STORAGE AND HANDLING

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

Maps, posters, large prints, and other oversize objects create storage problems for any institution. Such materials are unwieldy and therefore vulnerable to damage, especially if they are not mounted or backed. It is best to store oversize objects unrolled and flat in map-case drawers or in large, flat archival boxes. When inside drawers or boxes these objects need the additional protection of folders or other suitable enclosures. Because every collection contains objects larger than the available drawers, further storage solutions must also be found. Some of these are discussed in the final section of this leaflet.

STORAGE FURNITURE

Map Cases (Flat File Cabinets)

Map cases, or flat file cabinets, composed of wide, shallow drawers are essential for collections with oversize sheet material. Like all furniture for the storage of works of art or archival materials, map cases should be carefully chosen. They must not only protect physically, but the cases must be made of chemically stable materials that will not harm paper. Metal cases are much less damaging than wooden ones, but not all metal cases are 100 percent safe. Steel cases finished with baked enamel, once the furniture of choice, can be problematic. If the enamel has not been baked long enough or at a high enough temperature, it may give off volatiles such as formaldehyde that can damage paper. Recommended metal storage cabinets have solvent-free powder coatings of finely divided polymers that do not appear to off-gas. Furniture made of anodized aluminum is also excellent. This lightweight metal is strong and, because it has no coating to emit gases, is nonreactive.

Wood has often been used for storage cabinets, including flat file cabinets, but wood gives off harmful gases in far greater quantities than improperly baked enamel. Even old wooden cabinets are potentially damaging, especially oak ones. If you cannot replace your wooden files, then line the drawers with a barrier material. Suitable barriers for lining the insides of wooden cabinets
include polyester film (Melinex), 4-ply 100 percent ragboard, or Marvelseal®, a laminate of aluminum and inert plastic.

Before lining wooden file drawers with a barrier material, seal the wood to give an extra measure of protection. Although no coating or sealant will completely block emissions, polyurethane seals as well as any. After applying the sealant allow it to air for at least several weeks. It is essential to buy water-based polyurethane, not the more common oil-modified type. Avoid oil-based paints and other oil products for archival storage. Not all water-based polyurethanes are safe, however. Check with a preservation professional for guidance.

Flat file drawers should be no more than two inches deep and should never be filled to the top. The bottommost folder should be easily removable. The drawers may be equipped with dust covers to prevent objects from being damaged or caught up at the back of the drawers, but they should not have heavy brackets, which put undue localized pressure on objects in their folders. Drawers should have ball bearings for smooth gliding and stops to prevent them from dropping out of the cabinet when opened all the way.

It is important to have a large surface close to the drawers for inspecting oversized objects. A large table serves this purpose well, or the top of the file cabinet if it is kept clear. In storage areas it is often difficult to keep work surfaces clear, but doing so is essential for the safety of the collection during retrieval and inspection. Aisles should be wide enough to allow easy removal of items from the drawers.

**Boxes**

Although vertical storage in office files or in upright flip-top archival document storage boxes is acceptable for legal-sized or smaller documents, objects larger than 15" x 9" should be stored flat. Sheets smaller than 30" x 40" fit into archival boxes, which come in various sizes and are much less expensive than flat files. These boxes from conservation suppliers should be lidded, buffered, and lignin-free.

Boxes come in a variety of sizes and types. A good choice is the black Solander box, or museum case, which is sturdy enough to hold a group of matted artworks. In addition, the thick walls of a Solander box insulate the contents from environmental influences and provide physical protection. The lids of these boxes have lips that help keep out air-borne dirt.

Because Solander boxes are costly, they are used primarily by museums for artworks or important documents. Archival materials are also housed in lighter-weight boxes. Some are the “clamshell” style, which are constructed in one piece so that the cover and tray lie flat and remain connected when they are open. Others are “drop-front,” which means that when the cover
is removed one side of the tray drops down to provide easy access to the contents. The style should be determined by what is comfortable for those who use them.

Inside the Drawers or Boxes: Protective Enclosures

Inside drawers or boxes, individual sheets need the additional protection offered by enclosures such as folders, polyester envelopes (encapsulation), and window mats. Folders are the most commonly used enclosure for archival collections as they are lightweight and do not take up much space. Polyester encapsulation may be chosen for fragile or much-used oversized objects, but it is best to keep encapsulated materials inside folders as well, because stacks of encapsulations can be slippery to handle and scratch easily.

Folders

Folders are the least expensive storage enclosure. Like storage boxes, folders should be chemically stable and made of lignin-free stock. Folders buffered with an alkaline material are recommended for most paper artifacts. However, certain objects such as blueprints are alkali sensitive. For these, some conservators recommend pH neutral lignin-free folders that have not been buffered. Recent research indicates, however, that if the storage environment is maintained at an acceptable relative humidity (30 to 55 percent), unbuffered folders may not be necessary. Both types are available from conservation suppliers or can be made in-house from archival folder stock. If you buy both kinds of folders, be sure the supplies are clearly labeled and your staff know when to use each type.

Each folder should be somewhat larger than the sheets inside. To keep smaller folders from getting lost among larger ones, all folders should be cut to near the size of the drawer or box. Works of art with delicate surfaces, fragile sheets, or very large or thick objects should have individual folders. Other materials of similar size may share a folder. Significantly smaller objects should be housed apart so that they are not overlooked in a stack. Interleaving with chemically stable paper is recommended, especially if the objects are subject to abrasion. Acidic or otherwise chemically unstable materials should definitely be interleaved so that they do not cause contact staining or deterioration. The number of objects per folder and folders per drawer or box should be a matter of common sense, determined by the condition and size of the materials. This usually indicates between five and ten objects per folder. As a general principle, do not overcrowd. Each object must be stored so that it can be retrieved without damage.

If an oversized object is especially brittle, a folder made from a heavier, more rigid material such as 4-ply archival board provides better support than one made from folder stock. Folders should be placed in drawers so that they open at the front to provide uniformity and ease of access. (In flat boxes it may be necessary to place half of them opening toward the front and half opening toward the back so that they stack evenly.)
They should be clearly labeled toward the front with all contents to eliminate disruptive, and possibly damaging, rummaging. They should be labeled in pencil or waterproof ink. To further discourage rummaging, good finding aids are essential. Avoid self-adhering labels because they often bear adhesives that stain invasively and migrate into the folder. Moreover, adhesives of this type often fail in time.

Polyester Film Encapsulation

Encapsulation in Melinex, a clear, flexible, inert polyester film, is an attractive solution for oversized materials, especially if they are fragile or frequently handled. Polyester encapsulation has been used a great deal for posters and maps. The object is sandwiched between two sheets of film slightly larger than the object. The edges of the plastic are sealed either with ultrasonic welding equipment or with a heat welder. Polyester film provides excellent protection during handling.

Encapsulation is not suitable for acidic objects, however, or those with powdery or loosely bound media. Because polyester contains a static charge, media such as pastel, charcoal, soft pencil, and flaking paint can be easily dislodged by plastic. Research at the Library of Congress has also found that acidic papers deteriorate faster within a closed environment such as a polyester envelope. Because most old untreated papers are acidic to some extent, objects should be deacidified or washed to remove accumulated acid in the paper before encapsulation. Washing or deacidification must be done by a conservator. When this treatment is not possible, a sheet of buffered paper in the polyester envelope placed behind the object can be helpful. Leaving the corners of an encapsulation unsealed is of little, if any, use in protecting the contents from accelerated acid deterioration.

Window Mats

Mats are much more expensive than folders or polyester envelopes, and they occupy more space. Once matted, however, an object is ready for framing and exhibition. Matted objects can also be handled without being touched, and they provide more rigid support than folders. Light-colored mats are extremely susceptible to soiling, though, and must be handled with the utmost care to remain presentable.

Mats can usually be made by a commercial framer or in-house. Successfully cutting oversize mats is extremely difficult, however; usually it is best to leave this to a commercial framer who has the proper equipment and expertise to cut oversize mats efficiently.

To be rigid enough to support oversized materials, mats should be made of 4-ply or thicker board. The standard museum mat is composed of two sheets: a window and a backboard. These are held together with a strip of cloth tape along one edge, usually the top or the left edge. The
object is attached to the backboard, usually by hinges along the upper edge. There must be a sufficient number of hinges, and both hinges and adhesive must be strong enough to support the weight of the object. For hinging, conservators recommend kozo papers and a homemade starch-based paste. Commercial tapes should be avoided as they can deteriorate as they age and many stain or fail. The "archival" tapes sold by conservation suppliers should not be used with objects of value. These are less damaging than most commercial products but are difficult to remove in time.

In recent years, some institutions have become reluctant to apply adhesives to artifacts and have experimented with other methods of mounting. Corner supports and edge strips are becoming increasingly popular. For further information about this and other matting issues, see the NEDCC preservation leaflet, "Matting and Framing for Art and Artifacts on Paper."

**Folders with Polyester Film Interior Covers**

These containers combine the advantages of a plain folder and polyester encapsulation. They are constructed, as shown in Figure 1, with a sheet of polyester film attached inside the folder. This type of enclosure can be purchased from a conservation supplier, or it can be made in-house using double-sided tape to attach the polyester. Such an enclosure is safe for untreated acidic materials for which encapsulation may be inappropriate. The enclosed object can be seen without being touched and is safely held in place by the polyester. Like encapsulation, however, such enclosures cannot be used with powdery or loosely bound media such as pastel or charcoal.

![Figure 1](image1.png)

![Figure 2](image2.png)

A variation on the above is an enclosure made of 4-ply (or heavier) archival board with a cover sheet of polyester attached at the top with double-sided tape (Figure 2). Because board is more rigid than folder stock, this type of enclosure is especially suitable for oversize materials and brittle materials that should not be flexed.
STORAGE OF VERY LARGE SHEETS

Rolling

For objects larger than the available drawers, rolling on a tube is a common solution. Though not ideal, it may be the only practical means of storing oversize materials in some institutions. Rolling saves space and is satisfactory for materials that are flexible enough to withstand unrolling and rerolling. It is especially suitable for items that are seldom consulted, and related items, such as groups of architectural drawings, can be rolled together on a tube. Rolling the largest objects is often a two-person job.

Conservators recommend rolling oversize materials around the outside of a lignin-free tube at least 4 inches in diameter; still larger is better. The tube should be long enough to extend beyond the sheets by at least 2 inches at each end, so that the edges are protected from crushing. Lignin-free tubes of varying diameters are available from conservation suppliers, but large-diameter tubes are expensive. If these are not available, a nonarchival-quality tube can be covered with a barrier sheet of polyester film wrapped around the tube and secured to it with double-sided tape completely underneath the polyester. The stored material must not be allowed to come into contact with the tape.

Normally objects are rolled front side in with a single sheet of archival-quality interleaving paper covering the entire recto. It is better not to use numerous smaller sheets because they can be dislocated, crumpled, and bunched during rolling. When rolled, the interleaving paper serves both as a barrier and as a cushion between segments of the map rolled onto itself. Finally, the assembly should be wrapped in archival-quality paper or polyester film to protect against abrasion, dust, and pollutants. The outer wrapper may be secured with ties of undyed fabric tape or white polyester ribbon. Ties should be at least 1/2" wide. For additional protection some institutions store tubes wrapped with archival-quality materials inside larger-diameter tubes. Tubes should be stored horizontally one layer deep, never vertically, as the rolled materials may slip down. Shelves should be deep enough so that the tubes do not extend into the aisles, where they may be bumped. They can also be stored by inserting a pole through the tube and resting the ends of the pole on wall brackets.
A rolled folder made of 4- or 5-mil polyester film provides an alternative storage solution (see Figure 3). Rolled polyester folders, like encapsulation, reinforce and support oversized objects. As with encapsulation, acidic materials should not be placed in polyester rolls unless they are resting against buffered paper. Such folders can be made from a sheet of polyester film folded in half. The object is placed inside and the folder is rolled and secured with ties. The ties can be kept in place by feeding them through holes punched in the end of the roll. A label of archival paper can be attached to the film with double-sided tape (3M brand #415). Labels should face out and not touch the object. The object itself should face in so that it is protected from light exposure.

Many collections contain objects that have been rolled for years and are too brittle to unroll safely. Such materials were not appropriate for rolled storage in the first place. They should be forwarded to a conservator for humidification and flattening, then an alternative storage solution must be found. If they cannot be flattened right away, rolled objects may be wrapped temporarily in archival-quality materials and stored horizontally in a single layer on shelves wide enough to support them. They should be put off-limits to researchers. For better protection, the rolls may be placed inside wide-diameter tubes long enough to contain them or in the long, narrow archival storage boxes sold by commercial vendors for this purpose. The rolls should be wrapped before placing them in containers to protect them when they are pulled out.

Please remember that flat storage is preferred to rolling. Objects should be rolled only if they are too large to fit in drawers or folders on protected shelves.

Folding

Folding damages paper and is not recommended. Some objects, such as newspapers, are meant to be folded once. Such sheets may remain that way but should not be folded a second time. If they are already folded additionally, unfold them cautiously. With age they may become brittle and resist unfolding, so that they could break in the process. If that is the case, they should be brought to a conservator for professional treatment. Do not unfold oversize objects until you have figured out how to store them afterward.
Hanging

Wall maps, posters, and other oversize objects can be stored by hanging them if they are specially prepared for this, provided that their mounting is secure. For example, they may be lined with paper and cloth or a double layer of paper that extends beyond the upper edge and provides a border for attachment to a hanging fixture. (Any lining should be carried out by a professional conservator.) The object should be provided with an encapsulation or other enclosure that protects it from mishandling, accidental damage, and air-borne dirt and pollution.

In the past wall maps were customarily backed with cloth, attached to wooden rods at the top and bottom edges, and hung on the wall with only a coating of varnish to protect their surfaces. These maps are often dark and brittle because of their age, long exposure, and the inherent instability of the paper on which they were printed, and their mounts are often failing. They can be treated by a professional conservator, however, and given the protection of a new backing and an encapsulation. Note that once encapsulated, an object can never be rolled or the encapsulation will deform and the welds will break.

Sectioning

At one time libraries routinely cut maps into sections for easier storage. Sometimes the sections were mounted together on a single cloth with gaps between the sections, and the cloth was folded through the gaps and put inside a cover in book format. These interesting examples of early map preservation are found in many libraries. Today professional library and archives practice prohibits cutting up maps. Some, however, can be sectioned without cutting. Many early materials, especially maps, are printed or drawn onto two or more sheets of paper that have been joined together. In the course of conservation treatment these sheets can sometimes be separated, treated, and then kept separate. Sectioning in such cases is a radical solution but it is not irreversible. The component parts can always be put together for viewing or permanently rejoined at a later time. The question of whether to section, like so many other conservation issues, should be decided on an individual basis, with consideration of the object's aesthetic significance, its uniqueness, its original function, the amount of handling it will receive, and the feasibility of storage alternatives. This is essentially a curatorial issue that must be decided by the collection manager with input from a conservator.

SUGGESTED FURTHER READING


ACKNOWLEDGMENTS

NEDCC gratefully acknowledges the work of Margaret R. Brown in illustrating this leaflet.

 Attribution-NonCommercial-NoDerivs
 CC BY-NC-ND