

National Archives and Records Administration (NARA)

Motion Picture Technical Processing Guidance

This document summarizes the factors considered by staff in NARA's Motion Picture Preservation Lab when assessing unprocessed collections and organizing records into an archival set for the [NARA Moving Image and Sound Branch](#), or custodial unit. This document is intended to be used for guidance only and not as an instructional manual. Lab staff rely on specialized expertise and years of experience to inform their decisions and frequently consult with each other before making determinations. Please note that this document reflects practices at NARA and practices at other institutions may vary.

Some of the terms in this guidance are specific to NARA, while others are more widely adopted. Appendix 1 contains a glossary defining terms used throughout this document. Additionally, the [NARA Guide to the Contextual Assessment of Film Elements and Related Materials](#) defines common motion picture element identifiers used on film containers and their contents. The terms are useful when completing technical processing and may assist readers in understanding this guidance document.

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What is Technical Processing of Motion Picture Records?

In the archival context, processing is the act of preparing materials to be used by the public. Technical processing by the Motion Picture Preservation Lab is a critical procedure that allows the custodial unit to complete archival processing. Technical processing focuses on the physical aspects of motion picture records and includes identification of film elements (see Appendix 2 for NARA's list of element type acronyms) and determination of archival sets for preservation and access purposes. The individual rolls, or film elements, are inspected and organized, and information about organization and condition is recorded on an Inspection Sheet (see Appendix 3). Cleaning and repair of film may also be part of technical processing.

How is Technical Processing Applied to Motion Picture Records?

The National Archives Moving Image and Sound Branch uses a color-coded, hierarchical system to assign levels of access and protection to film elements. Every film item is organized into an archival set with up to three instances, consisting of a Preservation (P), Intermediate (I), and Reference (R) copy. An item is a discrete record, including all film reels and elements that comprise that record.

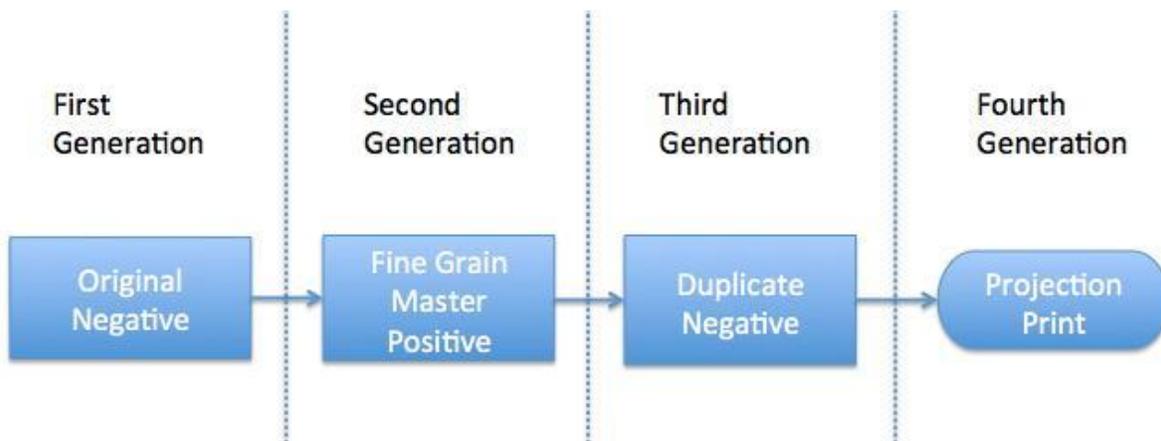
Each item will have at least a P copy, but may not necessarily have an I or R copy. The three copies should all contain the same content, with the Preservation copy being in the best-condition; the earliest generation that is handled the least; and ideally kept in cold storage for long-term preservation. Preservation and Intermediate copies may be handled by approved vendors, but not by members of the public. Films designated as Reference copies are served to the public in the Moving Image and Sound Research Room and viewed on flatbed viewers. We generally refer to films that have been organized in this way as an "archival set," or "P-I-R set." The film cans are labeled with color swatches indicating the level of protection. Much like a traffic light, red reminds us to stop and only open the can if necessary, yellow means proceed with caution, and green tells us we can go ahead and serve the film to a researcher.

The goal of creating an archival set is to ensure that an item remains permanently accessible. Preservation elements are rarely handled, consistently remaining in storage with optimal low temperature and humidity controls. Intermediate elements serve as film masters that may be used in place of the protected Preservation elements. These elements can be digitized in-house for upload to the Catalog, or digitized by approved vendors for film and television production. Reference elements are stored in warmer conditions to more promptly serve on-site researchers.

Determining Generation, Completeness, and Condition

To create an archival set from multiple copies of the same item, lab staff complete a full inspection, hand winding through all of the elements of a film item and ascertaining the generation, completeness, and condition of each reel. This section defines the terms “generation”, “completeness” and “condition” and how each is evaluated.

Sample Sequence of Motion Picture Film Generations



How is the “generation” determined?

In motion picture film, the earliest possible generation element is the film that was exposed in a camera. This can be a “camera negative,” “original negative,” or “original

reversal.” These negatives and reversals can be duplicated, and the resulting copies can be duplicated, and so on. Each duplication results in a new “generation,” and is a certain number of “generations” away from the first generation. Accounting for generation is essential to technical processing, as each subsequent generation is of lesser quality than that of its predecessor. In the above example, an original camera negative is duplicated to create a positive fine grain master, also called the “second generation.” This print is then duplicated, resulting in another negative, called the “third generation,” and so on. Certain identifiers, such as frame lines and edge markings, can provide evidence pointing to the “generation” of a film, or how far it has progressed from the first generation element. For more detailed information refer to Appendix 4 - Sequences of Motion Picture Film Generations

How is “Completeness” determined?

It is common for some motion picture film elements to be missing frames or scenes. Frames or scenes may be removed intentionally through the editing process, or unintentionally through damage from projection. A film reel that contains all of its original content is considered “complete,” whereas a film reel with missing frames or scenes is considered “incomplete.” For example, suppose that the first generation camera negative in the above sample was duplicated to create the second generation master positive. The master positive was then edited and had scenes removed. The third generation duplicate negative was then made from that edited master positive. As a result, both the master positive and the duplicate negative would be shorter, and less complete, than the camera negative. When comparing elements for completeness, it is useful to measure and compare reel lengths, and to look for splices as evidence of content removal.

How is “Condition” assessed?

The condition of archival film is assessed by conducting a full inspection. Starting with the opening of the film can, lab staff observe and record a number of observations

about the film, including base type, evidence of chemical decomposition, the amount of shrinkage, the presence of edge damage, base and emulsion scratching, or any other deterioration or visible defects. When first assessing multiple copies of the same item, lab staff conduct a cursory inspection of all of the elements, opening each can, checking for vinegar syndrome and identifying the element type, and then sorting into a preliminary archival set. Lab staff then conduct a more thorough inspection, winding through each reel and recording all measurements and observations in an inspection sheet that will be added to a larger database. As lab staff inspect the reels, they refine the archival set until it represents the best possible arrangement to protect the original and provide access to the content.

Guidelines for Assigning Film Elements to P-I-R Sets

- 1. Preservation (P) Copy - These reels are given the most protection and should be pulled infrequently and only when absolutely necessary. The can(s) will be marked with a Red Color Swatch.**
 - a. Designate the *earliest generation, best condition, most complete* element(s) as the P copy.
 - i. If an earliest generation element is missing large sections, is significantly damaged, shrunken, scratched, vinegared, or faded, and other, better elements exist, then it may be discarded. (Please note that elements for films with high intrinsic value may be retained regardless of condition or completeness.)
 - ii. If the earliest generation, best condition copy is incomplete (missing reels, etc.) or has some other deficiency, a later generation but more complete element may be included in the P copy to ensure that all of the best condition footage is protected. This may result in a P copy set of mixed generations, with negative and positive reels intermingled.

- b. If the earliest generation element is not eligible for the P copy as described above, then place the most *complete* element in the P copy set, regardless of condition. Additional elements may be retained in the P copy as a protective measure if the primary element has condition issues that may make it difficult to duplicate (high shrinkage, perforation damage, etc.).
- c. If the P copy contains A & B Roll elements, then a single-strand element produced from these A & B Rolls should also be included in the P copy set to serve as a record of color timing and fade decisions. This also provides a protected element that is easier to handle, and less labor-intensive to digitize, than the A & B Rolls.
- d. Due to equipment limitations, 35/32mm elements should be retained only if they are the sole existing element, or if other elements are incomplete or have sustained deterioration or damage.
- e. If the film originated on 35mm, a 16mm reduction element should be retained in the P copy only if it is the only element, or if the 35mm elements are incomplete or damaged. In this case, the 35mm elements would be retained along with the 16mm reduction unless the damage, deterioration, or missing sections are extreme.
- f. If the original film elements are color, black-and-white film elements should be discarded unless they have content that is not found in the color element.
- g. If an accompanying soundtrack exists for the selected P element, then it should also be placed in the P copy.
 - i. If the selected P element is silent, but sound exists among other elements, then the best condition sound element must be added to the P copy along with any sync picture elements in order to create a complete P copy set.

- ii. If there is a 16mm or 35mm magnetic soundtrack, it should be designated as a P copy along with an optical track. These magnetic soundtracks contain higher quality audio than optical soundtracks, but an optical soundtrack should also be kept in the P copy set for printing purposes.

2. Intermediate (I) Copy - These reels are pulled regularly to satisfy duplication requests at vendor facilities. Only approved vendors are allowed to handle them and they are not routinely monitored for damage or deterioration. The can(s) will be marked with a Yellow Color Swatch.

- a. Designate the *next earliest generation, next best condition, and/or next most complete* element(s) as the I copy.
 - i. These elements should be in relatively good condition for frequent use. If an element is missing large sections, is significantly damaged, shrunken, scratched, vinegared, or faded, then it may be discarded. If it is in poor physical condition, but matches the condition of the preservation copy (i.e. faded or scratched), then it is a sufficient I copy.
 - ii. Missing a few frames compared to the P copy is permissible, but missing frames should be recorded in the inspection notes.
- b. If an accompanying soundtrack exists for the selected picture element, then it should also be placed in the I copy set.
- c. If the P copy is color, the I copy must also be color and black-and-white elements are not retained.
- d. For ease of use, the I copy should not contain a 35/32mm element and optical soundtracks are preferred over magnetic tracks.

3. Reference (R) Copy - These reels are viewed by researchers in the Moving Image and Sound Research Room via flatbed film viewers. The can(s) will be marked with a Green Color Swatch.

- a. Designate the *next earliest generation complete positive* element(s) as the R copy.
- i. This element may have sound or be silent depending on the original content, but it *cannot* include a separate soundtrack. If the P copy has a soundtrack, the R copy must be a composite (with picture and track combined).
 - ii. If the P copy is color, the R copy must also be color and black-and-white elements are not retained.
 - iii. The R copy should be in relatively good condition for frequent use. If an element is missing large sections, significantly damaged, shrunken, scratched, vinegared, or warped, then it may be discarded.
 1. Some scratching and fading is acceptable, as long as the content is visible.
 2. For use on the Research Room flatbed film scanners, this element should have low warping and shrinkage, be free of vinegar syndrome, and have minimal splices and perf damage.
 3. A digital access copy can always be made from a better condition intermediate or preservation element, but due to the resources needed to replace every reference print, a “good-enough” print should not be discarded.

Appendix 1 - Glossary of Terms for Archival Processing

For more information about specific elements and their definitions, please refer to the *NARA Contextual Assessment of Film Elements and Related Materials* document.

Archival Set A group of films, of the same item, organized into the Preservation (P), Intermediate (I), and Reference (R) categories. A sub-grouping of films within each of these categories is also referred to as a “set” (Ex: There are two reels in the “P” set).

Base The plastic layer that provides the support needed to carry the images, sound, and any other information in motion picture film.

Completeness Refers to the amount of present content in an element compared to what may have existed when the film was originally produced. A reel that is missing frames or scenes may be considered “incomplete.”

Condition The current physical state of a record, accounting for film base type, chemical decomposition, shrinkage, scratching, and other evidence of deterioration.

Edge Markings Manufacturer markings outside of the image area that may indicate year of production or stock type.

Element An individual roll of film that comprises a reel or item, defined by qualities such as whether it is picture or sound, negative or positive, etc. Refer to Appendix 2 for a complete list of film element acronyms and their definitions.

Emulsion The photosensitive coating on film that contains the images and other information.

Frame The smallest unit of motion picture film. Each frame is an individual still image in a sequence of images.

Generation Refers to the order of duplication of film elements. A copy of a copy of a negative is said to be a “third generation” element.

Item A particular film title, including all film reels and elements that comprise that title. (Ex: 111-H-1515 is an item).

Master A film element used for reproduction purposes.

Negative A film element in which light and color values are inverted. Items originating on a negative element must be printed or digitized to a positive form for viewing.

Positive A film element in which light and color values are not inverted and are appropriate for viewing.

Reel A physical unit of division that breaks longer works into segments. A film item may be a single reel or many reels long. Multiple elements (for example, separate picture and track) may comprise a single reel.

Reversal A film stock that has no negative, reversal film uses a chemical process so that the film shot in the camera is developed to result in a positive image.

Shrinkage A measurable effect of physical deterioration of the film base. As deterioration progresses, the film's dimensions change and it is more difficult to run on standard equipment. Shrinkage may occur in the presence of Vinegar Syndrome or on its own.

Splice A physical joining of two separate pieces of film, usually occurring at the frame line.

Technical Processing Assessing the physical aspects of records in order to create appropriately-organized archival sets.

Vinegar Syndrome A deterioration process that affects acetate film base, identifiable by the vinegar smell that becomes evident as the acetate base breaks down. Films with vinegar syndrome will shrink and lose flexibility and are eventually unrecoverable.

Appendix 2 - NARA Film Element Acronym Definitions

The National Archives uses the following acronyms to identify film elements. Other institutions may implement their own methods of identification, but it will be helpful to refer to this list when working with motion picture materials at the National Archives.

NARA Film Element Acronyms			
Silent (Image only)			
Black & White		Color	
ONS	Original Negative, Silent	ONSK	Original Negative, Silent, Color
ORS	Original Reversal, Silent	ORSK	Original Reversal, Silent, Color
DNS	Duplicate Negative, Silent	INSK	Internegative, Silent, Color
FGMS	Finegrain master, Silent	INTPSK	Interpositive, Silent, Color
		CRI	Color Reversal Intermediate (neg)
DRS	Duplicate Reversal, Silent	RSK	Reversal, Silent, Color (duplicate)
		MPSK	Master Positive, Silent, Color
MPPS	Master Projection Print, Silent	MPPSK	Master Projection Print, Silent, Color
PPS	Projection Print, Silent	PPSK	Projection Print, Silent, Color
Composite (Image with sound)			
Black & White		Color	
ONC	Original Negative, Composite	ONCK	Original Negative, Composite, Color
ORC	Original Reversal, Composite	ORCK	Original Reversal, Composite, Color
DNC	Duplicate Negative, Composite	INCK	Internegative, Composite, Color
FGMC	Finegrain master, Composite	INTPCK	Interpositive, Composite, Color
DRC	Duplicate Reversal, Composite	RCK	Reversal, Composite, Color
MPPC	Master Projection Print, Composite	MPPCK	Master Projection Print, Composite, Color
PPC	Projection Print, Composite	PPCK	Projection Print, Composite, Color
Soundtrack Only			
ONT	Original Negative Track	DNT	Duplicate Negative Track
MPT	Master Positive Track	MAG	Magnetic Soundtrack (film)

Appendix 3 - Inspection Sheet Example

Project Type SAMPLE

ITEM NUMBER 79-EXAMPLE-15

DATE 4/2/2019

INSPECTOR Anne X. Ample

TITLE ON FILM Sample Film Extravaganza

P COPY ELEMENTS

Reel	1 A-Roll	1 B-Roll	1	1	2 A-Roll	2 B-Roll	2	2
Element	ORSK	ORSK	DNT	INSK	ORSK	ORSK	DNT	INSK
Gauge	16	16	16	16	16	16	16	16
Date Code	1972	1972	1973	1995	1972	1972	1973	1995
Base (a/p)	a	a	a	p	a	a	a	p
Acidity	0.5	0.5	0.5	0	0.5	0.5	0.5	0
Shrinkage	0.5%	0.45%	0.35%	0.15%	0.4%	0.45%	0.4%	0.15%
No. of splices	117	111	1	0	94	92	1	0
Emulsion Scratches	0	0	0	0	0	0	0	0
Base Scratches	2	2	1	0	2	1	1	0
Perf/ Edge Damage	0	0	0	0	0	0	0	0
Warping	0	0	0	0	0	0	0	0
Fading/Color Shift (Y/N)	Y	Y	N	N	Y	Y	N	N
Footage	762	762	762	762	536	536	536	536

I COPY ELEMENTS

Reel	1	1	2	2				
Element	INSK	DNT	INSK	DNT				
Gauge	16	16	16	16				
Date Code	1973	1973	1973	1973				
Base (a/p)	a	a	a	a				
Acidity	0.5	0.5	0.5	0.5				
Shrinkage	0.55%	0.4%	0.5%	0.4%				
No. of splices	1	1	1	1				
Emulsion Scratches	1	0	1	0				
Base Scratches	2	2	1	2				
Perf/ Edge Damage	0	0	0	0				
Warping	0	0	0	0				
Fading/Color Shift (Y/N)	N	N	N	N				
Footage	762	762	536	536				

On a Scale of 1-4: 1=Slight 2=Fair 3= Moderate 4=Heavy

R COPY ELEMENTS

Reel	1-2							
Element	PPCK							
Gauge	16							
Date Code	1979							
Base (a/p)	a							
Acidity	0.5							
Shrinkage	0.6%							
No. of splices	1							
Emulsion Scratches	1							
Base Scratches	2							
Perf/ Edge Damage	1							
Warping	1							
Fading/Color Shift (Y/N)	Y							
Footage	1288							

On a Scale of 1-4: 1=Slight 2=Fair 3= Moderate 4=Heavy

Additional notes or information regarding the film (i.e. title on leader, areas of damage, or other conditions):

P copy--ORSK A/B Rolls also contain some stock dated 1971 and some sections flipped to A-wind position. Some RSK included. Some sections are color-shifted to purple.

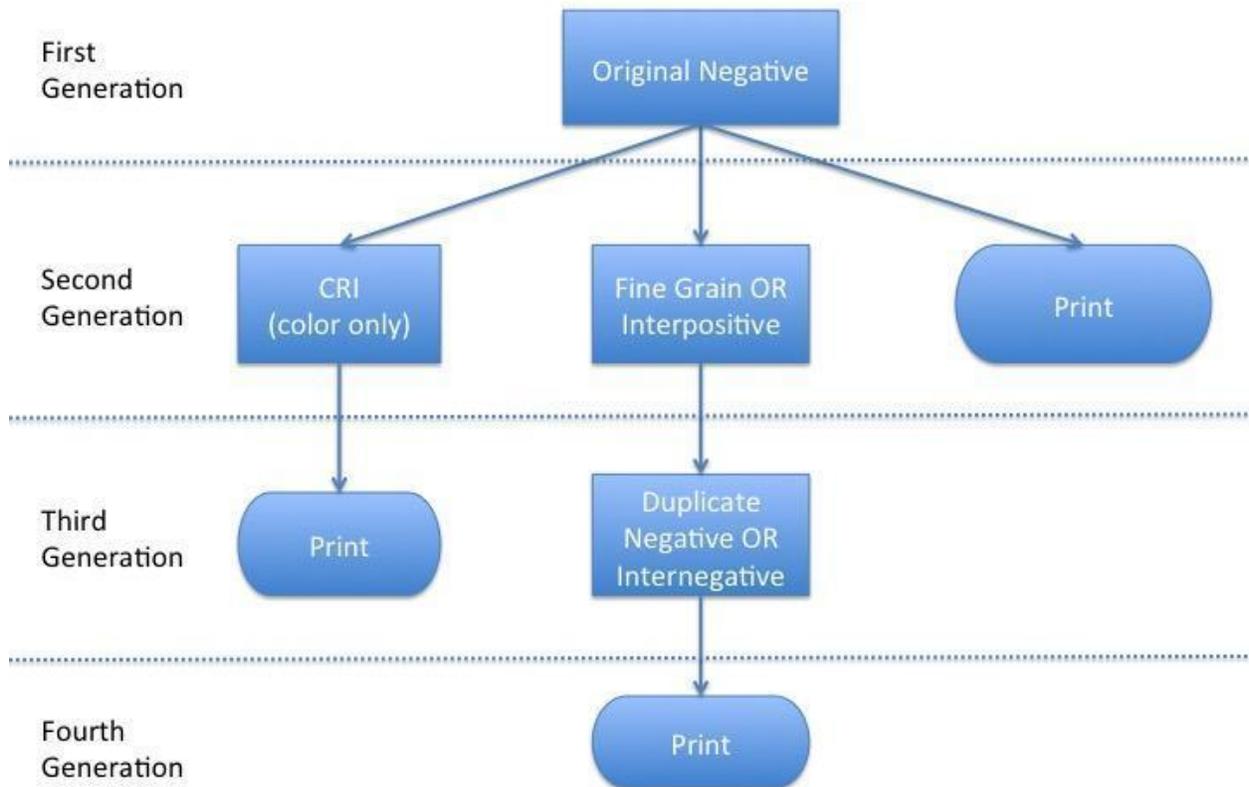
R copy--PPCK has faded to magenta.

Discarded 3 PPCKs that were more scratched, shrunken, or damaged than the one retained. Discarded individual sound edit rolls because mix is retained in the P set.

Appendix 4 - Sequences of Motion Picture Film Generations

The following flowcharts demonstrate potential generational sequences of motion picture film, beginning with either an original camera negative or an original camera reversal element as the source. These charts do not express all possibilities of film duplication, but merely provide a few common examples. Although these flowcharts end with positive exhibition elements, it is possible to continue duplication from those elements. However, it should be noted that quality diminishes with each duplication.

Original Negative Sequence



Original Reversal Sequence

