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WASHINGTON, D.C.

AIIM MS32-1996

STANDARD

Standard Recommended Practice —
Microrecording of
Engineering Source Documents
on 35mm Microfilm



AIIM MS32-1996

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**Standard for Information
and Image Management —**

**Standard Recommended Practice —
Microrecording of Engineering Source
Documents on 35 mm Microfilm**

Association for Information and Image Management International

Abstract:

This standard specifies the procedures, dimensions, and quality values governing the microrecording of engineering documentation on 35 mm microfilm.

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Foreword (This foreword is not part of *American National Standard for Information and Image Management — Microrecording of Engineering Source Documents on 35 mm Microfilm, ANSI/AIIM MS32-1996*.)

Drawing offices produce, in addition to drawings, documents that differ in purpose, form, and intent. The microfilming of these documents enables the information they contain to be readily handled, transported, and stored. Micrographics technology is such that faithful constitution of the microform image can best be accomplished if the original document satisfies certain requirements. Those requirements are defined in applicable documents, which appear in the reference section of this standard.

The committee that prepared this standard has assumed that documents to be microcopied have been prepared/originated in accordance with the prescribed requirements. The user should recognize that accurate reproduction of the microimage can be readily achieved only if the prescribed requirements, as well as the dimensions and other quality specifications that follow, have been met.

It should be further recognized that the dedicated image area, which is specified in this document, is the standard accepted by member countries of the International Organization for Standardization. Thus, magnification of the dedicated image area can be expected to be universally accepted regardless of the size of the original document when microfilmed.

Limitations of document size are grouped for specific reduction ratios. Each group includes:

- the ISO series A paper sizes;
- the ISO series B paper sizes;
- the ANSI Y14 paper sizes (8 1/2 inch by 11 inch base size).

These provisions have been made in accordance with the proposed U.S.A. conversion to the metric system, as well as with existing current practices.

The user is advised that the metric dimensions appearing in this document are direct conversions from the U.S. dimensions in actual use. Consequently, the metric dimensions and tolerances that appear in ISO 3272, and which are based on the selection of metric whole numbers, may not correspond to the metric dimensions in this document. The committee felt that accuracy, rather than metric convention, was paramount in documenting the state of the art in the United States.

Suggestions for improvement of this Standard Recommended Practice are welcome. They should be sent to the Chair of the AIIM Standards Board, Association for Information and Image Management International, 1100 Wayne Avenue, Suite 1100, Silver Spring, MD 20910-5603. The AIIM Standards Board had the following members at the time it approved this Standard Recommended Practice:

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Stephen Urban	Delta Information Systems

This standard was originally approved by the AIIM Committee C7. C7 has since been combined with C4 and C11 to form C23, Micrographics Technologies. C23 had the following members at the time it approved this revision:

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<u>Name of Representative</u>	<u>Organization Represented</u>
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March, Emrys	Eastman Kodak Corporation
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Neale, William	First Image Management Company
Nye, Wayne	Anacomp, Inc.
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Vaiana, Paul F.	NMT Corporation
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American National Standard for Information and Image Management —

Standard Recommended Practice — Microrecording of Engineering Source Documents on 35 mm Microfilm — ANSI/AIIM MS32-1996

1 Scope and purpose

This standard specifies the procedures, dimensions, and quality values governing the microrecording of engineering documentation on 35 mm microfilm. This includes procedures, dimensions, and quality values for:

- microform physical characteristics that are related to engineering source document microfilming (characteristics such as curl, durabilities, and orientation)
- microimages created by placement of engineering source documents on the copyboards of 35 mm planetary cameras
- the duplication of the original microimage

The scope of this standard does not include microrecording of cartographic and architectural material, or other engineering graphics that do not conform to requirements of pertinent standards under ANSI/ASME Y14, Drafting Practice.

This standard assumes that source documents are of satisfactory quality for conversion to a film medium and that the user is applying photographic properties of an original drawing or high quality copy. The character and line sizes are assumed to comply with ANSI/AIIM Standard Y14.2M Line Conventions and Lettering and the distinction between the data and background is high-contrast black and white.

ANSI/AIIM MS23 Standard Recommended Practice for operational procedures/inspection and quality control of first-generation, silver microfilm of documents (the latest version of that publication) should be used to establish the resolution and background density requirements if the source material is of lesser quality.

2 References

All standards are subject to revision. When the following documents are superseded by an approved revision, that revision may apply.

2.1 Referenced international standards

ISO 417-1993, Photography — Determination of residual thiosulfate and other related chemicals in processed photographic materials — Methods using iodine-amylose, methylene blue and silver sulfide.

ISO 3272 1-5, Microfilming of technical drawings and other drawing office documents.

ISO 3334-1989, Micrographics — ISO resolution test chart no. 2 — Description and use.

2.2 Referenced American national standards

ANSI/AIIM MS1-1988, Information and image management — Recommended Practice for alphanumeric computer-output microforms — Operational practices for inspection and quality control.

ANSI/AIIM MS9-1987, Information and image management — Method for measuring thickness of buildup area on unitized microfilm carriers (aperture, camera, copy, and image cards).

ANSI/AIIM MS10-1987(R1993), Information and image management — Method for determining adhesion of protection sheet to aperture adhesive of unitized microfilm carrier (aperture card).

ANSI/AIIM MS14-1988, Information and image management — Specifications for 16 and 35 mm roll microfilms.

ANSI/AIIM MS19-1993, Information and image management — Recommended practice for identification of microforms.

ANSI/AIIM MS23-1991, Information and image management — Practice for operational procedures/inspection and quality control of first generation, silver-gelatin microfilm of documents.

ANSI/AIIM MS26-1990, Information and image management — 35 mm planetary cameras (top light) — Procedures for determining illumination uniformity of engineering drawings.

ANSI/AIIM MS41-1988, Information and image management — Dimensions for unitized microfilm carriers (aperture, camera, copy and image cards).

ANSI/ASME Y14.1M-1992, Metric drawing sheet size and format.

ANSI/ASME Y14.2M-1992, Line conventions and lettering.

ANSI IT2.19-1990, Photography — Density measurements — Geometric conditions for transmission density.

ANSI IT9.2-1991, Imaging media — Photographic processed film, plates, and papers — Filing enclosures and storage containers.

ANSI IT9.5-1992, Imaging media — Ammonia processed diazo films — Specifications for stability.

ANSI IT9.6-1991, Photography — Photographic film — Specifications for safety film.

ANSI IT9.10-1991, Imaging media — Determination of the curl of photographic film.

ANSI IT9.11-1991, Imaging media — Processed safety photographic film — Storage.

ANSI/NAPM IT1.52-1994, Photography — Film dimensions — Film for documentary reproduction.

ANSI/NAPM IT9.1-1992, Imaging media (film) — Silver-gelatin type — Specifications for stability.

ANSI PH1.19-1986, Designation of emulsion side.

ANSI PH1.30-1990, Photography (film) — Films in rolls for recording instruments and miscellaneous uses — Dimensions.

ANSI PH1.51-1983, Photography (film) — Micrographic sheet and roll film — Dimensions.

ANSI PH3.45-1971(R1992), Contact printers, contact uniformity test.

2.3 Other referenced standards

MIL-M-9868E (2) — Military Specification — Microfilming of engineering documents, 35 mm, requirements for, 10 February 1993.

MIL-C-9877B — Military Specification — Card, aperture, 24 April 1992.

2.4 Referenced publications

AIIM TR2-1992, Technical Report for the Association for Information and Image Management — Glossary of imaging technology.

3 Definitions

The following definitions apply to terms that appear in this standard. Other terms may be defined in *ANSI/AIIM TR2, Technical Report for Information and Image Management — Glossary of imaging technology.*

3.1 frame pitch: The frame pitch is the distance measured from one point on a film frame to the corresponding point on the succeeding film frame.

3.2 microrecording: See "Microform production" in AIIM TR2.

4 General requirements

4.1 Film stock

All 35 mm unexposed, unperforated microfilm shall meet the following requirements:

- ANSI IT9.6
- ANSI PH1.51 (applicable dimensions)

Silver-gelatin type microfilms, intended for archival application, shall meet the requirements of ANSI IT9.1.

Other types of microfilms should be processed to comply with the manufacturers' recommendations.

4.2 Quality

The illumination, resolution, and density of each image recorded on the film shall be such that every line and character of the document is recorded with sufficient contrast and definition to be legible and reproducible up to and including the distribution copy. (See 5.5.1, 5.5.2, and 5.5.3 for information on illumination, resolution, and density, respectively.)

The film shall be free of scratches, finger marks, drying marks or any other defect that would impair either the quality of a reproduction from the film or its legibility when used in a microfilm reader.

4.3 Physical characteristics

4.3.1 Curl

All microfilm shall be free of excessive curl.

Exposed and processed microfilm to be mounted in aperture cards shall be measured for maximum curl, in accordance with Method B in ANSI IT9.10. Transverse curl (35 mm) should not exceed 1.6 mm (0.06 inches) and longitudinal curl (1.87 inches or 47.5 mm) should not exceed 2.4 mm (0.09 inch). (See annex A, clause 1.)

4.3.2 Durability/longevity

(See annex A, clause 2.)

4.3.3 Orientation

Microimages on first (odd) generation (camera/ original) film shall be right reading through the base side of the film material. (See example of right reading in figure 1.) Microimages on second (even) generation (duplicate) film shall be right reading on the emulsion (light-sensitive) side of the film. (See example of right reading in figure 1.)

Microimages on odd generation film (when applied to aperture cards) shall be placed in the card with the base of the film toward the printed (face) side of the card. The emulsion shall be toward the unprinted (reverse) side of the

card. (See annex A, clause 3.) Microimages on even generation film (when applied to aperture cards) shall be placed in the card with the base of the film toward the unprinted (reverse) side of the card. The emulsion shall be toward the printed (face) side of the card. (See annex A, clause 3.)

The preferred orientation of microimages on both odd and even generation microfilm shall be upright reading when the printed (face) side of the card is upright reading. (See annex A, clause 3.)

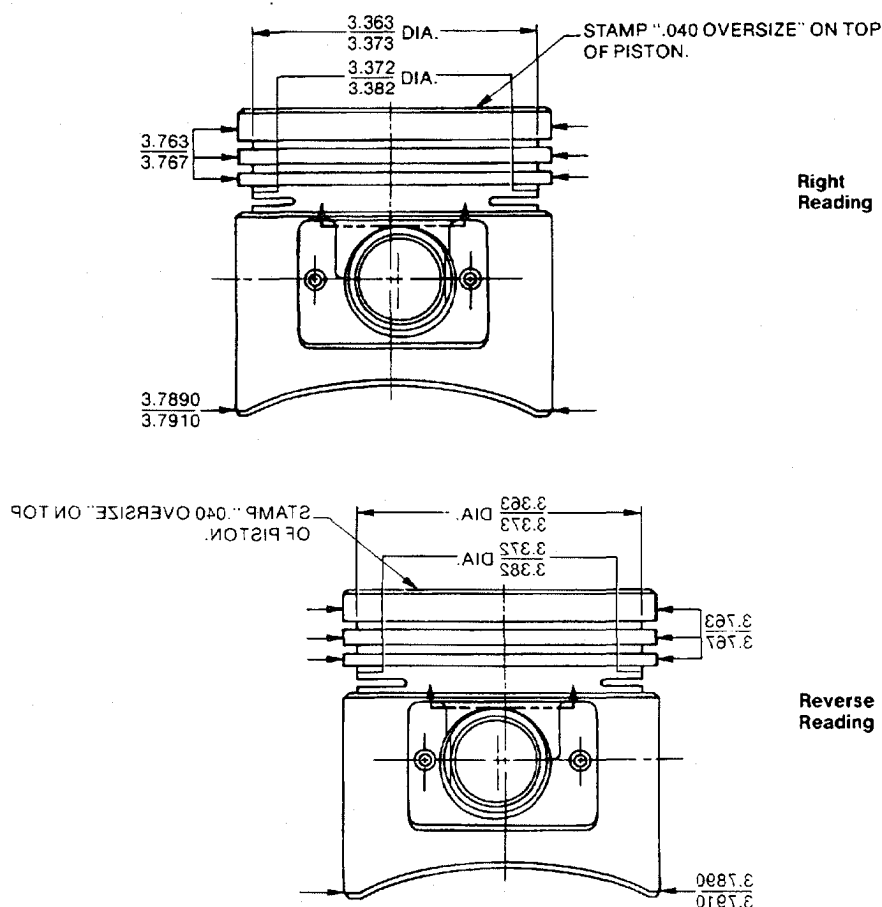


Figure 1 — Examples of right reading and reverse reading

5 Source document microimages

5.1 Document image area

The document image area shall be as indicated in figure 2 and table 1 (a1 x b1).

5.2 Frame area

The frame area shall be as indicated in figure 2 and table 1 (a2 x b2).

5.3 Frame pitch (spacing)

The distance between the trailing edge of one frame and the trailing edge of the succeeding frame (t dimension) shall be as indicated in figure 2 and table 1. (See annex A, clause 4.)

Microfilm	Inches	Millimeters
Frame Area (a2 x b2)	1.250" x 1.812" (Max)	31.75 mm x 46.02 mm (Max)
	1.218" x 1.750" (Min)	30.94 mm x 44.45 mm (Min)
Image Area (a1 x b1)	1.197" x 1.615" (Max)	30.40 mm x 41.02 mm (Max)
Frame Pitch (t)	2.00" (Min)	50.8 mm (Min)
	2.06" (Max)	52.3 mm (Max)

Table 1 — Dimensions of source document microimages

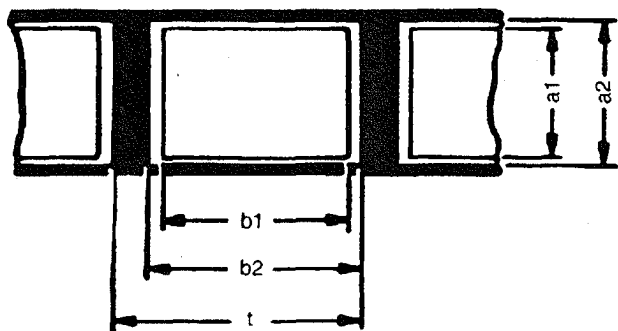


Figure 2 — Dimensions of source document microimages

5.4 Centering

5.4.1 Frame

The frame area shall be centered across the width of the microfilm within plus or minus 0.20 mm (0.008 inches).

5.4.2 Image area

The document image area shall be centered across the width of the microfilm within plus or minus 0.20 mm (0.008 inches).

5.4.3 Image

The document image shall be centered across the width of the microfilm within plus or minus 0.20 mm (0.008 inches)

and shall be centered across the length of the frame area within plus or minus 0.20 mm (0.008 inches).

NOTE: In order to achieve this, the engineering drawings, or segments thereof, shall be placed on the copyboard of 35 mm planetary cameras in such a manner as to align the center of the copyboard and the center of the drawing, or segment thereof, with the center points of the camera aperture within plus or minus 3.0 mm (0.12 inches). (See annex A, clause 5.)

5.5 Exposure

5.5.1 Uniform illumination

It shall be determined that uniform illumination on the camera copyboard has been achieved in compliance with ANSI/AIIM MS26.

5.5.2 Resolution

It shall be determined that the combination of the camera lens and microfilm resolving capabilities are such as to meet the resolution pattern requirements indicated in table 2. (See ANSI/AIIM MS26.)

Reduction Ratio	First Generation	Second Generation	Distribution Copy
1:30	4.5	4.0	3.6
1:24	5.0	4.5	4.0
1:16	7.1	6.3	5.6

Table 2 — Minimum resolution requirements

5.5.3 Background density

The background density of the document image area of a negative or positive silver-gelatin image film shall be within the appropriate range given in table 3. All densities shall be visual diffuse transmission densities. (See 5.5.4.)

NOTE: COM generated "Reversal Processed" film shall have a density of 1.5 min. The user is advised that this density requirement may not be compatible with the density requirements of source-document microimages. There is one exception. Laser base recorders with automatic density calibration are capable of generating background density of the same value as filmed source documents. Filmed source documents should have a background density in the range of 0.95 to 1.25. (See table 3.)

	First Generation	Second Generation	Distribution Copy
Negative	0.95 to 1.25	0.95 to 1.25	0.95 to 1.35
Positive	0.16 max	0.16 max	0.20 max

Table 3 — Density requirements

5.5.4 Base-plus-fog density

Base-plus-fog-density shall be determined as visual diffuse transmission density, as specified in ANSI/AIIM MS23.

5.6 Scaling

Scaling dimensions from a micrographic printout is not recommended because of the optical distortion characteristic. However, when required by the user, a ruled scale may be placed or drawn on each drawing (or segment thereof). The scale shall not obscure any detail of the drawing or segment thereof. (See annex A, clause 6)

5.7 Reduction ratios

Nominal reduction ratios of 1/30, 1/24, 1/16, as shown in table 4, are acceptable for all document sizes. (See annex A, clause 8) The tolerance on the nominal reduction ratios shall be +4, -0 percent.

5.8 Document placement

Drawings not more than 863 mm (34 inches) in width and not more than 1,118 mm (44 inches) in length shall be microfilmed as shown in figure 3. (See annex A, clause 7) Individual sheets of multisheet drawings, if microfilmed in a single frame (see figure 4) do not require multiple frame identifications. (See annex A, clause 8)

Document sizes	Nominal Reduction Ratios	Image Sizes
Group A		
Width: Not more than 457 mm (18 inches) Length: Not more than 609 mm (24 inches)	1/16	Not more than 28.6 mm x 38.1 mm (1.12 x 1.50 inches)
Group B		
Width: From 457 mm to 609 mm (18 inches to 24 inches) Length: From 609 mm to 915 mm (24 inches to 36 inches)	1/24	Not more than 25.4 mm x 38.1 mm (1.00 x 1.50 inches)
Group C		
Width: From 609 mm to 914 mm (24 inches to 36 inches) Length: From 914 mm to 1230 mm (36 inches to 48.4 inches)	1/30	Not more than 30.5 mm x 41.0 mm (1.20 inches x 1.61 inches)
Group D		
Width: More than 914 mm (36 inches) Length: More than 1230 mm (48.4 inches)	Multiple Frames @ 1/30 ea.	Multiple Images not more than 30.5 mm x 41.0 mm ea. (1.20 inches x 1.61 inches)
Note: 1. If the document is not within both limits, the next higher reduction ratio shall be used to produce a single frame. 2. If the document exceeds one or both of the maximum dimensions in Group C, the reduction ratio and procedure in Group D shall apply.		

Table 4 — Nominal reduction ratios

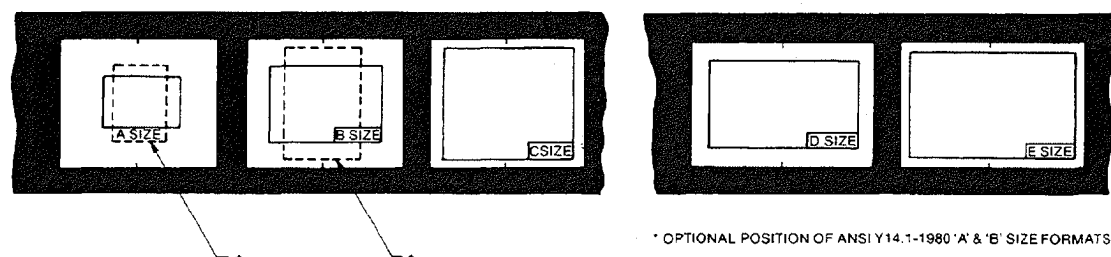


Figure 3 — Single frames

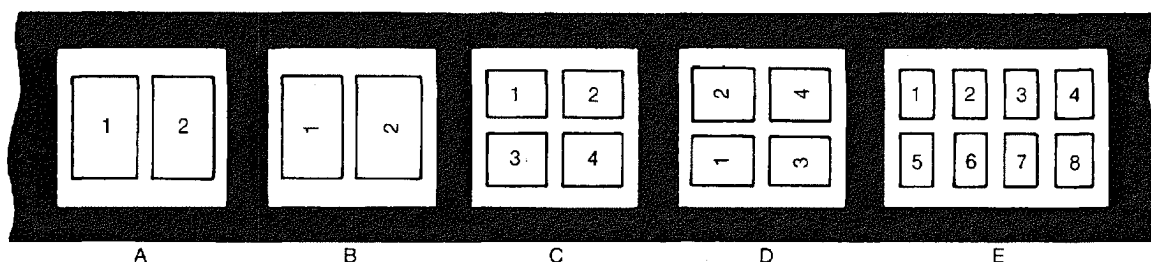


Figure 4 — Multiple sheets of single frames
(See A9, Appendix A)

Drawings or individual sheets of multisheet drawings not more than 863 mm (34 inches) in width but more than 1,118 mm (44 inches) in length shall be microfilmed in segments, using multiple frames so that they will appear on the processed microfilm as shown in figure 5.

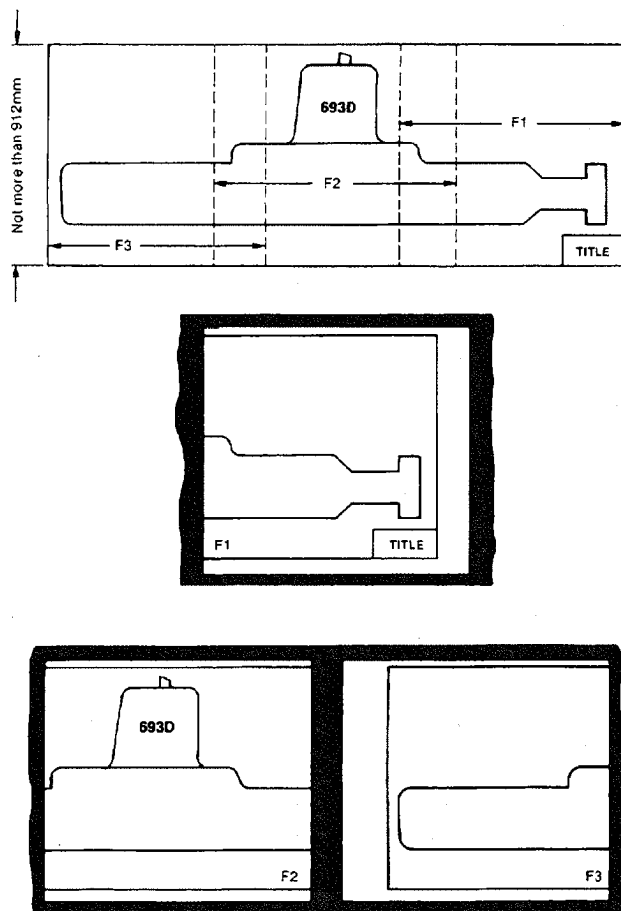


Figure 5 — Multiple frames (3 frames)

Drawings or individual sheets of multisheet drawings more than 863 mm (34 inches) in width but not more than 1,118 mm (44 inches) in length shall be microfilmed in segments, using multiple frames so that they will appear on the processed microfilm as shown in figure 6. (The drawing must be rotated 90° in a counterclockwise direction.)

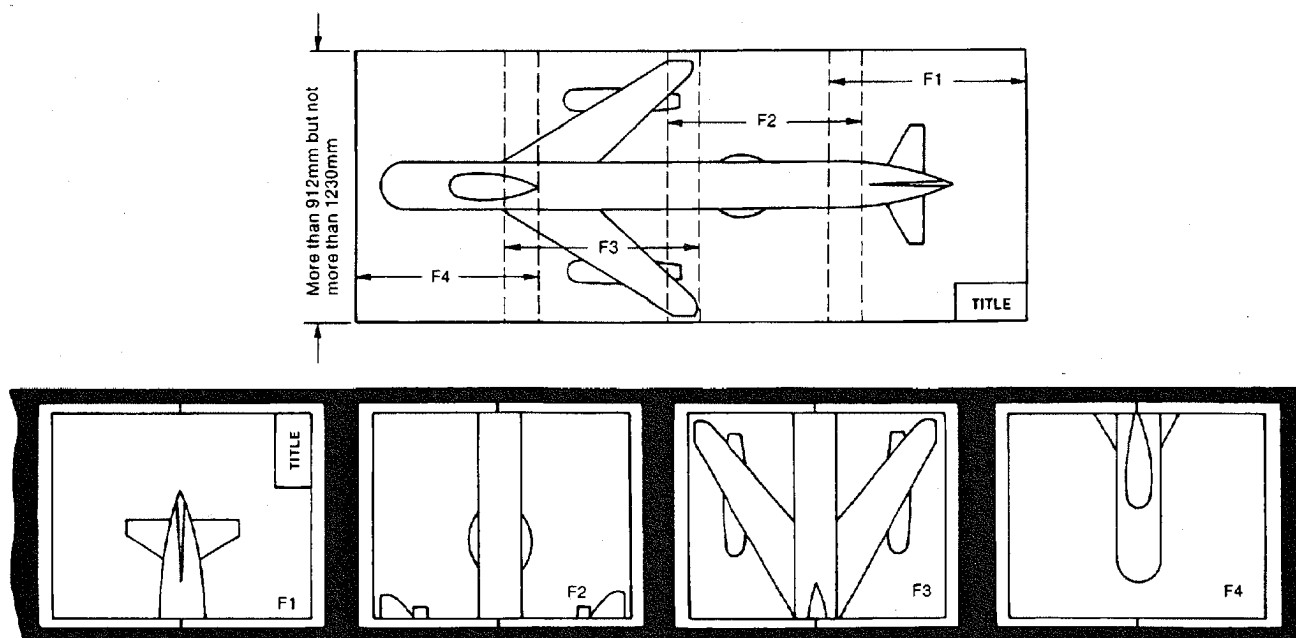


Figure 6 — Multiple frames (4 frames)

Drawings or individual sheets of multisheet drawings that are more than 1,118 mm (44 inches) in width and more than 1,118 mm (44 inches) in length shall be microfilmed in segments using multiple frames so that they will appear in the processed microfilm as shown in figure 7.

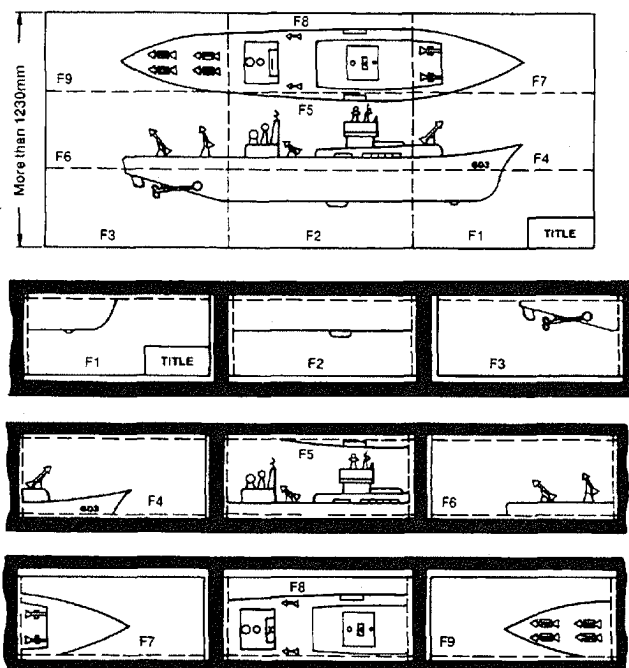


Figure 7 — Multiple frames (9 frames)

When drawings or individual sheets of multisheet drawings are microfilmed in segments using multiple frames (see figures 5, 6 and 7), no segment to be microfilmed shall exceed 863 mm by 1,118 mm (34 x 44 inches) in size, and there shall be a minimum of 100 mm (approximately 4 inches) overlap between adjacent segments. To utilize a full frame for the final segment, the overlap may be greater.

When drawings or individual sheets of drawings are microfilmed in segments using multiple frames, each frame shall contain multiple frame identifications. (See figures 5, 6 and 7.)

Each frame of a multiframe series shall be identified by consecutive frame numbers as shown in figures 5, 6 and 7, as well as by the engineering document and sheet number.

The first frame of a multiframe series shall be numbered F1. Succeeding frames shall be numbered F2, F3, etc., etc. Identification characters used in microfilming shall be at least 25 mm (approximately one inch) in height, white on a dark background, and shall be positioned so that they will appear on the lower part of the microfilm frame in such a manner that the information on the engineering document is not obscured. (See annex A, clause 9)

Annex A Supplemental information

(Informative)

(This annex is not part of the *American National Standard for Information and Image Management — Microrecording of Engineering Source Documents on 35 mm Microfilm, ANSI/AIIM MS32-1996*.)

A1 Control of curl is required to preclude excessive distortion of the aperture card. Excessive distortion of the complete image card can cause malfunctions in electronic accounting machine equipment as well as jamming of automatic card feeding mechanisms in microfilm enlarging apparatuses. Excessive "pillowing" (combined transverse and longitudinal curl) may also cause premature abrasive damage in manual aperture card systems. If the roll film does not meet curl requirements, the entire roll should be rewound in accordance with aperture card manufacturers' recommendations before the mounting/insertion procedure is attempted. Excessive curl can cause difficulties when performing the mounting/insertion operation. Protective coatings are not readily available for use on aperture cards and are only available for use on rolls to be used for storage or silver duplicating. Known coatings are susceptible to heat (Diaz duplicators) and scratching (Readers, printers and Diaz duplicators) thereby effectively precluding use on actively used film.

A2 Active use of microfilm in a systems application may result in damage to the film image. To provide protection, one or more of the following may be necessary:

- (1) an LE 500 retention value file
- (2) a confidential/security file
- (3) a catastrophic event file

These files (non-use) should be maintained in accordance with ANSI IT9.11 and ANSI IT9.2.

A3 It should be noted that the emulsion (light-sensitive) side of the film laminate is never placed in contact with the adhesive of the Type I aperture card described in MIL-C-9877B. The face/reverse application of the adhesive on the aperture card affords the intimate optical contact of the light-sensitive (emulsion) sides of the microfilm. This arrangement is required to minimize the loss of image acuity in the duplicating process through successive generations and precludes undesirable adhesion characteristics between the emulsion of the film and the adhesive on the aperture card.

To permit automated handling on duplicators and hardcopy printers, the user should not intermix front and rear emulsions. If desired, emulsions can be caused to face the same way through the use of direct and reversal silver duplicating films.

The preferred orientation agrees with that prescribed in MS41 and MIL-M-9868E. Remember that for some microfilm readers, when the user places the card in the reader the printing may look upright to the user, but the image may not be upright on the screen. It may be necessary to change orientation of the card (obscuring the printing) to achieve an upright reading image on the screen.

A4 The *t* dimension is necessary to provide adequate handling of the film when mounting/inserting it into aperture cards. The cut 35 mm film segment should be 47.62 mm to 47.68 mm (1.875 inches to 1.8777 inches) long — the additional material of *t* being a safety factor to ensure full segment severing during the mounting/inserting operation. It also provides a safety factor should there be variations in camera film advance.

A5 Centering of the document image is required to provide adequate optical alignment for:

- reproduction of the microimage during card-to-card generation
- enlargement of the microimage in automatic image card printout devices

When mounting/inserting microimaged film in aperture cards, the center datum dimension from the right card edge (*y* axis) of figure 2, in ANSI PH5.8 to the center of the document image area is computed to be 40.06 mm (1.577 inches).

A6 A special ruled scale will be required to:

- (1) avoid the presence of shadow created by the scale thickness and
- (2) provide acceptable legibility at prescribed reductions.

At this writing a commercial item does not appear to be readily available.

A7 Document sizes include international paper sizes (Series A & B, ISO 216) as well as U.S. customary sizes (ANSI/ASME Y14.1M).

A8 The current 863 mm (34 inch) standard accommodates use of reader/printers with both 17 inch and 18 inch print paper stock at 14.5x magnification. The size of 914 mm (36 inch) is "printable" if either 18 inch print paper stock or variable reductions of 14x or less are used.

Similarly a 1,118 mm (48 inch) long drawing is printable only on 24 inch length stock paper. To use 22 inch length stock paper one must use a variable reduction printer of 14x or less.

A9 The microfilming of multiple sheets of multisheet drawings in a single frame should be avoided if any of the individual sheets is subject to revision or is not uniform in color with all others to be placed in the same frame.

