

Storage Standards and Guidelines for Film and Videotape

Motion Picture Film

ANSI and IPI publications are most useful for addressing problems caused by cellulose acetate film deterioration and color dye fading. Long considered an ideal replacement for hazardous nitrate film, acetate film also deteriorates over time. As it ages, the acetate base reacts with moisture in the storage environment and slowly releases acetic acid vapors and other gases which in the end leave the film a shrunken, buckled, and embrittled version of its original condition. Due to a rather noticeable vinegary odor, preservationists have named this process the "vinegar syndrome." Color film dyes, essentially made from organic materials, also react with heat and moisture exposing the magenta or, for newer stocks, yellow layer as the film ages.

"The combined effect of lowered temperatures and lowered humidity in retarding both vinegar syndrome and color fading is startling and increasingly well documented. The one encouraging finding about these deterioration processes is how significantly both can be slowed by the right storage conditions."

— *Film Preservation 1993*

The choice of storage conditions should be based upon the desired Life Expectancy and the condition of the film (e.g., whether the film is fresh or degrading, or whether the color dyes have some fading). If used for fresh black-and-white triacetate film, the conditions cited below would result in 0.5% free acidity between 70 and 90 years; for degraded film the acidity would double in approximately 20-30 years.

ANSI/ISO Recommended Extended-term Storage Conditions

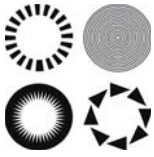
Black and White (Silver Gelatin) Film

Maximum Temperature	RH Range
21°C / 70°F	20%-30%

Color Film

Maximum Temperature	RH Range
2°C/36°F	20%-30%
-3°C/27°F	20%-40%
-10°C/14°F	20%-50%

For institutions that may not be able to maintain adequate low RH, the application of desiccants such as molecular sieves takes on increasing importance. Molecular sieve packets inserted in a sealed container of film absorb moisture and decomposition gases. Another useful device for maintaining film collections in archival storage is A-D strips. These acid detection strips of paper change color in the presence of acidic vapor emitted by degraded film. The color indications can be used as a basis for prioritizing reels for duplication or for placing them in colder storage conditions to slow down the rate of deterioration.



AMIA the association of moving image archivists

Videotape

"In reality the life expectancy of videotape as measured in various storage conditions cannot be plotted with much accuracy. Much more research and guidance are needed in this area. Nonetheless, the improvement of storage conditions remains one of the most important strategies for maintaining tapes in good condition."

— *Television and Video Preservation 1997*

The storage of videotape is complicated by the continuing debate about whether to save the artifact as long as possible or only long enough so that it can be migrated to another format to ward off obsolescence. For archives and libraries lacking sufficient resources to reformat their tapes, extended storage remains viable as a preservation strategy only as long as the playback technology remains accessible.

The chemical breakdown of videotape binders or coatings due to hydrolysis has been well documented. The binders absorb atmospheric moisture and release acids and alcohols that act as catalysts hastening deterioration. Acids may be present from the tape itself or contracted from common pollutant gases. Aged tapes are more hygroscopic than newer tapes in their ability to absorb moisture. Hydrolysis weakens the binder causing particle shedding, dropouts, and eventual loss of the tape through severe degradation. High humidity increases the rate of moisture absorption; it increases tape pack stresses, distortion, tightness, and dropouts form debris and exudations; and, it results in clogging, sticky shed syndrome or "stiction", scoring, and head wear. High temperatures can also cause damage such as increased tape tightness, pressure, distortion, dropouts from wound in debris, layer to layer adhesion, changes in dimensions, all of which promote tracking errors.

ANSI Recommended Standards for the Extended Storage of Videotape

Maximum Temperature	RH Range
20°C/68°F	20%-30%
15°C/59°F	20%-40%
10°C/50°F	20%-50%

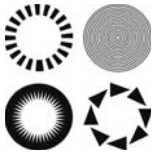
Storage Providers

FPC/Kodak PRO-TEK, 1017 North Palmas Ave., Hollywood, CA 90038. Phone 800-814-1333, 323-468-5775; fax 323-468-5774. Web site: <http://www.fpcfilm.com>

Hollywood Vaults, Inc., 742 North Seward St., Hollywood, CA 90038. Phone 800-569-5336, 323-461-6464; fax 323-461-6479. Web site: <http://www.hollywoodvaults.com>

Iron Mountain Film and Sound Archive Services, 1025 North Highland Ave., Hollywood, CA 90038. Phone 800-883-8000, 323-466-9287; fax 213-612-0180. Web site: <http://national-underground.com>

Underground Vaults & Storage, Inc., 906 North Halstead, Hutchinson, KS 67501. Phone and fax: 316-662-6769. Web site: <http://www.uvsinc.com>



AMIA the association of moving image archivists

Source Materials and Further Information

Although ambient temperature and RH significantly influence rates of deterioration, there are other factors that should be considered in providing a storage environment conducive to preservation. Among them are air pollutants, including gases and particulate matter, the composition of storage containers, materials kept in the vault that may be harmful, acclimation, and time out of storage. To obtain copies of the pertinent standards and guidelines in all these areas, consult these sources:

ANSI Standards and SMPTE Recommended Practices

ANSI IT9.2-1991, Imaging Media - Photographic Processed Films, Plates, and Papers - Filing Enclosures and Storage Containers. \$30.

ANSI IT9.11-1993, Imaging Materials - Processed Safety Photographic Films - Storage. \$61.

ANSI/NAPM IT9.23-1996, Imaging Materials - Polyester Base Magnetic Tape - Storage Practices. \$51.

- Order from Global Engineering Documents, 15 Inverness Way East, Englewood, CO 80112. Phone: 800-854-7179; fax 303-397-2740. Order on line at the GED web site: <http://global.ihs.com/>

SMPTE RP-103, 1995, Care, Storage, Operation, Handling and Shipping of Magnetic Recording Tape. \$13.

SMPTE RP-131, 1994, Storage of Motion Picture Films. \$13.

- Order from SMPTE, 595 West Hartsdale Avenue, White Plains, NY 10607. Phone: 914-761-1100; fax, 914-761-3115. See SMPTE's web site: <http://www.smpte.org/stds/index.html>

IPI Publications and Products

James M. Reilly, IPI Storage Guide for Acetate Film. \$25.

James M. Reilly, Storage Guide for Color Photographic Materials. \$25.

A-D Strips (check web site for prices and quantities)

- Order from the Image Permanence Institute, Rochester Institute of Technology, 70 Lomb Memorial Drive, Rochester, NY 14623. Phone 716-475-5199; fax 716-475-7230. Order on line at IPI's web site: <http://www.rit.edu/~661www1/>

Molecular Sieves

- Order from FPC, Inc., A Kodak Company, 6677 Santa Monica Blvd., Hollywood, CA 90038.

Phone 213-468-5774; fax 213-468-5771. See FPC's website at <http://www.kodak.com/country/US/en/motion/about/environment/mol.shtml>

Library of Congress Preservation Studies

Film Preservation 1993: A Study of the Current State of American Film Preservation. Washington, DC: Library of Congress, 1993. Stock No. 030-000-00251-2. \$47.

Television and Video Preservation: A Study of American Television and Video Preservation. Washington, DC: Library of Congress, 1997. Stock No. 030-000-00279-2. \$64.

Order from the Government Printing Office, Superintendent of Documents, P.O. Box 371954, Pittsburgh, PA 15250-7954. Phone (GPO Order Desk) 202-512-1800; fax 202-512-2250. These studies, together with Redefining Film Preservation: A National Plan, can also be downloaded from the National Film Preservation Board's web site at <http://lcweb.loc.gov/film/filmpres.html>