

# Documents and Works of Art on Paper

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Documents and works of art on paper can be preserved for years of use and enjoyment provided that some basic care is given to their preservation. The conservation staff at The Henry Ford have compiled the information in this fact sheet to assist in promoting the responsible care of documents and works of art on paper. The first step in the care of collections is to understand and minimize or eliminate conditions that can cause damage. The second step is to follow basic guidelines for care, handling and cleaning.

## **THE STRUCTURE OF WORKS OF ART ON PAPER**

Numerous combination and types of materials have been used in the creation of documents and works of art on paper. Most paper items consist of three basic components: the paper support, a sizing material or ground, and the media that is used to create the document or work of art.

### **THE PAPER SUPPORT**

Most paper consists of cellulosic materials. There are a variety of plants that serve as sources of cellulose for papermaking, among them are; linen, hemp, cotton and mulberry, in addition to hard and soft woods.

Prior to the 19<sup>th</sup> century, all paper was handmade. Most paper consisted of cotton, hemp, linen or mulberry fibers. Paper that is made from these fibers is commonly referred to as rag paper. Rag papers are generally very durable and can be preserved for hundreds of years.

With the dawn of the modern paper industry in the early 19<sup>th</sup> century, wood-based papers became an abundant and inexpensive alternative to costly rag-based papers. As with many inexpensive materials, cost efficiency did not coincide with durability. Wood-based papers are prone to degradation due to the presence of lignin. Lignin, that is not removed during the process of paper manufacture, degrades to form acidic compounds. The presence of acids causes the paper to degrade rapidly becoming yellow and brittle eventually leading to total disintegration. Modern newsprint and magazine paper is an example of wood-based paper.

## **SIZING AND GROUND MATERIALS**

Sizing refers to the application of adhesives such as gelatin, plant gums and starches to the surface of a sheet of paper. Unsized paper is highly porous and absorptive, thus it is unsuitable for use with media such as ink and watercolor paints. Size is added to make the paper surface less absorptive in order to prevent the bleeding and blurring of media. Sizing is also added to give strength to the paper.

In the early 16<sup>th</sup> century, alum (potassium aluminum sulfate) was introduced as an additive to gelatin size. The alum served as an effective hardening agent for the gelatin. Unfortunately, alum degrades to form sulfuric acid, which leads to the eventual degradation of the paper support.

Certain processes such as printmaking and silverpoint drawing require the use of paper having an extremely smooth surface. A ground layer consisting of clay, chalk or pigmented materials that are held together by an adhesive, can be applied to the paper to give the required smoothness for these processes.

## **MEDIA**

Media refers to the materials that have been used to create the work of art itself. Some commonly used media include watercolor paints, pencil, chalk, pastels and conte crayons.

## **FACTORS THAT CAUSE DAMAGE**

There are a variety of factors that contribute to the degradation of works of art on paper. These include careless handling, poor environment, inappropriate storage, exhibition and framing, inherent vice and improper cleaning and conservation.

### **CARELESS HANDLING**

Careless handling is by far the most prevalent cause of damage to paper objects. It can lead to tears, wear, loss of the image, creases and staining. The following guidelines are included to assist in the prevention of damage that can occur during handling.

- In order to prevent damage that can be caused by salts and oils from human hands, clean white cotton gloves should always be worn when handling a document or work of art. Oils and salt can cause damage in the form of staining and can also transfer dirt to the paper surface. Cotton gloves can be purchased from conservation suppliers (see supply list). If gloves are not available, care should be taken to ensure that hands are washed and dried frequently when handling paper.
- All workspaces and tabletops should be neat and free of dirt.

- When moving a paper object, always support it from below. The safest method for moving a document or artwork is to slide a piece of stiff paper or matboard underneath the art so that the matboard, not the object, is handled. This is particularly necessary when handling brittle paper items that cannot support their own weight. Never lift a piece of paper by its edges, particularly if there are any tears present.
- Stacked, paper objects should never be dragged, or slide, across each other. This can cause abrasion or smudging of their surfaces. It is preferable to lift them up one at a time.
- Never eat, smoke or drink in the vicinity of documents or works of art. Accidents can lead to irreparable staining or burns.
- Stains can also be caused by ink pens and markers. It is a good rule to use only pencils when working on, or around, documents and works of art. Never write on artwork with a marker or pen. It can bleed through to the other side or can complicate future conservation work.
- Paper clips, binder clips and post-it notes should not be used on documents or works of art. Metallic clips can corrode and leave rust stains on the paper surface. Post-it notes can damage the image or paper surface.

## ENVIRONMENT

The overall environment conditions under which documents and works of art are stored and displayed can have a great effect upon their longevity. Factors that can lead to damage include: pollution, pests and inappropriate temperature and relative humidity levels.

**POLLUTION** - The fading of dyes and pigments, and the overall degradation of paper, can be caused by a variety of pollutants. Common pollutants include sulfuric acid, nitric acid, ozone and formaldehyde. These chemicals can originate either from the outside air or from materials in the environment. Wood and leather are common sources of acid, as are some rubber and plastic materials.

Air filtration is the most effective way to minimize damage due to pollution. If air filtration is not feasible, proper framing and storage can help to prolong the life of paper objects.

Measures should also be taken to eliminate storage or display of paper in the vicinity of materials that emit hazardous gases (see proper storage and display).

**PESTS** - There are a variety of insects that can damage paper artifacts. The primary insects that pose a threat to paper are silverfish, firebrats and the book louse.

Silverfish - Silverfish feed on mold and starchy materials that are found on paper. Silverfish are small gray insects (approximately 12mm in length). They have a scaly appearance. Silverfish are generally found in dark, cool and moist environments such as basements. Evidence of silverfish damage is visible as an abraded, rough surface on paper materials.

Firebrat - The firebrat is similar in appearance to the silverfish; however, it is somewhat darker in color. Like silverfish, firebrats also feed on mold and starchy materials. The major difference being that firebrats prefer warm, moist and dark environments.

Book Louse - The book louse is generally found in heated buildings. They feed on mold spores that are found on paper and cardboard. Direct feeding by these insects does not cause visible damage to paper; however, their squashed bodies can cause staining. Book louse prefer high humidity levels (above 60%) and they reproduce at warm temperatures above 25 ° C.

Pest Prevention - In general, good housekeeping is the best method of deterrence. Regular inspections of stored artwork, provides the cheapest and safest method of safeguarding paper collections. Screening on windows and doors will aid in keeping out larger pests. In addition, fresh flowers and plants should be inspected before being brought into the home. When infestations are suspected, sticky insect traps can be placed under cabinets and cupboards. These traps do not poison insects, but they do aid in assessing the numbers and types of insects that are present.

The maintenance of moderately low humidity levels that are unfavorable for insects is advisable. In general, insecticides should not be used on, or in the vicinity of, documents and works of art on paper. Insecticides can cause the fading and discoloration of works of art. If you do find an infested item, place it in a sealed plastic bag and contact a professional conservator immediately.

**TEMPERATURE AND RELATIVE HUMIDITY** - Fluctuations and extremes in temperature and humidity levels can have a detrimental effect upon the preservation of documents and works of art on paper.

Temperature and humidity are interrelated. In temperate climates, heated buildings generally have very low relative humidity levels in winter. Conversely, humidity levels are high in the summer months.

Low humidity levels can cause the drying out and embrittlement of paper materials. Conversely, high humidity levels can cause swelling of paper materials. This swelling and expansion of paper leads to planar distortions. In extreme cases, high humidity levels (above 60%) lead to mold growth. For these reasons, storage in damp basements should be avoided.

By far, the greatest damage is caused by rapid fluctuations in relative humidity and temperature. This is particularly a problem with paper objects that are constrained by wooden stretchers or backings. Since wood and paper absorb moisture and expand at different rates, uneven expansion of constrained paper can lead to the formation of tears.

Ideally, cool storage is desirable for paper, however, in the home it is not practical. In order to avoid extremes in temperature and humidity, paper objects should be kept away from heat sources such as furnace vents, fireplaces, warm lights and direct sunlight. Acceptable temperature and humidity levels for the storage and display of paper materials are as follows:

<b>Winter Temperature</b>	15-20 ° C
Relative Humidity	35%-50%
<b>Summer Temperature</b>	20-25 ° C
Relative Humidity	50%-55%

Inexpensive temperature and humidity sensors can be purchased from University Products Inc.(see suppliers).

**LIGHT** - Another major cause of damage to paper is exposure to high light levels. Exposure to light leads to fading of media, discoloration of paper and embrittlement due to heating.

The most damaging portion of natural and artificial light is Ultra Violet. Ultra Violet is the invisible high-energy portion of light. It is the same energy that has been proven to damage eyes and skin. Ultra Violet filtering for windows and picture frames is commercially available and can significantly reduce the damaging effects of Ultra Violet.

In addition to damage resulting from exposure to Ultra Violet, visible light can also damage documents and works of art. The recommended light levels for display of paper materials in museums is very low. 50 LUX is the level of light that is recommended for

short periods of time (6 months). Watercolors, magazines and newsprint papers are among the most susceptible to light damage and should be displayed in dim areas, free from bright light sources. Media such as charcoal and black ink can tolerate somewhat higher exposure levels.

A camera light meter can be used to read visible light levels within your home (see CCI IIC NOTES 2/5). This method cannot be used to record Ultra Violet levels.

## **STORAGE, EXHIBITION AND FRAMING**

The proper storage and display of documents and works of art on paper can help to minimize many of the factors that can lead to degradation.

### **STORAGE**

Proper storage can aid in keeping paper clean and free from dust. Most documents and works of art can be stored in clear plastic (mylar) envelopes or in acid-free folders. The folders and envelopes should be housed in acid-free boxes for long term storage. Mylar envelopes and acid-free boxes can be purchased from conservation suppliers.

Newsprint paper should be stored in folders or mylar sleeves that include a sheet of alkaline-buffered paper behind them to neutralize acids from the lignin-based papers.

Special care must be taken when storing pastel and charcoal drawings. The powdery surface of these works of art prohibits the use of folders. In addition, plastics such as mylar have a tendency to develop a static charge which attracts the charcoal and pastel. The buildup of static can result in the transfer of the charcoal and pastel to the mylar.

In order to provide safe storage of pastels and charcoal drawings, the use of window mats or individual boxes for each drawing is recommended. The drawings should be placed face up in an individual box. An alternative method, that saves space, is the use of a window mat (see CCI IIC Notes for an illustration of window mats).

All storage boxes, folders and tissue paper should be acid-free, lignin-free and have a neutral pH. Acid that is generated by poor quality wood-based cardboard boxes can cause the degradation of artworks stored within them.

Severely degraded paper should be stored with buffered boxes or folders that contain an alkaline reserve. Alkaline reserve buffers are chemicals that act as scavengers that absorb acids that are generated by the degraded paper. In general, buffered storage materials should not be used with watercolor paintings. The alkaline buffers can cause damage to some watercolor paints.

The storage of paper with materials such as leather, plastic or metal should be avoided.

In general, good housekeeping is essential to the preservation of documents and artworks on paper. Routine inspection and cleaning of boxes and folders will aid in extending the life of collections.

### **DISPLAY**

The display of paper objects in the vicinity of fireplaces or air ducts should be avoided, since dirt and soot can be deposited on the paper. Fragile items, such as newspapers and magazines, should not be exhibited. However, the display of digital or color photocopies may offer a viable alternative to displaying the original.

### **MATTING AND FRAMING**

When framing documents and works of art on paper, high-quality, acid-free, lignin-free matboard is recommended. Paper objects should always be framed using a window mat. Window mats provide space between the surface of the paper and the glass of the frame. This method of framing prevents the paper from becoming stuck to the glass surface (see CCI IIC Notes 11/5 on Framing).

The document or artwork should be attached to the matboard using only acid-free paper hinges and high-quality adhesives. Staining can be caused by contact with acidic or other poor-quality materials such as scotch tape or rubber cement. The recommended adhesives for hinging paper are wheat starch paste, methyl cellulose and ready-made paper framing/hinging tape is available from University Products, Inc.

The use of Ultra Violet filtering glass and Plexiglas, in frames, can help to reduce damage from Ultra Violet light. Plexiglas, however, should not be used with pastels or charcoal drawings. Plexiglas has a tendency to build up static electricity, which can pull the pastel and charcoal off of the surface of the paper.

### **INHERENT VICE**

Some materials degrade at an exceptionally rapid rate due to their chemical composition. These materials are said to have "inherent vice". Two materials that fit into this category are wood-based papers and iron gall ink. Wood-pulp paper degrades due to the presence of lignin which forms acidic compounds as it degrades. Lignin-based paper is commonly used for magazines and newspapers that were produced after 1840. Iron gall ink is manufactured from a mixture of oak galls and ferrous sulfate. As the ink ages, it also emits sulfuric acid, which eventually

destroys the underlying paper support. Due to their unstable nature, these materials may require the attention of a professional conservator.

## **REPAIR AND CLEANING**

In general, the cleaning, and repair, of paper materials should be carried out by a professional conservator. However, if you wish to carry out some surface cleaning, the following procedures should be cautiously followed.

### **SURFACE CLEANING**

Prints, watercolors and pencil drawings can be lightly dusted with a soft brush to remove surface dirt. Prior to dusting, the art should be inspected carefully to insure that there is no loose or powdery media that could be brushed away during cleaning.

Pastel, charcoal and conte drawings should never be dusted. The fragile surface of these drawings could be permanently damaged. A professional conservator should be hired for the cleaning of these types of works of art.

If brushing does not remove sufficient surface dirt, dry eraser pads, such as opaline and Skum-X, can be used. Again, this method of cleaning should only be used for stable images.

To clean with opaline or Skum-X, simply shake the powder onto the surface of the artwork and very gently rub it over the surface of the paper with your fingers. The powder should then be brushed off using a soft brush. Care should be taken to clean only the areas around the media, not the actual media.

Proceed with caution when cleaning. Over-cleaning can cause more damage than the dirt itself. Cleaning with water or solvents should only be carried out by a professional conservator.

### **MOLD REMOVAL**

Paper materials that have been stored in damp environments are highly susceptible to damage by mold growth. In situations where mold growth has occurred, the mold must be removed before it can cause permanent staining or contamination of other objects.

The safest method of mold removal for paper items is to brush the mold off of the surface of the artwork. Since mold spores can spread through the air and contaminate other objects. The Canadian Conservation Institute has devised an inexpensive method



of making a vacuum that can be used to trap mold in a glass vial containing water (see CCI IIC Sheet 18/2).

Since the vacuum has extremely low suction, the mold should be loosened by brushing with a small brush and vacuumed up.

If a low-suction water-vacuum cannot be constructed, an alternative method is to simply brush the mold off the surface of the paper. This must be carried out in an area where other paper and objects will not become contaminated. In the summertime, this could be carried out outdoors. Frequent cleaning of brushes is essential.

After mold removal, the artwork should be placed in a stable environment with moderately low humidity levels. The condition of the object should be monitored periodically.

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A Guide to Museum Pests. Zycherman and Schrock. Washington , DC : American Institute for the Conservation of Historic and Artistic Works, 1988.

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## **STORAGE AND DISPLAY**

Canadian Conservation Institute, 1030 Innes, Ottawa Canada K1A 0C8, (613)998-3721

### **NOTES**

2/5 Using a Camera to Measure Light Levels 11/2 Storing Works of Art on Paper

11/5 Matting Works of Art on Paper

18/2 Making a Mini Vacuum Cleaner

Matting and Hinging of Works of Art on Paper. M. Smith and M. Brown. Washington , DC : The Library of Congress Preservation Office, 1981.

Polyester Film Encapsulation. Preservation Office Services. Washington , DC : Library of Congress, 1980.

## **SUPPLIERS**

(suppliers of framing supplies and temperature and humidity sensors)



University Products  
517 Main Street  
PO Box 101  
Holyoke , MA  
800-762-1165  
<http://www.universityproducts.com>

Talas  
330 Morgan Ave  
Brooklyn, NY 11211  
212-219-0770  
212-219-0735 Fax  
[www.talasonline.com](http://www.talasonline.com)

Archival Methods, LLC  
235 Middle Road  
Henrietta , NY 14467  
866-877-7050 toll-free  
585-334-7067 Fax  
[www.archivalmethods.com](http://www.archivalmethods.com)

## **REFERENCES**

For a listing of conservators in your area, please contact:

The American Institute for Conservation of Historic & Artistic Works  
1717 K Street NW  
Suite 301  
Washington, DC 20006  
202-452-9545  
<http://aic.stanford.edu/guide/form.html>

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Note: The in-house conservation staff at The Henry Ford has developed these Preservation Fact Sheets to assist in caring for your historical materials. These fact sheets provide basic information on the care, cleaning, and handling of a particular type of artifact, referral information to other conservation organizations, and a bibliography of authoritative works. Individuals may also arrange for a private consultation with a conservator. For more



information, please contact the Benson Ford Research Center at [research.center@thehenryford.com](mailto:research.center@thehenryford.com).

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