUSTING BRUSH:** to clean off work surfaces.



CONTAINERS

Sturdy plastic containers in a range of sizes to hold tools, water; with lids to hold small quantities of adhesives.



CUTTING TOOLS

- **SCALPEL, MAT KNIFE OR OTHER CUTTING IMPLEMENTS:** for trimming paper or cutting materials. Have extra blades on hand. A dull cutting tool can be dangerous and difficult to use.
- **UTILITY KNIFE:** useful for cleaning the backs of spines.
- **SELF-HEALING CUTTING MAT:** provides a grid surface for cutting paper; particularly useful trimming endpapers on the book where you cannot use a paper cutter. Does not dull the blades of cutting implements.



HAMMER

A special bookbinder's hammer, used with a backing press to shape the spines of the text block prior to binding.

SPATULA

A useful tool for lifting tape and getting adhesive into narrow places.



NEEDLES

Large eyed needles (No. 3 darning needle or No. 6 crewel needles are useful sizes) for sewing pamphlets into binders and for sewing signatures.

PRESS BOARDS

Wooden boards are needed for pressing material underweight. These may be hardwood, acrylic, plywood, or tempered Masonite, sanded and finished with polyurethane. Useful sizes are 9 x 12" and 6 x 9".



- **METAL EDGED PRESS BOARDS:** Wooden boards with metal edges on the long side, projecting 1/16".
- **PLEXIGLASS RODS OR NO. 4 OR 5 KNITTING NEEDLES:** for applying adhesive when tightening hinges or pressing hinges with boards (see page 45).



RULERS AND STRAIGHT EDGES

- **RULERS:** used for measuring.
- **METAL STRAIGHT EDGES:** for cutting with scalpels or knives, and for scoring with a bone folder.
- **T-SQUARES AND TRIANGLES:** for cutting materials where right angles are required.



SHEARS

- Heavy shears for cutting lightweight board and cloth.
- Medium sized scissors for cutting paper.
- Smaller scissors for reaching narrow spaces.



TACKING IRON

A small, light-weight iron, thermostatically controlled; used to apply heat-set tissue or dry mends.



WEIGHTS

- Bricks wrapped in heavy paper or binders cloth.
- Bean bags or leather/cloth weights filled with shot.
- Jars filled with shot or pennies, paperweights.
- Acrylic covered lead weights.

LARGER EQUIPMENT

Book Presses: One of the guiding principles of book repair is to get good adhesion between the hinge of the text block and the joint of the case. If budgets are limited, you may begin with boards, bricks, and knitting needles or acrylic rods. However, metal-edged boards are a more efficient and effective way of setting the joints. They may be used with weights or with book presses. If you rebind large numbers of books, a heavy metal book press and press boards will improve the quality and efficiency of your work.

Casing Press: As repair operations expand, you may want to add a casing press. The press itself can be attached to the workbench and used as a book press to set the joints of bindings after repair. Assembled in its stand with beveled boards, it becomes a backing press, a versatile machine for holding the text block when cleaning or backing/reshaping spines, or doing finish work.

Board Shear or Heavy-duty Cutter: A cutting mat and a sharp table model paper cutter will be adequate for simple mending. However, if you want to do rebinding or make boxes—which requires frequent cutting of heavy board—you will need a heavy cutter. A board shear, or heavy-duty cutter, is a major financial investment and requires substantial space in the workshop. However, it is also one of your most important purchases because a sharp, accurate cutter will improve the quality and speed of work. It is important that the cutter be able to cut board and paper; that the blade be long enough to cut most common lengths of materials; that it have a clamping bar to hold materials being cut; and have scales for accurate measuring. Board shears are best for a professional bindery. Heavy-duty table models can cut lightweight board and are less expensive than floor models. Gaylord Archival carries book presses and a heavy-duty table model cutter. For vendors of board shears, large presses, and other heavy bookbinding equipment, consult the Supplies Directory of the Guild of Book Workers (Section 5, Resources). It is sometimes possible to find used equipment advertised in the Newsletter of the Guild of Book Workers.



SUPPLIES

The choice of materials for repair is critical. They should be acid-free, chemically stable, and durable. Labor is the most expensive cost of repair so it is not cost effective to save money on supplies if it results in repairs that fall apart because of stiff, brittle adhesives or papers and tapes that turn yellow and stain. The following are the most common supplies used in basic book and paper repair. You may find more specialized supplies listed in manuals that describe specific treatments.



ADHESIVES

For bonding paper, board, cloth, and the book together during repair. Three types of adhesives are commonly used: starch paste and methylcellulose for paper repair because of their reversibility, and PVA for binding repair because of its flexibility and strength.

- **STARCH PASTE:** Wheat starch makes a smooth, strong paste. It is made by cooking, though precooked wheat paste is also available. Both have a limited shelf life after preparation.
- **METHYL CELLULOSE:** Methyl cellulose is easily made by mixing powder with water. When paper repair is not done often, it is a good alternative to starch paste because it has a long shelf life.
- **PVA ADHESIVE:** Polyvinyl acetate is a white pH neutral synthetic resin that dries to a thin, clear, flexible film. It is water-based and is used in bookbinding where reversibility is not important.

BOARD

Several kinds of board are used when doing book repair. The thickness is measured in points, which correspond to mils or thousandths of an inch. For example, the blue/grey barrier board used for phase boxes is 60 pt. or .060 inches thick. Board should be acid-free. Be certain that your cutter can handle the size and thickness of the board that you choose.



- **LIGHTWEIGHT FOLDER STOCK:** 7 pt. folder stock is used for spine inlays and map pockets in the backs of books.
- **FOLDER STOCK:** 10 pt. and 20 pt. folder stock makes lightweight folders and enclosures, while 40 pt. stock is used for enclosures. 60 pt. stock can be used for the covers of pamphlet binders and phase boxes.
- **BINDERS BOARD:** Gray Davey Board is the traditional board used by binders. An acid-free version is now available in thicknesses from .067 for small books and .082 for standard sized books to .098 for large books.

CLOTH

- **CAMBRIC:** A closely woven white, starch-filled linen cloth used for hinges and spine linings.
- **SUPER:** A loosely woven cloth used to line the backs of spines.
- **BOOK CLOTH:** A generic term for the woven materials used to cover the case of books. It is typically made of cotton with starch and pigment fillers and an acrylic surface coating. Gaylord Archival carries various colors and sizes for book repair. These cloths, along with a wide range of linens and fine paper-backed cloths are available by the yard from vendors specializing in bookbinding supplies (see the *Guild of Book Workers Supply Directory*, page 49)





ERASERS

- **VINYL ERASERS:** recommended because they leave less residue on the paper.
- **DOCUMENT CLEANING PADS:** Pads of powdered eraser are even gentler.

PAPERS

- **ENDPAPER STOCK:** Papers selected for endpapers should be acid-free, buffered, and durable. Several colors are desirable: white for modern books, cream or beige to match the texts of older books. If precut sheets are available, select a size that fits your cutter blade.
- **JAPANESE PAPER:** Traditional handmade Japanese papers are excellent for repair because their long fibers provide a strong, yet flexible join. They come in a range of shades and weights. Libraries and archives typically use medium weight for guarding signatures and lightweight for mending paper.
- **HEAT-SET TISSUE:** This fine paper is coated on one side with an acrylic adhesive that adheres when heat is applied with a tacking iron. Heat-set tissue is used for mending tears and consolidating shattered edges of paper, especially for moisture-sensitive paper that cannot withstand the application of a wet paste.



OTHER PAPERS ALSO NEEDED FOR REPAIR OPERATION

- **BLOTTING PAPER:** for drying and flattening paper.
- **SILICONE RELEASE PAPER:** for use with a tacking iron when applying heat-set tissue.
- **SCRAP PAPER:** for all operations. Avoid fresh newsprint or any other paper with printing or writing that may offset onto your work.
- **WAX PAPER:** acts as a barrier and prevents adhesive from sticking to adjacent surfaces while work dries. Gaylord Archival carries a special wax paper for book repair.



TAPE

Although the range of tapes has increased dramatically with the development of synthetic materials and more stable acrylic adhesives, it is best to consider all tapes to be permanent. Once applied, tape is difficult or impossible to remove. Filmoplast® tapes are considered acceptable for some types of paper repair. Filmoplast® P has a lightweight, acid-free paper carrier with a stable adhesive. However, even it should not be used on rare books, documents, or archival materials with artifactual value. Some research libraries and archives use Japanese paper and starch paste for nearly all their paper mending, even on circulating collections. However, this requires a trained staff.

Section 5

Introduction

As you seek to expand your knowledge of preservation and conservation, the following websites can provide reliable information, much of which can be downloaded. We have noted special services or publications when appropriate (such as AIC's Find a Conservator tool and GBW's study opportunities). We urge you to explore the sites and their links to other preservation resources.

Resources

American Institute for Conservation of Art and Historic Artifacts (AIC)

www.conservation-us.org

AIC is the national membership organization of conservation professionals dedicated to preserving the art and historic artifacts of our cultural heritage. Its site includes Find a Conservator tool, brochures on Caring for Your Treasures, guidelines for selecting a conservator, and conservation training in the United States. The AIC site is also home to former Heritage Preservation resources, including information on disaster preparedness and emergency response.

Canadian Conservation Institute (CCI)

www.cci-icc.gc.ca

See especially the links to Preserving My Heritage with individual guidelines for preserving a range of materials.

Conservation Online (COOL)

www.cool.conservation-us.org

CoOL is the website for conservation professionals, but the general public will find much of interest, including a full text library of conservation information on a wide spectrum of topics related to the conservation of library, archives and museum materials. There are also links to a number of conservation organizations.

Guild of Book Workers (GBW)

www.guildofbookworkers.org

See especially their online guide to study opportunities in bookbinding, as well as their directory of supplies and services.

National Park Service (NPS)

www.nps.gov/history

See especially their online Conserve-O-Gram series on museum management.

Northeast Document Conservation Center (NEDCC)

www.nedcc.org

The NEDCC site includes Preservation Leaflets on a wide variety of topics, as well as Preservation 101 course resources and dPlan™ disaster planning tool.

Additional Resources

Banks, Paul N. and Pilette, Roberta, Editors. *Preservation: Issues and Planning*. Chicago and London: American Library Association, 2000.

A concise analysis of important preservation management issues facing libraries and archives.

Lull, William P. with Banks, Paul N. *Conservation Environment Guidelines for Libraries and Archives*. Ottawa: Canadian Council of Archives, 1995.

An indispensable guide for librarians involved in building construction and renovation.

Shultz, Arthur W., General Editor. *Caring for Your Collections: Preserving and Protecting Your Art and Other Collectibles*. New York: Harry N. Abrams, 1992.

Advice for the private collector on preservation of valuable art and artifacts. Experts explain the cause of deterioration and set forth guidelines for proper care and conservation. Other essays cover environment, home security, appraisal, authentication, donating collections, and selecting a professional conservator.

Section 1: Archival Storage of Paper

American Institute for Conservation of Historic and Artistic Works. *Matting and Framing Works of Art on Paper and Documents and Art on Paper*. Washington, DC: AIC.

Two *Caring for Your Treasures* brochures prepared by AIC, the professional association for conservators in the United States, cover general storage issues and describe the basics of proper matting and framing. Available online at www.conservation-us.org.

American National Standard for Permanence of Paper for Publications and Documents in Libraries and Archives, ANSI/NISO Z39.48-1992 (Revised 2009).

Sets out basic criteria for paper that will last several hundred years under normal use and storage. Available online at www.niso.org.

Bachman, Konstanze, editor. *Conservation Concerns: A Guide for Collectors and Curators*. Washington, DC: Smithsonian Institution Press, 1992.

This compilation has basic information on collections. Particularly useful is the chapter "Warning Signs: When Works on Paper Require Conservation."

Ritzenthaler, Mary Lynn. *Preserving Archives and Manuscripts (2nd ed.)* Chicago: Society of American Archivists, 2010.

An overview of preservation issues, ranging from the causes of deterioration of archives and library materials to the means of preventing and retarding deterioration. Includes detailed information on how to process and store specific types of materials.

Wilson, William K. *Environmental Guidelines for the Storage of Paper Records*. NISO Technical Report (NISO-TR01-1995). Bethesda, MD: NISO Press, 1995.

Provides guidelines for levels of temperature, relative humidity, exposure to light, gaseous contaminants, and particulates in libraries and archives. Also provides background information and a glossary of terms. Available online at www.niso.org.

Section 2: Photography

Adelstein, Peter Z. *IP1 Media Storage Quick Reference (2nd ed.)* Rochester: Image Permanence Institute, 2009.

This guide explains in a simple fashion the role of storage conditions such as: temperature, relative humidity, and air quality for photographs, films, audio and video tapes, CD's and DVD's. It provides an easy to read booklet and a two-sided wheel.

Care, Handling and Storage of Photographs. International Federation of Library Associations and Institutions Core Programme on Presentation and Conservation, 2004. Available online at www.ifla.org.

Conservation of Photographs. Kodak Publication No. F-40. Rochester, NY; Eastman Kodak Company, 1985.

A good general overview of photographic materials and preservation topics.

Hendricks, Klaus B. CCI Notes 16/1-16/6, 1995-96. Canadian Conservation Institute. Available online at www.canada.ca.

Six technical leaflets that provide excellent summaries of current conservation information on photographic topics.

IPi Storage Guide for Acetate Film. Rochester, NY: Image Permanence Institute, 1993. Available online at www.imagepermanenceinstitute.org.

An overview of environmental specifications for acetate film storage with a methodology for assessing the impact of specific conditions on the longevity of film.

Keefe, Laurence E. and Inch, Dennis. *The Life of a Photograph: Archival Processing, Matting, Framing, Storage*. Second edition. Boston: Focal Press, 1990.

An excellent source of information on conservation framing and matting of photographs.

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

A thorough publication on research in the conservation of photographs. Now available in English, intended as a practical handbook for conservators, curators, collection managers, and others interested in photographic preservation.

Reilly, James M. *Care and Identification of 19th-Century Photographic Prints*. Kodak Publication No. G-2s. Rochester, NY: Eastman Kodak Company, 2010.

A thorough guide to the identification and preservation of nineteenth century photographic prints. Touches on storage conditions and enclosures, and contains a chart for identifying print processes.

Ritzenthaler, Mary Lynn and Vogt-O'Connor, Diane et al. *Photographs: Archival Care and Management*. Chicago: Society of American Archivists, 2006.

The best available guide to preserving and managing photographic archives.

Wilhelm, Henry. *The Permanence and Care of Color Photographs: Traditional and Digital Color Prints, Color Negatives, Slides, and Motion Pictures*. Grinnell, Iowa: Preservation Publishing Company, 1993.

An encyclopedic compendium of preservation information on color photography. Much information is also applicable to black and white material. Henry Wilhelm has conducted a number of tests on light-fastness of digital prints. His results and the full text of the book may be downloaded at www.wilhelm-research.com.

Section 3: Archival Storage of Textiles

Bachman, Konstanze, editor. *Conservation Concerns: A Guide for Collectors and Curators*. Washington, DC: Smithsonian Institution Press, 1992.

A compilation of basic information on collections. Four chapters deal with the basics of textile storage and conservation. Particularly useful is "Warning Signs: When Textiles Need Conservation."

CCI Notes, Chapter 13: "Textiles and Fibres." Ottawa: Canadian Conservation Institute. 2008-13.

Eighteen technical leaflets cover a range of topics on textiles. Available online at www.canada.ca.

Finch, Karen and Putnam, Greta. *The Care & Preservation of Textiles*. Berkeley, CA: LACIS, 1991.

A discussion of preventive conservation plus general instructions on surface cleaning and washing, sewing techniques, and illustrated case studies. Emphasis is on historic textiles.

Mailand, Harold and Alig, Dorothy. *Preserving Textiles*. Indianapolis: Indianapolis Museum of Art, 1999.

A good introduction to the care of historic textiles and dress.

Orlofsky, Patsy and Myron. *Quilts in America*. New York: Abbeville Press, 1992.

Chapter 11 on "Care" provides detailed instructions on cleaning quilts which could apply to other types of textiles.

The Henry Ford Museum offers a fact sheet on "The Care and Preservation of Antique Textiles and Costumes" at www.thehenryford.org.

Tech Talk, a column about preserving historic objects, buildings and sites, published by the Minnesota Historical Society, is available at www.mnhs.org.

The Textile Museum in Washington DC has several resources online at www.museum.gwu.edu.

Section 4: Introduction to Book Repair

Greenfield, Jane. *Books: Their Care and Repair*. New York: Wilson, 1983.

Lavender, Kenneth and Stockton, Scott. *Book Repair: A How-To-Do-It Manual for School and Public Libraries*. 2nd ed. New York: Neal Schuman, 2001.

Young, Laura. *Bookbinding & Conservation by Hand*. Reprint edition. Newark, Delaware: Oak Knoll Press, 1995.

The Northeast Document Conservation Center's Preservation Leaflets cover a variety of topics from proper storage and handling to emergency management online at www.nedcc.org.

Preserve Today. Share Tomorrow.

This booklet has provided information on collections care for paper, photography, textiles and books. There are many additional types of collections that can benefit from proper care and storage, as well. General guidelines for care include:

- **USE OF APPROPRIATE STORAGE MATERIALS**
- **MAINTAINING A STABLE ENVIRONMENT WITH LIMITED LIGHT**
- **HANDLING OF OBJECTS WITH CARE**

Looking for a specific solution beyond paper, photographs, textiles or books? Visit Gaylord.com or request a catalog to view our full range of products.

NATURAL HISTORY

Choose materials that don't abrade or deteriorate and housings that offer stability and physical protection. Designs that keep both object and label visible will reduce the need for handling. Use unbuffered materials for protein-based specimens and items with dyes. Use buffered materials for plant-based objects; they can also be used with proteins if there is unbuffered interleaving between object and storage container.



MEDIA

Use acid-free enclosures and boxes to protect from dust and abrasion in long-term storage. Specially sized envelopes, sleeves, cases and boxes are designed to store records, movie film, audiotape, microform and more to protect against damage from light, off-gassing, deterioration and the environment.



ARTIFACTS

Protect objects from physical damage by cushioning storage containers with crumpled tissue, batting or foam. Objects should be boxed individually or, if grouped, separated so they won't come in contact with each other. Minimize handling by using clear boxes or by placing labels prominently on the outside of storage containers.



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