

The Processing and Storage of Microfilm

Timothy Walsh

Australian Archives

Introduction

The purpose of this article is to bring to the attention of archivists and others some of the factors to be considered before a microfilm project is undertaken. The experience of many archivists in recent years is that microfilm projects have often been started before all the implications involved have been carefully considered. This has led to ill-conceived projects being started with subsequent problems in filming, processing, storage and retrieval.

What follows is not exhaustive by any means and a select bibliography is included at the end to enable the subject to be studied further. Microfilming is far more complex than is generally realised and solid background knowledge will lessen the chance of poor results.

No mention is made in what follows of specific types of equipment. The range of equipment available is changing constantly and there are any number of sources such as the journals of the various micrographics associations.

However one of the very few sources available for unbiased information on micrographics equipment is the U.K. Government supported National Reprographic Centre for documentation (NRCd). This body carries out evaluations of equipment available and publishes frequent reports on the results of its testing. These can be obtained from: National Reprographic Centre for documentation, Hatfield Polytechnic Annex, Endymion Road, Hatfield, Hertfordshire, U.K.

This present article does not go into such matters as what should happen to hard copy records after filming (disposal). This should be discussed fully with the appropriate archival authority before filming is undertaken. Nor does it cover the mechanics of filming. These matters are explained in a number of publications including:

Microphotography for Archives by Albert H. Leisinger Jr., Microfilming Committee, International Council of Archives, Washington, 1968.

The Selection and Preparation of Records for Publication on Microfilm by Frank B. Evans, National Archives and Records Service, Staff Information Paper No. 19, Washington, 1970

Microfilm Retrieval Equipment Guide National Archives and Record Service Records Management Handbook Washington, 1974.

Again, this matter should be discussed fully with archival authority staff before filming commences.

Film Types

The only film acceptable for the creation of permanent records is black and white silver halide film. Other types such as diazo and vesicular are available and are widely used but have not been recognised as being archival in nature. This means that they are only suitable for the creation of working copies and of records known to have a very limited life. No standards have yet been agreed upon for the manufacture or processing of a permanent microfilm other than that of silver halide microfilm.

Archival permanence in film refers to the ability of the entire processed microform to maintain its original characteristics and resist deterioration. This must take into account the base material, the emulsion, the processing and storage.

In addition to archival quality processing the following factors must also be taken into consideration: folding endurance, viscosity, ignition, burning rate, curl and brittleness.

All microfilm used must comply with American National Standard *PH 1.25 — 1976 Specifications for Safety Photographic Film*. Other standards to be met by the film used are:

ANSI PH 1.28 — 1976, Specifications for Photographic Film for Archival Records, Silver-gelatine Type, on Cellulose Ester Base.

ANSI PH 1.41 — 1976, Specifications for Photographic Film for Archival Records, Silver-gelatine Type, on Polyester Base.

ANSI PH 1.29 — 1971, Methods for Determining Curl of Photographic Film.

ANSI PH 1.31 — 1973 Method of Determining Brittleness of Photographic Film.

The master microfilm should be on silver halide film and this should be stored under the correct environmental conditions. A duplicate reference copy should be made and from this copy working copies can be taken. These working copies will generally be diazo or vesicular. The master film should not be used for the making of working copies as this will allow physical deterioration to take place.

In any microfilm project the least number of copies that should be made for any one record is three. This is made up of a master roll which

is stored in a secure and environmentally correct area. The second copy is used for making further copies and the third roll is used for day to day reference purposes. In government spheres the master rolls would normally be stored with the appropriate archival authority.

Processing

A successful microfilm programme depends very largely on correct processing of the film used.

Processed microfilm on cellulose-based materials should meet the requirements of American National Standard PH 1.28. The equivalent for polyester based film is ANSI PH 1.41. These standards specify those criteria (ignition rate, viscosity etc) that make the film capable of meeting archival requirements.

The procedure, chemicals, temperature and washing practices used in processing microfilm are critical in obtaining archival quality microfilm. The effect of residual chemicals on film can seriously affect the life of the image on microfilms.

For archival film life the residual thiosulphate should not exceed 0.7 Kg/Sq.cm.

The present method for testing processed microfilm is by the methylene blue and silver densitometric methods.

It is advisable to have an authority other than the organization doing the actual filming to test whether archival Standards have been met. Tests should be conducted after each batch of filming has been completed and must be done within the time scale set down in the Standard.

If the processing Standard has not been reached then rewashing and if necessary refilming must be insisted upon. The results of the processing Standards tests should be kept as part of the record of each particular microfilming project.

The processing of microfilm to archival (permanent) quality is covered in the following Standards:

- | | |
|----------------------|--|
| ANSI PH 4.8 — 1978 | Methylene Blue Method for Measuring Thiosulfate, and Silver Densitometric Method for Measuring Residual Chemicals in Films, Plates and Papers. |
| BS 1153: 1975, | Recommendations for the Processing and Storage of Silver-gelatine type Microfilm. |
| NMA — 1472, | Inspection and Quality Control of First Generation Silver Halide Microfilm. |
| ANSI PH 4.35 — 1972, | Method for Determining the Resistance of Photographic Films to Abrasion During Processing. |

ANSI PH 4.39 — 1977, The Spectrophotometric Determination of the Chlorine Requirements of Photographic Processing Effluents.

ANSI PH 4.40 — 1977, The Method for Determining the Biochemical Oxygen Demands (BOD) and Dissolved Oxygen (DO) in Photographic Processing of Fluids.

Storage

There is no point in using the correct film, processing it to recognised archival standards and then neglecting to store the film in the proper storage environment. Improper storage of microfilm will have a severe, adverse and lasting effect on the life of microfilm.

Kodak, in their pamphlet entitled *Storage and Preservation of Microfilm (No. D-31)* state that for the archival storage of microfilm the following conditions are essential:

- Temperature of storage area: 21°C
- Relative Humidity: 20-40%

The Australian Archives, in its recently completed low temperature microfilm storage vault in N.S.W. has researched the matter and concludes that the following conditions should be complied with for archival storage of microfilm (that is, for the master rolls):

- 10°C at 40% Relative Humidity

For film in everyday use, that is, the reference copies, the storage conditions should be:

- 20°-24°C at 50% Relative Humidity

When archival storage conditions are complied with it is necessary to provide reconditioning facilities for the movement of film into and out of storage. This will prevent condensation forming on the film and in the cans and allow gradual changes in film dimension.

Adequate fire protection in the form of a HALON Gas system is required for both archival and everyday microfilm storage.

The cans used to store roll microfilm are made from either metal or plastic, as are the reels on which the film is rolled. It has become apparent recently that some metal reels and cans are susceptible to rust and, when this occurs, severe damage can and has been done to microfilm. As well, some plastic containers may give off gases harmful to film. Therefore extreme care must be exercised when deciding in what the film is to be stored. Gaseous impurities such as sulphur dioxide, nitrous oxide, peroxide, hydrogen sulphide must be removed from the air in a microfilm storage area. Silver-gelatin microfilm must not be stored with other types of film because the gases given off by non-silver film may damage silver based films.

About every two years an inspection, by sample, of film must be made to identify problems such as mould or fungus on the film, excessive brittleness, film curl or discolouration and redox spots.

If deterioration of any sort is found then a silver duplicate must be made.

The following are most useful summaries of general requirements for microfilm: *Control Procedures in Microfilm Processing* Kodak Pamphlet D-17; *Storage and Preservation of Microfilms* Kodak Pamphlet D-31.

The recognised Standards covering the storage of microfilm are as follows:

ANSI PH 1.43 — 1976, Practice for Storage of Processed Safety Photographic Film.

ANSI PH 5.4 — 1970, Practice for storage of processed silver-gelatin microfilm.

BS 1153: 1975, Recommendations for the Processing and Storage of Silver-gelatine type Microfilm.

Summary

Microfilm is an efficient way to record and store information and to speed up retrieval of data. It is not, however, a panacea for a badly arranged paper record keeping system. Microfilming will not bring order out of chaos but will merely record that chaos on a media in which it is impossible to browse or scan.

Before any microfilming project is undertaken the following questions should be carefully considered:

- (a) What film is to be used and will archival processing standards be guaranteed.
- (b) What storage facilities are to be provided for the master film.
- (c) What reels and cans are to be used for storage of the rolls of film.
- (d) Will the master film be deposited with the relevant archival authority.
- (e) What fire protection facilities are available in the microfilm storage area.
- (f) Will a regular checking procedure be devised to allow early detection of film deterioration.
- (g) What will happen to the hard copy records following filming.

The importance of carefully planning the whole project *before* a start is made cannot be overstated. Discussions should be held at an early stage with officers of the archival authority to determine such questions as the possible permanent storage, for administrative and legal purposes, of the material to be copied. As well, consideration must be given to the status of the material to be copied. In most cases it is not worth copying record material of a temporary nature. Here, too, archives staff can advise on the nature of the material under consideration.

Recognised Film type and Processing Standards must be strictly adhered to in all cases. Rigorous laboratory testing must take place to ensure the maximum life of the photographic record being created. All

too often processing standards are not followed and this leads to rapid deterioration of the film image. Microfilming is expensive and all processes must be done properly.

Often little thought is given to the storage of the ultimate product — the microfilm. Again, the Standards laid down must be followed. Variations in temperature and relative humidity can soon lead to film degeneration.

Microfilm masters should be transferred to the appropriate archival authority.

Microfilm Standards

<i>Organizations</i>	<i>Abbreviation</i>
American National Standards Institute	ANSI
British Standards Institute	BSI
International Standards Organization	ISO
National Bureau of Standards (USA)	NBS
National Micrographics Association (USA)	NBA

Film

ANSI 1.25 — 1976	Safety Photographic Film, Specifications for
ANSI 1.28 — 1976	Photographic Film for Archival Records, Silver-gelatin, on Cellulose Ester Base, Specifications for
ANSI 1.41 — 1976	Photographic Film for Archival Records, Silver-gelatin Type, on Polyester Base, Specifications for
ANSI 5.3 — 1967 (reaffirmed as up to date 1973)	16 mm and 35 mm Silver Gelatin Microfilms for reel applications. Specifications for
ISO 4331 — 1977	Photography — Processed Photographic Film for Archival Records — Silver — gelatin Type on Cellulose Ester Base — Specifications
ISO 4332 — 1977	Photography — Processed Photographic Film for Archival Records — Silver — gelatin Type on Poly (ethylene terephthalate) base — Specifications.

Processing

ANSI PH 4.8 — 1978	Methylene Blue Method for measuring Thiosulfate and Silver Densitometric method for Measuring Residual Chemicals in Films, Plates and Papers
ANSI PH 4.35 — 1972	Resistance of Photographic films to Abrasion during processing. Method of Determining the
ANSI PH 4.40 — 1979	The method for determining the Biochemical Oxygen Demands (BOD) and Dissolved Oxygen (DO) in Photographic Processing Effluents

ANSI 4.39 — 1977	The Spectrophotometric Determination of the Chlorine Requirements of Photographic Processing Effluents
BS 1153: 1975	Recommendations for the Processing and Storage of Silver — gelatin type microfilm
ISO 417 — 1977	Determination of Thioulsulphate and other Residual chemicals in processed photographic Films, Plates and Papers — Methylene Blue photometric method and Silver Sulfide Densitometric method.
NMA MS 104 — 1972	Inspection and Quality Control of First Generation Silver Halide Microfilm
<i>Density</i>	
NMA MS 104 — 1972	Inspection and Quality Control of first generation Silver Halide Microfilm.
<i>Resolution</i>	
ANSI PH 3.50 — 1972	Resolution Test Target for Photographic Optics. Dimensions for
BS 4657: 1970	Method for Determining the Resolution obtained in Microcopying
NBS SRM 1010 a	Microcopy Resolution Test Charts (set of five charts)
ISO 3334 — 1976	Microcopying — ISO Test chart No. 2. Description and Use in Photographic Documentary Reproduction
<i>Storage</i>	
ANSI PH 1.43 — 1976	Practise for Storage of Processed Safety Phtographic Film
ANSI PH 1.53 — 1978	Photographic Filing Enclosures for Storing Processed Photographic Films, Plates and Papers
ANSI PH 5.4 — 1970	Practice for storage of processed silver-gelatin microfilm
ANSI PH 5.6 — 1968 (revised 1974)	Dimensions for 100 foot Reels for Processed 16 mm and 35 mm Microfilm
BS 1153: 1975	Recommendations for the Processing and Storage of silver — gelatin — type Microfilm

Select Bibliography

Establishing a Microfilming Programme

EVANS, Frank B., *The Selection and Preparation of Records for Publication on Microfilm*, National Archives and Record Service, Staff Information Paper No. 19, Washington 1970.

AVEDON, Don M., "Microfilm Generation and Polarity Terminology", *Special Libraries*, Vol. 68 No. 4 (April 1977) 141-144.

- AVEDON, Don M., "Selecting a Service Bureau", *Journal of Micrographics*, Vol. 10 No. 1 (September 1976) 3-8.
- STEWART, Charles G., "Establishing an In-House Micrographic Laboratory", *Journal of Micrographics* (July/August 1979) 347-350.
- KODAK, *Control Procedures in Microfilm Processing*, Pamphlet D-17; *Storage and Preservation of Microfilms*, Pamphlet D-31.
- LEISINGER, Albert H. Jr., *Microphotography for Archives*, International Council on Archives, Microfilming Committee, Washington, 1968.
- MATERAZZI, A. R., *Archival Stability in Microfilm — a technical review*, Technical Report No. 18, US Govt. Printing Office, Washington, 1978.
- N.A.R.S., *Microfilming Records*, National Archives and Records Service, Records Management Handbook, Washington, 1974.
- Microform Retrieval Equipment Guide*, National Archives and Record Service, Records Management Handbook, Washington, 1974.

Articles on Standards

- Guide to Micrographics Specifications and Standards*, Productivity Promotion Council of Australia, Micrographics Association of Australia (1979)
- ADELSTEIN, P. Z. and James B. RHOADES, "Dialogue on Standards: Archival Permanence" *Journal of Micrographics* Vol. 9 No. 4 (March 1976) 193-194.
- AVEDON, Don M., "Standards: Inspection and Quality Control", *Journal of Micrographics* Vol. 8 No. 2 (November 1974) 89-92
- AVEDON, Don M. and Ann M. DE VILLIERS, "Microfilm Permanence and Archival Quality", *Journal of the American Society for Information Science* (March 1979) 100-102
- BEIM, Alexander, "Federal Micrographic Rules", *Journal of Micrographics* (May/June 1979) 277-279
- COULSON, E. A., "Microfilming: — Technical Considerations and Standards", *Industrial Photography and Commercial Camera* (Australian), (December 1966) 15-26

Articles on Processing

- International Council on Archives, "Establishing Quality Control Over Microfilm Production in an Archives", Microfilm Committee, *Bulletin* 7, Madrid 1978, pp. 33-35, 25, 37.
- KURTILA, Kenneth R., "Dry Silver Film Stability", *Journal of Micrographics* Vol. 10 No. 3 (January 1977) 113-117.
- MONTUORI, Theodore R., "Testing Recently Processed Microfilm for Archival Stability", *Journal of Micrographics* Vol. 8 No. 2 (November 1974) 79-82
- HENDRIKS, Klaus B., "The Preservation of Photographic Records", *Archivaria* No. 5, 1977-78, 92-100

Articles on Storage

- Storage and Preservation of Microfilm*, Kodak Pamphlet D-31, Rochester.
- DORFMAN, Harold H., "The Effect of Fungus on Silver Gelatin, Diao and Vesicular Films", *Journal of Micrographics* Vol. 11 No. 4 (March 1978) 257-260
- KNIGHT, Nancy H., "The Cleaning of Microforms", *Journal of Micrographics* (November/December 1978) 119-122

Articles on Redox Blemishes

- MCCAMY, C. S., "Inspection of Processed Photographic Record Films for Aging Blemishes", *National Bureau of Standards, Handbook 96*, U. S. Government Printing Office, Washington D. C. 1964.

McCAMY C. S. and C. I. POPE, "Summary of Current Research on Archival Microfilm" *National Bureau of Standards Technical Note*, U. S. Government Printing Office, Washington D. C. 1965.

INTERNATIONAL COUNCIL ON ARCHIVES "Cause and Prevention of Microfilm Blemishes" *Microfilm Committee Bulletin 1*, Budapest 1972, pp. 45-47.

INTERNATIONAL COUNCIL ON ARCHIVES, "Microdeterioration of Microfilm"; "A Swedish Report on Microfilm", *Microfilm Committee Bulletin 2* Budapest 2, 1973, pp. 39-40, 47-53.

Future standards: A Joint Committee of the National Microfilm Association (U.S.A.) and the Society of American Archivists is working on a proposed Standard Practice for Microfilming Public Records. A draft shows that it will be a most useful document.