Micrographics

Technical and Legal

Procedures

Collections Management Branch
Division of Archives and Records
Department of Cultural Resources
109 E. Jones Street
Raleigh, North Carolina 27601-2807

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DEPARTMENT OF CULTURAL RESOURCES
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Jeff Crow, Deputy Secretary

DIVISION OF ARCHIVES AND RECORDS
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EMERITI: Kemp P. Burpeau, N. J. Crawford, H. G. Jones, William S. Powell, Alan D. Watson, Max R. Williams

The North Carolina Department of Cultural Resources is responsible, under N.C.G.S. §121-4 for ensuring the economical and efficient maintenance and preservation of public records created by agencies and public officials. The *Micrographics Technical and Legal Procedures* publication has been developed to aid state, county, and municipal agencies in producing microfilm which meets the requirements of the state and federal "Uniform Photographed Copies of Business and Public Records as Evidence Act." The original technical standards for microfilm were approved by the North Carolina Historical Commission on March 31, 1980. These standards establish quality control procedures which will ensure the permanence of microfilmed records. State, county, and municipal agency-operated micrographic systems should adhere to these standards.

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INTRODUCTION

Micrographics may be defined as the processes and equipment used to film, store, and retrieve records or other information in miniature photographic form. Microfilm can be created using traditional analog cameras, and it can be created with a Computer Output Microfilm (COM) device. In today's technology-driven office, there is still a place for micrographics as an inexpensive and long-term reformatting option for essential records. The basic principles of micrographics have changed little over the last 100 years, but the marriage of micrographics and information processing equipment has enabled the user to produce microfilm/fiche from paper or digital images, and to locate data on it much more quickly.

Many times micrographics is overlooked as a viable option for retaining records. As one component of a comprehensive and active records and information management program, it provides several benefits. Micrographics is an effective method for essential records protection, creating security backups of irreplaceable records which can be stored off-site. Properly created and stored microfilm can last for up to 500 years without degradation, and it is technologically neutral. No hardware or software is required to read microfilm, just a light source and method of magnification. Space savings of up to 98% can be realized if microfilm/fiche is used instead of paper. In addition, COM devices allow the creation of microfilm directly from digital images. These are all benefits of an active micrographics program, but the custodian of the records must realize that the entire records keeping system should be evaluated before expending the effort and expense to convert the information to microfilm/fiche. In other words, a micrographics program can play one part in a robust, well-designed records management program, but it will not help a records management system that is inherently faulty.

There are certain considerations which should be noted about the permanent preservation of records or other information. Records which are identified as being ***permanent*** in an agency's official records retention and disposition schedule should not be destroyed or otherwise disposed of unless there is an approved duplicate made, most often a microfilm duplicate. Retention schedules are located at the Government Records Branch Web site. For additional information about the human-readable preservation duplicate policy for permanent records, please refer to the "Public Records Requiring Human-Readable Preservation Duplicates" document from the Government Records Branch, also located on the branch's Web site. In addition, it is recommended that any records custodian who plans on implementing a scanning project for permanent records that will be reformatted to microfilm first contact an analyst with the Government Records Branch. There are additional resources advising records custodians on best practices and procedures for scanning projects and requirements for conversion of digital images to microfilm.

In summary, micrographics is still alive and well in the world of records management. To microfilm records or retain them in another format is a question that cannot be answered easily. The records must be analyzed and specific issues resolved. These issues include, but are not limited to, establishing reasons for microfilming the records, learning about legal and technical guidelines, deciding how long the microfilm must be kept, determining processing and storage costs, and examining retrieval equipment needs. It is

hoped that the information and standards in this revised edition of *Micrographics Technical and Legal Procedures* will be useful to anyone considering alternatives for the long-term retention of North Carolina's public records.

TECHNICAL STANDARDS FOR MICROGRAPHICS

The North Carolina Department of Cultural Resources, through the Office of Archives and History, requires that certain standards be met to assure quality microforms that are readily reproducible and, where necessary, capable of permanent preservation. These standards are based on the requirements of the American National Standards Institute (ANSI), the Association for Information and Image Management (AIIM), the National Bureau of Standards (NBS), and other federal agencies.

All micrographics operations conducted by the Office of Archives and History conform to the standards for permanent microfilm. Only those products, procedures, and methods recognized within the profession as offering the highest probability of reaching these standards of quality are employed.

There are four basic groups of standards that establish criteria for microfilm to be considered permanent: the standards for the manufacture of raw film; the standards affecting the method for filming in order to produce good overall results; the standards involved in processing (developing) microfilm; and the standards for the storage of processed microfilm.

All microforms produced by agencies which are to be kept for ten years or longer should be considered as permanent and these standards applied. When adhered to, these criteria will:

1. Assure the permanence of developed film
2. Ensure that raw film will be of permanent quality
3. Give necessary detail of image
4. Produce film that can be easily read and reproduced
5. Satisfy legal requirements that the film actually contains images of all documents intended to be microfilmed

WHY CERTIFICATION AND IDENTIFICATION OF MICROFILM IS NECESSARY

The "Uniform Photographic Copies of Business and Public Records as Evidence Act," 28 U.S.C. Section 1732, and N.C.G.S. § 8-45.1 and 153A-436, provide for the acceptance of microfilmed records of county, municipal, and state offices in both federal and state courts. However, there are three basic requirements established by these laws that must be satisfied in order for the microfilmed record to be as admissible in evidence as the

original paper record: the microform must be produced in the regular course of business, the microfilm should accurately reproduce to form a durable medium for duplicating the original, and the microfilm must be satisfactorily identified. Microfilm security copies of records which do not conform to these procedures are nonstandard and do not properly protect or preserve records of permanent value.

To ensure that the foregoing criteria for legally acceptable microforms are met, the Office of Archives and History, Department of Cultural Resources, has prepared forms, targets, and procedures to be used when microfilming public records. Technical standards which will ensure that records are correctly microfilmed and will form a durable medium for reproducing the original record also have been written. All have been consolidated in this publication with additional technical and professional advice that will accomplish these purposes when followed. In addition, every office or agency operating a microfilm system, including one converting digital images to film, should have written policies and procedures governing the content, context, and structure of their records to ensure their authenticity. Policies and procedures concerning the destruction of paper records and images after microfilming and inspection of the final product should be included. Contact your records management analyst for more information. Contact information can be found on the Government Records Branch's Web site.

Particular attention should be given to the selection of a method of destroying records that have been microfilmed, as well as extra care to ensure the records once microfilmed are authorized by the Department of Cultural Resources to be destroyed. Under no circumstances should records designated as permanent in an official records retention and disposition schedule be destroyed, even though they have been microfilmed, without the approval of the Department of Cultural Resources. For further information regarding destruction and approval procedures, please consult your agency's records retention and disposition schedule.

PRINCIPAL STANDARDS AFFECTING MICROFILM

The principal standards affecting microfilm, which follow, are listed by number and title. These standards should be used when establishing, as well as maintaining, an in-house microfilm program, when purchasing film or microfilm equipment, and when preparing a contract for services. These standards apply to silver halide film only—not to diazo, mylar, vesicular, or dry processed silver film.

Item 1. STANDARDS FOR THE MANUFACTURE OF RAW MICROFILM

Raw film purchased for permanent use (to be retained ten years or more) must meet the following standards:

- *Photographic Films-Specifications for Safety Film*, ANSI Standard IT9.6-1991(R 1996)
- *Imaging Media (Film) Silver-Gelatin Type-Specifications for Stability*, ANSI/NAPM Standard IT9.1-1996

These standards relate to both the film's base material and emulsion. When purchasing raw film, cite these standards as specifications in a purchase order or contract.

Item 2. STANDARDS AFFECTING THE METHOD OF FILMING TO PRODUCE GOOD OVERALL RESULTS

The following standards are to be used when filming permanent records:

- *Specifications for 16mm and 35mm Roll Microfilm*, ANSI/AIIM Standard MS14-1998
- *Practice for Operational Procedures/Inspection and Quality Control of First-Generation, Silver Microfilm of Documents*, ANSI/AIIM Standard MS23-2004

The following standards are to be used when creating digital images that will be converted to microfilm:

- *Recommended Practice for Quality Control of Image Scanners*, ANSI/AIIM Standard MS44-1998 (R1993)
- *Recommended Practice for COM Recording Systems Having an Internal Electronic Forms Generating System-Operational Practices for Inspection and Quality Control*, ANSI/AIIM Standard MS62-1999

Resolution

Resolution is the ability of a photographic system to record fine detail; a measure of sharpness of an image, expressed as the number of lines per millimeter, discernible in an image.

The procedure to determine resolution is the RESOLUTION TEST. In processed microfilm, resolution is a function of film emulsion, exposure, camera, lens, camera adjustment, camera vibration, and film processing.

The resolution standard for roll film is contained in *Micrographics - ISO Resolution Test Chart No. 2 - Description and Use*, International Standard ISO 3334-1991(E) and for microfiche in *Microfiche*, ANSI/AIIM Standard MS5-1992 (R1998).

Resolution is expressed in terms of number of lines per millimeter and is measured by examining a microfilmed image of the Resolution Test Target (Figure 1) under a

microscope (of 100X power) to determine the smallest pattern in which lines can be distinguished both horizontally and vertically. These patterns consist of five groups of lines, each of which are arranged on a chart and filmed at the start and end of a roll of film. An *original chart* (not a copy) must be used for the measurements to be accurate. The smallest line pattern in which lines can be distinguished in both directions establishes the resolving power of the system.

The following chart (Resolution Calculation Table) shows the results of multiplying the Reduction Ratio and the smallest Test pattern which has lines that are distinguished vertically and horizontally.

Reduction Ratio	Smallest ISO Test Chart 2 pattern read	Resolving Power (*line pairs per mm)*
12:1	9.0	108
16:1	7.1	114
20:1	5.6	112
21:1	5.6	117
24:1	5.0	120
28:1	4.5	126
30:1	4.5	135
36:1	4.0	144
40:1	3.2	128

Resolving power is affected by any or all of the following:

- Film type (the finer the film grain, the higher the potential resolving power)
- Camera lens
- Maintenance of lens (free of smudges or dirt, focus, etc.)
- Camera vibration

NOTE: The Resolution Calculation Table applies to images created with analog microfilm cameras and most scanners, but not to digitally created images converted to microfilm using a computer output microfilm (COM) device. The resolution for digital images converted to microfilm should be controlled at the time of document scanning. Because the conversion of paper to digital images to microfilm is a two step process using in most cases both a scanner and an archive writer COM device, quality control for proper resolution is essential at both steps.

Scanners can be checked for proper resolution using an “AIIM Scanner Test Chart #2” as outlined in *Recommended Practice for Quality Control of Image Scanners,* ANSI/AIIM Standard MS44-1998 (R1993). Scanners should also come with resolution targets included in their software. For more information about standard resolution targets for your scanner, please consult your vendor.

COM archive writer devices use their own resolution targets that are included with the operating software for that particular machine. These targets are written to film un-scaled and are a measure of the resolution of the archive writer that produces the film and not the resolution of the scanners that produced the images. For more information see *Recommended Practice for COM Recording Systems Having an Internal Electronic Forms Generating System- Operational Practices for Inspection and Quality Control,* ANSI/AIIM Standard MS62-1999.

When submitting digital images for conversion to microfilm, the recommended minimum resolution for standard business documents is 200 dpi/ppi. For images containing finer detail e.g., engineering drawings, maps, etc., a minimum of 300 dpi/ppi is recommended. Images over 300 dpi/ppi can be accepted, but will not necessarily result in the production of better microfilm and, due to their larger file size, are not recommended.

With regard to digital images received from state or local agencies or their vendors, it is important that the "Certificate of Authenticity" (Figure 10) at the beginning and end of the images include information stating the dpi of the scanned images. Other explanatory targets for the film are covered in Item 6 on page 16.

Quality Index

QUALITY INDEX is the method to determine the legibility of the final distribution microfilm image. This procedure is to be performed before a microfilming project is begun. The evaluation is based on the height of the smallest pertinent letter (usually the lower case "e") in a good contrast document. It is not necessary to apply this method to text characters if the information they give is repetitive. The height of the character is measured in millimeters. Also included is the evaluation of the camera's resolving power at the specific reduction ratio for which the documents will be filmed. This procedure is discussed in detail in *Practice for Operational Procedures/Inspection and Quality Control of First-Generation, Silver Microfilm of Documents,* ANSI/AIIM Standard MS23-2004.

Density

Density is the light absorbing quality of the photographic image or the degree of contrast between the image and non-image background.

The standard establishing the requirements for the acceptable density of microfilm is known as the DENSITY TEST. It is contained in ANSI/AIIM MS23-2004.

The degree of background density is measured by an instrument called a densitometer. The density patch should be filmed using a sheet of clean white bond paper or white card stock. This image is used to determine the density created by the camera setting and calibration with the processor. Density is the one critical factor most subject to change, and it must be watched very closely. Excessive light causes the image to be dark or

overexposed, and insufficient light causes the image to be light or underexposed. Processing also affects the density of microfilm.

Density is affected by:

- Variations in film emulsion
- Use of expired film
- Line voltage changes
- Lamp aging
- Dirty mirrors and glass guides in rotary cameras
- Temperature variations and speed changes in the processing of film
- Age of chemicals used during processing
- Changes in ambient or overhead light conditions when using a planetary camera
- Latent image fade

There are several important density terms. The maximum density is D-max, while the minimum density is D-min. Background density is the source document's background on the imaged film. Delta density (▲D) is the difference in density between two imaged areas on film and is often the difference between the D-max and D-min. The concept of delta density is crucial becausethere must be sufficient difference in density between the dark and light areas on the original document for good reproduction. The film copy also must have sufficient (▲D) for reading and copying. Density control is extremely important in producing good quality microfilm.

Due to limitations in most photographic systems, thin lines in the original documents will tend to fill in when filmed as a function of their width and density. Therefore, as the reduction ratio of a given system is increased, it may be necessary to reduce the background density to achieve an image with relatively low line density so the copies will contain legible characters.

Sometimes an exposure series should be made of selected documents to obtain appropriate background density as recommended by groups 1 to 4.

Group 1. High-quality, high-contrast, printed books and periodicals; black type face; fine-line orginals; black opaque pencil writing; and documents with small, high-contrast print. Density of 1.00 to 1.30.

Group 2. Pencil and ink drawings; faded and very small print (i.e., footnotes at the bottom of a printed page); scenic checks; documents with printed pictorial images; and newspapers. Density of 0.90 to 1.10.

Group 3. Low-contrast manuscripts and drawings; graph paper with pale, fine-colored lines; letters typed with a worn ribbon; poorly printed, faint documents. Density of 0.80 to 1.00 (1:24 reduction or less).

Group 4. Very low-contrast (worst case) documents can require extremely low background density. Density 0.75 to 0.85 (1:24 reduction or less).

The base-plus-fog density of the unexposed, processed, clear-base film should not exceed 0.10, and are generally below 0.05. When a tinted base film or thermally-processed silver film is used, the density will increase by 0.10 to 0.20, which must be added to the 0.10 value.

Note: The above density guidelines are for microfilm created using original documents and a traditional microfilm camera. When film is created using a computer output microfilm device, density requirements may vary based on the type of device used. COM devices utilizing lasers to create film from images may produce densities closer to the groups above. COM devices using CRT may require higher densities, typically in the 1.4 to 1.7 range. Please consult with Imaging Unit staff for additional information on recommended densities from film created with COM devices.

The ultimate density criteria are for the microfilm to be legible for its intended use (reading, duplicating, or printing hardcopies) and for all images in a roll to be duplicated at the same duplicator exposure.

Item 3. RECOMMENDED PROCEDURES FOR PROCESSING MICROFILM

The following principal procedures are for processing microfilm. These procedures should be used when establishing and maintaining a microfilm processing lab or be specified in any contract with a vendor. *Practice for Operational Procedures/Inspection and Quality Control of First-Generation, Silver Microfilm of Documents,* ANSI/AIIM Standard MS23-2004- covers topics such as deciding whether to use a vendor or processing film in-house. This standard also covers points to consider when choosing a processor.

Processing of silver halide microfilm should conform to relevant standards AIIM/ANSI MS23-2004. Standard tests should be performed by the processing operator to confirm that the film processor is properly calibrated and the chemicals are properly mixed. This is accomplished by running a “control strip” of film through the processor, before running any camera film, to ensure that the desired density is achieved. This will help to ensure that optimum density and contrast has been achieved and that the chemical processing has been properly completed.

Processor Control

The basic function of the processor is to transport the film through the various solutions and to permit an appropriate treatment time for the film in each bath. There are a number of factors that influence the outcome of film processing:

a) Temperature - Fluctuations in temperature will cause density readings to increase or decrease depending on the extremes of the change.
b) Machine Speed - For even processing and consistent results, the processor film speed must remain the same throughout the roll.
c) Agitation and Replenishment - To keep developer and fixer most effective, you must ensure proper agitation and replenishment.
d) Filtration of Wash Water and Processing Solutions - Regularly check water and chemical filters and change when needed.
e) Film Drying - Control of both temperature and humidity is essential for obtaining desired physical properties. Insufficient drying causes film to be too tacky; over-drying will result in excessive curl and brittleness.

The processor should wash the film thoroughly to meet archival standards. The test which establishes the amount of residual thiosulfate remaining on the surface of microfilm after the final wash is commonly known as the RESIDUAL THIOSULFATE TEST, or METHYLENE BLUE TEST. It is contained in the *Photography - Determination of Residual Thiosulfate and Other Related Chemicals in Processed Photographic Materials - Methods Using Iodine-Amylose, Methylene Blue and Silver Sulfide,* ANSI/NAPM Standard IT9.17-1993 and *Imaging Media (Film) - Silver-Gelatin Type - Specifications for Stability,* ANSI/NAPM Standard IT9.1-1996. This standard specifies a maximum of 1.4 micrograms per square centimeter of the thiosulfate ion.

Adequate washing is essential to the permanence of microfilm. After all of the underdeveloped silver halide has been converted, the emulsion is still saturated with the chemicals of the fixing bath and some dissolved silver compounds. If these are not removed by washing, they will slowly decompose and attack the image, causing discoloration and fading. Also, the smaller the grain size of the image, the greater the reaction. Since most microfilm is composed of very fine grains, it is very sensitive to this effect.

Testing should be conducted regularly for excessive and damaging amounts of sodium thiosulfate remaining on the surface of microfilm after the final wash. Film processed in-house should be tested and certified once a week. Processing services off-site should include provisions requiring that the methylene blue test be performed every 24 hours. As with all quality control records, the methylene blue test results should be recorded and maintained.

Environmental Concerns

A processing lab must also consider how it will dispose of fixer. *Silver Recovery Techniques,* AIIM Standard TR04-2005 describes photographic silver recovery and the processes involved. *Environmental Right-to-Know Regulations Affecting Microfilm Processors,* ANSI/AIIM Standard TR20 - 1994 addresses laws and regulations that control photo processing wastewater discharges, regulate hazardous material storage and disposal, protect communities from hazardous chemicals, and provide protection to

employees exposed to hazardous substances. The intent of this publication is to review the federal requirements of these regulations. Silver recovery can be attempted in-house or contracted out. Unprocessed and processed microfilm should be disposed of through a commercial recycling company that will recover silver from the film before disposing of the base material.

Standards Involved in Testing the Results of Film Processing

The following standards or technical reports apply:

- *Photography - Determination of Residual Thiosulfate and Other Related Chemicals in Processed Photographic Materials - Methods Using Iodine-Amylose, Methylene Blue and Silver Sulfide,* ANSI/NAPM Standard IT9.17-1993
- *Silver Recovery Techniques,* AIIM Standard TR4-2005
- *Environmental Right-to-Know Regulations Affecting Microfilm Processors,* ANSI/AIIM Standard TR20 – 1994
- *Practice for Operational Procedures/Inspection and Quality Control of First-Generation, Silver Microfilm of Documents,* ANSI/AIIM Standard MS23-2004

Item 4. STANDARDS AFFECTING THE STORAGE OF PROCESSED MICROFILM

Microfilm Storage

Standards also apply to the storing of permanent silver halide microfilm. It is extremely important that the required storage conditions be followed for this type of film.

Imaging Media - Photographic Processed Films, Plates, and Papers - Filing Enclosures and Storage Containers, ANSI Standard IT9.2-1998 requires that materials such as plastic that are used for reels be free of peroxides. Do not use rubber bands to hold film onto reels. If paper bands are used they must be free of acid which is harmful to silver based film. Silver based microfilm must not be stored with other types of microfilm such as diazo or vesicular microfilm because possible contamination may occur. Film should be stored in closed containers that are composed of non-corrosive material such as anodized aluminum, stainless steel, peroxide free plastics, or acid and lignin free cardboard.

Environmental conditions for the storage of permanent microfilm include the following:

Temperature – Ideally, the maximum temperature for extended periods should not exceed 25° C, and a temperature below 21° C is preferable. The peak temperature for short periods of time should not exceed 32° C. Lower temperatures are recommended for added protection.

Humidity – Relative humidity should be around 30% and shall not exceed 40%. Rapid and wide range cycling of humidity and temperature is to be avoided (not to exceed ± 5° temperature range in a 24-hour period).

Air Purity – Mechanical filters should remove any solid particles from the air that may abrade or react with the film image. Gaseous impurities such as sulfur dioxide, hydrogen sulfide, peroxides, etc., should be removed from the air since they can cause deterioration in the film base.

Microfilm Inspection

At approximately two-year intervals, a one percent sample of randomly selected rolls of microfilm should be inspected. For each two-year inspection, a different lot sample should be chosen, allowing some over-lapping to note any changes in previously inspected samples. The film should be inspected for mold or fungus, excessive brittleness, film curl or discoloration, excessive scratches, and the presence of redox blemishes.

Acetate film, which can chemically decompose and give off acids, is to be tested for vinegar syndrome. Vinegar syndrome is a slow form of chemical deterioration. As this film degrades it gradually shrinks and becomes brittle. The decomposition also produces a sharp vinegar odor which indicates the presence of acetic acid.

If permanent film shows any of these problems, a silver duplicate should be made to replace the original reel. Refer to *Recommended Practice for Inspection of Stored Silver-Gelatin Microforms for Evidence of Deterioration,* ANSI Standard MS45-1990 and *Micrographics -- Inspection of Silver-Gelatin Microforms for Evidence of Deterioration,* ISO (Technical Report), TR 12031:2000 for more information.

Item 5. CARE AND HANDLING OF ACTIVE MICROFORM FILES USED AS REFERENCE COPIES

You can find general guidance for the storage, care, handling, and use of microforms in an active or working environment in *Preservation of Microforms in an Active Environment – Guidelines,* ANSI/AIIM Standard TR13-*1998*. All currently available microfilm types are briefly discussed and some general guidelines are provided for the use and care of readers and reader-printers.

Microfilm Handling

When handling microfilm, only touch non-image areas. Fingerprints contain oils and acids that, over time, have a damaging effect on the filmed image. You can minimize the chance of damage by wearing clean white gloves when touching film. If it is necessary to handle film without gloves, be sure your hands are clean and free of hand lotions and only touch the film on the edges.

Keeping microfilm readers clean is a primary requirement in the maintenance of this type of equipment. A dirty reader will scratch the film as it passes through the film guides. You will see improved quality in the viewer and prints when lenses, mirrors, and screens are cleaned regularly.

Storage Recommendations
Proper storage will ensure longer lasting film. Active microform files should meet medium-term storage conditions to ensure a minimum life of 10 years. Storage requirements can be found in standard *Imaging Media - Processed Safety Photographic Film – Storage*, ANSI Standard IT9.11-1998.

Microforms should never be stored near heat or exposed to excessive light. All microforms should be stored in containers such as envelopes or boxes, and these containers should be stored in trays or cabinets. As a general rule, reference copy microfilm should be stored in closed containers in an air conditioned environment.

SOURCES FOR SPECIFICATIONS AND STANDARDS

Microfilm standards and specifications named in this publication may be purchased from the following sources:

American National Standards Institute
25 W 43rd Street, 4th Floor
New York, NY, 10036
(212) 642-4980

Association for Information and Image Management
Publications Sales
1100 Wayne Avenue
Silver Spring, Maryland 20910
(301) 587-8202

Association of Records Managers and Administrators
11880 College Blvd., Suite 450
Overland Park, KS 66210, USA
(913) 341-3808

Item 6. PROCEDURES FOR FILMING A ROLL OF MICROFILM

The following procedures should be followed in preparing each roll of microfilm to properly certify and clearly identify the documents being filmed. It should be noted that the Resolution Test Chart and Density Target are not part of the certification and

identification material and are filmed before the Start Target. For digital images converted to microfilm, these explanatory targets can be created in a word processing program and inserted into the film using the COM archive writer device.

The suggested order of targets for roll film systems is:

a) White bond paper or card stock (to record density)
b) Technical Target—used to read and record resolution (Figure 1)
c) Start Target—denotes the beginning of the roll. (Figure 5)
d) Agency or Department Seal Target-show by whom and where the records were filmed. (Figure 6)
e) Reel Number Target—provides permanent identification of that reel. (Figure 7)
f) Special Explanatory Target—contains special explanatory material or information concerning the arrangement or description of the records, as appropriate. (Figure 8)
g) Certificate of Authenticity (filming)—filled in to show whose records are being filmed, what the records consist of, what the records begin with, date filming began, and reduction ratio. The certificate is **NOT** signed at this time. (Figure 9) or Certificate of Authenticity (scanning)—filled in to show whose records are being scanned, what the records consist of, what the records begin with, date scanning began, and reduction ratio. The certificate is **NOT** signed at this time. (Figure 10)
h) Documents to be filmed.
i) Certificate of Authenticity—completed by entering: ends with, date filming ended, and signature of the camera operator. Film after the last document. (Figure 9 or Figure 10)
j) End of Book Target—used only when books or volumes are filmed. (Figure 11)
k) End of Reel Target—the last item to be filmed on the reel. (Figure 12)

Specifications for 16mm and 35mm roll microfilm, ANSI/AIIM Standard MS14-1988, covers physical characteristics, formats, placement, and orientation for microfilming records. When filming to microfiche also refer to *Microfiche,* ANSI/AIIM Standard MS5-1992 (R1998).

Item 7. PROCEDURES FOR JACKETING MICROFILM

Certification should be completed for all microfilmed records. When the microfilmed records are jacketed, the first image inserted into the jacket should be the Certificate of Authenticity. When several case records are filmed on a roll of film that is to be jacketed, a Certificate of Authenticity should be filmed at the beginning of each case. All entries should be recorded in the microfilmer's records log to ensure acceptability of the filmed cases as evidence during future references or legal actions. Each Certificate of Authenticity should include the complete title and the location of the department or agency, the complete title of the program, the reduction ratio used, and the camera operator's signature. Each time a jacket is updated an entry should be made in the microfilmer's records log (Figure 18).

Item 8. PROCEDURES FOR CORRECTING ERRORS DETECTED WHILE FILMING

Errors made during filming, such as two documents microfilmed together or a document microfilmed with a corner fold or a crease, are corrected by filming a Correction Target (Figure 10) and then re-filming the documents. The microfilm camera operator should advance the film and continue filming. Where there is doubt in the operator's mind as to whether or not an error has been made, it is better to re-film the documents in question using this procedure than to wait and make the correction later.

Item 9. PROCEDURES FOR PROOFREADING AND LISTING ERRORS

Some errors are detected while documents are being filmed, and others are not found until the film is proofread.

Undetected errors made while filming are corrected after the film has been processed (developed), inspected, and proofread on a microfilm reader, image by image. It is recommended that a person who did not film the reel proofread the roll.

In proofreading the film, particular care should be taken to detect double feeds, turned down corners which obliterate vital parts of the document, fogged or blurred images, and any other defects which will prevent or impair the use of the film. In all such cases, the error or unsatisfactory image or images should be re-filmed. The retake, after processing (developing), inspecting, and proofreading, should be spliced into the film sequence where the error appeared. Another technique is to splice the correction after the End of Reel Target. See the section on Procedures for Splicing Retakes.

While proofreading the film, each error should be listed on an error sheet with sufficient information to enable another person to locate the original document for re-filming. An error sheet(s) should be established for each project and should include:

a) The name of the project.
b) The reel number.
c) Sufficient information to enable a person to identify the document(s) to be re-filmed.
d) Voucher numbers, county names, or any other identifying information, if any, should be noted. If supporting data is included, there should be sufficient information to enable a person to know just what and how much material is to be re-filmed.
e) The nature of the error. The type of error should be indicated, such as an overlap, a turned down corner, a blurred image, a machine error, etc.
f) The date the microfilm is spliced and the name of the individual who spliced the correction retakes.

Item 10. PROCEDURE FOR FILMING RETAKES

In making the correction retakes, the microfilm camera operator should carry out the following sequence of operation:

1. Film Start of Retake Target (Figure 14). Advance the film for three seconds on a rotary camera; do not advance the film on a planetary camera.
2. Film Splicing Authenticity Certificate (Figure 15 or Figure 16) with all entries completed EXCEPT the ending and the microfilm camera operator's signature. Do not advance the film between the certificate and the first image of the retake.
3. Film the unsatisfactory document(s) plus additional documents on either side of the error as follows (do <u>not</u> advance the film after the final document is filmed):
   a) 35mm film—one document preceding and one document following the error.
   b) For analog cameras:
      16mm film simplex 24:1 or 32:1—two documents preceding and two documents following the error.
      For camera/scanners:
      16mm film simplex 24:1 or 57:1
      For COM archive writers:
      16mm film simplex 24:1 or
   c) 16mm film duplex 32:1 or 40:1 letter-size documents—no additional documents.
   d) 16mm film duplex 32:1 or 40:1—small documents such as checks and tabulation cards, four images following the error.
4. Film Splicing Authenticity Certificate (Figure 15 or Figure 16) with the "ending with" blank line completed and signature of the camera operator entered.
5. Advance the film and film End of Retake Target (Figure 17) and advance the film again.
6. If there is more than one retake on a single roll of film, repeat the entire procedure as outlined above, leaving sufficient space between retakes to allow for splicing.

Item 11. PROCEDURES FOR SPLICING RETAKES

All persons splicing film should wear clean white gloves and handle film by the edges only. *Micrographics-Splices for Imaged Microfilm - Dimensions and Operational Constraints*, ANSI/AIIM Standard MS18 - 1992 recommends no more than 6 splices within the image area of each roll of film. This is especially important for permanent microfilm. The following procedures for splicing film should be followed:

a) If a single image is to be replaced, cut it down the middle; if more than one image is to be replaced, cut the first and last images down the middle and discard film between cuts. This procedure provides enough film for splicing the retake.

b) On 35mm film, the images immediately before and after the cut should be duplicated on the retake.
c) On 16mm film the images (two before and two after the cut) should duplicated on the retake.
d) Each retake should contain a Splicing Authenticity Certificate (Figure 15 or Figure 16) at the beginning and end of the documents.
e) On 16mm and 35mm film an addition is spliced at the end of the reel.

Improper splicing can result in numerous difficulties when duplicating or using fim on microfilm readers or reader-printers. ANSI/AIIM MS18-1992 discusses splicing recommendations. Heat weld splices are recommended for triacetate based film and ultrasonic splices are recommended for polyester based film. It is not recommended that splicing tape be used. If it is, the adhesive is to be formulated so it will not be injurious to the long-term keeping qualities of the film, and the adhesive will not migrate from under the splice.

Item 12. EXAMPLES OF ERRORS

Practice for Operational Procedures/Inspection and Quality Control of First-generation, Silver Microfilm of Documents, AIIM/ANSI Standard MS23-2004 details filming errors with descriptions and examples. Some examples of errors frequently detected are listed below:

Folded documents: If a number, name, or any vital information is covered, the document must be re-filmed. If the fold merely covers a portion of printed matter which is standard on every similar document, it is not necessary to re-film the document. Endorsements on checks should be clearly visible. If a turned down corner obliterates even a portion of one letter of a signature, the check or any other document should be re-filmed.

Overlaps: If the edge of one document is overlapped with the edge of another, and none of the information is covered, there is no error. If any information is hidden from view, there is an error, and the document should be re-filmed.

Splotches: Any splotch which obliterates part of the information on a document is an error. If there are splotches throughout a roll of film, there is a possibility that they can be removed by rewashing the film.

Scratches: Scratches occur in the form of irregular contour or straight lines and may be the result of faulty equipment (camera and/or processor). If a scratch obliterates part of a document, the document should be re-filmed. If there are scratches throughout a roll of film, unless the material cannot be read, it is not practical to consider every document that is scratched as an error. Sometimes the cause of the scratches must be determined by examining both the camera and the processor.

Fog: Fog may appear along the edges or throughout the entire reel. If edge fog blots out information, the documents should be counted as errors and re-filmed. If fog appears throughout the reel, the entire reel should be re-filmed.

Blurs: Images that are blurred are considered errors and should be re-filmed

"Stretched" Material: Any material that is stretched or appears to be pulled out of shape should be re-filmed.

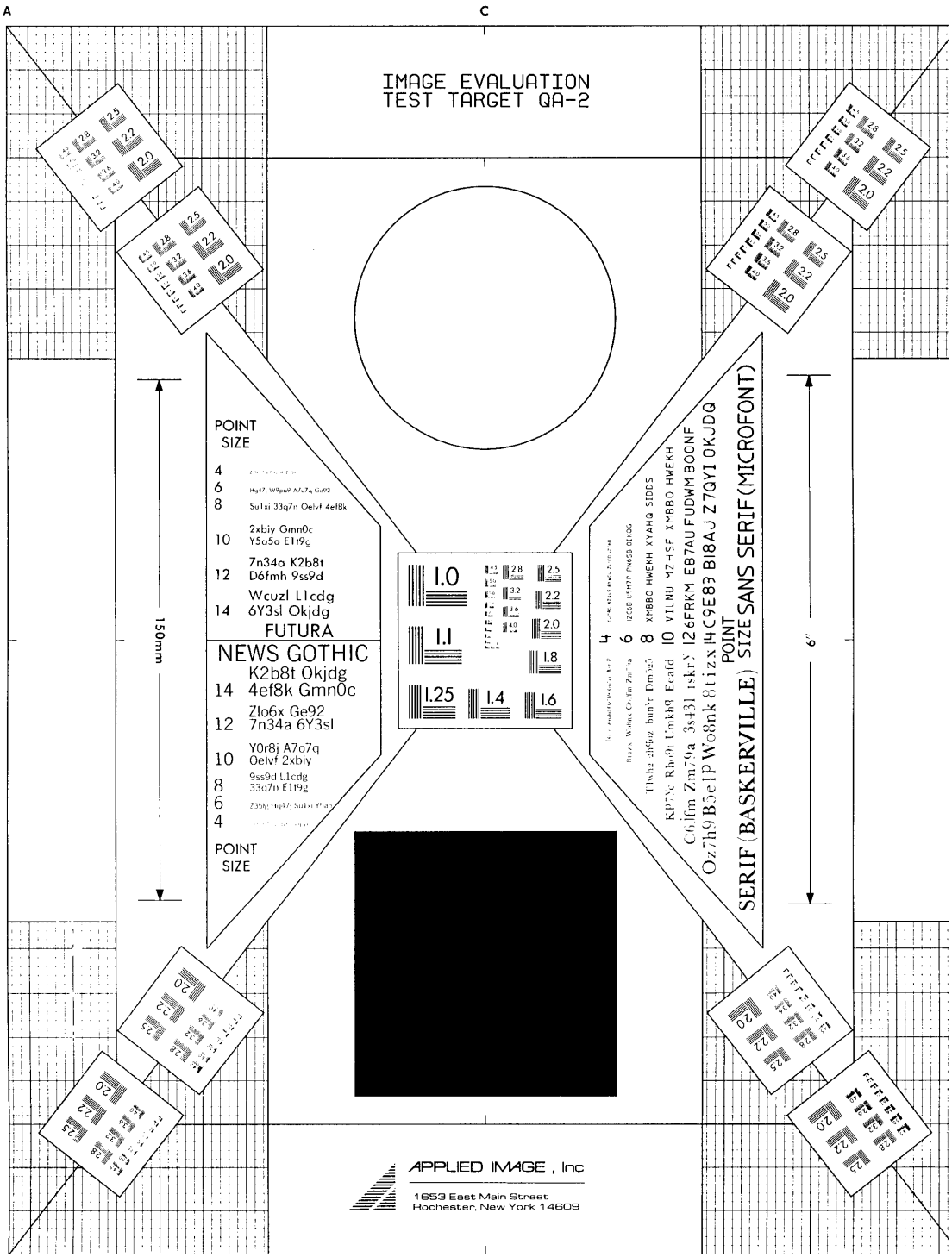
Static Marks: Static marks are exposed looking spots, streaks, or tree-like forms. They are caused by the discharge of static electricity. Images affected by this problem are to be re-filmed if the information of that document is illegible.

Over or Under Exposure: Overexposure produces filmed images that are too dark, and underexposure produces images that are too light. Images not meeting the selected limits are to be re-filmed.

Over or Under Development: Over development causes density to rise; under development causes it to drop. If the density does not fall into the required limits, the images (or entire roll) shall be re-filmed.

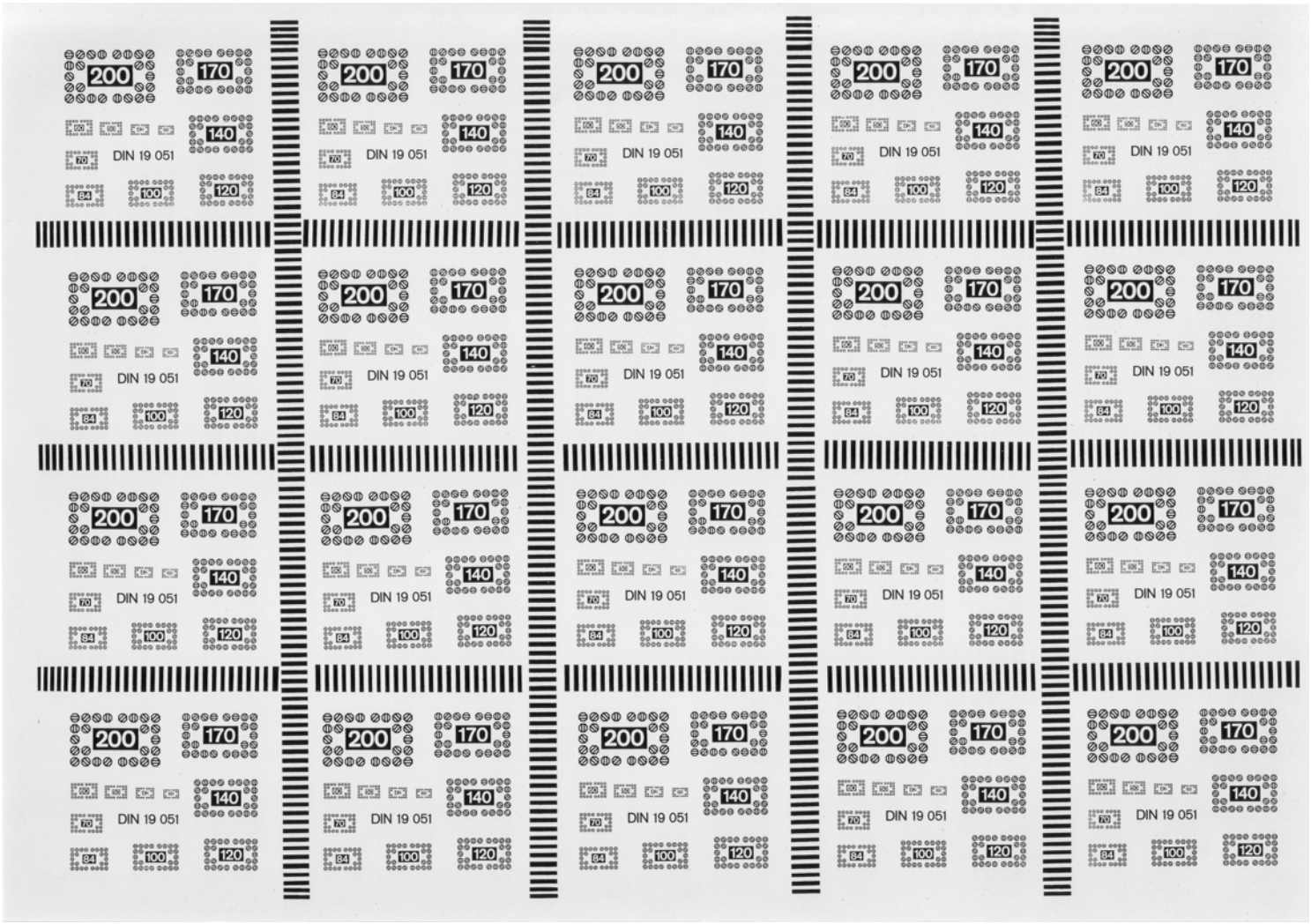
APPENDIX A

SAMPLE MICROFILM TARGETS used by the Department of Cultural Resources



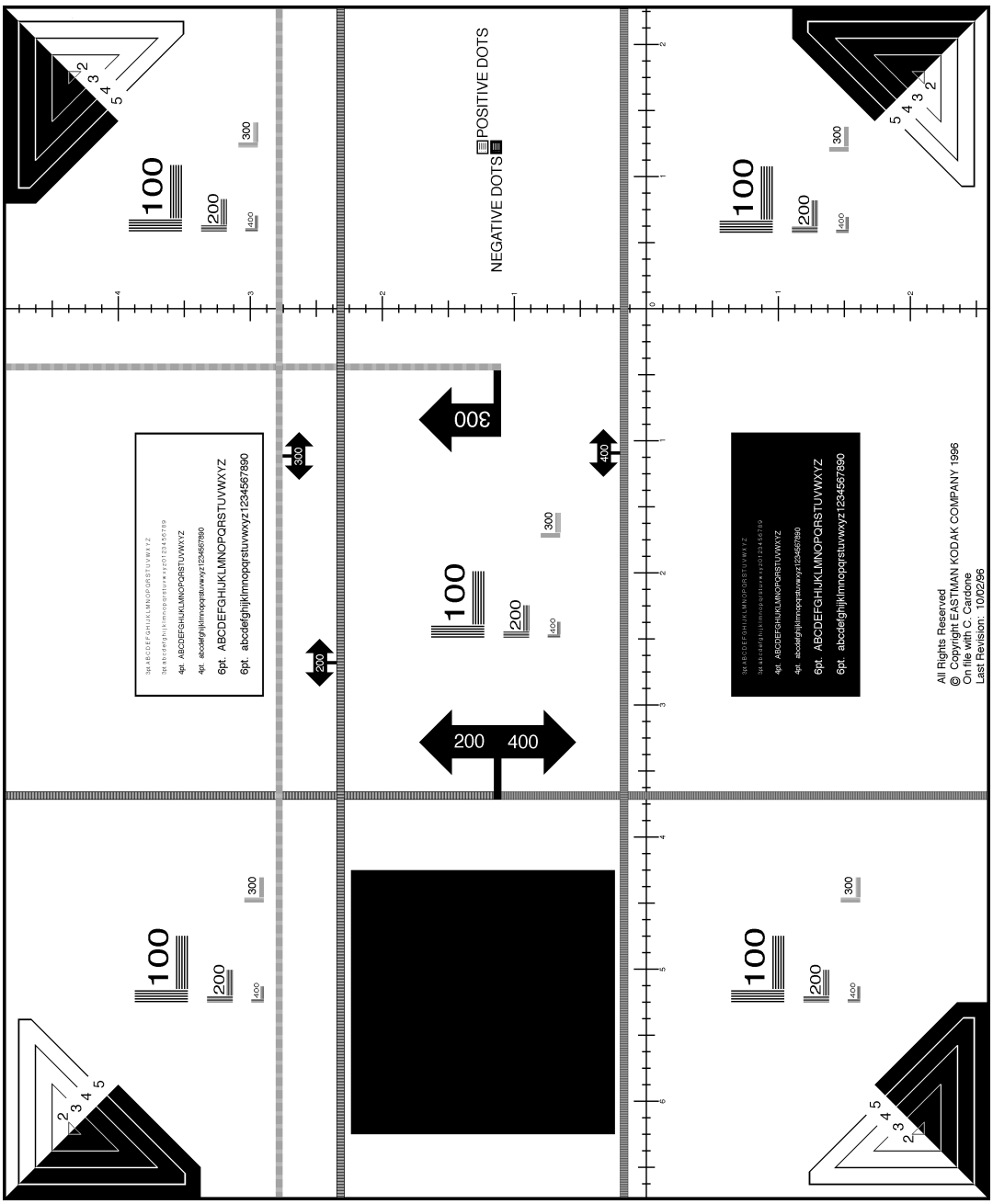
SAMPLE TECHNICAL TARGET - Not to be used for actual filming.

(Figure 1)



SAMPLE TECHNICAL TARGET -
SMA 51 archive writer **(Not to be used for actual filming)**

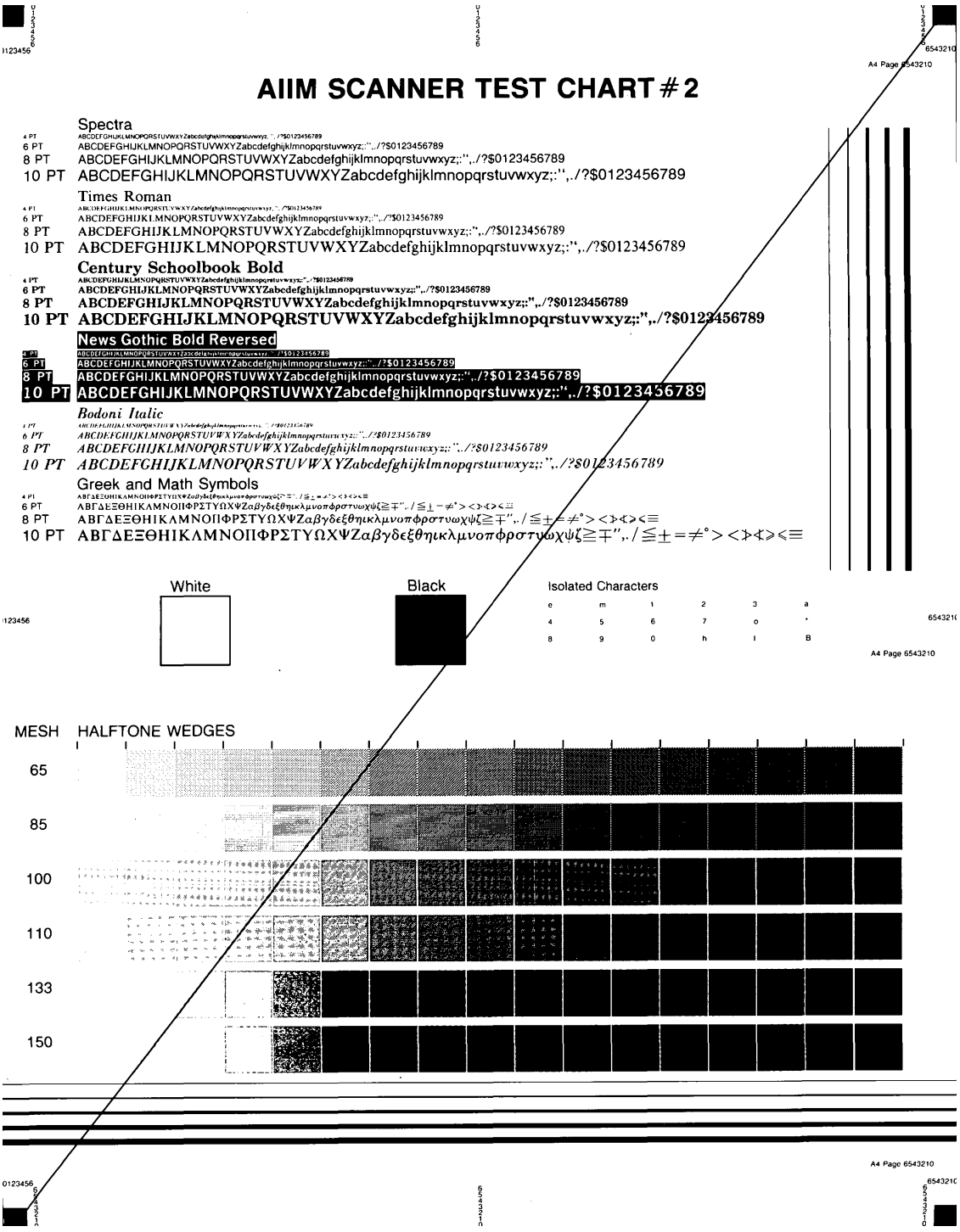
(Figure 2)



SAMPLE TECHNICAL TARGET -

Kodak i920 Archive Writer **(Not to be used for actual filming)**

(Figure 3)



SAMPLE AIIM SCANNER TEST CHART #2

(Figure 4)

(Figure 5)

STATE OF NORTH CAROLINA
Department of Cultural Resources

Microfilmed by
DIVISION OF HISTORICAL RESOURCES
Archives and Records Section
Raleigh, North Carolina

[Other agencies should develop their own targets.]

(Figure 6)

(Figure 7)

The following records are filmed in the order in which they were received by the Collections Management Branch of the Division of Historical Resources.

SAMPLE SPECIAL EXPLANATORY TARGET
(Figure 8)

CAuth

DEPARTMENT OF CULTURAL RESOURCES
DIVISION OF HISTORICAL RESOURCES

ARCHIVES AND RECORDS SECTION

CERTIFICATE OF AUTHENTICITY

This is to certify that the micrographics appearing on this film are true and accurate reproductions of records originated during the normal course of business by the

_____

_____

and consist of_____

The records begin with_____

_____

_____

and end with_____:_____

_____

_____

It is further certified that the above records were microfilmed in conformity with the provisions of the *General Statutes of North Carolina,* chapter 8-45.1 and 8-45.4, *"Uniform Photographic Copies of Business and Public Records as Evidence Act";* that the microphotography processes accurately reproduce the records so microfilmed; that the film forms a durable medium for reproducing the original, if necessary; and that the film used conforms to American National Standards Institute, *Photographic Films-Specifications for Safety Film, ANSI IT9.6-1991 (R-1996)* and American National Standards Institute, *Imaging Media (Film)-Silver Gelatin Type-Specifications for Stability, ANSI NAPM IT9.1-1996.*

This is further to certify that the microphotography processes were accomplished by the undersigned on the date and at the reduction ratio indicated below.

Date filming of this reel began _____ **Reduction Ratio_____**

Date filming of this reel ended _____

_____

Microfilm Camera Operator

[SAMPLE CERTIFICATE OF AUTHENTICITY (FILMING)]

(Figure 9)

DEPARTMENT OF
CULTURAL RESOURCES
DIVISION OF HISTORICAL RESOURCES
ARCHIVES AND RECORDS SECTION

CERTIFICATE OF AUTHENTICITY

This is to certify that the following images are true and accurate reproductions of records received by this agency for the purpose of scanning and creating microfilm from the scanned images. It is further certified that any micrographic format created through conversion or duplication of these images complies with the Uniform Photographic Copies of Business and Public Records as Evidence Act, as described in G.S. 8-45.1, and forms a durable medium for reproducing the original record. It is also certified that processes exist to prevent the unauthorized creation, addition, alteration, deletion, or deterioration of these images, and that these images were scanned under the direction of the undersigned on the date(s) indicated below.

_____

_____

and consist of

_____

The records begin with_____

_____

and end with_____

_____

Date scanning began_____ **Scanning Resolution (dpi)**_____

Date scanning ended_____

_____
Scanner Operator

[SAMPLE CERTIFICATE OF AUTHENTICITY (SCANNING)]
(Figure 10)

END OF BOOK

(Figure 11)

END
OF
REEL

(Figure 12)

CORRECTION

(Figure 13)

START OF RETAKE

(Figure 14)

SAuth

DEPARTMENT OF CULTURAL RESOURCES

DIVISION HISTORICAL RESOURCES

ARCHIVES AND RECORDS SECTION

SPLICING AUTHENTICITY CERTIFICATE

This is to certify that the following records of _____

_____

consisting of _____

_____

beginning with _____

_____

and ending with _____

_____

have been microfilmed to correct an error in, or to improve the quality of, the original film. The error or the unsatisfactory image or images will be cut out of the original film or will otherwise be obliterated and the retake beginning and ending as indicated above will be spliced in as a replacement.

This is further to certify that the microphotography processes were accomplished in accordance with chapters 8-45.1 - 8-45.4, inclusive, *General Statutes of North Carolina*, by the undersigned on the date and at the reduction ratio indicated below.

Date _____ Reduction Ratio:_____

_____
Microfilm Camera Operator

[SAMPLE SPLICING AUTHENTICATION CERTIFICATE (FILMING)]

(Figure 15)

SAuth

DEPARTMENT OF CULTURAL RESOURCES

DIVISION HISTORICAL RESOURCES

ARCHIVES AND RECORDS SECTION
SPLICING AUTHENTICITY CERTIFICATE

This is to certify that the following records of _____

_____

consisting of _____

_____

beginning with _____

_____

and ending with _____

_____

have been scanned to correct an error in, or to improve the quality of, the original film. The error or the unsatisfactory image or images will be cut out of the original film or will otherwise be obliterated and the retake beginning and ending as indicated above will be spliced in as a replacement.

This is further to certify that the microphotography processes were accomplished in accordance with chapters 8-45.1 – 8-45.4, inclusive, *General Statutes of North Carolina*, by the undersigned on the date and at the reduction ratio indicated below.

Date scanning began_____ Scanning Resolution (dpi)_____

Date scanning ended_____

_____
Scanner Operator

[SAMPLE SPLICING AUTHENTICATION CERTIFICATE (SCANNING)]

(Figure 16)

END
OF
RETAKE

(Figure 17)

(Records Log) **Name of Agency/Office**

Reel No.	Case No.	No. Exposures or Pages	Date Filmed	Camera Operator	Comments

RECORDS LOG

(Figure 18)