

STORAGE AND HANDLING

4.1 Storage and Handling for Books and Artifacts on Paper

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INTRODUCTION

By itself, any single paper item or book would seem easy to store and simple to preserve. However, most cultural heritage collections present challenges based simply on the number of items they contain. When combined with considerations about storage space, storage methods, and shelving, the challenges of storing one item among many become complex.

Storage and handling methods have a direct impact on the useful life of collections and the accessibility of information. Damage to collections can be avoided by preventing overcrowded, careless, or haphazard storage conditions. Chemically unstable and improperly fitting shelving and storage enclosures accelerate the deterioration of materials they are intended to protect. Normal use causes wear, but inexpert and rough handling can quickly lead to extensive damage to collections requiring expensive repair or replacement. The longevity of collections can be extended significantly by putting into practice the guidelines discussed here.

BOUND VOLUMES

Hardcover books appear to be the most robust of the paper-based materials because of their hard covers and complex construction. Careful viewing of any book collection, however, will reveal that those very properties work against the items when improperly stored. To prevent damage to books while sitting on the shelf and while being used, a few relatively simple steps should be taken: adequate air circulation, proper shelving practices, housing books in custom protective enclosures where needed, and

encouraging safe handling practices for staff and users.

To prevent damp or stagnant pockets of air (that can lead to mold growth), good air circulation should be maintained in storage areas. To help promote circulation:

- do not block or deflect heating or cooling vents;
- store books at least three inches away from exterior walls, especially when in below-grade storage areas (e.g. basements)
- periodically open closed cabinets, especially those housed against exterior walls or those that are fireproof; and
- do not store materials directly on the floor.

Storage and Shelving for Bound Volumes

The first step in safely storing bound volumes is to ensure adequate shelving. Shelving that is too shallow forces books to extend beyond the edges of the shelf, which exposes them to passing book trucks, backpacks, vacuums, and feet. If the shelving is not sufficiently strong, shelves can bow and the entire unit can become unstable. Finally, some shelving units contain by-products that contribute to the deterioration of collections or have rough surfaces that can be abrasive. For information on selecting quality shelving for paper-based collections, consult NEDCC's Preservation Leaflet 4.2 [Storage Furniture: A Brief Review of Current Options](#).

To avoid damaging bindings, books need to be

shelved upright and supported. Non-damaging bookends with smooth surfaces and broad edges will prevent bindings from being abraded and pages from being torn or creased. Wire bookends that are built into shelving are less desirable as they are frequently an incorrect size and often damage books that are shorter or taller than average.



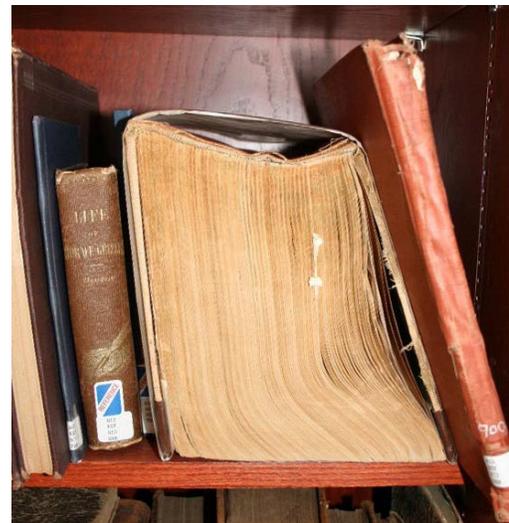
**On left: adequate bookend.
On right: safest bookend**

also allowing adequate space for expansion of the collection. Books should not be shelved so tightly that they are damaged when they are removed from the shelf.

If books are too tall to fit safely on the shelf, they may be moved elsewhere or the shelves rearranged so that the books fit on the shelves standing upright. If moving or rearranging is not possible, store volumes with the spine down. (Storing a book with the spine up may cause the text to pull out of the binding due to its weight. See photo.) Call numbers can be moved from the spine to a corner of the cover for oversize volumes to allow for identification when shelved in this way. (What is categorized as “oversize” is determined by an individual institution’s shelf height.) Whenever possible, shelve books by size since small volumes cannot adequately support larger ones.



Inadequate bookend



**Damage to book from
being stored spine up**

In a relatively static collection (i.e. one that is not expected to grow), it may be possible to arrange volumes so that shelves are full, preventing books from leaning. In actively growing and changing collections, it is important to provide support while

House very large or heavy volumes lying flat, because upright storage can result in heavy books pulling away from their bindings. When books are stored horizontally, stacks should be 2-3 volumes high to make retrieval less intrusive. Bindings with special value should be boxed to prevent abrasion to the bindings when stored flat. Take care to ensure that call number flags or titles are visible so that the books can be identified with minimal handling.

For special collection materials, placeholder blocks

(i.e., dummy books) can be used to reduce shifting that can lead to damage. Placeholder blocks can be made from Ethafoam, cloth covered wood, or foam core and should be labeled and stored throughout the storage area for easy access.

Custom Protective Enclosures

Custom protective enclosures provide books with structural support and protection from dust, light, and mechanical damage. For the best level of protection, enclosures should be constructed of permanent, durable materials and custom made to fit the book's dimensions exactly. Detailed information on boxes can be found in NEDCC's Preservation Leaflet 7.4 [Custom Protective Enclosures](#). Candidates for protective enclosures include:

- volumes with fragile bindings of special value that should be retained in their present condition;
- damaged books that have low value or are rarely used and that do not warrant treatment or repair of the binding;
- thin, small, fragile, limp, or oddly-shaped volumes; and
- parchment bindings.

Enclosures come in many varieties and each has its strengths: drop-spine boxes, phase boxes, wrappers, slipcases, book shoes, dust jackets, and pamphlet binders. **Drop-spine boxes** provide rigid support and restraint, especially for parchment bindings, which can easily warp in fluctuating environments. **Phase boxes** can provide support and protection to larger books. (Both drop-spine boxes and phase boxes are available from a wide variety of vendors and archival suppliers.) **Wrappers** provide support and protection for small books and can easily be constructed in-house with minimal equipment. (See Leaflet 7.4 for illustrated instructions.) **Slipcases** are not recommended because they abrade the covers when the book is removed or replaced. Some publications are issued with slipcases, and these may be retained; however, if the slipcase does not fit well or is in bad condition, then consider storing it separately to prevent damage. A **book shoe** may be appropriate for volumes that require structural support but that cannot be placed in a box; for

example, books on display in an historic house that are part of a permanent exhibit. (See NEDCC's Preservation Leaflet 4.7 [The Book Shoe: Description and Uses](#) for more information.) For books that have red rot or otherwise could negatively impact books stored adjacently, **polyester film dust jackets** provide simple and inexpensive protection. **Envelopes** are sometimes used for the storage of books but do not provide the support required by damaged volumes and should ideally be replaced with one of the previously mentioned enclosures. Envelopes can also damage materials through abrasion or tearing when users physically remove and replace items. Rubber bands and string are damaging and are not appropriate means of holding books together. Instead, volumes can be boxed, wrapped in paper, or tied with a flat and undyed **cotton, linen, or polyester tape**. Tape should be tied at the top or fore-edge of the text block to prevent bows and ties from damaging adjacent volumes. Avoid the use of colored tying tape, which can transfer dye to materials when wet. Overly tight ties can damage bindings.



Volume tied with cotton tape

Pamphlets

Pamphlets are small texts not bound in hard covers and are often stored interfiled with hardbound texts. Because of this, pamphlets sustain considerable damage unless they are stored in a protective enclosure. One of the most common enclosures is a pamphlet binder. When using binders, select those that allow the pamphlet to be sewn in or that have pockets or 4-flap enclosures built in, rather than

those that require gluing the pamphlet in. Binders with pre-glued hinges will obscure information and damage the cover and pages of the pamphlet over time. Modern pamphlets can be stapled in to binders if stainless steel staples are used. Historic or brittle

pamphlets are best housed in binders with 4-flap wrappers or in folders in boxes.

When foldering pamphlets, use acid-free, lignin-free, buffered folders. If pamphlets are in stable condition, contain fewer than 50 pages, and are similar in size, then they can be housed spine down in groups of up to five items in one folder, with optional wrappers of buffered paper to protect them from abrasion. Pamphlets that are brittle, torn, otherwise fragile, or especially thick should be foldered individually. Folders can be housed either in document storage boxes or in buffered hanging files in metal file cabinets.

Groups of pamphlets that are the same size and title can be housed together in custom boxes or wrappers. This strategy is economical and practical for pamphlets that are physically and chemically stable, and for titles that are accessed infrequently. Another affordable alternative, “shelf files” (e.g., open magazine/pamphlet boxes), provide little support or protection from light and dirt, and may damage pamphlets as they are accessed from these open, stiff-sided enclosures. As such, shelf files are not recommended for paper-bound materials.

Scrapbooks

Scrapbooks pose challenging preservation problems because they often contain a variety of components and media. They may have raised surfaces, three-dimensional decoration, or moving parts. They are frequently unique, fragile, damaged, and of significant associational value. The addition of the scraps themselves causes the binding to bulge and be unduly stressed.

Scrapbooks should be stored flat (horizontally), singly or in stacks of two. When possible, do not store scrapbooks on shelves with other bound materials because damage may result from the different sizes, shapes,

weights, and conditions.

Scrapbooks can be individually stored in custom-fitted boxes. This is especially appropriate for scrapbooks of special historic value that are in their original form. Custom boxes can be purchased economically from a variety of archival supply vendors. When measuring for boxes, remember to measure the *widest* width, the *tallest* height, and the *thickest* point in the binding. For more information on measuring, see NEDCC’s Preservation Leaflet 7.4 [Custom Protective Enclosures](#).

For scrapbooks that are very damaged and that do not have value to the institution as an object, pages can be removed, numbered, put into individual folders, and boxed, which will protect the content and provide easier access.

Handling Bound Volumes

Poor handling procedures can cause significant damage to books, resulting in restricted, delayed, or discontinued use, or requiring expensive conservation treatments before the volume can be used again. Pulling a volume off the shelf by the headcap can damage the spine and joints of the book, as shown in the photo below.



Pulling by the headcap can damage the book

Do not pull on the headcap of a book when removing it from the shelf. Instead, there are two alternatives, shown in the photos below. The first is to put a finger on top of the pages (rather than on the headcap) and gently tilt the book out. The other is to slightly push in the books on either side of the desired book, then pull out the desired book by gently grasping it on both sides with the thumb and fingers (or pull the book out by using the textblock as leverage, not the headcap). Once removed, the remaining books on the shelf and the bookends can be shifted so all books are supported. When the book is replaced, the bookend should be loosened, the books moved on the shelf to make a space, and the book reinserted in the space. The bookend should then be repositioned.



Option 2: Push



Option 1: Tilt the book



Option 2: Then pull

When oversize books that are stored flat are removed from the shelf, transfer the upper volumes to a permanently dedicated (and labeled) empty shelf or book truck. Lift oversize volumes with both hands, and once the desired volume is reached, return removed volumes to the shelf. Reshelving the book after use should be done in the same way. For very large or heavy volumes, two people may be necessary for handling to reduce the risk of injury to staff and the risk of damage to collections.

Using book trucks to move volumes is strongly recommended. When using book trucks, use bookends as if the books were on the shelf, or stack volumes according to size so they are supported and do not extend beyond the edges of the truck. Keep the center of gravity of the loaded book truck low to the ground to help stabilize it, and use extra caution when wheeling trucks into and out of elevators or over thresholds so that items do not fall off.

Reading Rooms

When special collections and oversize volumes are used in a reading room, cradles, snake weights, and page-turners should be made available to researchers to support stiff and fragile bindings. Page-turners can be anything thin that slips in between pages, including microspatulas, thin Teflon folders, or simple items made out of stiff paper. A video showing general handling of special collections materials, "Handling Harvard's Special Collections," is available online at <https://youtu.be/UOv0SOQ8B68>.

Users should be instructed in the careful handling of bound volumes and in the use of the cradles and snakes in an initial orientation, as well as when formats change and require different handling practices. Staff training for safe handling practices is important as well, to ensure that materials will be preserved during processing and also so that the public receives consistent instruction and guidance.

Photocopying or Scanning Bound Volumes

Books are often unnecessarily damaged during

photocopying and digital scanning. Photocopiers and flatbed scanners encourage users to press the binding flat in order to get a good image, and this damages the volume. Overhead scanners are best for public use because they allow a book page to be copied with the book open less than 180 degrees. If an overhead scanner is not available, photocopiers and flatbed scanners with a "book edge," which does not require the book to open more than 100 degrees, are preferred over standard copiers/scanners. The "book edge" allows bound volumes to fall over the edge of the machine and puts less stress on the binding. The resulting image has less distortion, and the information in the inner margins is captured more clearly.

Historic documents and photographs should never be fed through a sheet-fed copier/scanner, as they may jam the machine and become damaged in the process.



Do allow binding to fall over edge



Don't crush binding on platen

UNBOUND DOCUMENTS

Manuscripts and other unbound documents are vulnerable to damage from inappropriate storage and handling practices because of the commonly brittle or fragile nature of the paper. To protect loose sheets during storage and handling, there are some basic practices to follow, including: foldering and boxing with chemically stable materials, removing corroded metal fasteners such as staples, storing materials by size and type, and encouraging safe handling practices for staff and users.

Storage and Boxing for Unbound Documents

Unbound documents can be stored either vertically or horizontally depending on size and quantity. Letter-sized documents should be housed in acid-free, lignin-free, buffered file folders and placed vertically in a flip-top storage box in a manner that prevents the foldered documents from slumping down within. When the paper is stable, several sheets can be stored in a

single manuscript folder. Most archival folders are designed with expandable bottom folds to accommodate the thickness of the papers. Fragile paper may require fewer sheets per folder or an individual polyester sleeve for additional support prior to foldering.

Larger documents that cannot be housed in a standard vertical manuscript box should be stored horizontally in an archival drop-front box after foldering. Horizontal storage folders of the same dimension may be stacked within the same drop front box. Individual folders should not be over filled as to create a bulge upon which stacked folders will rest, as this creates a pressure point that can result in damage to other materials. Prior to foldering, documents and manuscripts should be unfolded for storage if this can be done without splitting the paper or fracturing the fold. If a fragile paper resists unfolding, or if unfolding may result in damage, a preservation or conservation professional should be consulted before proceeding. Letters should be stored with their corresponding envelopes.

For **paper collections**, objects of the same size and

category should be stored together. Differences in size and thickness within an enclosure create a potential for physical damage, so it is not advisable to store flat sheets in the same box with books or pamphlets. For the same reason, heavy objects should be stored separately from lighter ones, as should bulky objects, which cause uneven pressure inside boxes. In addition, because acid migrates from chemically unstable paper to any other paper with which it comes into direct contact, it is important to isolate chemically unstable document types such as Dazotype architectural drawings, mimeographs, and other printing processes that require chemical processing or solvents.

Folders should be kept in chemically stable document-storage boxes. All folders inside a single box should be the same size and should comfortably fit the interior dimensions of the box to limit side to side movement and not the size of the sheet. There are both flat and upright boxes that are suitable for document storage.

Flat boxes should be stacked only two to three high to facilitate access and prevent crushing of boxes. In upright storage boxes as previously mentioned, documents and folders should be well supported to prevent slumping, which will deform the contents. Spacers made from chemically stable materials can be used to fill in empty space to support the folders, as shown below. Care should also be taken not to overfill boxes as this can cause damage when items are removed or replaced.



Folders in box with a supportive spacer

Ephemera

Many cultural heritage collections include ephemera (e.g., trade cards, valentines, patterns, paper dolls). Unbound ephemera should be grouped by size and type (photographs, printed material, manuscripts, and so on), individually enclosed to protect items from acid migration and mechanical damage, and stored in a way that will support them structurally. Some vendors of archival supplies offer standard-size storage boxes and sleeves for common ephemera such as postcards and stereo views. Others can produce custom-sized enclosures in quantity to meet special needs.

Photographs

For information on storing photographs, please consult NEDCC's Preservation Leaflet [5.6 Storage Enclosures for Photographic Materials](#).

Unbound Oversize Materials

For information on storing oversize materials—such as architectural drawings, blueprints, maps, large prints, and wallpaper samples—please consult NEDCC's Preservation Leaflet 4.9 [Storage Solutions for Oversized Paper Artifacts](#).

Handling Unbound Documents

Careless or inattentive handling of documents and manuscripts can cause damage resulting in the loss of information or requiring expensive conservation treatments to allow the items to be used again. When working with documents in folders, work on a flat table and keep items in the folder to maintain order. If papers are brittle or difficult to separate, use a page-turner. As mentioned, page-turners can be microspatulas, thin Teflon folders, or simple items made out of stiff paper—basically anything thin that can smoothly slip in between pages. When using documents and manuscripts, try to handle only blank areas of the page. After use, pages should be stacked neatly in the folder and the folder returned to its proper place in the box. When handling oversize materials, be sure to have adequate room for handling, viewing, and unrolling.

Reading Rooms

Users should be instructed in the careful handling of unbound documents and works of art on paper in an initial orientation, as well as when formats change and require different handling practices. Staff training for safe handling practices is important as well, to ensure that materials will be preserved during processing and also so that the public receives consistent instruction and guidance.

Photocopying or Scanning Documents

Unbound documents and manuscripts can be damaged during photocopying and digital scanning. Care should be taken when handling any brittle materials to prevent tears or losses. Page-turners should be available to help lift fragile paper, and the paper should not be allowed to slide under the frame of the platen. Historic documents and photographs should never be fed through a sheet-fed copier/scanner, as they may jam the machine and become damaged in the process.

GENERAL GUIDANCE FOR BOTH BOOKS AND UNBOUND DOCUMENTS

Processing for Storage

When marking cultural heritage collection materials, the best practice is to use non-damaging methods. **Interior markings** on bound volumes and marks directly on unbound documents should be made only in pencil. If bookplates are used, they should be made of acid-free, lignin-free, buffered paper and attached with a stable, reversible adhesive, such as starch paste or methyl cellulose.

Exterior markings on bound volumes, such as painted-on call numbers or labels attached with pressure-sensitive tape, should be avoided because they can be permanently disfiguring or damaging and may discolor the binding. Instead, call numbers and label information can be typed or written in pencil onto text-weight, alkaline paper flags placed inside the volume. Flags should be about two inches wide and two to three inches longer than the book is high. Avoid flags with cut-out tabs that fit over the page as

these can be damaging. For volumes that are individually boxed, place the call number or label directly on the box. For volumes with powdery leather bindings (“red rot”), use a box or construct a polyester film jacket and then place call numbers and labels on the enclosure, simultaneously labeling the volume and protecting adjacent volumes from the red rot.

For rare or special collection materials, attaching labels is not recommended because the collections may be damaged by the adhesives or during future removal of the label. If bar codes, RFID tags, or any other adhesive label must be used, it should be attached to a flag, the box, or a polyester film jacket as described above. For volumes that do not have special value, care should be taken to ensure that the label adhesive will remain effective over time. It is especially important that the adhesive does not desiccate, which causes labels to come loose or fall off, and does not ooze, which causes stickiness on the volume that will attract dirt and may damage adjacent materials.

When possible, **remove ephemera** such as bookmarks, scraps of paper, and pressed flowers from bound collections before boxing and shelving. This will prevent the acid in the inserts from migrating to book pages and damaging them and will also reduce strain on the binding. If ephemeral inserts need to be kept in place, then house items in small polyester or acid-free, lignin-free, buffered sleeves within the book. If there are too many items to safely store in the book without straining the binding, label the pieces to record their location in the book and then store in folders within boxes.

Ideally, all fasteners on historic documents should be removed during arrangement or cataloging; however, if the fastener has clear artifactual significance then it should remain with the material and be sleeved in polyester to prevent the fastener from abrading adjacent material. If the institution has chosen to streamline archival processing (e.g., by following More Product, Less Process), a discussion needs to be held with preservation staff and curatorial/archival administration to determine the importance and

desire to, at minimum, remove significantly corroded staples, paper clips, and pins to prevent further deterioration and breakdown of the paper supports. Any non-stainless steel fastener that will be stored in an uncontrolled or unstable environment should be removed as a preventative measure against inevitable future corrosion. To learn about proper removal of paper clips and staples, see NEDCC’s Preservation Leaflet 7.8 [Removal of Damaging Fasteners from Historic Documents](#). Never use plastic clips as they cause considerable deformation in the paper and can snag and create a pressure point when large quantities of collection material are handled.

Use of Protective Gloves

The practice of wearing white cotton gloves when handling archival and library materials has fallen out of favor because cotton gloves provide limited protection for collections and reduce the user’s tactile sensitivity, making it difficult to handle collections carefully and ultimately increasing the chances of physical damage. Cotton gloves have many small fibers that can catch on brittle page edges or worsen an existing tear. Cotton is also very absorbent and thus easily soiled, picking up dirt, dust, and other materials that can then be transferred to the item being handled. *Instead of wearing cotton gloves, it is recommended that users be required to wash and dry their hands carefully before using paper-based collections, and to rewash them whenever they begin to feel dirty.* Hand washing is preferable to using alcohol-based hand sanitizing gels. While these products may be effective in killing germs, they do not remove dirt and leave behind lotions and oils that can be damaging to collection materials.

Photographs, film, and objects made from metals that will tarnish are the exception to this rule. Users must wear gloves when handling photographs, negatives, and film, since these can be damaged by fingerprints. When gloves must be worn for the protection of the user or the collections, lint-free cotton, latex, or nitrile (in case of latex allergies) gloves should be worn.

Use of Digital Cameras

Copying or scanning of books should be done by staff members if the materials are particularly fragile. If materials are stable and an overhead scanner is available, researchers can be trained to make their own copies. Digital cameras and phone cameras can be used safely with appropriate policies in place. For guidance in using digital cameras specifically in special collections and archives, see “Capture and Release”: *Digital Cameras in the Reading Room* at <https://www.oclc.org/content/dam/research/publications/library/2010/2010-05.pdf>.

CONCLUSION

Knowing how storage and handling methods will impact the useful life of collections and the accessibility of information will lead to improved policies and procedure. By avoiding overcrowded, careless, or haphazard storage conditions, improperly sized shelving, and chemically unstable storage enclosures, the longevity of collections can be extended significantly. While even normal use causes wear, rough handling can cause extensive damage that requires repair or replacement. Adopting improved storage methods and handling procedures will enable large collections to be preserved with systematic care particular to the many individual items.

RESOURCES

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4.7 The Book Shoe: Description and Uses. <https://www.nedcc.org/free-resources/preservation-leaflets/4.-storage-and-handling/4.7-the-book-shoe-description-and-uses>

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

5.6 Storage Enclosures for Photographic Materials. <http://www.nedcc.org/free-resources/preservation-leaflets/5.-photographs/5.6-storage-enclosures-for-photographic-materials>

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