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Preservation of Processed Film

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The storage and handling requirements for processed motion picture film differ from those of raw stock because the film is no longer photosensitive. You can store processed film safely for very long periods, if you give proper attention to three conditions. The first is the composition of the film; this is the responsibility of the manufacturer. However, the user should select a film compatible with the intended use and life expectancy of the film. The other conditions of processing and storage are controlled entirely by the user, and include temperature and humidity.

Composition

The only motion picture films that are acceptable for extended life expectancy use are black-and-white silver-halide gelatin films on either cellulose ester polyester bases. These films must meet the compositional requirements for safety film on cellulose ester or polyester base, as specified in ANSI/NAPM IT.9.9-1996,* *Imaging Materials--Stability of Color Photographic Images--Methods for Measuring (revision and redesignation of ANSI IT9.9-1990)*. Black-and-white films not complying with this standard cannot be considered for extended life expectancy. Because of color dyes, no color films qualify for extended life expectancy, regardless of the base or storage conditions. However, many films will remain in usable condition for many years if the recommendations in the following processing and storage sections are met.

* Write to the American National Standards Institute, 1430 Broadway, New York, NY 10018. Telephone 212-642-4900.

Processing

Processing is one of the most important factors contributing to a film's satisfactory life expectancy. Residual processing chemicals in the film can be detrimental to long life. Residual thiosulfate (hypo) remaining in the processed black-and-white film can fade the silver image by partially converting it to silver sulfide.

This is especially true under conditions of high humidity and temperature. Residual silver salts can also cause density changes. If in doubt, the residual hypo content should be determined. The Methylene Blue Method recommended in ISO 18917:1999, *Photography--Determination of residual thiosulfate and other related chemicals in processed photographic materials--Methods using iodine-amylose, methylene blue and silver sulfide*, is a worldwide standard test to detect residual hypo.

Thiosulfate salts allowed to remain in color film can also fade the dye images; one dye will probably be affected more than the other two, causing an undesirable change in color balance and a deterioration of the image. Therefore, color films require as much care in processing and washing as black-and-white films.

Storage

This discussion covers two storage conditions defined as "medium-term" and "long term." These storage conditions are described in detail in ISO 5466:1996, *Photography--Processed safety photographic films--Storage practices*; ANSI/PIMA IT9.11-1998, *Imaging Media--Processed Safety Photographic Films--Storage (revision and redesignation of ANSI/NAPM IT9.11-1993)*; and SMPTE Recommended Practice RP 131-1994, *Storage of Motion-Picture Films*. The conditions specified are ideal; however, compromises may be necessary.

Medium-Term Storage. Films stored under these conditions should be usable for a

minimum of 10 years, provided they meet requirements of composition and processing. The relative humidity for acetate films should be between 15 and 50 percent, and for polyester films 30 to 60 percent. For black-and-white films, the preferred temperature is 21°C (70°F) or lower. The temperature should not exceed 24°C (75°F) for extended periods with maximum short-time peaks of 32°C (90°F). Store color films at 2°C (36°F) or lower, with an RH of 15 to 30%.

Long-Term Storage. Many current motion picture films can be considered long-term films-usable for several centuries if stored properly. As discussed under "Composition," only black-and-white silver-gelatin films complying with ANSI Specifications IT9.9-1996 and IT9.11-1998 meet this criteria. However, storage at these conditions will usually improve the keeping properties of all films..

The relative humidity range for black-and-white triacetate and polyester films is 20 to 30 percent. The temperature should not exceed 21°C (70°F), and you can expect improved protection at lower temperatures.

There are two approaches when long-term storage of color film is required. One approach is to store the film at lower temperatures and humidities. The relative humidity is the same as above. The ideal temperature should be 2°C (36°F) or lower. Deep freezer temperatures have given good results.

You can achieve these temperatures in two ways, but always maintain the film at the proper relative humidity. You can store film in untaped cans in storage vaults or rooms with controlled temperature and relative humidity, or freezers with humidity control.

The other approach is to make black-and-white separation positives. Store all three separations together at recommended conditions.

More details are given in the Adelstein, Graham and West publication "Preservation of Motion Picture Color Films Having Permanent Value" and [other publications](#).

General Storage. Most libraries store film on metal shelves or in metal cabinets made especially for this purpose. These metal cabinets are usually supplied with adjustable shelving. Wood is not recommended as volatile components can cause image fading. Cans of print film can be stored on edge for easy access for the short term. However, for long-term storage, keep rolls of film that are wound on cores flat to prevent deformation caused by the weight of the roll. Separate the storage cabinets enough to permit free circulation of air on all sides. Be sure storage areas are located on the intermediate floors of buildings, never in damp basements, on the top floors of uninsulated buildings, near radiators, hot air ducts, or other sources of heat and humidity.

Keep film storage and handling areas as free as possible from dust and dirt. ideally, you should supply such rooms with cooled and filtered air. Take precautions to prevent the entrance of dust and dirt through ventilators, heating ducts, and windows.

Use the same precautions that apply to the storage of any other safety motion picture film for film with a magnetic coating on which sound has been recorded. Even though a magnetic sound track, as far as we know, may be as permanent as the film base to which it is applied, heat and humidity cause deterioration. Storing the film in a metal container, such as a film cabinet or an aluminum or steel film can, will not adversely affect the recorded sound. Do not store the film near a permanent magnet or near electrical wiring that carries a heavy current.

A word of caution about films on cellulose nitrate base. Although cellulose nitrate motion picture films have not been manufactured in the U.S.A. for over 50 years, some may still be present in old collections. The nitrate base deteriorates and becomes a serious fire hazard. Furthermore, the gaseous products of deterioration can damage other films in the same storage area. Cellulose nitrate films require separate and special storage areas. A full discussion of the subject can be found in KODAK Publication No. H-23, *The Book of Film Care*.

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