

“Your Gonna Do What!?!”
The Conservation of Paper-based Archival Materials

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ICA/SUV Conference
Michigan State University
September 2005

Abstract: The safekeeping of archival collections is the duty of all archivists and both preservation and conservation play a role. Preservation issues look at the overall collection in such areas as the environment, storage conditions and disaster planning. Conservation deals with individual items within the larger collection. Each item must be evaluated separately for proper conservation treatment and repair. Conservation techniques include washing, deacidifying, mending and encapsulating with the goal of making the item usable again and increasing its lifespan. These treatments and other common conservation techniques are explained in detail with an analysis of its proper use. Conservation and preservation compliment each other and should be included in any archives management program.

One of the major responsibilities for any archives is the safekeeping of the materials in its care. The best processing and organizing system in the world will mean nothing if the documents themselves are deteriorated beyond use. The preservation of archival materials has many components. This paper will provide an overview of one example of how things are done in archives in the United States. It must be emphasized that this is only one way, and not the only way, to preserve and conserve archival materials. The benchmarks and procedures in this paper may not be entirely appropriate for all areas of the world or even regions in the United States. But they will give a general idea of what can be done, and should be strived for, to preserve precious archival mater

This paper will first touch on preservation issues such as ideal environmental conditions and disaster planning, then illustrate some examples of typical conservation treatments. For those who are confused between the two terms, preservation is the broader term and conservation the more specific. Preservation deals with the collection as a whole while conservation focuses on individual pieces one at a time within the whole collection. This will become more apparent as each is discussed in further detail.

Environmental Conditions

The first line of defense in any preservation program is environmental conditions. The environment is the factor that will effect your collections in the broadest sense. Controlling the environment is the single most important thing, besides a collection's organization, you can do for an archives. Placing materials in the proper conditions will make sure the collection does not suffer daily harm. Paper-based materials last the longest when the temperature is slightly cooler than normal room temperature (around 65°), the relative humidity is slightly below 50% and there is not a constant source of light on the materials. If this sounds vague, it is. The specifications change on a regular basis and must be matched to each individual institution depending on their capabilities and use patterns. The main points to remember are:

- 1) Stability is important, even if the temperature and humidity aren't always ideal.
- 2) Constant change in conditions will cause damage.
- 3) Chemical reactions (i.e. deterioration) increase with a rise in temperature.
- 4) Keep materials as cool, dry and dark as possible.

Storage Conditions

After the environment in the room or building is stabilized, it is time to look at the storage conditions. While very few archives will ever have the luxury of moving to a new building just because the storage conditions are not ideal, there are things that can be done to help the collections just by knowing the physical characteristics of the archives building. What kind of roof does it have and is it prone to leaks? Does the basement flood or is it prone to dampness? Even if the collection is not on the top floor water from a roof leak might still drip (or pour!) to lower floors and a damp basement can cause mold conditions which might spread to upper levels. Find out if the building has a fire suppression system and if it is a wet- or dry-pipe system or uses chemical suppression. A wet-pipe system delivers water to a fire faster but can leak since the water is always in the pipes. Chemical systems won't cause water damage but can be hazardous to your health or the stability of your collection. How the records are stored is also important. Papers in heavy-duty records boxes are protected from many damaging elements: dust, small fluctuations in temperature and humidity, light, and water or chemical fire suppressants. Properly packed cardboard boxes will also burn much slower; plastic storage boxes can melt under the intense heat of a fire. And a well packed and organized records box will minimize the unnecessary handling and use by scholars since they will easily be able to find what they are looking for.

Disaster Planning and Mitigation

Every archivist should have a touch of pessimist in him or her. It is foolish to hope that a disaster will never strike your archives. It should be understood that a disaster could very well arrive at the archives today and be prepared. In other words, fear of the worst is healthy for any collection. There have been many books and in-depth workshops on disaster planning which is out of the scope of this paper. However, here are some points to remember:

- 1) Have a complete inventory of the collection and decide what is most important if only one box could be grabbed before disaster struck.

- 2) Disasters come in a variety of forms and can strike from anywhere: flooding from below or above, fire, natural disasters (tornados, hurricanes, earthquakes, etc), mold or insect infestations.
- 3) Are there other offices in the archives building? The archives staff may be the most careful people in the world, but the office upstairs may not even think to contact anyone when their water pipes burst.
- 4) Plan ahead on what might happen. Make a list of what to do if disaster strikes. Is there an off-site space to store materials while the building is repaired? If materials are wet, mold will become an issue. Is there a freezer facility to store materials in until they can be dried? Freezing a wet item will effectively stop further damage until it can be attended to.

There are also many other aspects to think about as well. A disaster plan should not be an elaborately published document. Keeping it in a three-ring binder is preferable so it can be updated as needed. Include a floor plan of the storage areas, a list of the collections in order of importance, a list of vendors for supplies and services in the area who can be called on, and a phone list of employees and volunteers who can help in the recovery. And most important, don't keep a single copy in the archives. Make multiple copies and store some in a remote location. This is a very brief overview of disaster planning. It is urged that you to study this topic further or take a workshop to help develop a plan for your archives.

Reformatting

Finally, preservation covers the realm of reformatting. For a variety of reasons, sometimes collections are copied so the originals do not have to be used. The standard method, although this is changing, is microfilm. Microfilm's advantages are that it is low-tech and has a proven life expectancy. Digital is an up and coming format which has both advantages and disadvantages. Until recently it has mostly been viewed as an access medium, not a preservation medium. With digital, researchers can easily locate the information they need and they don't even have to be onsite (of course this has both positive and negative implications). Many copies can be distributed for both publicity and preservation purposes. But preservation is still problematical. The long-term stability of digital media are still not entirely known. Several years ago it was said that compact discs would only last 10 years. But advances in production have raised that estimate. And new media such as DVDs and inexpensive, large capacity hard drives have increased the time frame even more. But as technology changes, we have to make sure the old data on the old formats will still be able to be read. Regular backup and migration of data is key to the preservation of the digital medium.

Conservation

The realm of conservation has a narrower focus and concentrates on the single item rather than the collection as a whole. Ideally, a sound preservation program would be in place before conservation treatments begin. Spending time and money to conserve a document is for naught if it will go back into conditions that will only hasten its deterioration. Before a sample conservation treatment is outlined, some issues which concern

conservators will be discussed. Again, it must be emphasized that what is presented in the paper is not the only method to treat archival materials and would not be appropriate for all items or all archives from around the world. Even within the United States, different conservators will have different treatments depending on regional variations, institutional needs, and training background.

In-house vs. Outsourcing

One issue that must be decided is whether to repair items in-house or outsource to a conservation professional. Unless the archivist has some knowledge or training, the repairing of collections is best left to a professional. But if the archivist understands the basic principles of conservation and has had some training, it makes sense for him to perform routine repairs such as simple mends on torn pieces of paper or placing fragile items in protective sheets. But the archivist should know when to stop and consult a conservator before he does harm to the documents.

When first contracting for conservation work, it is important to check references and make sure the individual has the proper training and credentials. Training for conservators can take many forms, from a formal education at a degree-granting institution to the time-honored apprenticeship system. What is most important is that the conservator has the proper experience to perform the job assigned and that she work in an ethical manner. At least in the United States, there is no certification program which guarantees that an individual has the proper training and follows the generally recognized guidelines, so the burden of finding a qualified conservator is in the hands of the archivist. There are many reputable conservation labs around the world that take outside work. Some resources for locating qualified conservators are listed below.

Reversibility of Repairs

One of the key concepts of conservation is reversibility. Conservators will aim to make any treatment performed reversible. That is, a repair should be able to be undone at some future point if further damage needs to be addressed or newer, better conservation treatments are developed. Thus, using plain adhesive tape is not acceptable because to remove it is difficult and could cause damage to the item. A preferable way to repair the item would be to use a starch paste and Japanese paper since it can be reversed with just a little bit of water. This does not mean the reversible repair is weaker. In fact, it is better for the document since it is more sympathetic to the original materials. Using materials much stronger than the original for any treatment only invites the document to become damaged on either side of the mend.

Restoration vs. Conservation

One of the goals of any archives is to retain the collection in its original format as much as possible. The same is true for the conservator. If this were not important, it would be much cheaper and simpler just to photocopy everything and throw out the originals. During the course of a conservation treatment, even small shards of paper will be

reattached to the document and care will be taken to note any instance where a new piece of material had to be substituted for an original. This is a different philosophy than a document restorer has. The restorer's goal is to make the item look like it did when new. The conservator will stabilize as much of the original as possible and the finished treatment may look much like it did when it left the archives. But rest assured, the document may not look different on the surface, but changes have taken place which will have long lasting effects for its survival.

Sample Conservation Treatment: Condition Survey and Treatment Proposal

The first step in starting a conservation treatment is writing up a condition survey. The materials are examined in their current condition with such things noted as types of materials (different kinds of paper, photos, electronic media, etc.), different kinds of writing media (inks, pencil, mimeograph, etc.), total number of pieces (either a folder count or actual page count), organization structure, and types of damage observed. A condition survey form might be filled out or short report written instead. The conservator and archivist then sit down and discuss the collection at hand and the different options available. The conservator will discuss appropriate treatments for the materials and the various outcomes of such treatments. The archivist will respond to these suggestions and express the needs for the collection – such as the collection cannot be encapsulated for storage reasons or the need for the paper to be optically whitened for an exhibit. After factoring time and costs, a mutual decision will be reached and the conservation treatment can proceed.

Materials Testing

After the appropriate treatment is decided on, all materials are tested for stability. Sometimes, as in the case for most papers, the chemistry behind the material is well known and is only tested if it appears unusual in some way. In the case of writing media, testing is usually done since there are so many different types of inks and colorants and it is hard to know exactly what brands or formulas have been used and how they will react to water and chemical solvents. Washing a document in water is a common treatment to remove ground-in dirt and acids in the paper; solvents are used to help remove adhesives from previous repairs or backings. Any suspect media are tested with any potential solvent which might be used. The testing is done in a discrete area which will not be readily seen when the conservation treatment is finished. Inks, for example, are brushed over with a cotton swab soaked in water or the solvent. The area is examined for fading or feathering and the swab is checked for transferred colorant.

Surface Cleaning

Surface cleaning involves removing dirt, soot, unwanted markings and even mold from the document. If surface grime is not first removed, subsequent treatment steps may drive the dirt into the fibers of the document where they are much more stubborn to remove or might not be removable at all. First, large particles are removed with a soft brush. Care is taken to brush these into a waste container and not onto the work surface. In the case of

mold, a fume hood or vacuum with a HEPA filter is helpful to keep the mold spores from settling on other documents. Second, a soft eraser, often broken in small pieces called crumbs, is gently rubbed over the document. Care must be taken not to abrade the fibers of the document or remove any of the media. Sometimes this step is skipped if the document is written in pencil or other easily erased media or the paper is very soft and abrades easily.

Tape Removal

The removal of previous mends is one of the most common of conservation treatments. Depending on the collections provenance, chances are if any items were damaged, someone repaired them with some sort of self-adhesive tape. The first step in tape removal is to determine the age and type of tape. Removal techniques vary depending on if the tape is water-based gummed glassine (the oldest kind of tape) or rubber-based cellophane or a more modern acrylic-based “Magic” tape. Removing the tape by mechanical means (gently lifting the carrier and scraping away the adhesive residue) is often the best means. But if the paper is soft or the tape firmly attached, this may not work. A heated spatula can loosen the adhesive and help in its removal, but again care must be taken not to damage the paper or the media and both must be tested for any heat sensitivities. Finally, solvents may be used. The safest solvent is water and will remove any water-based adhesives, of course, but can also aid in removing acrylic-based tapes. Other chemicals such as acetone, ethanol or methanol, toluene and hexane are used by themselves or in a “cocktail” to loosen the adhesive. These can be applied directly, as a poultice, or the paper may be exposed just to the fumes. For all methods, the media have been checked for stability with that specific solvent. A fume hood is also necessary when working with these chemicals since some are dangerous when inhaled and others are known carcinogens.

Mending Tears and Losses

Wear and tear will create tears and losses in any paper-based collection. The tears may need to be repaired if a previous, non-archival repair has just been removed or the tear may never have been mended before. Tears are usually (but not always) fairly easy treatments, but there are a variety of techniques that can be applied. The easiest is using an archival repair tape, such as filmoplast P. This is an acrylic-based self-adhesive tape (the same as “Magic” transparent tapes) but manufactured to higher standards. The carrier is an acid-free tissue and the adhesive is slightly reversible if it ever needs to be removed. The advantage to using an archival repair tape is that it is easy to use and the archivist, with the proper training, can repair tears while processing the collection. If the document is older or on thin paper or fragile in any way, archival tapes are not appropriate. A better method for such documents would be using a thin, but strong Japanese paper and wheat starch paste. Such a repair can almost be made to disappear and is much more sympathetic to the original materials, but must be dried under weights so as not to cause the paper to cockle. Whatever method is employed, care must be taken to match the edges of the tear and not to cause stress on the rest of the page.

Losses in documents are more difficult to repair. Losses are defined as when a section or piece of the document has gone missing. Obviously, there may be sections of the informational content that are lost. Sometimes it is best to leave such gaps as is, but for large losses or oversized, heavy documents, this might cause further damage when the piece is handled. Using a piece of heavier Japanese paper, perhaps toned to match the original paper, can patch the void. If another copy of the document is available (this is perhaps easier for books than for one-of-a-kind manuscript collections) a photocopy of the missing section can be made, preferably on a lighter-weight paper or even a Japanese paper, and pasted into place. Finally, if the conservator has the proper artistic skills, the loss can be in-painted to match the original. This is most appropriate for smaller losses where only a letter or two is missing or on maps where the informational content is fairly obvious (such as connecting a straight road). In any case, if losses have been replaced by any means, a note should be made in the collection's records indicating this addition for future scholars. The job of the conservator is not to hide the repairs or deceive anyone on the nature of the repair. That is why documentation of all conservation treatments is so important.

Washing

Washing a piece of paper can be a bit shocking at first as the conservator tosses the document into a tub of water. Or to be a bit less cavalier in the description, the paper is gently submerged in a bath of room-temperature water after testing all inks for water-fastness. The water may have various chemicals added to it. A mixture of water and ethyl alcohol will make the water "wetter" and help it penetrate into the fibers of the paper. Adding calcium or magnesium will act as a gentle deacidifying agent. The effects of washing paper can be quite dramatic, however. The paper can be optically lightened by washing and the water afterwards will often turn the color of weak tea – a sign that the water has removed ground in dirt and acids which cause yellowing. The paper is left in the water anywhere from a few minutes to an hour, usually followed by a second rinse. If any bleaching chemicals are used, then several rinses (including chemical counterbalances to remove all the bleaching agents) will be employed. Chemical bleaching of paper is not normally recommended since it deteriorates the fibers and can cause future damage if any of the bleaching agent is left in the paper. If the paper needs to be optically brightened, especially for display purposes, the preferred way is to use short exposures to UV radiation, often while the paper is submerged in water.

Deacidifying

Brittle paper is a problem any archivist will have to face. Brittle paper, the phenomenon of paper that has lost all its inherent strength and crumbles at the slightest touch, is caused by acids that eat away at the fibers of the paper. While there are many sources for acidity, including atmospheric pollution, the main culprit is the acid in wood-based paper. The acidity increases over time, causing the yellowing of the paper and then the loss of strength. Papers made from other fibers, such as cotton, flax or hemp, do not suffer this problem. Wood pulp paper was first introduced around the middle of the 19th century. Archival collections and books from around 1860 on into the late 1930s are suffering the

most. Paper from the 1940s onwards will start deteriorating over the next few decades so the problem will not be going away anytime soon. Many modern papers, while still made from wood, are manufactured with an alkaline buffer that will neutralize any acids that form after its manufacture.

To over simplify the process, deacidifying acts on the same principle as adding a buffer to modern papers. The acids currently in the paper are neutralized and then a buffer is soaked into the fibers which will continue to neutralize acids in the future. There are two major methods of deacidification. The first is aqueous, or in other words, placing the paper in water suffused with magnesium or calcium. The other method is non-aqueous and involves spraying an agent onto the paper to impart the alkaline chemicals. The carrier is a solvent which will dissipate in a short amount of time leaving the chemical, again usually magnesium or calcium, embedded in the paper fibers. Aqueous deacidification does a better job of providing a buffer in the paper but has the disadvantage of having to subject the paper to a water bath; for a book or bound manuscript this means having to disbind the item. Non-aqueous spray systems don't use water so disbinding and drying are not issues. However, the solvent used to carry the chemistry can sometimes damage ink media, so testing of the inks must be performed beforehand.

Encapsulating

After washing and deacidifying, encapsulating is the next step for weak paper. For paper that is not brittle or will not be handled on a regular basis, encapsulating isn't always necessary. Encapsulating involves sandwiching the paper between two pieces of clear polyester and sealing the edges. The edges can be sealed with double-sided tape or welded with either heat or ultrasonic technology; all three methods produce the same effect. There are many types of clear polyester. The one most commonly used is produced by DuPont and called Melinex 516 (formerly known as Mylar Type D). Other types of clear polyester are available, but often have coatings on the surface that make it unsuitable for conservation use. In the past, clear acetate was also used for encapsulation, but acetate is unstable and will yellow and crack over time and possibly cause damage to the paper inside.

Once encapsulated, brittle paper can be handled safely. Whole books can be encapsulated leaving extra margin on the binding edge so that they are returned to the form of a book. The caution with encapsulating is that it can form a microclimate for the item. Studies have shown that paper which is acidic (and not deacidified) will actually deteriorate faster than if it was not encapsulated. So deacidification must precede any encapsulation project. An alternative to full encapsulation is using an "L" sleeve. This is two pieces of clear polyester joined on two contiguous sides forming the "L." The item is easily slipped in and out of this type of protective enclosure.

Rehousing

Finally, after all this work has been performed, it is important to properly house the newly conserved items. Using acid-free file folders and boxes of the proper size is ideal for most archival collections. For newspapers, storing them unfolded in either a map case or in oversize boxes will make them last longer. Maps, architectural drawings, and other oversize or odd-sized items all need special care in storage as well. Packing the box or drawer correctly will help in the collections long-term survival. Folder and boxes should not be overstuffed. If a box is not entirely full, a spacer should be placed behind the last item so that the folders do not slump over and shift in the box.

Other Treatments

There are other treatments that may be performed on archival collections but are not as common. Some treatments have fallen out of favor in recent years. One example is lamination. Lamination is intrusive on the item being conserved and not as easy, and sometimes impossible, to reverse. Conservators will still use heat-set adhesives backed on tissue to strengthen paper, as opposed to over-the-counter laminates which have plastic backings. Tissue can also be laminated onto paper with starch paste. The heat-set tissues are often reversible with solvents (which may affect the inks on the paper) and starch paste is easily removed with water, but either method is time consuming and can cause damage. While lamination may be appropriate in some cases, it should be a last choice and not the first.

Another treatment, usually associated with library collections, is the post binding, but it can be found in archival collections as well. A post binding is a form of a book often associated with scrapbooks or encapsulated books. The front and back covers and all the pages are held together by several screws along the spine which are inserted through the thickness of the book. These books can be awkward to open and need wide gutter margins (along the spine edge of each page) but have the advantage of being easily taken apart and put back together again if a page needs to be removed for any purpose.

Many of the above conservation techniques also apply to books, which do show up in archival collections from time to time. A book can be totally disbound, its pages cleaned, mended, washed and deacidified, before it is rebound. Many paper conservators will outsource such work to book conservators, while most book conservators know at least the basics of paper conservation. In any case, a good conservator will always admit when he or she does not know how to perform a required treatment and ask that you consult with someone more qualified in that area.

Information Sources On Conservation

As with any topic these days, further information about conservation can be found on the web. So as not to be overwhelmed with too many long Internet addresses, here is a short list conservation links. Conservation On Line, or CoOL, (palimpsest.stanford.edu) is the home of several major U.S. conservation organizations, has many online papers and reference resources, as well as many links from around the world. The Canadian Conservation Institute (www.cci-icc.gc.ca) is a leading conservation research laboratory

with any extensive website of their publications. The U.S. National Archives (www.archives.gov/preservation) has information specifically about the preservation and conservation of archives. Jeanne Drewes, Michigan State University's Associate Director of Access and Preservation maintains a list of conservation websites in Spanish (www.lib.msu.edu/drewes/Spanish/spanrev1.htm). Two major conservation organizations, the International Institute for Conservation (www.iiconservation.org) and the American Institute for Conservation (aic.stanford.edu) both offer informational websites. The AIC has a book and paper specialty group and an archives discussion group as well. Finally, the Northeast Documents Conservation Center, or NEDCC (www.nedcc.org) offers information about their conservation services as well as many technical leaflets on all areas of conservation.

It is hoped that the reader has gained a better understanding about what preservation and conservation are and how it affects archival collections. A sound preservation plan which includes environmental and storage conditions and a disaster plan will give any collection a solid base on which to survive. And knowing the details of various conservation treatments should help the archivist make decisions on how best to deal with damaged items in their collections. In either case, knowledge is power and with this power the archivist can help make their collections last for generations to come.