

Film/Videotape Factsheet

The information in this factsheet has been gathered from a variety of sources, including the experiences of archivists in the United States and abroad, as well as professional journalists and industry product recommendations. It is intended as a brief summary of current understanding of preservation and storage for film and videotape. The standards outlined here are not intended as definitive, but as practical working guidelines.

Motion Picture Film

Nitrate

Prior to 1951, 35mm films for theatrical release were made on a film stock composed of nitrocellulose (or nitrate), a relative of gun cotton that is used for explosives. Nitrate is highly flammable, and once ignited, cannot be extinguished. It deteriorates, giving off an acrid odor, becoming sticky with soft bubbles, and eventually disintegrating into a fine brown powder. In its final stage of decomposition, it can ignite spontaneously at a temperature as low as 106°F, a level often reached in attics or garages during the summer months. The degree and rate of deterioration depend on the conditions in which a film has been stored and the quality of its original processing and manufacture.

Besides 35mm films, 21mm, 11mm, and most 17mm films were also made on nitrate stock. Usually, a nitrate film can be identified by the word "nitrate" on the edge of the film. When a nitrate film suffers advanced deterioration with no remaining image, it must be disposed of carefully, with assistance from the local fire department.

Safety

As early as 1912, safety (non-flammable) film stock was developed for non-theatrical use. This "diacetate" safety film was used extensively in educational, religious, and amateur films, and often gives off an odor of camphor.

Modern safety film bases usually are composed either of acetyl cellulose (triacetate) or polyester (product names "Estar" or "Cronar"). When exposed to a flame, modern safety film will curl and extinguish itself. While safety film must be stored properly to minimize shrinkage and brittleness, it does not decompose over time and is estimated to have a shelf life as long as that for good quality paper, approximately two hundred to three hundred years.

The most common gauges on safety stock are 70mm, 35mm, 16mm, 8mm,

super-8mm, and a number of early gauges that utilized diacetate safety, including 9.5mm, 22mm, 28mm, and some 17.5mm (positives only).

Preservation

■ Nitrate film is preserved by copying onto safety film stock. Using the best surviving material, a duplicate negative is made from a positive, or a fine grain master-positive is made from a negative. In either case, the process is best carried out to the answer print stage to test the quality of the pre-print. The print then may be used for viewing. Opinion is divided on what to do with the original nitrate after copying. Some suggest retention for as long as possible; others propose junking once the preservation safety material has been checked thoroughly.

■ Black-and-white safety film which has been processed, used, and stored properly does not require preservation.

“ . . . safeguard original negatives, finegrains, or positive reversals by making additional copies for printing and viewing, and properly storing originals.”

It is important, however, where conditions have not been ideal, to safeguard original negatives, finegrains, or positive reversals by making additional copies for printing and viewing, and properly storing originals. Safety films that have been damaged must be recopied onto new safety stock.

■ Color safety film: Color dyes in all monopack (single-strip emulsion/Eastman process) color films fade over time. The degree and rate of fading depends on conditions of use and storage, and original processing. Fading occurs in both negatives and positives. Color films made in the Technicolor process using black-and-white separation negatives and imbibition positives do not fade; however, this process is not often used today because of its considerable expense for processing, equipment, and storage. Currently, the only way to preserve a color film is to make b/w separa-

tion negatives. The only cost-effective means of dealing with color fading is to slow the rate of fade by storing color films in low temperature and humidity vaults. This is, however, only a stop-gap method designed to safeguard the film.

Storage

Films for long term storage should be checked, wound, and rewound with a uniform tension periodically to optimize shelf life. Films should be stored in cans on cores. The cans should be kept horizontally, and not stacked more than six to eight high to allow "breathing" (the natural escape of gases given off by all films). Stability — even more than specific levels of temperature and humidity — is critical, as fluctuations can cause problems such as fading, extreme shrinkage, brittleness, fungal growth, emulsion flaking, and decomposition. It is recommended that preservation pre-print and originals be stored separately under proper conditions, while acceptable answer prints (used first to check pre-print quality) be utilized for viewing.

■ Nitrate film should be copied onto safety film as soon as possible. Until that is done, nitrate should be stored in specially designed and constructed vaults at no more than 50°F and 40%-50% rh.

■ Black-and-white safety film also should be stored at 50°F and 40%-50% rh. It must not be stored with nitrate film because the gases given off by nitrate will harm safety film.

■ Color safety film should be kept at 32°F and 30% rh, to slow the rate of color fading. Film stored at such levels must be "staged" or "acclimatized" before use: the film must be allowed to adjust slowly to the ambient temperature in a staging room over a period of twenty-four hours. Failure to stage a film can result in problems with condensation.

It must be noted that some sources recommend below freezing temperature and relative humidity of 15%-30%. While such levels should, in fact, significantly retard the fading of color dyes, they may also contribute to other physical problems, such as brittleness and curling. Some have suggested, therefore, that to be safe, color films be stored just above freezing and in a moderately dry environment: 32°-40°F and 30%-50% rh.

Videotape

By means of a magnetic, mechanical, and/or electronic device, images and sounds can be recorded as electronic

Continued on page 21

Film/Videotape

Continued from page 6

signals into magnetic oxide particles that adhere via a binder to a polyester base. This is basically what happens when recordings are made onto videotape. There are many varieties of this medium, which came into existence in the 1950s. Since then, there have been numerous changes in tape technology, both for hardware and tape itself. Some common reel-to-reel formats include 2-inch quadplex, 2-inch helical, 1-inch helical, and 1/2-inch helical. There are also cassette formats such as 1/4-inch U-Matic, 1/2-inch Beta, 1/2-inch vhs, and 1/4-inch.

Images and sounds on videotape can be affected by a number of problems. There is, of course, the loss of information on a tape by accidental erasure. Economic, rather than archival, considerations can force the intentional erasure of information as a tape is re-used.

“Nitrate is highly flammable, and once ignited, cannot be extinguished.”

Dropout — an impairment or loss of video information caused by a loss in the level of the recorded signal — normally results in a black or white horizontal line in the picture. Print-through can result from the magnetic field of one layer of oxide particles on a tape affecting the signal on an adjacent layer, and causes overlapping sound and sometimes picture. While these and other problems are inherent in the material itself, storage conditions — as with film — are a major factor in the long-term keeping characteristics of videotape.

Preservation

Many archivists do not consider magnetic tape to be an archival medium as the information recorded on it is not permanent and can be altered or removed. While there is evidence that tapes produced in recent years may retain an acceptable signal for at least twenty to thirty years and possibly for as long as one hundred years, there does not yet exist a means to guarantee a shelf life equal at least to that of safety film. Research in videodiscs, laser and holographic storage media, and digital mass storage may provide a means to preserve information on videotape sometime in the near future, but for now safeguarding appears to be the most appropriate strategy.

The condition of a videotape depends on the quality of tape manufacture, and conditions of use and storage. Poor or uneven tape batches, overuse, hot and humid conditions, and dirty tape player heads and transports all can severely shorten the life of a tape. As with safety film, making a copy of a tape for viewing while properly storing the original appears to be the best available means to safeguard a tape and still make the information it holds accessible. This arrangement also holds the promise that, when a truly archival means to preserve videotape is developed, the original material will still exist for preservation.

Because of the rapid development of videotape technology and the variety of tape formats, it has become apparent that in long-term archival storage, equipment for playing tapes (as well as spares for parts and manuals for operation) also must be safeguarded. There already are formats, such as 1/2-inch reel-to-reel, which are no longer actively used and for which playback equipment is hard to find.

Storage

Tape should be stored and used in a dust free environment. Stability of the temperature and humidity levels is critical for proper storage of videotape. As for film, periodic checking, winding, and rewinding of tape is recommended for long-term storage. Reel-to-reel tape should be kept in its original box or replacement container, and cassettes stored in original boxes or cassettes that support the tape reel at its hub. For reel-to-reel tapes, the outer end of the tape should be secured with an adhesive tab that leaves no residue after it is removed.

There are two points of view on the need to keep tape away from anything that may generate a magnetic field. Recently, there has been discussion that the danger of a loss of signal from exposure to equipment that may generate a magnetic field has been overestimated. There has also been the more conservative view, however, that to be safe, tapes should be stored away from such things as motors, transformers, electrical fixtures, and loudspeakers. In addition, if a metal rack is used for storage, it should be grounded as a further safeguard against damage to the signal from voltage fluctuations or lightning.

With regard to transporting tapes, there is no evidence that passing video tape through x-ray machines at security checkpoints in airports is damaging. The hand-held wands that may be passed around an individual, however, do generate a magnetic field; thus, tapes should

be kept away from these.

Most sources recommend storage at 65-70°F and 40%-50% r.h. Some archivists have recommended storage at 50°F and 40%-50% r.h. Recently, there has been evidence to suggest that a low humidity environment at 25%-50% r.h. may be best for long-term storage of videotape.

Most sources recommend storing tapes — whether reel-to-reel or cassette — on end. Tape should be wound with proper tension and uniformity before storage. There is no agreement on the type or direction of wind, however. Some recommend a real time winding of a tape back to start without stopping before storage, while others suggest simply a full last rewind. Another point of view suggests that a tape be stored "tails out," because there may be less of a chance for print-through to occur. Whichever recommendation is followed, it is clear that a tape must not be put back on a shelf after use without a uniform winding, as the starts and stops of normal play can result in wide variations in tension and wrap that may damage a stored tape.

Additional information may be obtained from the National Center for Film and Video Preservation, The American Film Institute, Box F, John F. Kennedy Center, Washington, DC 20566

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National Center for Film and Video
Preservation

New Jersey Historical Society
Continued from page 7

Benjamin Henry Latrobe, and others. The survey of the 263 items included accession or reference number and a title or description. "Work to be done" listed whether the drawing needed dry cleaning, a water bath, repairs, or matting. The mat size needed was also noted, as well as estimated time of repair.

This survey was submitted to the National Endowment for the Arts as part of a grant application. NEHS was awarded \$3,420, to be matched by the Society, for the repair, preservation, and improved storage of the drawings. The project took about a year and a half to complete. Some of the restored drawings were displayed at Headquarters in an exhibit entitled "Steam Power to Move the World."

Five standard sizes are used by the museum for framing works. After a work has been matted to the closest frame size, it is stored in a solander box until needed. The smallest size is fifteen inches by twenty inches and the largest is thirty-six inches by forty-eight inches.