HYBRID MICROFILM GUIDANCE

NOTE FROM OHIOERC: As the use of digital alternatives has increased, reliance and support for microfilm has declined. However, this guidance remains available to support archival research and access to legacy collections that are still preserved on microfilm. Please check back with OhioERC for updated resources and expanded guidance as we continue to evolve our support in this area.

INTRODUCTION:

The development of document image processing has evolved to include the conversion of digital images to archival quality microfilm via a device commonly called an "archive-writer." The Ohio Electronic Records Committee (OERC) recognizes that this evolution of hardware and associated software provides a long-term eye-readable preservation option for records that have been born-digital or converted to digital via image processing.

SCOPE:

This document provides guidance for Ohio public sector agencies for the conversion of records to microfilm, which were either born-digital or converted via image processing, for the purpose of maintaining official records in an eye-readable, micrographic format and/or as a redundancy or back-up copy.

INTENT:

This guidance is intended to assist Ohio state agencies, local governments, and public educational institutions with ensuring that the records they convert from a digital format to microfilm are authentic, reliable, have integrity, and are usable. It is not the intention of the OERC to impose standards upon a public body that will reduce the intended benefits of the recordkeeping system. The ultimate criteria are that the records be legible and accessible for their intended use.

RECORDKEEPING BASICS:

Selecting an appropriate recordkeeping system is like selecting the appropriate level of insurance for one's organization:

- records with a greater value to the agency warrant a greater level of insurance
- records with lesser value "may" warrant a lesser level of insurance

Regardless of the value, all records and recordkeeping systems maintained by a state agency, local government, and/or public educational institution must conform to four basic characteristics:

- **Authentic**: An authentic record is one that can be proven to be what it purports to be, to have been created or sent by the person purported to have created or sent it, and to have been created or sent at the time purported. To ensure the authenticity of records, agencies and local governments should implement and document policies and procedures which control the creation, receipt, transmission, maintenance and disposition of records to ensure that records creators are authorized and identified and that records are protected against unauthorized addition, deletion, alteration, use and concealment.

- **Reliable**: A reliable record is one whose contents can be trusted as a full and accurate representation of the transactions, activities or facts to which they attest and can be depended upon in the course of subsequent transactions or activities. Records should be created at the time of the transaction or incident to which they relate, or soon afterwards, by individuals who have direct knowledge of the facts or by instruments routinely used within the business to conduct the transaction.
- **Integrity:** The integrity of a record refers to its being complete and unaltered. It is necessary that a record be protected against unauthorized alteration. Records management policies and procedures should specify what additions or annotations may be made to a record after it is created, under what circumstances additions or annotations may be authorized, and who is authorized to make them. Any authorized annotation; addition or deletion to a record should be explicitly indicated and traceable.
- **Usable:** A useable record is one that can be located, retrieved, presented and interpreted. It should be capable of subsequent presentation as directly connected to the business activity or transaction that produced it. The contextual linkages of records should carry the information needed for an understanding of the transactions that created and used them. It should be possible to identify a record within the context of broader business activities and functions. The links between records that document a sequence of activities should be maintained. The records must be accessible for the duration of the retention period.

The OERC strongly encourages Ohio public sector agencies and organizations to recognize their responsibilities associated with the management of their records and information. These include the following:

- The development and/or and maintenance of a record retention and disposal schedule.
- Implementation of a retention and disposal policy that compliment appropriate business practices, policies, and procedures.
- Selection of appropriate recordkeeping system(s).
- Development of a business analysis to determine whether image processing and/or microfilming will be a cost effective, efficient and durable method of managing records through the retention period of the record.
- Development of a quality assurance level of acceptance that confirms that the expectations of the agency or organization are being met.

EQUIPMENT BASICS:

There are two basic types of equipment that are used to create hybrid microfilm:

- Archive-writer: a device that converts digital images to microfilm; while typically more expensive, the agency has the ability to make sure a quality digital image has been captured prior to committing it to microfilm.

- Scanner/filmer: an imaging device with two cameras, one that scans a digital image and one that images the document to microfilm; while less expensive, this equipment type is not recommended as it is more complex to correct documents that are scanned poorly.

STANDARD OPERATING PROCEDURES:

A key component of an efficient, auditable operation is the development of implementable standard operating procedures (SOP). An SOP is a document or a collection of documents that defines the way certain functions or processes are always performed. The SOP should define the basic processes involved in the production of microfilm from a digital or digitized format. Types of functions or processes may include, but may not be limited to:

- A discussion of the role of hybrid microfilm within your organization's records management program
- Equipment testing requirements and frequency
- Required technical specifications
- Document preparation functions common to all jobs
- Pre-production testing
- Index data and film backup
- Production Quality Control
- Access and security
- Administration and maintenance
- Audit trails
- Disaster recovery
- Employee safety

TECHNICAL SPECIFICATION RECOMMENDATIONS:

There are various technical specifications that an organization needs to consider in the production of hybrid microfilm. The following are suggested best practice guidelines:

- **Microfilm Type:**
  - **Original Master:** The master microfilm for permanent records should be 16mm, 35mm, or 105mm negative non-perforated silver-gelatin on a polyester base, as described in ANSI IT9.1. The film should have an LE-500 rating (Life Expectancy of 500 years).
  - **Duplicate:** If the film is expected to be handled more than 10 times during its lifetime, a duplicate copy should be made. The use copy may be silver-gelatin film, diazo film or vesicular film. Diazo film is the recommended and preferred type for usage film.

- **Digital Image Resolution:** The resolution of digital images should be a minimum of 300dpi; this corresponds to the OERC recommendations for the imaging of public records.
- **Reduction Ratio:** Due to the various sizes and types of documents that can be imaged, it is not practical to specify which reduction ratio (scale) should be used when converting scanned images to microfilm. A reduction ratio should be selected that is capable of producing legible images.

  A lower reduction ratio will typically provide higher image quality. Tradeoffs exist between image quality, storage density and film usage. If image quality alone is considered, larger images are usually better. A larger image is generally more tolerant of poor quality original documents and other microfilm variables such as density fluctuations, camera vibrations, and resolution loss.

  The standards require the characteristics of the record, the tasks the system is designed to perform, and the user requirements to be satisfied be taken into account when selecting a reduction ratio. Lastly, an appropriate reduction ration is also dependent upon the size of film one is creating: 16mm, 35mm, or 105mm.
- **Image Sequencing:** Images on the microfilm should be organized so the records can be accessed in the same way they would if the microfilm had been created from paper systems. The equipment used to create microfilm from digital images or digital originals places the digital object in the sequence in which they are received, therefore, public sector organizations should determine how records will be accessed in the microfilm format and define a proper sequence for the images.
- **Indexing:** It is preferable for the content of all index fields associated with the images on individual rolls to be provided in a microfilm format. It is strongly encouraged to create rolls of microfilm with only one record series on each roll.
- **Blip:** At minimum, single level blip marks should be used, even if there is no intention of utilizing them. This may aid your organization in the future migration of the microfilm images should it become necessary. Image marks or blips that are used to identify the frame number of each frame on a roll of film. They are created by the camera at the time of the film image conversion, and are used to facilitate rapid retrieval of items from a roll. Each frame number is uniquely identified by a sequential number on each roll.
- **Targets:** The following film targets are required by the standards to certify the authenticity of the records being filmed (see Appendix C for examples):
  - At FRONT of Roll of microfilm before images:
    - Background Density Target: The acceptable density range on targets shall be 0.80 – 1.25. There should not be more than a .20 density variation on targets in a single roll.
    - Resolution Test Target (Manufacture supplied; test targets such as ANSI/AIIM Test Chart # 2 are designed for traditional

microfilm creation and do not perform as well with archive-writes)
    - Certificate of Authenticity: This certification form should be signed by the department or agency head (records custodian) along with the document imaging supervisor, and the hybrid microfilm equipment operator.
    - Title Target: this should include Title of records, first record and last record. Film created for (agency). Reduction Ratio, File type, Type of equipment, equipment number#, and Roll identification
  - At END of Roll of microfilm after images:
    - *Equipment Operator Certificate:* Date of film creation, Roll identification, Title of records, Equipment #, Number of images, signature of operator certifying that the image of records on this film are true copies of the original.
    - Resolution Test Target
    - Background Density Target
- **Film Leader/Trailer**: **Its recommended that each** roll of microfilm should have a leader of no less than a 3-foot of film before the first target of the roll and no less than a 3-foot trailer after the last target of the roll of film.
- **Silver Film Processing:** The standards require exposed microfilm to be processed within two (2) weeks of the completion of the image capture. Processing must be carefully controlled in order to ensure consistent results. Film produced for purposes of managing public records should be processed in accordance with ISO 18901:2002 – *Imaging materials - Processed silver-gelatin type black-and-white films - Specifications for stability* (as amended or replaced) and ANSI/AIIM MS23-1998 – *Practice for Operational Procedures / Inspection and Quality Control of First-Generation Silver-Gelatin Microfilm of Documents* (as amended or replaced).
- **Residual Thiosulfate:** It is recommended that testing for residual thiosulfates (commonly known as methylene-blue testing) be performed not less than once per month. LE-500 films should contain no more than 0.014 g of thiosulfate ion per in^2. In normal silver film processing, fixer or "hypo" is used to remove unused silver particles from the emulsion of the film. If left in the emulsion, these silver particles will continue to react and over time begin to alter the appearance of the film. If left on the film this fixer, a basic (salty) compound, will damage the film image, and it must be sufficiently washed from the film in order to reduce the possibility of damage to the film in the future. Residual thiosulfate should be measured using ANSI/NAPM IT9.17-1993 - *Photography-Determination of Residual Thiosulfate and Other Related Chemicals in Processing Photographic Materials-Methods Using Iodine-Amylose, Methylene Blue and Silver Sulfide*_(as amended or replaced). In cases where an outside service provider is processing the film, test results should be submitted monthly. In the event of a failure, all film processed after the last successful test should be recalled, rewashed and retested in order to ensure that low

levels of residual thiosulfates reside on the film. This re-washing process must be performed within two weeks of the original film processing.

- **Quality Control/Inspection of Newly Processed Film:** Quality control processes should be implemented for each application to be microfilmed. Quality control is defined as those steps incorporated into the production processes that are designed specifically to reduce error. Quality criteria may include, but may not be limited to:
    - Overall legibility
    - Smallest detail legibility captured
    - Completeness of detail
    - Dimensional accuracy compared with the original
    - Completeness of overall image area
    - Density
    - Image skew
    - Image orientation
    - Index data accuracy
    - Image and index format compliance
    - Newly processed film should be inspected for both major and minor defects. Identification of these defects may lead to the creation of retakes for a given roll or if the defects are indeed major, the entire roll may be rejected. Examples of minor defects (those that can be repaired by recreating and replacing the defected image) would be skewed images, images in a wrong orientation, or corner or overlapped images. Major defects (errors cannot be repaired) may include a failure to meet minimum density requirements or incorrect start or end of roll targets. For more information regarding inspection of original microfilm see ANSI/AIIM MS23-1998 – *Practice for Operational Procedures / Inspection and Quality Control of First-Generation Silver-Gelatin Microfilm of Documents* (as amended or replaced).
- **Splicing and Retakes:** The standards do not allow a roll of film produced from digital images to contain splicing or retakes.
- **Film Storage:** Under ideal circumstances, properly manufactured, processed and stored polyester based silver gelatin microfilm (LE-500) can be expected to last for as much as 500 years. The conditions required to meet this life expectancy are: (1) the residual thiosulfate levels are sufficiently low, and (2) the film is stored in an environmentally controlled storage facility. An environmentally controlled facility should meet the following minimum requirements:
    - The original (or security film) should be stored in a separate building from the duplicate or working copy.
    - The storage room must be separate from other types of storage, offices or work areas.
    - The storage room must be equipped with a fire alarm system.
    - Stored in a constant cool environment with temperatures not exceeding 70 degrees

- The humidity of the storage facility must be maintained at 35% +/- 5%
- Dissimilar films (silver, diazo, vesicular) should not be stored in the same storage container or cabinet.
- Contained in acid free cardboard boxes or inert plastic containers.
- At minimum, each year a random sample of not less than 2% of the total number of rolls stored in the facility should be examined to determine if deterioration is taking place. Each successive year the sampling population should include new rolls stored in the facility and the balance from the rolls not examined in the previous year.

For more information regarding storage environment see ISO 18911:2000 – *Photography—Processed safety photographic films—Storage practices (formerly ANSI/NAPM IT9.11-1993)* (as amended or replaced).

- **Expungement:** Expungement—the process by which record of criminal conviction is destroyed or sealed—is the removal or destruction of an image from a microfilm recording. This procedure requires that no record or identification of the documentation ordered expunged remain on the film. If expungement is necessary, the standards require the abrasion method. Punching a hole in the image, blotting out the image with any type of ink or marker or by chemically removing the image should not be used so as not to risk damaging surrounding images. Any duplicates in existence should be recalled, destroyed and re-issued. An expungement certificate should be maintained that details the reason for the expungement, the authority to expunge, the date of the original filming and the date of the expungement. The expungement certification should also indicate that the original and all copies have been expunged, including the digital version from which the film was created.

FINAL CONSIDERATIONS:

Hybrid Microfilm takes advantage of the need to only image a document once, as opposed to digitally scanning and then imaging under a traditional microfilm camera. While this is advantageous, the image quality is only as good as the image quality produced through one's image processing program. As such, your organization should be fully conversant with the OERC's Digital Document Imaging Guidelines before embarking upon a hybrid microfilm project.

If microfilm is produced by a third party, the public sector organization should hold the vendor responsible for ensuring that they are in compliance with these guidelines.

APPENDIX A: ACKNOWLEDGMENTS:

The Hybrid Microfilm Guidelines Workgroup consulted the following resources in the development of these guidelines:

- Sandy Algin, System Developer, Butler County, Ohio
- State of Michigan, Department of History, Division of Arts and Libraries
- State of New Jersey, Department of State, Division of Archives and Records Management
- State of Oregon, Secretary of State, Archives Division
- State of South Carolina, Department of Archives and History

The Hybrid Microfilm Guidelines Workgroup consisted of:

- Craig Brown, Columbiana County
- Dave Keener, Lorain County
- Daniel Noonan, The Ohio State University
- John Runion, Stark County

APPENDIX B: REFERENCES:

The following standards and recommended practices issued by the American National Standards Institute (ANSI), the Association for Information and Image Management (AIIM), the National Association of Photographic Manufacturers (NAPM) and the International Association for Standards (ISO) may contain additional information that will assist public sector organizations in implementing a hybrid microfilm program.

- ANSI/AIIM MS6-1981 (R1993) (R1999) – *Microfilm Packaging Labeling*
- ANSI/AIIM MS8-1988 (R1998) – *Image Mark (Blip) Used in Image Mark Retrieval Systems*
- ANSI/AIIM MS14-1988 (R1996) – *Specifications for 16 and 35 mm Roll Microfilm*
- ANSI/AIIM MS23-1998 – *Practice for Operational Procedures / Inspection and Quality Control of First-Generation Silver-Gelatin Microfilm of Documents*
- ANSI/AIIM MS45-1990 – *Recommended Practice for Inspection of Stored Silver Gelatin Microforms for Evidence of Deterioration*
- ANSI/AIIM TR2-1998 – *Glossary of Document Technologies*
- ANSI/AIIM TR34-1996 – *Sampling Procedures for Inspection by Attributes of Images in Electronic Image Management (EIM) and Micrographics Systems*
- ANSI/NAPM IT9.17-1993 – *Photography-Determination of Residual Thiosulfate and Other Related Chemicals in Processing Photographic Materials-Methods Using Iodine-Amylose, Methylene Blue and Silver Sulfide*
- ISO 15489-1:2001 – *Information and Documentation - Records Management - Part 1 - General*
- ISO 15489-2:2001 – *Information and Documentation - Records Management - Part 2 - Guidelines*
- ISO 18901:2002 – *Imaging materials - Processed silver-gelatin type black-and-white films - Specifications for stability*
- ISO 18911:2000 – *Photography—Processed safety photographic film —Storage practices (formerly ANSI/NAPM IT9.11-1993)*

APPENDIX C: MICROFILM TARGET EXAMPLES:

INSTRUCTIONS AND TARGETS FOR MICROFILM CREATED FROM DIGITAL IMAGES

The following eight pages are targets and examples of targets to be utilized in the creation of microfilm from digital images. The sequence in which they are laid out is the sequence they should appear on the film. These are used in place of the typical targets used by a camera operator when filming documents for microfilm.

The heading, letterhead or logo of the agency for whom the microfilm is being created should be inserted at the tops of the targets.

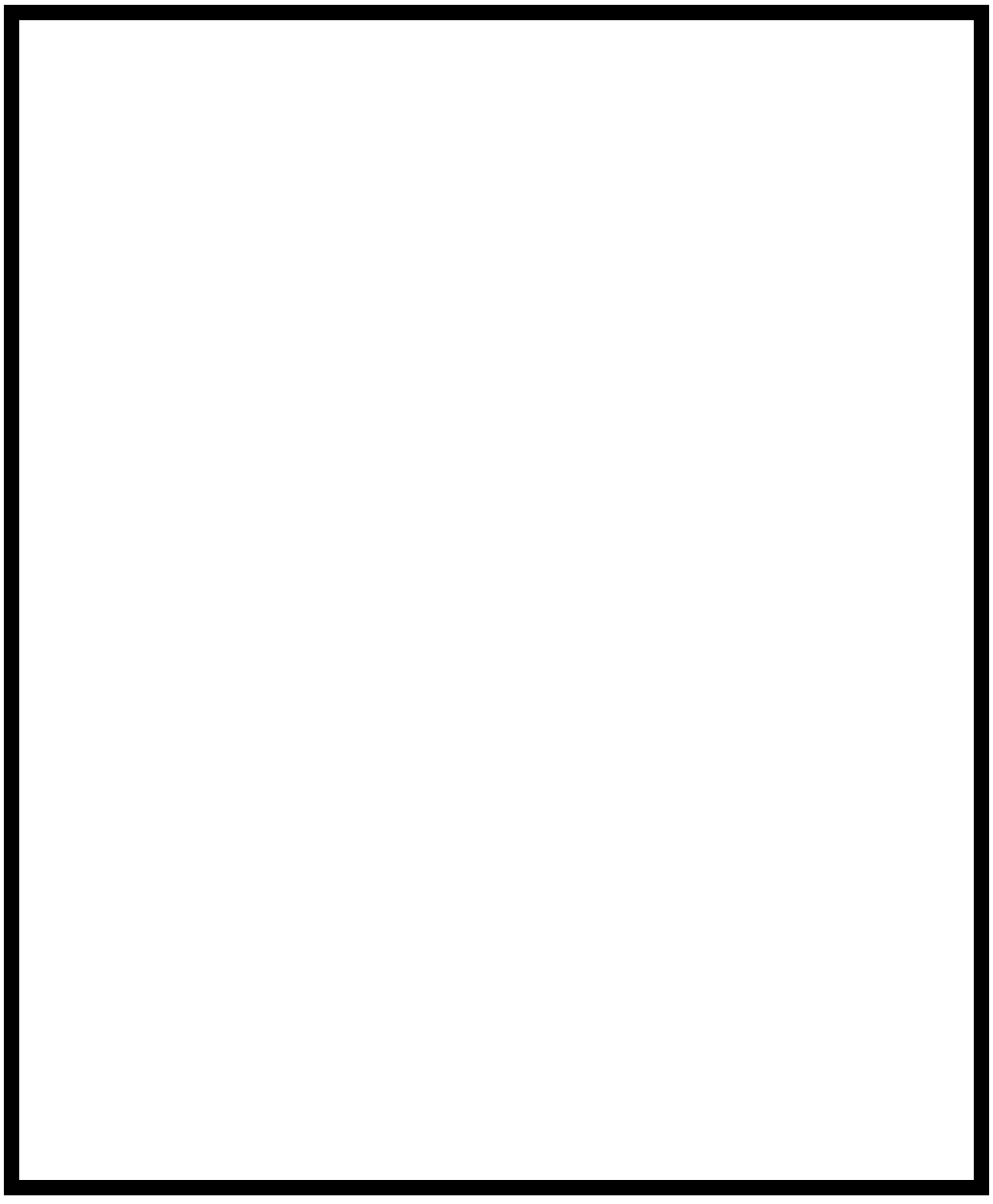
At FRONT of roll of microfilm film before images:

- ✓ Front Background Density Target
- ✓ Front Resolution Target (The enclosed is an example only; actual target must be the manufacturer supplied target or purchased from ANSI or ISO)
- ✓ Certificate of Authenticity
- ✓ Title Target

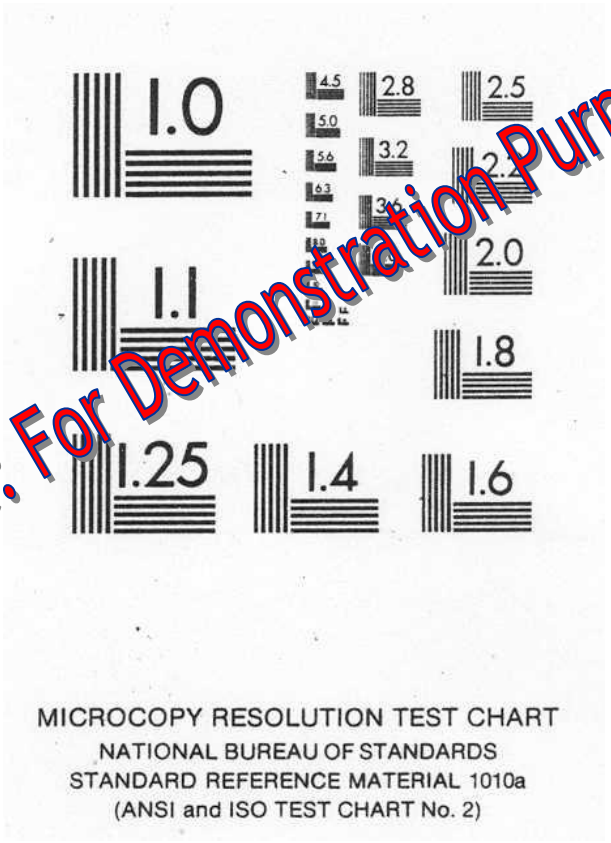
At END of film after images:

- ✓ Equipment Operator's Certificate (operator of the equipment that is creating the microfilm)
- ✓ End Resolution Target (The enclosed is an example only; actual target must be the manufacturer supplied target or purchased from ANSI or ISO)
- ✓ End Background Density Target

FRONT: BACKGROUND DENSITY TARGET



FRONT: RESOLUTION TARGET



FRONT: CERTIFICATE OF AUTHENTICITY

This is to certify that the digital images appearing on this roll of microfilm are complete and accurate reproductions of the original records and have been digitally imaged in the normal course of governmental affairs.

AUTHORIZATION:

Date	**Signature of Custodian**

For microfilm creator use

Date	**Signature of Imaging Supervisor**
	Signature of Hybrid Equipment Operator

FRONT: TITLE TARGET

TITLE OF RECORD SERIES: _____

_____

_____

FIRST RECORD: _____

LAST RECORD: _____

FILM CREATED FOR (AGENCY): _____

REDUCTION RATIO: _____

FILM TYPE: _____

TYPE OF HYBRID EQUIPMENT: _____
(utilized to create microfilm from digital images)

HYBRID EQUIPMENT NUMBER: _____

ROLL IDENTIFICATION

_____

END: HYBRID EQUIPMENT OPERATOR'S CERTIFICATE

CREATION DATA

DATE OF FILM CREATION: _____ **ROLL IDENTIFICATION #:** _____

FILM CREATED FOR (AGENCY): _____

TITLE OF RECORD SERIES: _____

_____

HYBRID EQUIPMENT #: _____ **NUMBER OF IMAGES:** _____

INDEXING DATA

BEGINS WITH: _____

ENDS WITH: _____

MISSING DOCUMENTS (IF NEEDED)

_____

_____

_____

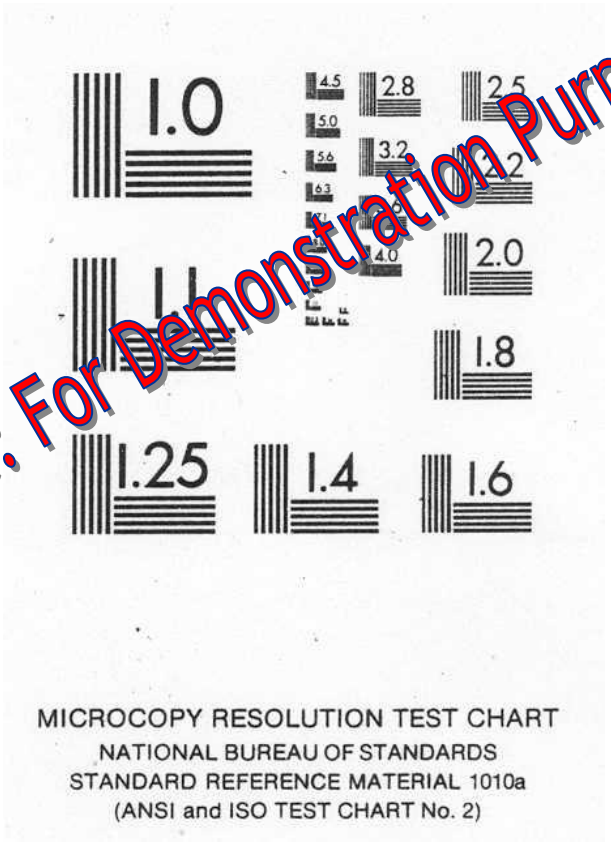
Microfilm of the above digitally imaged records was created by (name of agency): _____

I hereby certify that the images of the records appearing in this roll of film are true and accurate copies of the original documents described above.

_____

Signature of Hybrid Equipment Operator

END: RESOLUTION TARGET



END: BACKGROUND DENSITY TARGET