



SECRETARY of STATE

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Division of Archives & Records Management

**Washington State Standards
For the Production
And Use of**

MICROFILM

**Adopted by the State Archivist
In accordance with the provisions of
RCW 40.14**

Revised 2/2008

Authority: The standards published herein were adopted in 2008 by authority of Chapter 40.14, Revised Code of Washington, and are published by the Washington State Archivist to update and supersede the 1998 edition.

New sections: Standards have been added to address the conversion of digital files to microfilm. Varying resolution inspection methods have also been added to accommodate different document sources.

Note to public officials: These are minimum technical and procedural standards applying to the production, processing, inspection, storage, and handling of microfilm intended to serve as a copy of essential records secured against loss of the original or as a legal copy of public records required by law to be kept permanently. Specific authority to establish these standards is assigned to the State Archivist under RCW 40.14.020, section (8). ***It is strongly recommended that these standards be cited and incorporated into the language of contractual arrangements with vendors of microfilm services.***

Note to microfilm service providers: These standards set the minimum requirements for microfilming the permanent and essential public records of Washington State, and apply to all agencies and political sub-divisions of state government. In contracting to film essential and permanent public records, vendors should be prepared to guarantee in writing that the standard will be met. The technical standards described and cited herein apply to the production, processing, inspection, storage, and handling of microfilm intended to serve as a copy of essential records secured against loss of the original or a legal copy of public records required to be kept permanently. The State Archivist issues these standards by authority of Chapter 40.14.020, section (8), of the Revised Code of Washington.

Further information: For assistance or additional information regarding the use of this manual, contact the Washington State Archives at (360) 586-2487.

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Washington State Standards for the Production and Use of Microfilm

Adopted by the State Archivist in accord with the Provisions of Chapter 40.14 RCW.

In all microfilm applications intended to produce security or preservation microfilm copies of public records, the following minimum standards shall be adhered to in the selection, preparation, storage, and handling of film. Said standards must apply to "in-house" operations, as well as to all work committed to external service bureaus.¹

1 DEFINITIONS

- 1.1 **Public Records** - "The term 'public records' shall include any paper, correspondence, completed form, bound record book, photograph, film, sound recording, map drawing, machine-readable material, compact disc meeting current industry ISO specifications, or other document, regardless of physical form or characteristics, and including such copies thereof, that have been made by or received by any agency of the state of Washington in connection with the transaction of public business, and legislative records as described in RCW 40.14.100."²
- 1.2 **Essential Records** - Essential records, also referred to as vital records, are records essential to: 1) the resumption and/or continuation of operations; 2) the re-creation of the legal and financial status of the agency; or 3) the fulfillment of obligations to local, state, and federal governments and the public.³
- 1.3 **Permanent Records** - Permanent records are those records required by law or regulation to be retained indefinitely by the office or agency of origin.⁴ Records designated as permanent will be so identified in an approved records retention schedule.
- 1.4 **Archival Records** - Archival records are those records identified by the State Archivist, or his designees, as possessing sufficient historical value to be retained indefinitely. Records designated as archival must be approved as such by the State or Local Records Committee and will be so identified in an approved records retention schedule.

Note: Some records may meet all of the above definitions for essential, permanent, or archival records. For clarification contact the State Archives or one of its regional depositories.

¹ The standards and procedures set forth herein are based upon American National Standards Institute/Association for Information and Image Management MS48-1990 (*Recommended Practice for Microfilming Public Records on Silver-Halide Film*). Additional specific standards are cited when relevant.

² *Revised Code of Washington* (RCW) 40.14.010. ISO refers to the International Organization of Standardization.

³ On designating records as *essential*, see RCW 40.10.

⁴ The agency must retain the designated primary copy of the record.

- 1.5 **Direct Microfilming** - The process of microfilming using light reflected from the documents in order to expose film will herein be referred to as *Direct Microfilming*.
- 1.6 **Digital Microfilming** - *Digital Microfilming* refers to creating microfilm from digital images.
- 1.7 **Security Microfilm** - Security microfilm refers to microfilm that is produced with the explicit purpose of creating a secure, off-site backup to original public records officially identified as essential or permanent. The film is also produced with the specific intent of storing the original camera negative at the State Archives, apart from the original records or working copy microfilm.
- 1.8 **Preservation Microfilm** - Preservation microfilm will refer to film that is intended and suitable for use in the ongoing preservation of information contained in archival records, particularly where the original records are in a state of deterioration and are in danger of loss, or where it is desirable to easily disseminate copies.

Note: Both security and preservation microfilm must be manufactured, processed, and stored in accordance with national standards to achieve an LE-500 rating.⁵ The life expectancy of all microfilm is largely dependent upon:

1. Film Type
2. Photographic Processing
3. Storage Conditions and Handling

Thus, the life expectancy (LE) of microfilm depends upon film type, processing, storage conditions, and handling being in accord with the standards for such film hereinafter described.

2 MICROFILM QUALIFICATIONS

Microfilm may qualify as *security*, *preservation*, or *working copy*, depending on the retention value of the source documents to be filmed and/or the intended use of the resulting microfilm.

- 2.1 ***Security Microfilm or Preservation Microfilm*** is produced for those records that are officially designated as essential, permanent, or archival, according to the definitions outlined above.
- 2.2 ***Working Copy Microfilm***, also referred to as the reference, use or service copy, is microfilm designated for everyday use in an office or for other reference purposes. Working copy microfilm may be produced 1) as a copy of a security or preservation microfilm master or printing negative, or 2) as a first- or second-generation film where the filmed

⁵ The term LE (life expectancy), refers to the minimum number of years for which information may be retrieved without significant loss. In the case of LE-500, it is 500 years. See ANSI/NAPM IT9.1-1992 (*American National Standard for Imaging Media (Film)--Silver Gelatin Type--Specifications for Stability*) and ANSI/NAPM IT9.13-1992 (*American National Standard for Imaging Media--Photographic Films, Papers, and Plates--Glossary of Terms Pertaining to Stability*) for a more detailed explanation.

records are not of permanent value and are filmed for the purpose of active reference use for a period not to exceed six years.

Note: *If multiple working copies of security or preservation microfilm will be needed, it is recommended that the production of such microfilm conform to a three-generation system as noted in section 7.1 of ANSI/AIIM MS48-1990 (American National Standard for Information and Image Management--Recommended Practice for Microfilming Public Records on Silver-Halide Film).*

Such a system consists of an original camera negative, also called "master negative"; a second-generation copy of the camera negative, also called "duplicate negative," "printing master," or "printing negative," to be used for producing additional copies; and one or more third-generation working copies produced from the second-generation film.

3 FILM BASE AND EMULSION MATERIAL

3.1 Original Camera Film

Film base material for all microfilm records shall be durable and sufficient for the definition of that record as an original. All such film stock shall conform to the standard enunciated in ANSI/NAPM IT9.6-1991, ANSI/ISO 543-1995 (*American National Standard for Photography--Photographic Films--Specifications for Safety Film*).

All security or preservation microfilm must be produced on polyester-base film manufactured to achieve an LE-500 rating. Acetate-base films are not acceptable for security or preservation microfilm.⁶

Film emulsion material for security or preservation microfilm must be of the silver-halide type. Such film will comply with the minimum standards of quality as set forth in ANSI/NAPM IT9.1-1992 (*American National Standard for Imaging Media (Film)--Silver Gelatin Type--Specifications for Stability*).

Note: Agencies using microfilm systems that do not produce an original silver gelatin film that meets the standard for security microfilm must make a silver gelatin duplicate negative or positive that does meet the standard before depositing such film for security storage at the State Archives.

3.2 Working Copy Film

Working copies for reference or daily use may be of the silver halide, diazo, or vesicular composition, although diazo is preferred. An LE-500 rating is not required for duplication film, an LE-100 is

⁶ Polyester base is also referred to as "poly (ethylene terephthalate)." Acetate base is also referred to as "cellulose ester," and includes cellulose acetate, cellulose acetate propionate, and cellulose acetate butyrate. See ANSI/NAPM IT9.6-1991, ANSI/ISO 543-1990 for a further discussion of base types.

recommended. Polyester-base film is not required, but is nonetheless recommended for its superior durability.

3.3 Film Generations

1. First Generation - Camera Master Negative (silver halide)
2. Second Generation - Reproduction microfilm made from first-generation microfilm (silver halide, diazo, or vesicular)⁷
3. Third Generation - Reproduction microfilm made from second-generation microfilm (silver halide, diazo, or vesicular)
4. Fourth Generation - Reproduction microfilm made from third-generation microfilm (silver halide, diazo, or vesicular)

4 DOCUMENT PREPARATION

4.1 Preparation

Proper care shall be taken in the preparation, contents, and arrangement of original records for filming to see that a true, accurate, and complete reproduction is made.⁸

Remove all staples, paper clips, and attachments, etc., before document filming.

Mend tattered or torn documents prior to filming to eliminate camera malfunctions and filming errors, and to protect the original records against further damage.⁹

Eliminate creases or folds in the documents by pressing or flattening, either mechanically or manually, to prevent shadows, risk of damage to the document, or camera malfunction.

Pages of post-bound volumes may be removed for filming provided that they are replaced without damaging the book. Sewn volumes of historical value must be filmed in such a manner so as not to break or destroy the bindings.¹⁰

⁷ When using the three generation system as described in the note below section 2.2, the second generation, or printing master in this case, must be made of silver halide type film.

⁸ Restoration or repair of documents determined to be of historical value will be in accord with procedures established by the State Archives.

⁹ Do not use pressure sensitive adhesive tape. Please consult the State Archives.

¹⁰ Contact the State Archives if you have any questions or concerns about bound volumes.

4.2 Arrangement

Source documents shall be arranged and filmed in a manner consistent with their customary reference and use, or as specified by the agency of record.

5 MICROFILM AND CONTAINER IDENTIFICATION¹¹

5.1 Direct Film Roll Film Identification

Eye-readable targets must be filmed at the beginning and end of each roll of film as follows¹²:

- 5.1.1 “Beginning of Roll” and “End of Roll” Targets, before the first and after the last image on the roll.
- 5.1.2 Density Target, 3 sheets of 8 ½ X 11 white paper just after the “Beginning of Roll” target and just before the “End of Roll” target.
- 5.1.3 “Certificate of Authenticity”,¹³
- 5.1.4 “Information” or “Guide Sheet”, describing the records series or inclusive portions thereof found on the roll of film, the beginning and ending index numbers or letters, date filmed, the type of camera, the film and reduction ratio, Disposition Authority Number, the name of the camera operator, and if necessary, the name of the organization performing the work.
- 5.1.5 Resolution Test Chart (see section 6.2.1 of this guide).
- 5.1.6 Flash Targets, at appropriate places in the film, as required for reference point, i.e., for each file folder, each change of alphabetical category, etc., or as specified by contract.

Note: Correct targeting of microfilm is critical to quality control, and lack of proper targets may impact court admissibility.

¹¹ The following section applies to all microfilm, both original and duplicate copies.

¹² Refer to the Sample Targets at the end of this guide, or call the State Archives to obtain Targets.

¹³ The “Certificate of Authenticity” target is not required to meet the standards which are contained in this manual. The target (see Appendix 2 for an example) may be altered or omitted, depending upon the legal requirements as set forth by the office for which the records are being filmed.

5.2 Film Container Identification

Roll film containers should clearly identify:

1. The office of record
2. Records series
3. Inclusive file numbers or alphabetical range
4. Inclusive dates
5. Date filmed
6. Roll number
7. Disposition Authority Number (DAN)
8. Inspection results for density and resolution
9. The reduction used for filming the roll
10. Generation number
11. Reels containing varying reductions must also include the height of the representative lower case "e" as described in ANSI/AIIM MS-23.

6 PRODUCTION AND INSPECTION - QUALITY CONTROL STANDARDS¹⁴

6.1 Reduction Ratios¹⁵

- 6.1.1 Reduction ratios for simplex cine or comic mode will vary with the size of the documents and the size of the film. Legal- or letter-size documents on 16mm microfilm should be within the 20:1 to 32:1 reduction range, ideally 24:1. For 35mm microfilm the recommended reduction ratio range is 8:1 to 14:1, ideally 12:1.¹⁶
- 6.1.2 Unburst computer printouts may be filmed simplex cine at 32:1.
- 6.1.3 Reduction ratios for duplex modes should not exceed 32:1 when using 16mm film.
- 6.1.4 Reduction ratios employed in the filming of oversized documents, exclusive of engineering drawings, may be adjusted consistent with retrieval needs for either 16mm or 35mm film.
- 6.1.5 Engineering drawings will be filmed at 15:1, 16:1, 24:1, or 30:1 reductions, depending on drawing size. Filming with a 4- to 6-inch scale is recommended. This will enable reproduction

¹⁴ This section applies both to camera originals and to duplicate copies.

¹⁵ Documents filmed on 35mm film and then reduced to 16mm film, may or will have a reduction ratio greater than 32:1.

¹⁶ For security or preservation microfilm, 35MM microfilm is recommended, although not required.

from the original negative to full scale, although half-size is acceptable in most situations.

6.2 Resolution

- 6.2.1 Each roll of film will contain a photographic image of the standard resolution test card or chart. International Organization for Standardization (ISO) Test Chart No. 2 as specified by ANSI/AIIM MS51-1991 (*American National Standard for Microcopying--ISO Test Chart No. 2--Description and Use in Photographic Documentary Reproduction*), or National Bureau of Standards Form 1010A, or their equivalent for rotary cameras, must be filmed at the beginning and ending of each roll.

These chart images should be used to monitor resolution as filming progresses. The line patterns must be read in each corner and in the center of each chart (or on a diagonal for rotary cameras) and the lowest resolution reading must be posted to the film container and to the guide sheet or other laboratory record.

Substandard results must be reported immediately to the office of record or to the camera station. The cause of the substandard resolution must be identified and corrected prior to further production filming. All substandard film shall be corrected before shipping to the State Archives for storage.

- 6.2.2 For films with a consistent reduction throughout the reel, a minimum of 120 lines per millimeter shall be obtained regardless of the reduction ratio type of camera used.

Reels with varying reductions must attain a quality index of 5 or higher using the **Quality Index Method** of evaluating resolution as described in ANSI/AIIM MS23-1991 (*American National Standard for Information and Image Management - Practice for Operational Procedures/Inspection and Quality Control of First Generation Silver-Gelatin Microfilm of Documents*). **This does not refer to the number 5 line-pair reading on standard resolution charts.**

6.3 Density

- 6.3.1 All camera film must be optically inspected for density using a transmission type densitometer designed to measure diffuse density. Test results must be posted to the film carton and to the guide sheet or other laboratory record. The film production

or processing laboratory will immediately advise the office of record of substandard test results. Corrections of unacceptable material should be filmed at the earliest possible time. All substandard film shall be corrected before shipping to the State Archives for storage.¹⁷

6.3.2 Density Standards

6.3.2.1 Processed security or preservation negative films with capacity to produce three or more print generations:

D-Min:¹⁸ no greater than 0.10

Background Density:¹⁹ 1.1 ± 0.1

6.3.2.2 Processed working copy films with the capacity to produce two or more print generations:

D-Min: no greater than 0.10

Background Density: 1.2 ± 0.3

Note: Paper Photostats or other **reverse-image documents** may not produce an acceptable image if filmed at standard densities. Step tests should be taken and hard copy reproductions made from the step test images before filming such documents. The densities of the best of these reproductions should be established as the filming criteria. Experience indicates that a density greater than 1.0 and as high as 1.5 may be required.

A full and informed review of the issues of resolution and density values is contained in ANSI/AIIM MS23-1991. This bulletin addresses, among other things, the Quality Index Method mentioned above.

6.4 Film Processing, Treatments, and Inspection

6.4.1 Film must be processed as expeditiously as possible to insure that images meet density standards. Processing laboratories cannot guarantee proper densities after 14 days.

¹⁷ Excludes thermoplastic films, for which diffuse density cannot be measured using a transmission type densitometer.

¹⁸ Dmin, or minimum density, is the lowest density obtainable in a processed film as measured in the clear part of the camera negative on which there is no image.

¹⁹ Background density, or Dmax (maximum density), is the highest obtainable density for a particular photosensitive material as measured in the dark part of the camera negative image.

- 6.4.2 The chemical testing of processed film will be required in order to comply with the standards set forth in ANSI/NAPM IT9.17-1993, ANSI/ISO 417-1993 (*American National Standard for Photography--Determination of Residual Thiosulfate and Other Related Chemicals in Processed Photographic Materials--Methods Using Iodine-Amylose, Methylene Blue and Silver Sulfide*). The Methylene Blue Test will be used to meet this requirement (see also 6.4.5 below). Microfilm failing to meet the following minimum standards will be deemed to be unacceptable for its respective intended purpose (security, preservation, or working copy).
- 6.4.2.1 For Security or Preservation Microfilm, the film will be washed to reduce the amount of residual Thiosulfate ion (hypo) to something greater than 0 and less than 0.014 g/m².
- 6.4.2.2 For working copy microfilm, the allowable maximum limit of hypo is 0.014 g/m².
- 6.4.3 Additionally, all silver-halide film must undergo chemical treatment for the conversion of silver images against oxidation, referred to as the polysulfide treatment, or "brown-toning." The effectiveness of this conversion process must be tested daily using the dichromate bleach test, as set forth in ANSI/NAPM IT9.15-1997 (*American National Standard for Imaging Materials –Methods for the Evaluation of the Effectiveness of Chemical Conversion of Silver Images Against Oxidation*), and the solution decomposition test.
- 6.4.4 The minimum acceptable conversion rate of metallic silver into silver sulfide via the polysulfide treatment is 65% when using the dichromate bleach test (or 40% if using a visual density measurement), as outlined in ANSI/NAPM IT9.15-1997. When using a density measurement, it is necessary to use a process control strip with six or more density levels between 0.1 and 1.2.

6.4.5 The Methylene Blue Test. All polysulfide treated film will need to have a Methylene Blue test done to insure that the polysulfide solution has been washed out of the film. The test needs to be conducted daily, if not at the end of each run or batch to verify that the above requirements are met. Testing for residual polysulfide solution may be conducted at the same time as testing for residual Thiosulfate. Other testing methods may be approved by the State Archivist.

6.4.6 Film production or processing laboratories are required to test the processes for limiting residual Thiosulfate and for conversion of silver images (polysulfide treatment) and to provide customers, the State Archivist, or the State Auditor proof of testing upon demand.

Note: All film submitted for security storage with the State Archives must undergo polysulfide treatment to acceptable levels. The State Archives will provide polysulfide treatment to security microfilm on a cost-recovery basis if desired. Contact the State Archives for more information regarding the polysulfide treatment and process control tests.

6.4.7 Post-filming inspection²⁰

6.4.7.1 Content Quality As soon after processing as possible, all camera film shall be inspected on a light box for content quality, including inspection for correct targets and target sequence, missing pages/documents/files, incorrect page/document/file order, etc.

6.4.7.2 Physical Quality Additionally, all camera film shall be inspected on a light box for physical quality, including inspection for image orientation/skew, fog, stretched or overlapping documents, scratches, chemical or water stains, finger prints, and other faults as described in ANSI/AIIM MS23-1991.

6.4.7.3 Inspection reports shall be prepared detailing defects and errors, if any, and any corrections which need to be made. Said reports will accompany the film when it is delivered to the customer.

6.4.8 Splicing

²⁰ Ultimately, it is the agency which receives the microfilm after processing, that ensures that the film meets post-filming inspection requirements.

When an error in the film sequence has been detected, the decision must be made as to whether or not the contents will allow for splicing corrections into the film. The recommended criteria are as follows:

1. There should be no splicing into the camera-original film to correct file content errors with documents of legal significance. For example: if an entire legal case file has been filmed and documents are missing, blurred, etc., on the original film, then the entire case file should be re-filmed. Anything less than this could affect court admissibility.
2. If splicing is permitted, an ultrasonic splice is required. Security or preservation microfilm shall not be spliced with tapes, rubber cement, glues, or any other adhesives. Splicing should be done in accordance with guidelines established in ANSI/AIIM MS23-1991 and ANSI/AIIM MS18-1992 (*American National Standard for Information and Image Management--Splices for Imaged Microfilm--Dimensions and Operational Constraints*). Matching densities of the original roll of camera film with the correction is essential for duplication.

6.5 Digital to Microfilm Conversion

Introduction

The Washington State Archives has allowed for and encourages the production of security microfilm copies of permanent records that have been digitally created (born digital) or imaged from paper. The Archives recognizes that the recent development of new hardware and software capable of producing quality archival microfilm, directly from digital images, offers several advantages. Chief among these is that, if done properly, higher levels of quality and economy can be achieved. Archival microfilm still offers the greatest potential for ensuring the durability and permanence of valuable records, thus making a strong case for support from the Archives for this approach. The following guidelines provide the necessary controls to ensure reasonable quality control for digital-to-film technology. The format of the microfilm shall be such that people with access to microfilm readers can readily find items on the film by using the index, in the same way they do now with microfilm created from paper systems. These microfilming procedures shall not be a substitute for normal system backup procedures. Rather, they are regarded as an additional safeguard for permanent records of a critical nature.

6.5.1 Quality Monitoring of Scanner

All operations using the digital-to-film process follow procedures outlined in ANSI/AIIM MS44 Recommended Practice for Quality Control of Image Scanners. The AIIM Scanner Test Chart #2 is scanned weekly on each scanner and included on the front and rear of rolls. The scan chart at the beginning shall correspond to the week of the earliest scanned record on the roll, and the one at the end shall be scanned during the week of the last scanned record on the roll. The date that each chart was scanned must be displayed on the film. Additionally, a control scanned image of AIIM Scanner Test Chart #2 will be created once as a control image and placed directly preceding the weekly test chart on each roll of film. The purpose will be to easily compare variations in quality over long periods of time. It is vital that the test charts being used are scanned on the same equipment that processed the source documents on the film. Charts scanned on one piece of equipment should never be used on reels with images from another scanner.

6.5.2 Quality Monitoring of Images

Each image will be visually compared against its corresponding original document in order to identify and correct the following defects:

1. Missing pages
2. Page skew
3. Text cutoff at edges
4. Double-page feeds
5. Contrast problems
6. Images in a different order than originals

6.5.3 Resolution Test Targets

Computer output microfilm (COM) of scanned or born digital images should include resolution charts as recommended in ANSI/AIIM MS 44 1993 Recommended Practice for COM Recording Systems Having an Internal Electronic Forms Generating System—Operational Practices for Inspection and Quality Control.

6.5.4 Density

The minimum background density on microfilm output must be within the ranges prescribed for the Archive Writer or COM

within the ANSI/AIIM MS 1-1996 ANSI/ISO 5/2 recommended standard.

6.5.5 Print Test

The Washington State Archives reserves the right to periodically “test” the quality of any given roll of microfilm from scanned or born digital images provided by vendors and service providers. This will be done through film duplication to the generation required for the records schedule application.

6.5.6 Microfilm Type

The microfilm produced must conform to ANSI/AIIM MS 23-1998 standard, and ISO 18901:2002 and ISO 18906:2000 Imaging materials -- Processed silver-gelatin type black-and-white films -- Specifications for stability, which defines physical and chemical properties leading to LE 500 certification.

6.5.7 Reduction Ratio

The reduction chosen for the microfilm output should be consistent with recommended practices for microfilm of records of permanent retention. Space savings should be secondary to the goal of providing good clarity, sufficient detail, and reproducibility in the duplication process, and in paper prints. As a general rule, lower reductions serve to provide a better quality image.

6.5.8 Indexing

It may be desirable to include a printed index at the end of the film. The content of all index fields associated with the images on individual rolls should be provided, in a microfilm format, and should be a part of the microfilmed series submitted for deposit.

6.5.9 Document Grouping

All images will be annotated on the film with corresponding image marks (a.k.a. “blips”) and folder level indexing (Exhibit A).

6.5.10 Order of the Images

The prevailing method accepted by the user community (book and page for recorded instruments) shall be used. Only one record series will be placed on a roll of microfilm. Requests for exceptions to this provision must be made in writing to the State Archivist.

6.5.11 Film Polarity

Microfilm used in conventional cameras produces “negative appearing” images (clear characters on a black background) from “positive appearing” source pages (black characters on a white background). For this reason, this first generation camera film has been called the “camera negative”. Raster image recorders are capable of accepting positive or negative appearing digitized images and producing positive or negative appearing images on microfilm. Unless there is a compelling reason to produce positive appearing microfilm, negative is preferred. Negative film more effectively hides dust and other foreign material that can become attached to the film and it does a better job of hiding base side film scratches. Because of this, pages scanned from negative film produce cleaner looking images with smaller file sizes.

6.5.12 Page Size vs. Film Size

Documents that include letter/A size (8.5”X11”), legal (8.5”X14”) and tabloid/B size (11”X17”) pages are suitable for recording on 16mm film. Larger formats such as C size (17”X22”), D size (34”X22”) or, E size (35”X44”) are best preserved on 35mm film.

6.5.13 Image Resolution

300 dpi resolution is preferred because it produces sharper lines. Smaller fonts or fonts that contain detailed serifs require resolution in the 400 to 600 dpi range depending on the characteristics in the font that are to be preserved.

6.5.14 Image Contrast

Sufficient contrast between character and background density is important to producing film that will print or scan clearly. The exposure level in the image writer’s software should be set to produce a 0.95 – 1.05 background density for 300 dpi scanning. Background density is measured in the dark areas of

the image using a properly calibrated transmission densitometer.

6.5.15 Blip Coding

Critical to an effectively organized microfilm file is the use of a multi-level blip coding strategy. Blips are rectangular marks exposed by the film recorder under each page as they are written on the film. These marks can be programmed to appear in different sizes to identify file level, document level, page level, etc. images. Applying this sequence to recorded documents, a large blip would indicate the beginning of a book, a midsized blip would then indicate the first page of a document within the book, and a small blip would indicate a supporting page within that document.

If a document number rather than book and page system is used, a two-level blipping scheme is sufficient. A large blip designates the first page of a document while small blips indicate supporting pages within the document.

6.5.16 Image Annotation

Whenever practicable, image annotations should be used to provide an extra measure of organization and document reproducibility. Exhibit A provides several examples of image annotations.

6.5.17 Page Orientation

Pages can be recorded on microfilm in two ways. In “cine mode” where the text on a page runs perpendicular to the length of the film and in “comic mode” where the text on a page runs parallel to the length of the film. Unless a lower reduction ratio is needed for acceptable image quality, recording letter and legal sized pages in comic mode is preferable. This is accomplished by rotating the images 90° prior to recording or feeding the page “sideways” through the scanner. The advantage of comic mode recording is that more pages can be written on each roll of film saving storage space and promoting more efficient scanning in the event that the film needs to be used to recover lost image data.

6.5.18 Skew

Skew is defined as having an oblique direction or position; slanting. Images that are tilted to the left or right of

perpendicular are said to be “skewed”. Prior to recording on the film, digitized images should be de-skewed to permit maximum packing density on the film and to produce an easily read page when rescanned and displayed on a monitor.

6.5.19 Page Spacing

Pages need to have sufficient separation to allow a film scanner to reliably differentiate adjacent pages on the film. There should be a minimum separation of 0.06” (1.5mm) between adjacent pages. Pages that touch each other at any point may preclude them from being captured separately by a microfilm scanner. If splicing must occur within a film roll, additional space between frames will be required to accommodate the splicing process.

Important Note: Although maximizing packing density improves scanning efficiency, documents recorded on film should not span rolls.

6.5.20 Splicing

The convergence of document scanning and raster image recording has created a unique opportunity to abandon the practice of splicing. When all legibility/completeness checks and edits are done on the electronic image file, any problems found are easily corrected prior to creating film. When this practice is followed, microfilm is not only capable of preserving the documents it holds but it can also add a measure of insurance against document fraud. Because of the reasons stated above, it is strongly recommended that the practice of splicing be eliminated in favor of digitized image file editing as the preferred process for correcting mistakes. If splicing cannot be avoided, splicing procedures should follow the recommendations found in ANSI/AIIM MS18-1992 (R1998)

6.5.21 Targets

The following targets must be eye-readable (without magnification) and included on each reel in the order below:

Beginning Targets

1. Beginning of Roll
2. Control Resolution Chart
3. Week Resolution Chart
4. Density Sheets (3x)

Ending Targets

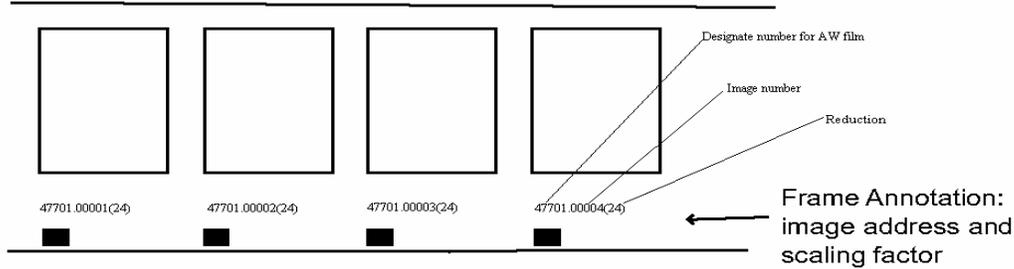
1. Control Resolution Chart
2. Weekly Resolution Chart
3. Density Sheets (3x)
4. The Certificate of Authenticity (Appendix 1) shall be signed by the scanner operator, and included at the end of each roll. This document must include the following information:
 - a. Name of agency/office
 - b. Name of scanner operator
 - c. Records series title
 - d. Date span of records
 - e. Date scanned
 - f. Disposition Authority Number (DAN)

End of Roll

Exhibit A – Document Grouping

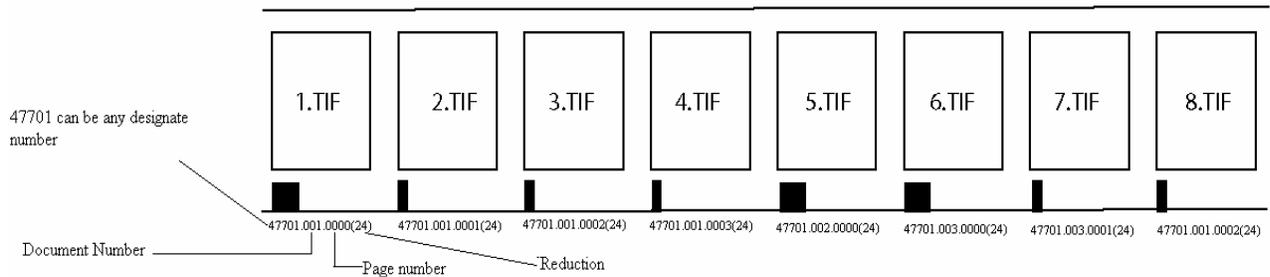
Page-level: Images are not grouped. Every frame is written with a small image mark.

Example 1: One channel, 24X reduction with frame annotation.

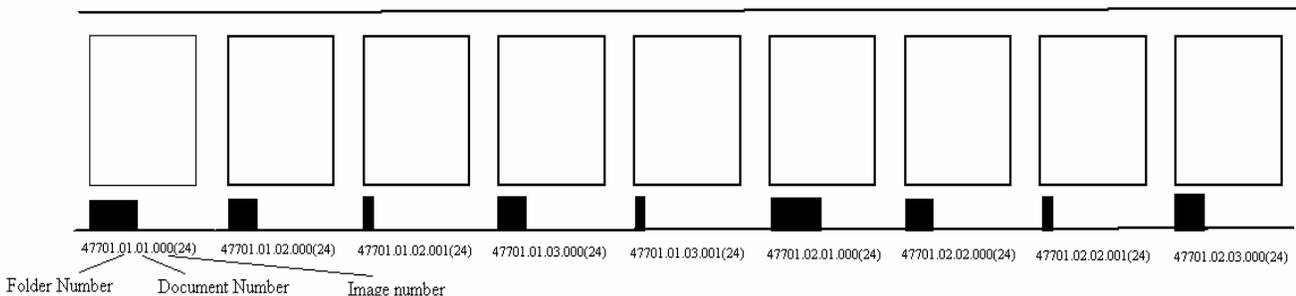


Document-level: Images are grouped using a document level hierarchy. The first frame within each group is written with a medium image mark. Subsequent frames within the group are written with a small image mark. Retrievals can be made of an entire group or individual images.

Example 2: 2 level offset on film



Folder-level: images are grouped using a folder-level hierarchy. The first frame within each group is written with a large image mark. Subsequent frames within the group are written with a medium or small image mark depending on the image level specified via the input method. Retrievals can be made of an entire group, document-level subgroup, or individual images.



7 STORAGE

Security or preservation films shall not be used as a daily work record. Additionally, security and preservation microfilms shall not be stored either within the same room or in rooms connected by ventilating ducts with working copy microfilm, due to the off-gassing of non-silver films. Security or preservation films shall be stored in a vault meeting the standards cited below.

7.1 Security or Preservation Film Cores and Containers

7.1.1 Cores and Reels - Roll microfilm will be wound on cores and reels as specified in ANSI/AIIM MS34-1990 (*American National Standard Dimensions for Reels Used for 16mm and 35mm Microfilm*). The material for cores and reels shall be made of an inert plastic, which does not off-gas reactive fumes, such as those containing peroxides. Metal may be used as long as it is non-corrodible and free from sharp edges. Rubber bands shall not be used on microfilm rolls; strips of an acid and lignin free buffered paper with strong ties will be used to secure the film on the roll.

7.1.2 Storage Containers - Microfilm shall be stored in closed containers made of an inert material such as paper, plastic, or metal which conforms with ANSI IT9.2-1991 (*American National Standard for Imaging Media –Photographic Processed Films, Plates, and Papers – Filing Enclosures and Storage Containers*). Because of the lack of suitable tests to guarantee the inert quality of plastics currently used for film containers, paper storage containers are recommended.

7.1.2.1 Paper - The material shall be comprised of one piece, with hinged lid, made from .020" thick bleached kraft pulp board with a pH of not less than 7.2 nor more than 9.5 with at least a 2 % calcium carbonate buffer. The board shall be free of lignin, metal particles, waxes, plasticizers, adhesives and peroxide-generating materials. If the container is dyed, it should be dyed with a light, fast-drying, non-bleeding dye only on the outside of the container.

7.1.2.2 Plastic - The container shall be constructed of a chemically inert material that does not give off reactive fumes such as those which contain peroxides. Uncoated polyester materials, polyethylene and polypropylene are acceptable.

7.1.2.3 Metal - The metal used for containers shall be non-corrodible. Anodized aluminum and stainless steel are acceptable. Any surface protector on steel, which contains reactive fumes or peroxides, shall not be used.

7.2 Security or Preservation Film Storage

Storage should be in accord with ANSI/NAPM IT9.11-1993 (*American National Standard for Imaging Media – Processed Safety Photographic Films – Storage*), with minimum standards as follows:

7.2.1 Temperature - The temperature should not exceed 68° F.

7.2.2 Humidity - The optimum relative humidity varies with the temperature at which the microfilm is stored. At 68° ± 2° F., 35% ± 5% relative humidity is suggested. In no case should relative humidity exceed 50% or fall below 15%. Short-term, non-routine fluctuations in humidity should be avoided. Routine fluctuations should not exceed 5% over a 24-hour period.

7.2.3 Monitoring - Temperature and humidity levels for security film storage facilities should be checked and recorded daily.

7.2.4 Atmospheric Controls - Properly controlled air conditioning may be necessary for maintaining temperature and humidity. The controls should meet the specifications as outlined in ANSI/NAPM IT9.11-1993 and as follows.

7.2.5 Air Purity - It is important to protect security microfilm against airborne particles that might abrade or degrade the film image or film base. Solid particles should be removed by mechanical filters having an arrestment rate of 85 percent. Filters must be of non-combustible material. Gaseous impurities can be adequately eliminated by location of the security vault in an area as far as possible from urban or industrial areas where contaminants may be present in harmful concentrations. Where protection is not afforded by the above, air washers or absorbers are required.

7.2.6 Light - Film should be kept in dark conditions, with lights remaining off except when someone is in the storage area.

7.2.7 Fire and Associated Hazards - Protection can be achieved by placing security film in either fire-resistive vaults or insulated records containers (class 150). If fire-resistive vaults are used, they should be constructed in accordance with ANSI/NFPA 232-1991, Protection of Records.

Note: Damage to photographic film records by high temperatures can happen even if the film is not destroyed by fire. Silver gelatin images can withstand temperatures as high as 302° Fahrenheit for several hours without significant loss in image quality. However, in addition to potential

image loss, photographic films may become so severely distorted at high temperatures that they can be viewed, projected or printed only with difficulty. One danger to film as a result of high temperature exposure, is the sticking or blotching of adjacent sheets or laps, particularly with film having gelatin or special backings. Film must be protected against steam, otherwise sticking, gelatin emulsion melting, and severe distortion will result.

Ultimately the best protection against fire is keeping duplicate copies of the film in separate storage areas. If you use the three-copy system, the printing master should not be kept with the camera negative.

7.3 Working Copy Films Storage

7.3.1 Temperature - Preferably below 70 degrees with maximum temperature not to exceed 77 degrees.

7.3.2 Relative Humidity - Preferably 20-50%, with a maximum not to exceed 60%.

7.3.3 Atmospheric Controls - Not necessary unless film is subjected to frequent or sustained high humidity or temperatures, or stored in an area known for air pollution problems.

7.4 Custody of Microfilms/Security Storage

Security or preservation microfilms of public records must remain in public custody and must be retained in the office of record, or stored in a publicly owned facility subject to inspection and approval for security storage in accord with State microfilm storage standards. Security microfilm can be transferred to the State Archives for storage.²¹ Instructions for use of security vaults may be obtained from the State Archives.

7.5 Use and Removal of Security Microfilm

Security microfilm is for use only as a master for authorized film duplication. Security microfilm will not be removed from the state archives storage facility except for permanent return to the agency of origin upon a sixty-day notification by the agency or the division of archives. Any relocation of security microfilm must be to facilities meeting security film storage standards. (WAC 434-677-060)

²¹ RCW 40.14.020 "All Public records shall be and remain the property of the state of Washington." See also RCW 40.10.020 "The state archivist is authorized to reproduce those documents designated as essential by the several elected and appointed officials of the state and local government by microfilm...and to assist and cooperate in the storage and safeguarding of such reproductions in such a place as is recommended by the state archivist..."

8 FILM HANDLING

All microfilms should be handled only on their edges to prevent fingerprint smudges that can attract airborne particles that will abrade the film emulsion or contain oils that may have a detrimental effect on the film.

- 8.1 Security or preservation microfilms should always be handled on their edges and handlers are required to wear thin cotton gloves.
- 8.2 All films should be handled by film laboratory staff, after film processing and until the film is released to the custodian, as above.

9 FILM MAINTENANCE/INSPECTION

- 9.1 Security microfilms should be inspected annually for any signs of deterioration as per the requirements in ANSI/AIIM MS45-1990 (*American National Standard for Information and Image Management – Recommended Practice for Inspection of Stored Silver-Gelatin Microforms for Evidence of Deterioration*) and ANSI/AIIM MS48-1990. If any problems are encountered, notify the State Archives immediately for assistance.

9.1.1 Sampling - As a rule, if security microfilm storage is under 100 rolls, all films should be inspected. If the number is over 100 rolls, a representative sample may be inspected. An adequate number of properly selected lot samples should be inspected each year; this number should total 0.1% of the collection or 100 rolls, whichever is greater. The sampling pattern shall be created to ensure that all parts of the collection will be inspected. Samples should be selected so as to overlap with film previously inspected for the purpose of determining if any changes have occurred in the interim.

9.1.2 Inspection - Inspection should take place in a clean room, near the storage area to prevent damage during transit, with a relatively dust free atmosphere and with atmospheric conditions as close as possible to the storage area (see section 7). Additionally, the above standards concerning the handling of microfilm apply during inspection (see section 8).

9.1.2.1 Inspectors should look for mold, fungus, oxidation blemishes (redox), film curl, discoloration, excessive brittleness, emulsion separation, and sticking film.

9.1.2.2 The inspection process should also include re-reading the resolution test and re-measuring the density to ensure image stability.

9.1.2.3 The inspectors should also check for signs of rust, corrosion, or other deterioration on the cores, reels, and storage containers.

9.2 Working copy microfilms should be periodically inspected to determine the extent of abrasive damage that may have occurred during use. If the damage appears significant and if the film is to be retained and used for an extended period of time, it is probably cost effective to have it copied for security purposes.

10 DISPOSAL OF MICROFILM

10.1 Destruction Authorization

The State or Local Records Committee, in accord with RCW 40.14, must authorize the destruction of original camera and silver copy security microfilms.

For records destruction authorization procedures, state agencies should refer to the Division of Archives and Records Management's Records Handbook Number 2, and consult the agency Records Officer. Local agencies should refer to the applicable Local Government Records Retention Schedule and Records Management manuals, both published by the Division of Archives and Records Management.

10.2 Physical Disposal of Microfilms

When either the State or Local Records Committee has authorized the disposal of microfilms it shall be the responsibility of the agency having requested authorization, to destroy such records promptly and effectively. Such disposal should reduce the microfilm to an illegible condition. The most appropriate method of accomplishing destruction is by use of a cross-cut shredder.

11 MICROFILM PROGRAM, MATERIALS AND SYSTEMS APPROVAL

11.1 State Agencies may convert public records to microfilm provided that:

1. The records to be filmed are properly approved for filming and disposition by the State Records Committee in accord with the provisions of RCW 40.14.060.

2. The microfilm system meets state standards and the microfilm project is approved by the State Archivist in accord with the provisions of RCW 40.14.060 and 40.20.
3. Any planning and acquisition requirements of the Department of Information Services are met.

11.1.1 Records Retention and Disposition Authorization - Form SSA-53B, Records Retention Schedule, is used to schedule the retention and disposition of state records and must be presented to the State Records Committee for approval. The Agency Records Officer should be consulted on retention scheduling, and by law, has agency level responsibility for approving microfilm systems and projects.²²

Record scheduling decisions to use microfilm which affect the retention of the original record must be accompanied by a cost benefit analysis which compares the cost of converting to, using and maintaining the microfilm system with the cost of the present system, alternate film systems, and other alternatives.

11.1.2 Microfilm Project and System Approval - Requests for microfilm project/equipment acquisition are made to the Division of Archives. The Archives will also provide consultative assistance in system and equipment selection, and will assist with cost benefit analysis.

11.2 Local Government Agencies may convert public records to microfilm upon approval of the Local Records Committee, in accord with Chapter 40.14.070 RCW, except as otherwise provided by law, and provided the microfilm material and system has the approval of the State Auditor, in accord with Chapter 40.20 RCW.

11.2.1 Approval by the Local Records Committee is obtained by submitting a *Public Records Retention Schedule and Destruction Authorization* form SSA-24, citing the records to be filmed, their retention in the original form and retention of the microfilm.

11.2.2 Approval of the Microfilm Material and System by the State Auditor may be obtained by submitting a form SSA-31, *Local Agency Microfilm Project Authorization Request*, through the State Archivist.

12 AVAILABLE MICROFILM SERVICES

12.1 Use of State Archives Imaging Services - The State Archives provides microfilm services for use by state and local agencies through interagency agreement or competitive bid. Cost estimates are provided and use of the

²² See RCW 40.14.040 "...The records officer shall...Coordinate all aspects of the records management program."

service is initiated by a Authorization Request for Microfilm Services, form SSA-61. The Archives supports agency "in-house" camera operations with film processing and duplicating services. The State Archives also provides security microfilm storage (free of charge), post-disaster microfilm recovery, and film cleaning services.

- 12.2 Use of Commercial Services - State and local agencies may also contract with commercial service bureaus through competitive bid for production services, providing that the State Archivist certifies the vendor. Agencies should also consult with the Archives Imaging Services staff regarding contract specifications and compliance with state microfilm standards as part of their contract specifications.

Appendix 1

FOR ADDITIONAL INFORMATION AND ASSISTANCE ON:

Microfilm Standards, System Review and Approval, Security Microfilm Storage

Division of Archives & Records Management
Imaging Services
711 Tumwater Blvd SW
PO Box 40240
Olympia, WA 98504-0240
(360) 586-2487

State Records Retention Scheduling

Division of Archives & Records Management
Records Management Section
1129 Washington Street SE
PO Box 40238
Olympia, WA 98504-0238
(360) 586-4900

Local Records Scheduling, Appraisal, and Archival Records Transfer

CENTRAL REGION

Serving: Benton, Chelan, Douglas, Franklin, Grant, Kittitas, Klickitat, Okanogan, and Yakima Counties.

Central Washington University
Bledsoe-Washington Archives Building MS: 7547
400 East University Way
Ellensburg, WA 98926-7547
(509) 963-2136
E-mail: Archives@cwu.edu
Web Site: www.secstate.wa.gov/archives/archives_central.aspx

EASTERN REGION

Serving: Adams, Asotin, Columbia, Ferry, Garfield, Lincoln, Pend Oreille, Spokane, Stevens, Walla Walla, and Whitman Counties.

Eastern Washington University
960 Washington Street
Cheney, Washington 99004
(509) 235-7508
E-mail: era@mail.ewu.edu

Web Site: www.secstate.wa.gov/archives/archives_eastern.aspx

NORTHWEST REGION

Serving: Clallam, Island, Jefferson, San Juan, Skagit, Snohomish, and Whatcom Counties.

Western Washington University

Goltz-Murray Building

808 25th Street

Bellingham, WA 98225-9123

(360) 650-7930

E-mail: state.archives@wwu.edu

Web Site: www.secstate.wa.gov/archives/archives_northwest.aspx

PUGET SOUND REGION

Serving: Kitsap, Pierce and King Counties.

Bellevue Community College

Pritchard-Fleming Building

3000 Landerholm Circle SE, MS-N100

Bellevue, WA 98007-6484

(425) 564-3940

E-mail: Archives@bcc.ctc.edu

Web Site: www.secstate.wa.gov/archives/archives_puget.aspx

SOUTHWEST REGION

Serving: Clark, Cowlitz, Grays Harbor, Lewis, Mason, Pacific, Skamania, Thurston and Wahkiakum Counties.

1129 Washington Street SE

PO Box 40238

Olympia, WA 98504-0238

(360) 753-1684

Email: swresearch@secstate.wa.gov

Web Site: www.secstate.wa.gov/archives/archives_southwest.aspx

DIGITAL ARCHIVES

Serving: All Counties in Washington.

960 Washington Street

Cheney, WA 99004

509-235-7509

Email: digitalarchives@secstate.wa.gov

Web Site: www.digitalarchives.wa.gov/default.aspx

The information in Appendix 1 above was updated on January 31, 2008.

Appendix 2

Sample Microfilm Targets

- Beginning of Roll No.
- Certificate of Authenticity
- Guide Sheet
- Resolution Target
- Flash Targets
- New Folder or New Box target
- Retakes
- Correction
- End of Roll No.

BEGINNING OF ROLL

NO. _____

SSA-26A (REV. 8-98)

SECRETARY
of STATE



MICROFILM
CERTIFICATE of
AUTHENTICITY

DIVISION OF ARCHIVES
AND RECORDS
MANAGEMENT

COUNTY OF THURSTON)
)
) SS
)
STATE OF WASHINGTON)

I, _____, being duly sworn on oath,
depose and say:

That the papers and documents appearing on this roll of film were photographed by your affiant and that said papers and documents are true and correct copies of the originals thereof as the same appeared on record in the custody of the State Archives. That the microfilming of the papers and documents as aforesaid was done in the pursuance of, and in conformance with provisions of the statutes in these cases made and provided for as they appear in Title 40, of the Revised Code of Washington.

Signed _____

Subscribed and sworn to before me this _____ day of _____, 19 ____.

Notary Public in and for the State
of Washington, residing at Olympia,
Washington.

Name of Scanner Operator:
Records Series Title:
Date Span of Records:
Date Scanned:
Disposition Authority Number (DAN):
Scanner Operator Signature:

SSA-18 (REV. 1/2008)

**SECRETARY
of STATE**



DIVISION OF ARCHIVES AND
RECORDS MANAGEMENT

**MICROFILM BUREAU
MICROFILMED PUBLIC RECORDS
GUIDE SHEET**

Name of Agency _____

Title of Record

Reel Number _____ Start Number _____ Date _____

End Number _____ Date

Date Microfilmed _____ Document Count _____

Camera _____ Reduction Ratio _____

Operator _____ Operation Time _____

Remarks

Film Inspected by: _____ Date _____

Inspection Results

END OF ROLL

NO. _____

Appendix 3
Agency Forms

Local Government Forms

SSA-24 Public Records Retention Schedule and Destruction Authorization

SSA-31 Local Agency Microfilm Project Authorization Request

State Government Forms

SSA-53B Records Retention Schedule

SSA-61 Request for Microfilm Services

SOURCES*

Abbreviation Key

ANSI	American National Standards Institute
AIIM	Association for Information and Image Management
NAPM	National Association of Photographic Manufacturers
ISO	International Organization for Standardization
NFPA	National Fire Protection Association

Approved ANSI standards

ANSI/AIIM MS18-1992. American National Standard for Information and Image Management--Splices for Imaged Microfilm--Dimensions and Operational Constraints.

ANSI/AIIM MS23-1991. American National Standard for Information and Image Management--Practice for Operational Procedures/Inspection and Quality Control of First-Generation, Silver Microfilm of Documents.

ANSI/AIIM MS45-1990. American National Standard for Information and Image Management--Recommended Practice for Inspection of Stored Silver-Gelatin Microforms for Evidence of Deterioration.

ANSI/AIIM MS48-1990. American National Standard for Information and Image Management--Recommended Practice for Microfilming Public Records on Silver-Halide Film.

ANSI/AIIM MS51-1991, ANSI/ISO 3334-1989. American National Standard for Microcopying--ISO Test Chart No. 2--Description and Use in Photographic Documentary Reproduction.

ANSI/NAPM IT9.1-1992. American National Standard for Imaging Media (Film)--Silver-Gelatin Type--Specifications for Stability.

ANSI/NAPM IT9.2-1991. American National Standard for Imaging Media--Photographic Processed Films, Plates, and Papers--Filing Enclosures and Storage Containers.

ANSI/NAPM IT9.6-1991, ANSI/ISO 543-1990. American National Standard for Photography--Photographic Films--Specifications for Safety Film.

ANSI/NAPM IT9.11-1993. American National Standard for Imaging Media--Processed Safety Photographic Films--Storage.

* In all cases, the references cited in this manual are to be superseded by the most current versions thereof.

ANSI/NAPM IT9.13-1992. American National Standard for Imaging Media--
Photographic Films, Papers, and Plates--Glossary of Terms Pertaining to
Stability.

ANSI/NAPM IT9.15-1997. American National Standard for Imaging Materials –
Methods for the Evaluation of the Effectiveness of Chemical Conversion of
Silver Images Against Oxidation.

ANSI/NAPM IT9.17-1993, ANSI/ISO 417-1993. American National Standard for
Photography--Determination of Residual Thiosulfate and Other Related
Chemicals in Processed Photographic Materials--Methods Using Iodine-
Amylose, Methylene Blue, and Silver Sulfide.

ANSI/NFPA, 232 – 1991, Protection of Records

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Fox, Lisa L., ed. Preservation Microfilming: A Guide for Librarians and Archivists. 2nd
Ed. Chicago: American Library Association, 1996.

Elkington, Nancy E., ed. RLG Preservation Microfilming Handbook. Mountain View,
California: Research Libraries Group, 1992.

Robek, Mary F., Gerald F. Brown, and Wilmer O. Maedke. Information and Records
Management. 3rd Ed. Mission Hills, California: Glencoe Publishing, 1987.

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"Instructions for Using IPI Silverlock on Silver Microfilm." Rochester, NY: Image
Permanence Institute, Rochester Institute of Technology, 1996.

Reilly, James M. and Kaspar M. Cupriks. Polysulfide Treatment of Existing Microfilm
Collections. Final Report on NEH Grant PS-20565092, July 1992 to June 1995.
Rochester, NY: Image Permanence Institute, Rochester Institute of Technology, 1995.