

NARA Policy Statement on Cold Storage for Color Film Materials

This policy statement describes the use of cold storage vaults within the National Archives and Records Administration for the archival storage of color film materials. NARA has a fundamental commitment to construct and operate cold storage vaults. Film materials incorporating color dyes require special storage conditions, and cooler temperatures and lower relative humidities retard fading, thereby prolonging the useful life of color images of permanent value. While NARA is investigating new technologies, one of which may ultimately provide a long-term solution to the problem of preserving color images, cold storage vaults offer the best interim preservation method.

Color film is not an ideal archival medium because all color dyes are chemically unstable and will fade in time. Yet many valuable pictorial images exist on color film and must be preserved.

Archives have an obligation to see that the color images in their holdings remain as close to their original quality as feasible.

A color image shift toward magenta may reflect the inherent instability of color dyes but it may also indicate a failure to provide proper storage conditions. Several tests have conclusively demonstrated that sufficiently cool temperature and low relative humidity will decrease the rate of fading.

Conversely, warmer temperatures and higher humidities will accelerate the deterioration of color dyes. Changes in either temperature or humidity will add to the adverse effect on color

dyes. In short, constant, cool, and dryer storage conditions, together with a judicious selection of modern film stocks with better dye-keeping stability, should ensure adequate preservation of color images for many years.

NARA cold storage vaults should be designed or modified to fall within the standards promulgated by the American National Standards Institute as specified in the ANSI standard, "Practice for Storage of Safety Photographic Film" (PH 1.43-1983, or latest revision). This standard strongly recommends 35 degrees F or below for the archival storage of color film, with humidity at 15-30% for cellulose ester, and 25-30% for polyester, or 30% for mixed storage. In principle NARA favors 0 degrees F and 30% RH for its vaults. Nonetheless, the volume of holdings and limited monetary resources may make vaults with moderate temperatures more practical and less costly to operate.

All film should be conditioned to a relatively low moisture content before being placed in cold storage. This may be accomplished by means of conditioning cabinets or by leaving the film in staging areas with low humidity. The duration will depend upon the size and amount of film and ambient conditions. If the film is to be placed in hermetically sealed bags, the bags must be evacuated and sealed quickly after conditioning.

Conversely, when film is brought out of cold storage it should be allowed to return to ambient temperature before the containers

are opened. All personnel having access to the cold storage vaults should be trained in these procedures. Since current conditioning practices vary greatly, NARA will continue to monitor new developments in conditioning and will adopt techniques that improve procedures.

The use of hermetically sealed bags for cold storage depends upon the cold storage system's cooling features. Hermetically sealed bags are optional in systems able to maintain stable relative humidities at acceptable levels. However, color film materials placed in such systems should still be enclosed in unsealed bags. Motion pictures, for example, should be stored in polyethylene bags and polypropylene containers that meet the specifications developed by the Preservation and Technical Services Division. (See attachments 1 and 2.) The polypropylene containers, with halogenated flame retardant limited to 4%, are preferred to most metal cans because they are non-corrosive and cheaper. All other containers or enclosures should also meet ANSI standards for photographic enclosures (PH1.43 and PH1.53, latest eds.).

Hermetically sealed bags are essential in less expensive refrigeration systems with little or no control of relative humidity. Such bags should be made of safe materials (e.g., polyethylene), and reinforced with a layer of aluminum foil to provide a true vapor barrier. Double bagging is advisable. Only polyester and triacetate films should be placed in sealed bags.

The records that will most benefit from cold storage consist of any safety film-based materials incorporating color dyes, such as motion picture film, roll film, sheet film, and slides.* Cold storage should be limited or restricted to the storage of originals and preservation or intermediate copies that have been inspected and cleaned and whose anticipated use is infrequent. Reference copies need not be placed in cold storage.

An inspection of carefully selected film should be made periodically to determine if any deleterious changes have occurred and if a wider inspection is warranted. An inspection should include precise measurements of density changes in the cyan, magenta, and yellow layers. The new readings should be compared to the representative readings made when the film was processed in the laboratory; or, in the case of film acquired from outside of NARA, when the film was first prepared for cold storage.

*Nitrate-based film materials are excluded from the scope of this policy statement because (1) nitrate is not suitable for long-term storage but rather for copying and disposal, (2) nitrate should never be sealed in enclosures, and (3) it must be stored separately from safety film. See "Cellulose Nitrate Motion Picture Film" (NFPA40-1982), published by the National Fire Protection Association.

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Plastic Storage Containers

NN Division Directors

A meeting to discuss NN policy on the use of plastic storage containers with flame retardant was held on Thursday, April 4, 1985, with Trudy Peterson, Carlton Brown, William Cunliffe, Ken Harris, Judy Pratt, Les Waffin, and Susan Lee-Bechtold in attendance. A consensus on long term storage of audio and video tape and motion pictures arrived at the following statement:

Policy statement on the purchase and use of plastic containers for long-term storage of magnetic media and motion pictures.

Containers made from plastic may be used for the long-term storage of audio and video tape and motion pictures under the following conditions:

Composition

The plastic substance must be made from inert homo- or copolymer polypropylene with halogen-free substances used as antioxidants at a level of 1% or less.

If the plastic contains halogenated flame retardant, the weight percentage of flame retardant should not exceed 4%.

Implementation

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Containers with flame retardant can be used for all types and designations of film providing that the film is placed in a film storage bag which has no detrimental effect on the film, before inserting in the container.

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General Services Administration
National Archives and Records Service
Washington, DC 20408

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Date January 31, 1985
Reply to Attn of NNPR *bp*
Subject Specifications for Microfilm, Audio, and Motion Picture Plastic Storage Containers
To NAS-P
Thru: NNPD
NNP

PRE-PRODUCTION SAMPLE REQUESTED

Material: Inert homo- or copolymer polypropylene with a density of 0.94 g/ml or higher at 25 degrees C; Izod impact of 1.5 ft - lb/inch of notch for a 1/8 inch specimen (ASTM D256A); tensile yield strength of 3,800 psi (ASTM D638); flexural modulus of 125 at 1,000 psi (ASTM D790); flame retardant of ethylene bis (dibromonorborane) dicarboximide of 3.0 to 4.0%; UL flamability rating of V-2 or better; and with an anti-oxidant of distearyl thiodipropionate (DSTDP) of 1.0% or less.

Weight:

Motion Picture: 1.2 lbs
Microfilm: 60 grams
Audio: 440 grams (approx.)

Dimensions:

Motion Picture: 11-3/16 x 11-3/16 x 1-3/4" high
.080 thickness, with bosses on each side of the top to insure snug fit with the bottom (specifics of design per attached drawing - PRC#1209-1-2 & 2)

Microfilm: 1-7/8" x 3-7/8" long and stand 3-7/8" high; one-piece construction with lid held in position with two locking mechanisms located 1-7/8" apart and being 1/2" wide. (specs attached)

Audio: external top: 11 5/32" x 11 5/32" x 13/16";
internal top: 10 31/32" x 10 31/32" x 21/32"
with bosses on each side of top to insure snug fit with the bottom; external bottom: 10 15/16" x 10 15/16" x 23/32"; internal bottom: 10 3/4" x 10 3/4" x 5/8" with a center hub of 2-15/16" in diameter x 1/2" high; overall thickness is 3/32"; overall tolerance will be +1/64 throughout; specifics per PRC drawing #P10000, revised 9/25/84. Minimum wall thickness of 1.5mm, within 0.1mm tolerance over the entire box, including bent or curved areas.

Colors: Black
Grey

National Archives and Records Service
SPECIFICATION

Opaque Polyethylene Bag for the Packaging and Storage of
Archival Photographic Film, Photographic Plates, & Photo-
graphic Paper

1. Scope

This specification delineates the requirements for various sizes of opaque high density polyethylene bags for the long term dark storage of archival photographic film, plates, and paper.

2. Requirements

2.1 Size - The bag size shall be as specified in the bid request. Size specifications shall be expressed as the flat inside width (opening) by the flat inside length. Size tolerance shall be $\pm 1/8$ inch.

2.2 Shape and Construction - The bags shall be of the flat rectangular type with sealed side seams and a fold over bottom. One face of the bag shall be longer than the other to provide a lip for fold over closing. The lip extension shall be 1 and 1/8 inches on all size bags. The sealed side seams shall be 1/8 inch minimum to 1/4 inch maximum from the inside of the sealed area to the outside edge of the bag. The side seam shall be sealed along the entire length of the bag. The strength of the sealed seam shall be such that the bag material will fail before the seam fails.

2.3 Material Composition - The bags shall be made of black rubber modified high density polyethylene sheeting which shall be approved by the National Archives and Records Service for use in fabricating photographic material storage bags. The following polyethylene sheeting and colorants have been approved; equal substitutes must be approved by National Archives and Records Service prior to use.

1) Tenite Polyethylene E 2655-54AE Black (rubber modified; containing six percent carbon black colorant).

2) Tenite Polyethylene E6837-232F Natural (rubber modified) plus colorant. Colorants may be either of the following: Tenite Polyethylene 808E65695 Black or Ampacet 19238 Black in sufficient quantity to produce a film with a final carbon content of six percent.

2.4 Thickness - 0.0040 inches \pm 15%.

2.5 Visual Opacity - The polyethylene shall be "opaque" in that it shall be free from pin holes, translucent areas, gel streaks, and windows.

2.6 Photoactivity - The film bags shall be photographically inactive.

3. Methods of Test

3.1 Visual Opacity - Determine the presence of pinholes, translucent areas, and windows by visual examination using a full-width sample of the polyethylene sheeting used to make the bags or the bags themselves. The observations shall be made in a darkroom by an individual who has worn dark adaptation goggles for a minimum of 10 minutes and remained in the darkroom for a minimum of 5 minutes prior to the test. Place the sample in the light path from a 500 watt slide projector equipped with a lens approximately 2 and 1/2 inches in diameter, or an alternate light source approved by the National Archives. Make the observations looking toward the light source with the sample against the lens barrel. Report the number of pinholes, translucent areas, and windows, and the area of the sample tested. If the sample has any pinholes, translucent areas, or windows, the entire lot shall be rejected.

3.2 Photoactivity Test - Condition all films, packaging materials, and test materials for a minimum of 4 hours at 70 ± 2 °F and 50 ± 2 percent relative humidity.

Three processed test film strips shall be used to determine photoactivity - one each for the red-sensitive (cyan-dye forming), the green-sensitive (magenta-dye forming), and the blue-sensitive (yellow-dye forming) emulsion layers.

Place one of each type of test film strip in the film bag being tested. Wrap the film bag in .001 inch thick, photographically inert, dead-soft aluminum foil and seal in a photographically inert, heat-seal laminated foil envelope. Prepare a check package of film without the film bag. Place the envelopes containing the film bags in a dry air oven for 7 days at 120 ± 2 °F.

The test film shall be Kodak 7272, 16mm Color Internegative II Film.

The values measured for the test and check film strips shall include D-min for each color, and the dye shift at density 1.0 for each color.

Read the densities in the specified areas with a color densitometer. Take 3 readings in each area and average. The densities of the check film are subtracted from the densities of the test film, and the differences are recorded.

The D-min density difference shall be + .03 or less, and the dye shift shall be \pm .10 or less for each color.

If the sample fails to meet the requirements of this specification, the entire lot shall be rejected.

4. Workmanship

The bags, including the sealed seams, shall be free of rips, tears, holes, foreign matter, dirt, dust, oil, wax, and grease. The finished bag shall open easily, with no impediment from partial seal at the opening. The bag material shall not self adhere or "block".

5. Packing and Shipping

The bags shall be packaged flat, all oriented in the same direction, in corrugated shipping cases lined with polyethylene in a manner to protect them from physical damage, dirt, dust, or other contamination. The maximum weight of each case shall be 45 pounds.