



SELECTING MATERIALS FOR STORAGE AND DISPLAY

Collection Managers, Curators, Registrars, Conservators, Archivists and Librarians often have to make difficult decisions regarding appropriate storage and display materials for the preservation of historic objects and artworks. It is essential to choose materials that properly house and support artifacts without causing damage or deterioration. However, navigating a museum or archival supply catalog can be difficult. To further complicate decision making, many materials marked “archival” or “acid-free” in catalogs or in office supplies and craft stores may not be necessarily appropriate for the long-term preservation of collections.

The following tables show what materials are acceptable for use in display and storage of collection objects. Please note that many of these materials may be marketed under different product or trade names. When choosing products, if the material-type is unclear or if there are questions about its suitability for use with collections, contact the manufacturer and/or a conservator.

PLASTIC CONTAINERS AND SYNTHETIC SHEETINGS

Not all plastics are suitable for use with collections. However, stable plastic materials that do not off-gas can be ideal for safely housing collections items, easily handling, and providing support. Bags, containers, boxes, and sheeting made of appropriate types of plastics all have useful applications in museums, galleries, libraries, and archives.

Material type	Material details
Polyethylene (polythene)	Used to make storage bags, enclosures, cushions, foams and sheets or as a spun bonded fiber product. Chemically inert and very stable. Sometimes marketed under the brand names of Volara®, Ethafoam®, Trirod®, Colara®, Correx® or Tyvek®. The latter is waterproof yet breathable if used the right way: the smoother side should face the object. In general, be careful of moisture condensing on polyethylene sheets and use buffering materials such as acid-free tissue between the object and the sheeting. Polyethylene can also be cut into strips and used as straps to secure objects and books to mounts.

Polyester	Available in sheets, bags or enclosures. Sometimes marketed under the brand names Melinex®, Secol® or Mylar®. Sheets are sold under the brand name Remay®. Can be used for storage, and, because it is transparent, is also useful for handling paper artifacts. Polyester can be used in straps to secure artifacts to mounts.
Polypropylene (PP)	Used to make boxes, bags, and enclosures. Corrugated polypropylene boards are manufactured under the brand name Coroplast Archival®. Polypropylene boxes are useful especially when storage areas are at high risk of floods or water leaks as they are water resistant.
Polymethyl Methacrylate (PMMA)	Available in sheets under the trade name of Perspex®, Plexiglas®, or Lucite®. Used for glazing, they are scratch-resistant and low static, as well as UV filtering.

Avoid using PVC (polyvinyl chloride) plastic because as it deteriorates, and it gives off hydrochloric acid. The plasticizers used in PVC can affect photographic materials such as slides, prints, and negatives, as well as rubber materials and modern plastics. It is also best to avoid the use of cellulose nitrate, cellulose acetate (diacetate and triacetate) and polyurethanes, as they can crumble over time.

NATURAL AND SYNTHETIC FABRICS, THREADS AND PADDINGS

Select undyed and sizing-free materials. Fabrics, threads, and padding materials can be used to create custom storage solutions for textiles and to support objects within boxes.

Material type	Material details
Unsize, unbleached, and undyed cotton	Can be purchased at any fabric supply store or in archival catalogs, and can be used for storage enclosures, padding, and in exhibition cases. Fabrics should be washed with a phosphate-free detergent such as Lysol® before coming in contact with collections. Cotton can be found as a non-medical grade, more elastic material called Stockinet®, which is helpful to stuff and create padding within boxes, or for covering exhibit mounts. Unbleached calico sheets can be used as dust covers. Cotton can also be found as a twill tape, sold in different lengths and widths as well as undyed cotton string for securing objects.
Linen and jute	Available in fabric supply stores. Can be used similarly to cotton, as listed above. Linen and jute contain more lignin and are more abrasive fibers than cotton, so it is best to avoid direct contact with the artifact.

Un-fused polyester padding	Available in fabric and craft supply stores. Useful as a stuffing material when creating pads and supports for collections. Ensure it is covered with washed, unbleached cotton calico to prevent fibers catching on the surface of objects and small objects being lost within.
Flexible extruded polyethylene foams or polystyrene foams	Available in craft supply stores and through archival catalogs. Can be used to make trays within boxes and to support collections with round bases (baskets, pots) on shelves. Polyethylene is available under the name of Plastazote® and Ethafoam® and is preferable to polystyrene as it does not yellow as it ages. A soft foam with fine bubbles, these materials are inert and non-abrasive prior to cutting, so once shaped to accommodate the object it is best to first use a polyester lining layer tucked inside the foam.

Avoid using wool and felt as they give off sulphur compounds that can tarnish or corrode metals, fade feathers and ethnographic materials, as well as attract insects. Nylon threads or monofilament, also known as fishing line, should not be used because they fail and snap easily as they age. However, if already present in storage, fishing line should be used with padding placed between the object and the line. Do not use polyurethane foams as they become acidic and crumble overtime. Bubble wrap® (polyethylene layers) should only be used for temporary storage and wrapping for transport. The bubbles can leave a permanent impression in many materials (paints, Perspex) so it should always be used with the bubbles on the outside of the artifact, never in direct contact with the object. A layer of tissue or Tyvek® should be applied in between.

ENCLOSURES, SUPPORTS AND INTERLEAVING MATERIALS

Paper and paperboards are used to make boxes, folders, support board, and as interleaving materials. For museums, galleries, libraries, and archives collection preservation, materials that are marketed as both acid-free and lignin-free should be used. Foamex® boards can be used for display panels. Neutral off-white shades of all of these materials is suggested for aesthetic reasons, as well as to eliminate the risk of color bleeding in the event of contact with water.

Note that any papers or enclosures being used to store photographic materials should pass the Photographic Activity Test (PAT), which is a predictive test of reactions between an enclosure material and photographic material.

Material type	Material details
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<p>Acid-free: paper, tissue, cards, boards</p>	<p>Papers marked as acid-free are pH neutral or slightly alkaline at the time of manufacture (pH 6.0 – 9.0). Many papers marketed as acid-free are made from wood pulp and will become acidic over time and deteriorate as they age, so it is important to check for acidity and replace when needed. Useful for wrapping and padding.</p>
<p>Lignin-free: paper, cards, boards</p>	<p>Lignin is a material found in wood pulp and can cause yellowing and brittleness in paper over time. Lignin can be removed in the paper-making process, making the paper more suitable for collections storage applications. Papers that are lignin-free and acid-free can be named as cotton-based papers.</p>
<p>Buffered: paper, tissue, boards</p>	<p>Buffering works to neutralize acids that may form in paper by preventing acid migration and oxidation over time. Buffered papers are appropriate for most storage applications and especially good for plant-based materials preservation. However, they are damaging for proteinaceous materials (leather, silk, wool horn, bone, and ivory) and can also affect dyes, photographic materials (blueprints, cyanotypes) and metals. Buffered papers include an additive, usually calcium carbonate 3.5%, to make the paper slightly alkaline (pH 7.5-9.5).</p>
<p>Unbuffered: paper, tissue, boards</p>	<p>Unbuffered papers are pH neutral and do not contain any buffering agent. These papers are less effective than buffered paper at absorbing acids produced by the environment or objects. Appropriate for use in instances where more buffered papers might cause collections damage. For this reason, buy unbuffered papers for mixed collections if purchasing both is not an option.</p>
<p>Zeolites: paper, boards</p>	<p>Zeolites are molecular sieves that are imbedded into paper or paperboard. Zeolites trap gaseous pollutants either present in the environment or produced by the deterioration of the artifact. Artifacts enclosed in papers containing zeolites are provided additional protection. Sold under the brand name Micro-Chamber®, for interleaving paper and storage enclosures and, NielsenBainbridge ArtCare®, for matboards.</p>
<p>Zero Grade MDF, Medite (MDF without binder), Sundela K Quality (not grade A), Marine Plywood</p>	<p>These materials are acceptable as boards but should not be in direct contact with artifacts. They should be treated with barrier foil or acrylic varnish since they can be source of organic acids.</p>

Acrylic and polythene boards	Often found under the name of Perspex® and Correx®, these materials are stable and inert (see the above plastic containers table). They are solid strong resins that can be used to make mounts or supports, instead of wood.
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Ordinary paper, tissue paper, gummed paper, Foamcore® and glassine photo envelopes become acidic over time causing organic objects in contact with them to discolor and deteriorate, as well as accelerate metal corrosion and glass devitrification. Glassine, in particular, in very high RH environments tends to get sticky and in very dry environments can get brittle creating sharp edges that might scratch the surface of the artifact enclosed.

Wood and composite boards including plywood, chipboard, particleboard and hardboard should be avoided as they give off harmful phenol or urea formaldehyde, which forms organic acids. Formaldehyde reacts with other materials to form formic acid, which is very destructive. Phenols and formaldehyde are also a health hazard for people. In case it might be necessary to use wood, it is important that the wood is sealed. Barrier foil is the best method: it is a gas impermeable metal foil sealed between layers of inert plastic film, such as PP004 (Moistop®) and Marvelseal 360®. Seal edges with aluminum tape. Do not puncture the foil. An alternative method is to use an acrylic varnish which does not give off harmful vapors. Dacrylate®, Sealbond RJ119® and Cuprinol Enhance® are suitable. Use at least 3 coats and allow them to dry thoroughly between applications.

When wood must be used, use seasoned spruce, mahogany, walnut, basswood, poplar, and balsa, or exterior grade plywood as well as MDF (medium-density fiberboard), with formaldehyde-free adhesives.

Pellets should not be used, if not checked regularly as they can attract pests and disintegrate if wet.

ADHESIVES

Adhesives, even those marketed as “archival,” should never be placed in direct contact with collections. Some select tapes and glues can be used to make enclosures and to seal display cases.

Material type	Material details
Sellotape and double-sided tape (only 3M 415 double sided tape)	Sold in various widths for multiple applications. Can be used to make boxes and enclosures.
Ethylene/Vinyl Acetate copolymer adhesives: Hot Melt Glues or laminating emulsions such as EVACON-R. HMG Cellulose Nitrate adhesive, UHU Clear	Specially formulated neutral pH, non-plasticized, reversible archival paper adhesives. Useful for making boxes and acid-free cardboard enclosures. Some of which have a life span of no longer than 6 months.

HMG Paraloid B72 Acrylic adhesive, Evode Epoxy Resin	Can be used as adhesive for displaying object labels in areas where artifacts are present.
Polytetrafluoroethane (PTFE) tape	Useful for the display of framed materials. It can be stretched around the edge of glass before it is inserted into place. The tape relaxes and fills the gap between the glass and frame so holding it in place.
Self-Adhesive Linen Hinging Tape	It can be used for hinging window mats and securing photo corners; never apply it directly on an object. It's a non-yellowing, pressure sensitive adhesive. Coated with a neutral pH acrylic adhesive of archival quality, the tape has a high thread count and a release liner paper. Can be water activated or self-adhering. Often found under the name of Lineco®.

Be careful when using Polyvinyl Acetate emulsion (PVA) and Urea Formaldehyde adhesives because they give off acetic acid, which can attack various materials, especially metals. Prior to their use, consider what kind of artifact will be stored in the enclosure where the adhesive has been used. Avoid using rubber adhesives that give off sulphur and degrade by light exposure becoming brittle. Rubber sealants should also be avoided since they release acetic acid and harmful vapors.

ATTACHMENTS, LABELS, COATINGS AND PAINTS

Collections materials will sometimes need labeling and attached documentation. It is imperative that pens and self-adhesive labels are not used, as well as Velcro®, Blu Tac®, masking tape and sticky tape. Safe tested materials (Oddly test) must be used for mounts, such as coatings and paints.

Material type	Material details
Polyethylene sheathed metal pins	Acceptable for use, if necessary.
Spun-bonded Polyester labels	Also under the name of Tyvek® labels, can be gently tied on the materials using unbleached cotton tape or cord.
Ink and acrylic varnish (Paraloid B72®) dissolved in acetone	Can be used to write accession numbers on protected areas in discreet part of the object.
Two-part Epoxy Resins	Can be used as a sealant, and to cover floors and surfaces in storage areas as it is resistant to UV, shock and vibrations, corrosion, thermal cycling, and have low VOCs.

Anodized aluminum, powder-coated steel, chrome-plated steel, baked enamel (only if it has been tested for proper baking by performing a methyl ethyl ketone rub test)	Any of these metals are acceptable to be used as metal coating because they are resistant to corrosion, wear and don't release any VOCs.
Pencils and markers	Prefer soft pencils 4B/6B for paper and paperboards, solid graphite pencils 4B/6B for resin-coated supports and Sharpie® permanent black marker for plastic enclosures only.

Avoid using unsheathed metal pins that can corrode or stain when in contact with metal objects. Any other metal that has not been sealed with appropriate sealants might also be susceptible to chemical off-gassing or corrosion and thus should be avoided. Do not use oil or latex paints and varnishes.

Any sticky substance or adhesive applied directly to an object is non reversible and can cause chemical deterioration. Pressure-sensitive adhesives will fail with time, and labels will be lost.

SHELVING

Shelving materials can vary from wood to metal and within those categories there are several options. However, the best material for storing museum collections is powder-coated steel units with movable shelves. Metal as the advantage of being strong, durable and flexible. Avoid baked enamel coated shelving as it releases vapors over time.

Solid wood shelving can be used in collection storages and it is a cheaper option, but it is less durable and sturdy. It can also off-gases acidic vapors. For this reason, if used, it is best to seal it with two coating layers of polyethylene lacquer. Formica-covered plywood can also be a safe option for shelving. Always consider, however, the storage environmental conditions when purchasing new shelving units.