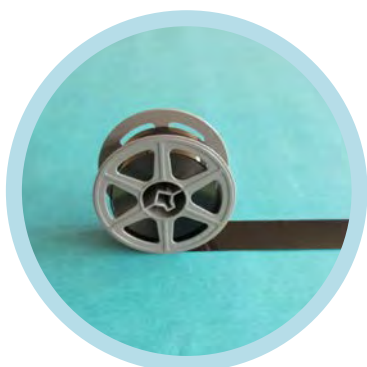


# Basics of Preserving Microforms



**Microforms** include microfilm, microfiche, and similar materials, which are excellent media for long-term preservation and have long been widely used at libraries and archives for media conversion and data acquisition.

No matter how good a particular medium is, however, proper long-term preservation requires an understanding of the basics of preservation, the proper management of the storage environment, and careful handling of the medium during use.

In addition, long-term preservation requires a certain amount of cost, manpower, and manhours for maintenance.

This brochure provides librarians and archivists with some tips for management of microforms, including what to do if you find deteriorating microforms in your collection, how to prevent deterioration, and various means of managing long-term preservation.

## Have you ever experienced this?

Have you ever taken a reel of microfilm out of storage only to find defects in the film? Here are some examples of what happens when microforms deteriorate.

- **It smells sour!**

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When cellulose acetate film hydrolyzes due to exposure to moisture in the atmosphere, it emits acetic acid, which gives off a smell like vinegar.

- **It's sticky!**

- **A crystalline substance has hardened and ruined the image on the film!**

- **The film has shrunk and curled!**

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Acetic acid from cellulose acetate film can cause plasticizers, which are added to provide flame resistance and flexibility, to seep out of the film base. Sometimes the crystallized plasticizer appears on the reel as a white powder.



- **It has a silver sheen!**

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This silver mirroring often appears when a film has been exposed to a gas with strong reducing properties.

- **There is a yellowish stain!**

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Microscopic blemishes are caused by air pollutants in the storage environment. Although not really a suitable means of repair, scotch tape is sometimes used to repair torn film, and the adhesive could cause discoloration, too.



- **The film is stuck together!**

- **There is mold growing!**

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Film stored in an environment with a high relative humidity is susceptible to mold. Grease and grime from a person's hands can also cause mold to grow.

- **It's scratched! It's Torn!**

- **It's ripped! There are fingerprint stains!**

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Film can be damaged when not handled properly. Adhesive from old film can peel off not just when the film is mounted on a viewer, but when it is mounted on a machine for duplication or digitization.

## Types of microform

In general, microfilm is used for conversion from other media, a master negative for preservation and a service copy (positive) are produced as a set. Sometimes, however, microforms obtained by purchase or donation include only the service copy.

There are two types of film in common use: cellulose acetate film and polyester film.

Film Bases	Distinguishing film types by their characteristics
Acetate film (cellulose acetate base)	Acetate film is still commonly found in the collections of many libraries and archives even though they are no longer used in the production of new microforms. Acetate film easily hydrolyzes and emits acetic acid. This is called the vinegar syndrome, due to its characteristic odor.  <u>Distinguishing characteristics of acetate film</u> It is easily torn and appears dark, because it is highly opaque.
Polyester film (polyester terephthalate base)	Polyester film is known as a safe and stable film for archival purposes.  <u>Distinguishing characteristics of polyester film</u> Does not tear easily and appears light, because it is highly translucent.

Available in several different types of photographic emulsion: silver-gelatin (or silver-halide) film, diazo film, and vesicular film.

Film Types	Characteristics and applications
Silver-gelatin film (or silver-halide)	<ul style="list-style-type: none"> <li>• Recommended for the creation of master negatives and duplicates.</li> <li>• Suitable for archival purposes.</li> </ul>
Diazo film	<ul style="list-style-type: none"> <li>• Used for duplication and service copies.</li> <li>• Not appropriate for archival purposes because it tends to fade after exposure to light.</li> </ul>
Vesicular film	<ul style="list-style-type: none"> <li>• Used for duplication and service copies.</li> <li>• Not appropriate for archival purposes, because it is easily affected by heat.</li> <li>• Emits an acidic gas after exposure to light or aging, that could affect other films.</li> </ul>

## Why does it deteriorate?

Microforms are suitable for long-term preservation, but also deteriorate if not stored in a suitable environment, if handled or repaired carelessly, or if not produced with proper processing and materials.

### ⊘ Unsuitable environments (temperature and relative humidity, air pollution)

- If the temperature and relative humidity of the storage environment are not managed properly, acetate film can easily hydrolyze and release acetic acid, which results in a vinegary odor, stickiness, the appearance of white powder, shrinkage, or the dissolution of reels. (vinegar syndrome). Once the vinegar syndrome reaches a certain stage, deterioration progresses rapidly, and film that has deteriorated cannot be restored. A technique to repair deteriorated film has been developed, but it does not protect against future decay, it just allows the film to be duplicated for a short time.
- If the film is stored in a relative humidity that is too low, it could result in cracking. On the other hand, relative humidity that is too high could cause mold.
- Air pollution is another cause of deterioration as are some chemical substances from building materials such as paint, rubber, plywood, or even natural lumber.

### ⊘ Improper processing or materials

- Improper processing during any phase of production could damage the image or shorten the service life of the film.
- Diazo and vesicular film are made of materials that are not suitable for long-term preservation.

### ⊘ Improper handling or repair

- Rough handling could tear or scratch the film.
- Handling film with bare hands could leave fingerprints or stain the film.
- Frequent use of archival film as a service copy could cause scratches or stains.
- Failure to inspect film carefully before putting it on a reader could result in exacerbating any existing damage or deterioration.
- Repairing torn film with scotch tape could result in discoloration due to adhesive and is not recommended.



## If any film in your collection shows signs of deterioration, the entire collection should be inspected.

The main purpose of the inspection is to determine how many films need treatment as well as the extent of deterioration on each film. These two points are key factors in estimating the cost of preservation measures.

If inspecting each individual film is impracticable, do a sample survey of the collection. It is likely that all films produced in the same decade will have similar levels of deterioration.

### Sign of deterioration 1: The film gives off a vinegary odor.

#### ✓ Smell test / A-D Strips

Acetate film often gives off a vinegary odor when it deteriorates. If the film smells sour, it should be carefully inspected.

A-D strips can be used to measure how much the acetate film has deteriorated. The extent of deterioration is determined by the color of the strip.

### Sign of deterioration 2: The film is warped, sticky, or shows other problems

#### ✓ Visual Inspection

Warping, stickiness due to plasticizer seepage, and discoloration of the film can be found by visual inspection.

### Sign of deterioration 3: Image defects

#### ✓ Visual inspection with a microfilm reader

Defects in the image might not be obvious to the naked eye, so the film should be inspected using a microfilm reader.

## Things to consider before taking action

Once the quantity and extent of deterioration have been assessed, you will need to consider preservation measures.

The first step is to judge whether or not the film is worth long-term preservation.

Things to consider when making a comprehensive decision include the following:

Are the films necessary to fulfill the mission of your institution?

Are the films for archival purposes or duplicate service copies?

Are the originals held at your institution or at a similar one?

When considering specific preservation measures, it is important to make a rational decision about measures that are suitable to the state of deterioration based on a comprehensive assessment of things such as the estimated cost and labor necessary as well as other access methods, such as copies held at other institutions.

In some cases, it may be better to transfer the information to a different medium and discard the deteriorated film.

# From the detection of deteriorated microforms to the formulation of a preservation plan

1. Deteriorated film is found in your collection (e.g., vinegary odor, warping of the film, defective images).
2. Inspect the microform collection to determine the quantity and condition of deteriorated films.
3. Make a comprehensive determination of whether or not the film is worth long-term preservation. The following are key factors for a decision.
  - The importance of the film for the mission and operation of your institution
  - Content and its value
  - Existence of originals and alternatives
  - Film for archival purposes or for service copies
  - Availability at other institutions
4. Consider the extent of the deterioration as well as the need for preservation. Consider countermeasures.

Extent of deterioration	Need for preservation at your institution	Specific examples of countermeasures
Serious deterioration	High	<ul style="list-style-type: none"> <li>• Digitalization from a master negative</li> <li>• Duplicate polyester film from a master negative</li> <li>• If there is no master negative, digitize or recreate after repairing.</li> </ul> <p>In either case, deteriorated film is not suitable for long-term preservation.</p>
	Low	<ul style="list-style-type: none"> <li>• Dispose of the film.</li> </ul> <p>Deteriorated film can adversely affect other microforms.</p>
Low to moderate deterioration	High	<ul style="list-style-type: none"> <li>• Remove the cause of deterioration and store the film with regular maintenance. See pages 6 &amp; 7 for details.</li> </ul>
	Low	<ul style="list-style-type: none"> <li>• Inspect regularly while the film is stored.</li> <li>• Dispose of the film.</li> </ul>

## Performing regular maintenance for archived film (1/2)

The long-term preservation of microforms requires that any cause of deterioration be removed and that the film be maintained regularly.

### Conditions for long-term preservation

The preferred environment for microform storage should properly be low temperature, low relative humidity, and clean air. The temperature and relative humidity should not only be kept low, it is also important to avoid repeated short-term fluctuations. For example, defects are more likely to occur if there is a large differential in temperature and relative humidity between the storage area and a reading room or if the film is left for a long time in a place where the temperature and humidity fluctuate repeatedly. Also, take care to protect the film from dust and dirt.

Processing and storing silver-gelatin microfilm per JIS Z 6009:1994

Relative humidity and temperature suitable for storing film				
Storage conditions	Relative Humidity (RH)			Temperature
	Highest	Lowest		Highest
		Acetate film	Polyester film	
Medium-term storage conditions	60%	15%	30%	25°C
Long-term storage conditions	40%	15%	30%	21°C

NOTE1. Japanese Industrial Standards (JIS)

NOTE2. Ideally, the temperature should not exceed 25°C and should be kept lower than 20°C during long-term storage.

The short-term peak temperature should not exceed 32°C.

Remarks 1. The humidity and temperature should be maintained 24 hours a day.

2. The recommended relative humidity when acetate and polyester films are stored in the same place for long periods of time is 30%.

#### Reference:

ISO 18911:2010 defines storage requirements for photographic film and specifies a temperature for the long-term storage of silver-gelatin films that is significantly lower than the upper limit of the temperature specified in JIS Z 6009 for the storage of acetate film.



## Performing regular maintenance for archived film (2/2)

### Examples of maintainance

1. Store in a humidity-controlled cabinet or similar storage unit.  
(Assuming the room temperature is controlled.)
2. Store in a climate-controlled storage facility.
3. Inspect film regularly.
4. Control humidity using a desiccant or moisture absorbing agent.  
(Requires regular replacement.)
5. Adsorption of acetic acid using an adsorbent.  
(Requires regular replacement.)
6. Sort microform collections by film type and store separately.
  - Some types of film emit gases that adversely affect other types, so silver-gelatin, diazo, vesicular, acetate, and polyester films should be stored separately.
7. Isolate deteriorated film.
  - Stop acetic acid released from deteriorated films from adversely affecting other films.
8. Air out the storage facilities for old acetate film to dissipate acetic acid.  
(Perform regularly.)
  - Slowly unwind and rewind film rolls using a film winder to dissipate acetic acid.
  - Remove sheet film from sleeve, separate, and leave in contact with the air.
9. Replace storage containers for acetate films.
  - Paper enclosures require regular replacement.
10. Handle films properly.



A humidity-controlled cabinet



A film winder

#### Useful Resources:

1. Adcock, Edward P., compiled and edited. *IFLA Principles for the Care and Handling of Library Material*. Paris: IFLA PAC, Washington DC: CLIR, 1998.

2. Canepi, Kitty, et al. "Managing Microforms in the Digital Age." Association for Library Collections & Technical Services, American Library Association, 2013.

<http://www.ala.org/alcts/resources/collect/serials/microforms>

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