

Public records information leaflet no. 7 

# Microfilm and microforms

South Carolina Department  
of Archives and History  
**Archives and Records  
Management Division**

## Introduction

When you discuss microfilm, you must understand the two terms “microfilm” (or “microfiche”) and “microform.” The term “microfilm” describes the type of film used; the term “microform” refers to the various formats in which microfilm is created and used. Familiarity with these terms is important because the type of microform used will affect office efficiency and records retrieval, while the type of microfilm used will affect the permanence of the record.

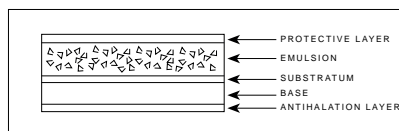
This pamphlet explains types of microfilm, the formats in which microfilm can be created, and the advantages and disadvantages of each of the options. You can use this information to choose the type of microfilm and the particular format that will suit your needs best.

## Microfilm

### **What is microfilm?**

Microfilm consists of a layer of emulsion coating embedded in a base of either cellulose—usually acetate or triacetate—or polyester (plastic). (See Figure 1.) Polyester-based film offers three advantages over cellulose:

- it has greater strength, which reduces film breaks and allows the use of thinner film
- it has stability, which makes the film less susceptible to problems caused by temperature, humidity, and aging
- it absorbs less water and dries more quickly after processing



**Figure 1:** cross section of microfilm

**Width:** Microfilm comes in widths of 16mm, 35mm, and 105mm. Usually, the 16mm width is used to film legal size or



smaller documents, the 35mm width to film large documents, and the 105mm width to make microfiche.

**Thickness:** Although microfilm bases run from 2.5 mils to 7 mils thick, film with a base of four or five mils is used most often. The number of images a roll can hold depends on the thickness of the base. Thin base film can hold more images per roll than thicker base film—a reel that will hold 100 linear feet of 5 mil film will hold 215 linear feet of 2.5 mil film. If a camera original is made on thin base film, the duplicate roll should be made on a base of the same thickness to avoid overloading the duplicate reel.

### Types of microfilm

There are five types of microfilm: silver gelatin, diazo, vesicular, electrophotographic, and dry silver.

#### *Silver gelatin film*

Silver gelatin film, also called silver halide, has a base of either polyester, acetate, or triacetate coated with silver halide compounds held in a gelatin emulsion. When light passes through the film, it strikes and solidifies the emulsion to form a latent (invisible) image. To make the image visible, the film must be chemically processed, fixed, and then washed.

**Advantages:** Silver gelatin film produces images of high quality and is used almost universally as the original camera negative. Its potential life expectancy (LE) of up to 500 years makes it the only film suitable for filming permanent records. Only fine-grained, high-contrast silver gelatin microfilm should be used when records slated for permanent retention are to be filmed and the originals destroyed.

**Disadvantages:** The permanence of this film depends on the way it is processed and on its storage under strict environmental standards—it will deteriorate if it is exposed to high temperatures, humidity, frequent handling, chemical agents, and pollutants. In addition, the silver in this film makes it expensive to purchase. Although the film can be used to produce duplicate research copies, other types of duplicate film are more appropriate for the job—they are less expensive, and they make better user copies as well because silver



gelatin film scratches easily and can be damaged by use in a reader.

**Diazo film** Diazo film has a triacetate or polyester base coated with an emulsion of diazonium salts, dye couplers, and a stabilizing agent. The film is exposed by ultraviolet light, which breaks down the diazo compound; it is developed and fixed by exposure to ammonia.

**Advantages:** Diazo film offers several advantages as a duplicate “user” copy. Its high resolution makes the quality of the image only about 4 percent less than the quality of the image on the original; it can produce copies; it costs less than silver gelatin; it can take more wear and tear; and it is sign maintaining—a positive copy can be made from a positive image.

**Disadvantages:** Prolonged exposure to light will fade the image and high temperature will damage it. If the film is improperly exposed, the residual diazo in the non-image area may darken and thus reduce the contrast.

**Vesicular film** Vesicular film has an emulsion of stabilized diazonium salts sandwiched between two layers of plastic. Like diazo film, vesicular film is used as a duplicate “user” copy. The film is exposed by ultraviolet light, and it is developed by heat, which softens the plastic until bubbles, or vesicles, form. A readable image is produced when light passed through the film is diffracted by the bubbles.

**Advantages:** Like diazo film, vesicular film is inexpensive and durable and has the additional advantage of requiring no chemicals to process.

**Disadvantages:** Vesicular film lacks diazo’s high resolution and should not be used to make copies. In addition, the image will deteriorate if the bubbles are damaged by forces like pressure and heat.

**Electrophotographic or thermoplastic film** Electrophotographic is “updateable” microfilm. It has a polyester base coated with a layer of photoconductive material. A corona discharge is used to sensitize the film, and the



film is then exposed to light, which dissipates the charge proportionally. The readable image is created either by (a) a heat processor—the heat produces depressions in the charged surface or by (b) toner—the toner is added to the charged surface, dried, and then fused.

**Advantages:** This film is unique because the fiche can be updated. Images can be deleted and added after the fiche is made; in addition, one brand of camera can be used to remove an image and replace it with another.

**Disadvantages:** Because this type of film has been used for only a short time, its advantages and disadvantages are not all apparent. Serious problems can arise over the legal admissibility of information on edited fiche. In addition, the relatively slow filming speed—about ten seconds per image—makes the stability of the film uncertain. Thus, the South Carolina Department of Archives and History cannot now approve its use for filming records whose retention period is over ten years.

**Dry silver film** Dry silver is a non-gelatin film, which records information by means of an electron or laser beam. The film is used primarily in the production of computer output microfilm.

**Advantages:** Since chemicals are not used to process the film, it can be developed in an office environment.

**Disadvantages:** The film should not be used to record information of permanent value because its life expectancy is unknown. The Department allows the use of dry silver microfilm to record information of long term value only if:

- 1 an approved retention schedule that has been drawn up according to the terms of the Public Records Act calls for it
- 2 the film is stored at a site the Department has approved
- 3 evidence can be given to convince the Department that the film will be stable for the length of time the record will be maintained

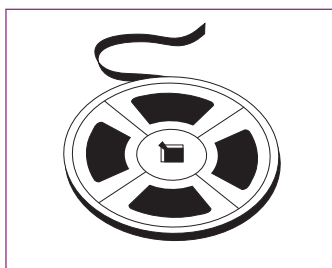
**Microforms** Microforms fall into two categories: **serialized (roll) microforms** and **unitized microforms**. Each category has several subcategories. Serialized microforms store images sequentially on a continuous roll of film. To locate one image, you must pass through all the images before it on the roll. Serialized microforms include open reels, cartridges, and cassettes. Unitized microforms are images that are cut or created in units and placed in special housings. Each image can be located directly. Unitized microforms include aperture cards, microfiche, and jacketed microfilm.

To choose the microform that suits you best, you should answer the following questions:

- How often and in what way will the data be retrieved?
- Will hard copies of the images be required often?
- Will the files have to be updated, and if so, how often?
- Is speed important in retrieving data?

The answers will allow you to weigh the benefits and drawbacks of each application according to your needs and to choose the form that will enable you to retrieve the information in the most efficient and least expensive way.

**Serialized microforms:**  
*Open reel (roll)  
microfilm*



**Figure 2:** Example of open reel film

Open reel (roll) microfilm is either 16mm or 35mm film that wraps around a spool (see Figure 2). It usually comes in 100 foot lengths, though it can come in lengths of up to 215 feet. Open reel film has the following characteristics:

- it is the oldest form and also the least expensive because it can store a large amount of information in a small place
- it provides a high measure of file security because images can be detached only by cutting the film
- it can be indexed simply with target sheets or odometer readings or by sophisticated high speed retrieval with blips, bar codes, or sequential numbering

**Advantages:**

- low cost
- high packing density
- guaranteed file integrity

- ease and low cost of distribution

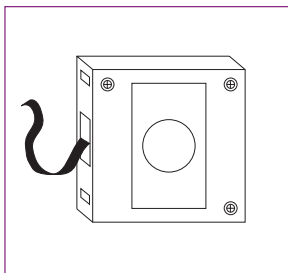
Roll microfilm is well suited for the following situations:

- when long-term storage and little access is required
- when security storage is required to protect vital records
- when semi-active records that are seldom updated need storing
- when a legally-admissible copy of microfilm that is converted to aperture cards or jacketed microfilm might be needed
- when absolute file integrity is important

**Disadvantages:**

- it requires sequential searching
- information cannot be retrieved as quickly as it can be on unitized microfilm
- the film must be hand threaded through a reader

**Cartridges**



**Figure 3:** Example of a microfilm cartridge

A microfilm cartridge is simply roll microfilm that has been placed in a compact plastic holder, which is self-threading in compatible retrieval equipment (see Figure 3). A cartridge has the characteristics of roll film and the following characteristics as well:

- it requires special insertion and retrieval equipment
- it protects the microfilm from fingerprints and dust

**Advantages:** A cartridge has the same advantages as roll film and the following advantages as well:

- it threads onto a reader and is handled more easily
- it allows faster access to information
- it can take advantage of sophisticated index coding

**Disadvantages:** A cartridge has the same disadvantages as roll film and the following disadvantages as well:

- the equipment for retrieval is more expensive than equipment for open reel retrieval
- the film must be rewound into the cartridge before it can be removed from the reader

**Cassettes**

A cassette is like a cartridge in that it houses a roll of microfilm but different in that it contains both a feed and take-up reel.

A cassette has the same characteristics as a cartridge.

**Advantages:** A cassette has the same advantages as a cartridge and the following advantages as well:

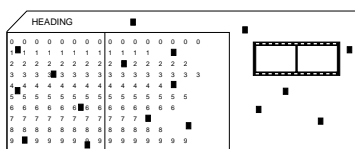
- the film does not have to be rewound before it is removed from a reader
- an image may be kept in position for later viewing

**Disadvantages:** A cassette has the same disadvantages as a cartridge and the following disadvantages as well:

- each time the cassette is used you must determine where the image you want is in relation to where you are on the film
- the choice of retrieval equipment is limited

**Unitized microfilms:**

*Aperture cards*



**Figure 4:** Example of an aperture card

An aperture card is a keypunch card with a rectangular window (see Figure 4) with either one frame of 35mm or several frames of 16mm microfilm inserted into the window. The card can be keypunched, notched, color coded, or manually indexed for retrieval. An aperture card is mostly used for large engineering drawings, although it can also be used for files that require frequent updating but are too small to justify jacketed microfiche.

**Advantages:**

- various size documents are reduced to a standard size
- information retrieval is fast and easy
- the card can be indexed
- handwritten annotations can be added to the card
- it stores compactly

**Disadvantages:**

- the unit cost of the film is high
- individual cards can be lost or misfiled

*Microfiche*

Microfiche is a sheet of film, usually 105mm x 148mm (4" x 6"), containing multiple images arranged in standardized columns and rows (see Figure 5). Microfiche can be produced from duplicated jacketed microfilm, from source documents using a step-and-repeat camera, and from com-



puter output microfiche (COM). The step-and-repeat camera films records in a grid pattern. Ninety-eight pages at a reduction ratio of 24x and 270 pages at a reduction ratio of 48x will fit on a fiche. Like jacketed microfilm, the top of the microfiche sheet contains identification information that can be read without magnification.

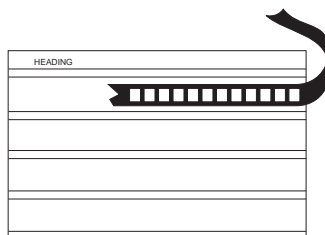
### Advantages:

- it can be duplicated economically
- the retrieval equipment is inexpensive
- it allows direct access to information
- it allows easy indexing and file access
- it has high information storage density

### Disadvantages:

- it lacks file integrity—sheets of fiche can be lost or misfiled
- the step-and-repeat cameras are more expensive than most planetary or rotary cameras.

### Jacketed microfilm



**Figure 6:** Example of a microfiche jacket

A microfilm jacket is a fiche-sized acetate or polyester carrier that contains three to eight sleeves or channels into which strips or single images of either 16mm or 35mm roll microfilm are inserted (see Figure 6). One jacket can hold up to sixty images. The top of the jacket contains an index area, which can be typed or written on. A jacket allows a file to be updated—new material can be inserted into the unused channels as it is filmed.

### Advantages:

- it can be used for records that are frequently updated
- the area at the top of the fiche allows easy access and file reference
- jacket to fiche duplication is inexpensive;
- the jacket protects the microfilm while it is being used
- microfiche readers are inexpensive
- it provides quick access to the records

### Disadvantages:

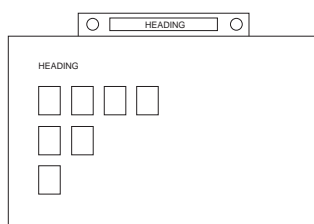
- cutting and jacketing the microfilm is labor intensive,



### Updateable microfiche

which drives up the cost of producing the jacket

- the film lacks file integrity—images can be removed from the sleeves as easily as they can be inserted.



**Figure 7:** Updateable microfiche

This microfiche is used to add images to an existing fiche as information is received (see Figure 7). Images can be added for up to three years after the first image has been placed on a fiche.

**Advantages:** This film has the advantages of microfiche and the added advantage of being updateable.


**Disadvantages:** This film has the same disadvantages as microfiche and two other disadvantages as well:

- because the film's life expectancy is uncertain, it cannot be used for records with a retention period of more than ten years
- cameras used to produce updateable microfiche are more expensive than other step-and repeat cameras

### For more information

This leaflet is one of a series of leaflets issued by the Archives and Records Management Division at the South Carolina Department of Archives and History.

The Division has statutory responsibility for advising government offices on micrographics; it also issues publications and gives advice and help on records management and archival administration.

For more information, please contact the South Carolina Department of Archives and History, Archives and Records Management Division, 1919 Blanding Street, Columbia, S.C. 29201. (803) 734-7914. 



### Public information leaflets from the Archives

- no. 1 *Legal requirements for microfilming public records (1992)*
- no. 2 *On choosing records for microfilming (1992)*
- no. 3 *Service bureau or in-house microfilming (1992)*
- no. 4 *Targeting and certification of microfilm (1996 revised)*
- no. 5 *Choosing a microfilm camera (1992)*
- no. 6 *Quality testing of microfilm (1992)*
- no. 7 *Microfilm and microforms (1992)*
- no. 8 *Choosing a micrographics service bureau (1992)*
- no. 9 *Choosing microfilm readers and reader/printers (1992)*
- no. 10 *Computer assisted retrieval systems (1992)*
- no. 11 *Microfilm storage (1992)*
- no. 12 *Preservation microfilming (1992)*
- no. 13 *Optical Disk: policy statement and recommended practices (1996 revised)*
- no. 14 *Storing records in the State Records Center (1993)*
- no. 15 *The deposit of security microfilm (1993)*
- no. 16 *Disaster preparedness and recovery in state and local government records offices (1993)*
- no. 17 *How to conduct a records inventory (1993)*
- no. 18 *How to establish records retention schedules (1993)*
- no. 19 *Photographic media (to be announced)*
- no. 20 *Editing and splicing roll microfilm of long-term or archival value (1994)*
- no. 21 *Managing E-Mail (to be announced)*
- no. 22 *Standards for microfilm service bureau certification (1996)*

