Report to the ARRB -President John F. Kennedy Assassination

Analysis of Selected Photographic Evidence

STUDY 2

Edge Print Analysis and Supporting Technical Information - 35mm Films

Note: This report corrects and updates the analysis of the 35mm films contained in the "Follow-up Report" 19 Dec. '96 to Mr. James Milch[1] based on our first brief visit to NARA.

Objective: Analyze the 35mm "blow-up" motion picture prints and determine to the fullest extent possible when they were printed, and on what film product, and the vintage of the print and/or print-through of the intermediate stock. (Per ARRB request)

35mm Prints of the Muchmore and Nix 8mm movies

Background: In response to a Federal subpoena, Mr. Robert. J. Groden provided two 35mm color prints made from 35mm blow-up internegatives from the Nix and Muchmore 8mm films to the ARRB. Mr. Groden, photo consultant to the House Select Committee on Assassinations and Technical Advisor to Oliver Stone's movie *"JFK"*, purportedly developed a videotape *"The Assassination Films"* incorporating the 8mm movies of Zapruder, Muchmore and Nix. We were informed that the videotape was possibly scanned from 35mm "wet gate" blow-ups. The Review Board was interested in determining the provenance of Mr. Groden's 35mm prints.

In the introduction to his book, *The Killing of a President*, Mr. Groden relates his working for a motion picture optical house owned by Mr. Moses Weitzman, and the knowledge and experience he gained using an optical printer to duplicate and enhance motion picture film. This awareness encouraged us to contact Mr. Weitzman to gain background and his support in analyzing some printing features and characteristics noted in the "Blow-up" 35mm prints of the Nix and Muchmore 8mm camera films submitted to the ARRB by Mr. Groden.

A letter was sent to Mr. Weitzman[2] questioning leader identification noted on the Nix film print material, printer drum

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[1] See *"Follow-up Report" 19 Dec. '96* to Mr. James Milch, appended.

[2] Request for information November 7, 1997 - appended.

identification marks as well as image orientation of selected scenes and selected scenes of the Muchmore 8mm film. A synopsis of information derived from the conversations with Mr. Weitzman as they applied to our analysis is interwoven into the text of this report.

Some of the information provided by Mr. Weitzman in our discussions expanded beyond specific questions about the two 35mm prints, and paralleled comments he made to the ARRB in hearings on the Zapruder film televised by C-SPAN2, April 2, 1997. The handling of the Zapruder film, therefore, became an important part of the understanding of the special handling and printing of the 8mm assassination films in general. Because the information derived from our discussions may be helpful to users of this report, it is appended.

Our primary focus is to analyze the Nix and Muchmore prints submitted by Mr. Groden to the ARRB for study. We have, to the best of our ability, approximated when they were printed, on what film product, the vintage of the print and, where possible, by edge marking print-through, the film product and vintage of the intermediate stock.

Part 1

Nix Film

Synopsis: The 35mm blow-up print of the NIX film contained several edge print markings[3] including: EASTMAN 5272-255 1401 101EA, a bar code and "man readable" numbering of KS 01 1063 5924• and, several special markings of a dollar sign, a right facing bracket, a pound sign and an open triangle; e.g. $, [, #, and Δ. Lettering height was about 1.5mm as well as 1mm. Within the print are two sources of edge print: the manufacturing edge print of the Eastman Color Print film (provided to NARA) and the print-through edge print of the 35mm laboratory intermediate film.

Mr. Weitzman reported to me that his laboratory never used Eastman intermediate Film 5272 as a "taking" film for the blow-up work because of its slow speed and the limited light through the 8mm-film frame. EASTMAN Color Negative film, a faster camera film, was his film of choice. Therefore the intermediate, identified as the internegative used to print the NARA copies, was derived from an earlier interpositive or print.

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[3] Eastman 35mm KEYKODE™ Numbers User's Guide is available from the Eastman Kodak Company, Professional Motion Imaging as publication H-43a, Cat. No. 1554583. A copy is appended to this report.

The edge print of the color print material would be plus density on a clear background and the intermediate edge print, being dark after processing, would print through as light density. The low density or clear area from the edge of the film, including between the perforations, of the intermediate film, often, or usually, because it does not hold back any light, obliterates most of the color print edge print. Some partial edge print is seen on this print.

Occasionally part of the edge print may be cut off (i.e. only a portion of the letter height shows) because the edge print is applied prior to the slitter knives and there may be a slight weave during slitting. Figure 2-1 shows the "S•AFETY FILM" partially clipped.

Based upon our viewing of the prints, we were able to interpret all product markings seen and some printing characteristics:

Figure 2-1 The Eastman Color Print Film Edge Marking "SAFETY FILM" can be seen in black and backwards over the yellow product markings and EASTMAN KEYKODE™ of the Intermediate Film (Neg. 4567, frame 23)

Note: Light yellow edge print markings. This film contains a Bar Code, which is "EASTMAN KEYKODE™", established for trade use beginning in 1989[4].

[4] See *Eastman Professional Motion Picture Films*, KODAK Publication No. H-1, CAT 155 2280, EASTMAN KEYKODE Numbers pp12 and 15.

Nix Film - Eastman Internegative Film Edge Print

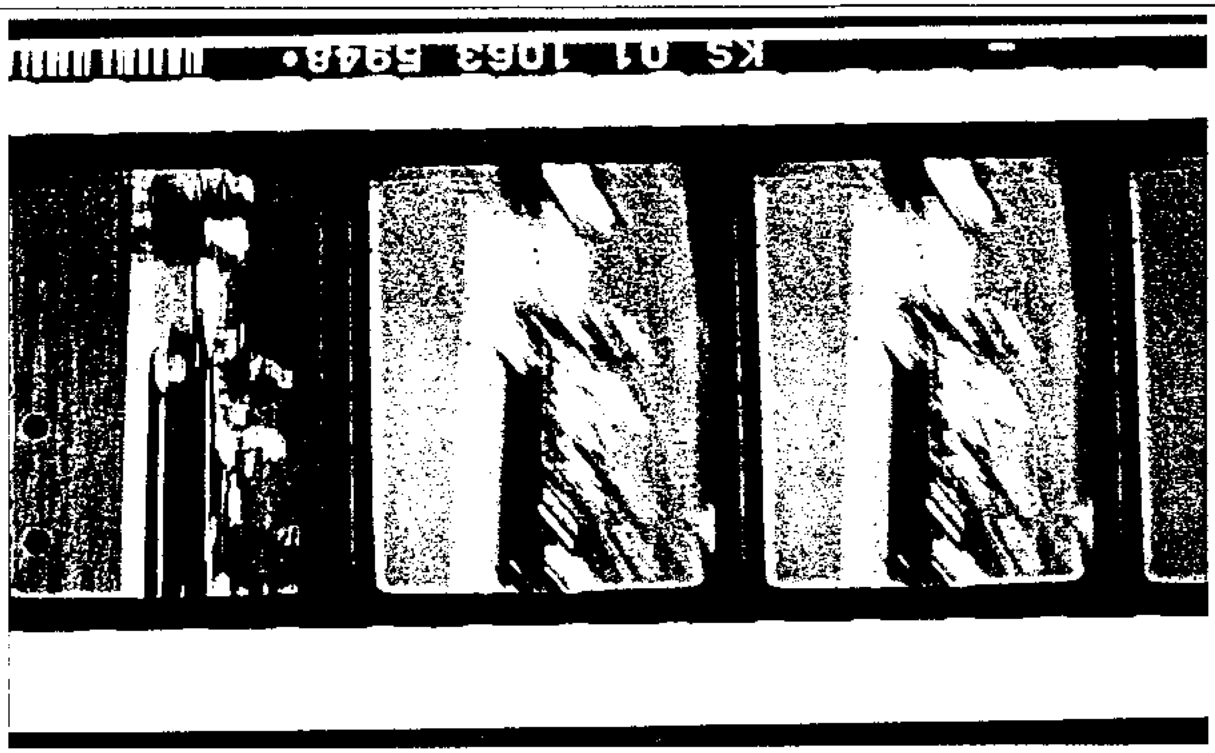

Figure 2-2 Eastman Film Product Code Marking; K= Kodak, S = Eastman Color Internegative Film/5272 (Neg. 4566 frame 16)

Edge Print	Significance
K	Manufacture Identification Code, K = Kodak
S	Film Identification Code A Letter which identifies film type; "S" is Eastman Color Internegative Film/5272, a low contrast intermediate. Note: a logical choice to reproduce a color reversal film.
	Key Number
01 1063	Prefix - Six digits that identify film roll.
5948	Count- Four digits that increment once per foot.
•	Zero-Frame Reference Mark Identifies frame directly above as the zero-frame
▮▮▮▮▮▮▮▮ ▮▮	EASTMAN KEYKODE™ Numbers Kodak's Machine-readable numbers.

Figure 2-3 Manufacturers Information Including Product Code, Emulsion, Roll, etc. (Neg. 4566, Frame 30)

Manufacturer's Information

EASTMAN	Film Manufacturer
5272	Product Code
255	Emulsion Number
1401	Roll and Part Number
101	Printer Number
EA	Year Code (EA is 1991)
_	Frame-Index Marker A Hyphen, which occurs every four perforations, to help locate position of frame line, especially in low-light level scenes. Note: The frame-index marker is not printed when it interferes with any other edgeprint information.
(Not seen)	Strip Number The strip number is printed (very small) between the perforations. Because of the aperture used by the laboratory printer, this area was not printed (exposed) from the intermediate to the print film.

Figure 2-4 Mid-Foot Key Number – Uses Smaller Type Size. Also note Perforated Strip Number "26" - Not Usual, See Text. (Neg. 4566, Frame 22)

KS 01 1063 5948-32
Plus Bar Code

Mid-Foot Key Number

Full key number plus bar code, including 32-perforation offset, positioned halfway between each footage number. Uses a smaller type size to distinguish from one-foot key numbers.

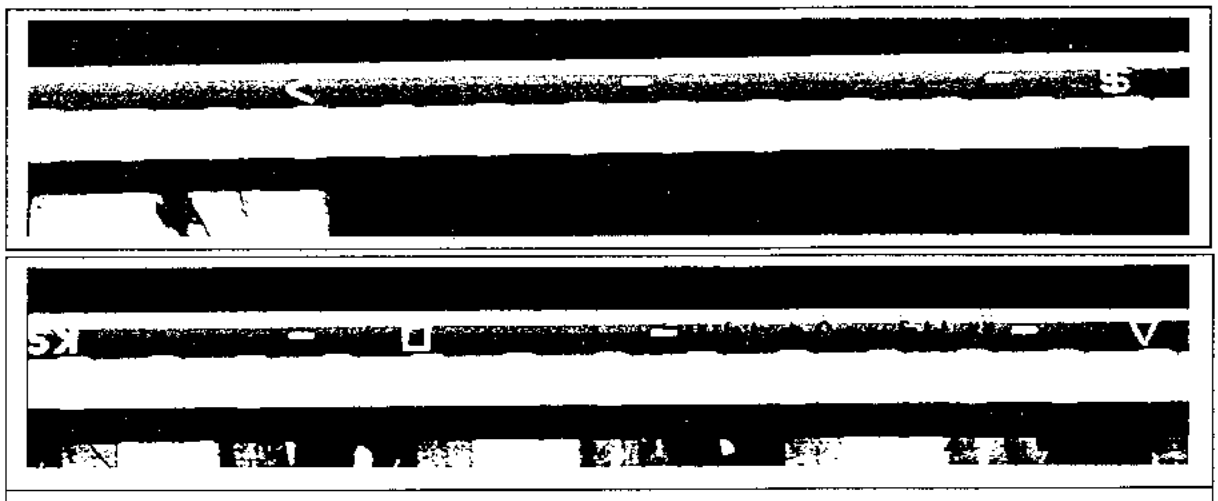

Figure 2-5 Matching Check Symbols: <, $, V, □. etc. randomly selected. (Neg. 4566, Frames 13 and 26)

$ > Δ /
[# □

Matching Check symbols

Two <u>randomly selected</u> and placed symbols designed as an extra matching check between workprint and negative.

Nix Film - Eastman Color Print

Note: The dark or D-max edge print was applied (by exposure) during manufacturing. Because the edges of the 5272 were clear, except for edge print, the process of printing (adding exposure) obliterated much of the edge print. Consequently it was difficult to provide a photographic record of all markings (e.g. the date code is superimposed on the bar code), however we were able to see and interpret the following:

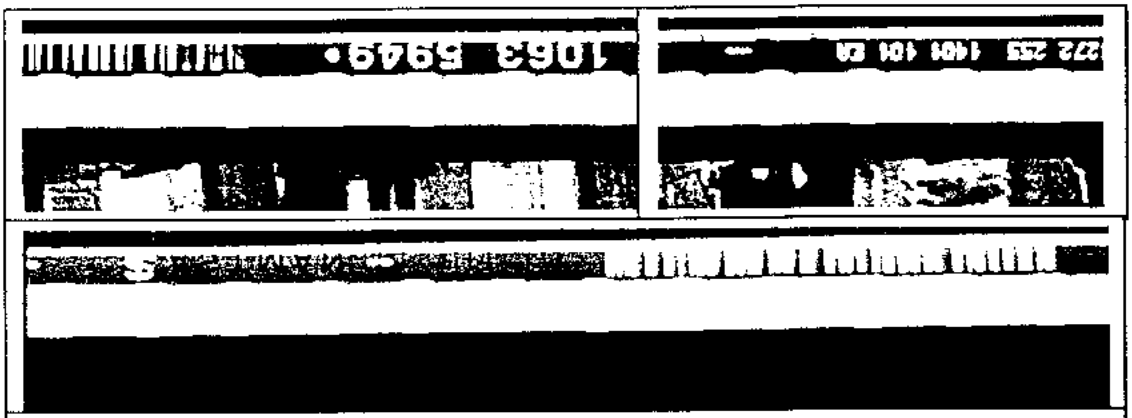

Figure 2-6 Examples of Eastman Color Print Markings Shown in Black. Examples include LPP, Date Code, Machine Code and Strip Number "14". (Neg. 4566, frames 11, 28 and 30)

Edge Print (In Black)	Significance
S•AFETY FILM	To identify that the film product is produced on a "safety base" per American National or ISO Standards. The dot (•) following the letter "S" in "S•AFETY" indicates USA - Rochester manufactured film. (Seen in Figure 2-1)
■ +▲	Date Code: This identifies the year of manufacture as 1992 (See Fig. 2-6 Upper Left)
LPP	Part of the Identification Code for EASTMAN Color Print Film, 5384 (See Fig. 2-6 Upper Right)
EASTMAN	Manufacturers name
• ł†T	Machine Code: Identifies the slitting machine applying the edge prints as machine #208.
14	Strip number: (partially visible) Nº14 of 38 strips of a 35mm stock roll.

No other manufacturing print film codes were visible.

Other Markings

Perforated number: No 26, seen printed-through from the original or intermediate (See Figure 2-4). Because the "holes" of the printed perforated number are black, they were most likely made in the intermediate. Note: A perforated number appears in more than one location. Most likely, this number identifies the manufacturing strip number. Typically this end identification is discarded. It could indicate that the printer operator, for testing purposes, was using "core-ends".

Printer drum notch: A single half moon is visible protruding into the perforation area in Figure 2-3. This type of notch code was sometimes used to identify printers of the same type within a laboratory to facilitate tracing printer problems. We were not able to attach significance to its presence with the films examined.

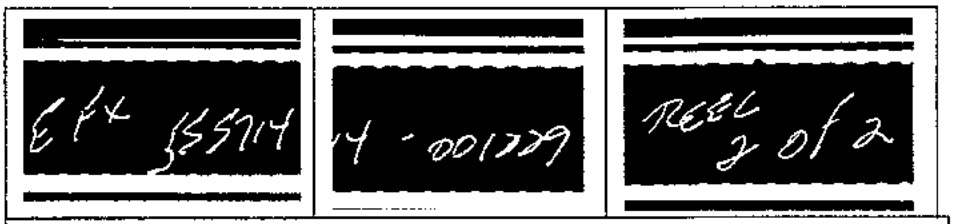

Figure 2-7 Nix Film – Print-Through of Intermediate Clear Leader Markings. (Neg. 4567, Frames 32 – 35)

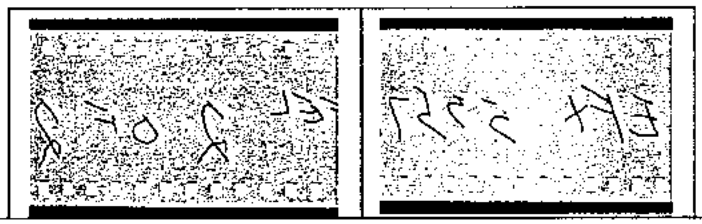

Figure 2-8 Nix Film Print-Through of Leader Markings. (Neg. 4566, Frames 34 & 35)

Heads/Tails Leader Identification Marks: The leader marking (typically used for laboratory internal control) printed clear or white letters with a black background on one of the Nix blowups is identified with: "EFX 555714 - 0012? Reel 2 of 2". See Figure 2-7. This would have appeared as clear leader with black ink marks on the intermediate film.

Another intermediate was identified "EFX = EL 2 of 2" printed clear with black letters onto the print film would have been from a D-max or black leader intermediate with scratched-in or clear letters. See Figure 2-8. Both are printed from EASTMAN Intermediate Film 5272 manufactured in 1991, (shown above in Figure 2-3) with the print film supplied to NARA manufactured in 1992 (shown above in Figure 2-6).

I had discussions with Mr. Moses Weitzman[5], a founding partner of an optical printing laboratory - Effects Unlimited. I asked his opinion on the significance of the identification on the 35mm prints supplied to the ARRB. In our discussion, Mr. Weitzman related that "EFX" stood for his company *Effects Unlimited* and that the company went out of business in 1989. Effects Unlimited was succeeded by Eastern Optical Effects and film code marking on product handled by the successor company after 1989 would probably have contained the initials "EOE" for leader identification.

Since the color prints were on recent vintage stock, we are not dealing with prints produced by Effects Unlimited. It appears that earlier versions of a blowup negative or interpositive intermediate were used to make the prints supplied to the ARRB.

Mr. Weitzman relate that he remembered that leader applied to the original would have been light on the "head" end and black on the "tails" end. Note: In the "Film Map" accompanying Mr. Horn's l April 9 - letter to Mr. Marwell, appended with Study 1, the leader with the Zapruder original is yellow with lettering identifying "EFX Start Zapruder Original Film (Color)" and on the opposite end clear or light struck leader with: "Head * Do Not Use This Start".

It appears clear that when someone made the interpositive, they added the leader. As noted earlier, Mr. Weitzman reported to me that his laboratory never used Eastman intermediate Film 5272 as a "taking" film for the blow-up work because of its slow speed and the limited light through the 8mm-film frame. EASTMAN Color Negative film, a faster camera film, was his film of choice. We must conclude therefore that the 5272 intermediate used as a print master for the color print film provided to the ARRB by Mr. Groden, was derived from an earlier, pre 1989, made intermediate or print.

Rotoscoping: Although our objective is the analysis of edge markings, one might be curious about the canted frame-to-frame images shown in Figure 2-1. No doubt the positioning of the individual frames onto the intermediate film was done to conduct a specific analysis of the scene content by rotoscoping. Rotoscoping is an optical effects technique - a long and tedious procedure - to achieve a matching of scene elements. Possibly used here to compensate for unwanted camera angle or movement.

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[5] Compendious notes of discussions appended.

Part 2

Muchmore Film

Synopsis: The 35mm print of the Muchmore film was edge printed "Eastman 19 ·1†T and footage marked 84697 (plus & minus). In smaller font S•AFETY FILM EASTMAN and elsewhere a bar, plus sign and solid triangle ▮+▲ and S•AFETY FILM. The light colored information (Figure 2-9) is a print- through of a footage number from the internegative. The dark or maximum density edge print (shown with the Nix film analysis and later here) was applied during manufacturing onto the print film.

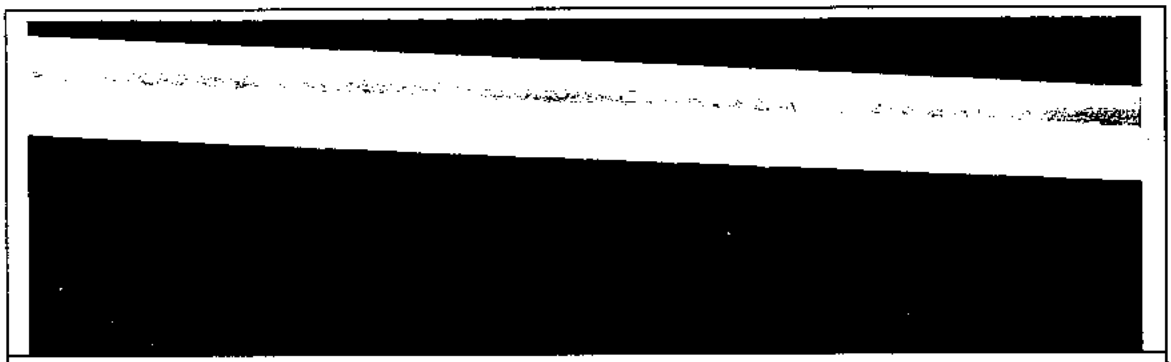

Figure 2-9 The Light Colored Information Is A Print- Through of a Footage Number from the Internegative (Neg. 4568, Frame 9A)

Intermediate Film and Eastman Color Print Edge Print

Edge Print	Significance
8 4 6 9 8	Footage number(s) printed through from the intermediate film. See Figure 2-9. Note: Sequential footage numbers were the only information printed through from the intermediate film precluding the opportunity for analysis of edge markings that would reveal product type or year of manufacture.

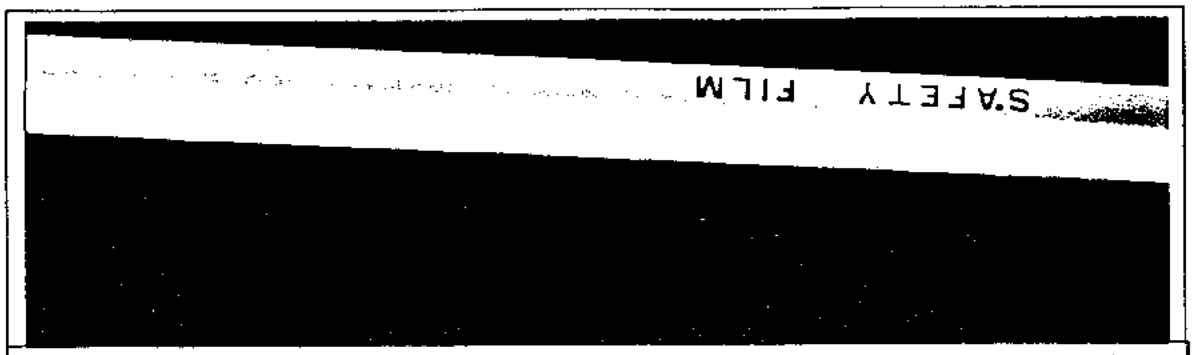

Figure 2-10 EASTMAN Color Print Film Edge Markings in Black. "SAFETY FILM" shown together with part of footage number printed-through from the Internegative. (Neg. 4568, frame 06)

S•AFETY FILM — A marking to identify that the film product is produced on a "safety base" consistent with practices recommended in American National or ISO Standards. The dot (•) following the letter "S" in "S•AFETY" indicates USA - Rochester manufactured film.

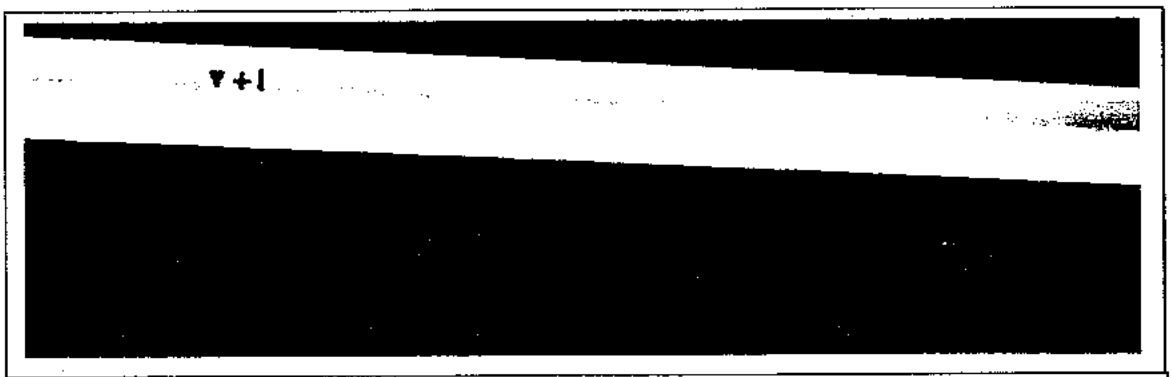

Figure 2-11 Date Code Markings in Black identifies the year of manufacture as 1973. (Neg. 4569, frame 6A)

I +▲ — Date Code: This code identifies the year of manufacture as 1973.

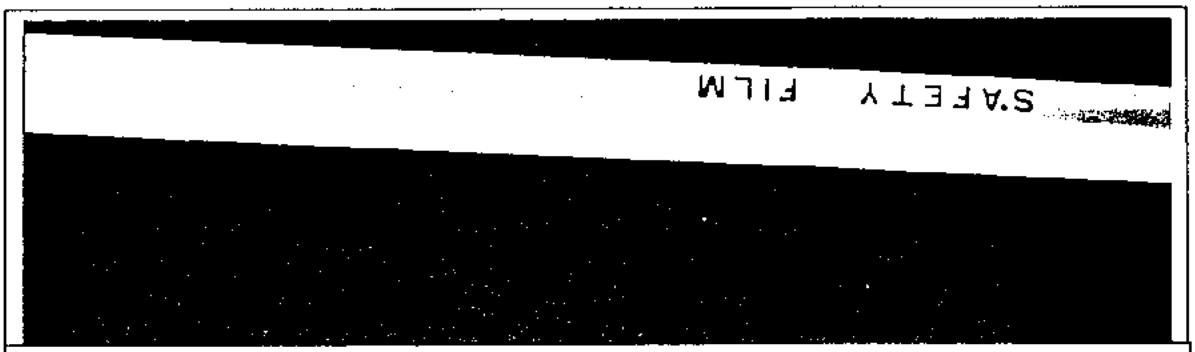

Figure 2-10 EASTMAN Color Print Film Edge Markings in Black. "SAFETY FILM" shown together with part of footage number printed-through from the Internegative. (Neg. 4568, frame 06)

S•AFETY FILM — A marking to identify that the film product is produced on a "safety base" consistent with practices recommended in American National or ISO Standards. The dot (•) following the letter "S" in "S•AFETY" indicates USA - Rochester manufactured film.

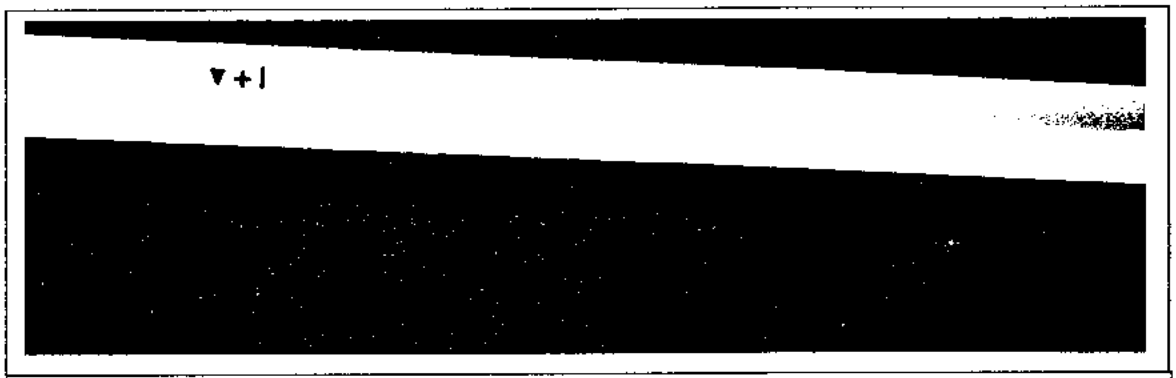

Figure 2-11 Date Code Markings in Black identifies the year of manufacture as 1973. (Neg. 4569, frame 6A)

I +▲ — Date Code: This code identifies the year of manufacture as 1973.

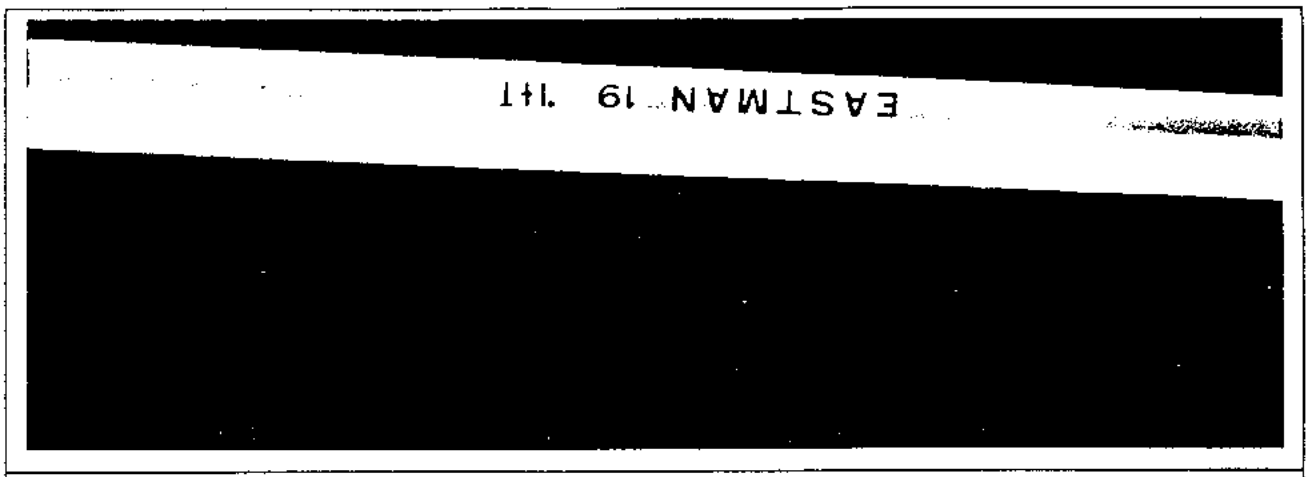

Figure 2-12 Manufacture's Name, Slit Strip Number and Slitting Machine Number Code. (Neg. 4568, Frame 8A)

EASTMAN	Manufacturer's name
19	Strip number: Nº19 of 38 strips of a 35mm stock roll.
11T	Machine Code: Identifies the slitting machine applying the edge prints as machine #208.

No other manufacturing edge-print film marking codes are visible.

Other Markings:

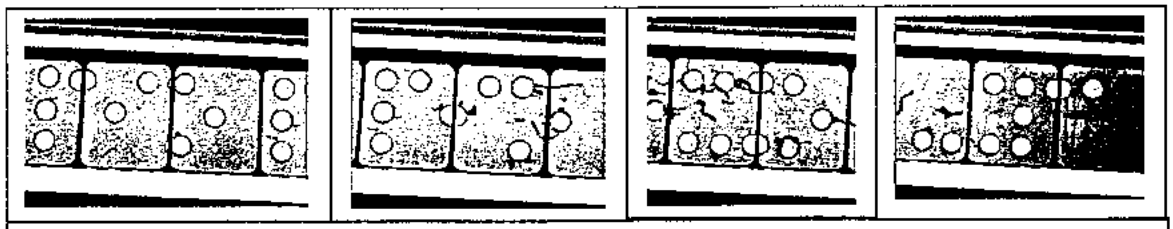

Figure 2-13 The Perforated Numbers Appear to be Processing Laboratory Customer Identification Placed into the 8mm Original Camera Film Prior to Processing. (Neg. 4568, Frames 10A-13A)

Processing Laboratory Perforated Customer Identification: The numbering appears to be the typical perforated processing identification numbers placed on the customer 8mm camera roll prior to processing. The literature[6] reports that the Kodak laboratory in Dallas on or just after November 25 processed the film. The numbers "3304" appear printed-through from the internegative film. Because the "holes" of the printed perforated number are clear and "blown-up" in the optical

[6] Trask, Richard B. Pictures of The Pain, Yeoman Press, Danvers Massachusetts, 1994, page 205.

printing, perforation most likely occurred in the 8mm original. The numbering of four digits is similar to that used for the Zapruder film and it's copies. (For reference, see Study 1, Part 3 and Figures 1-2 and 1-7)

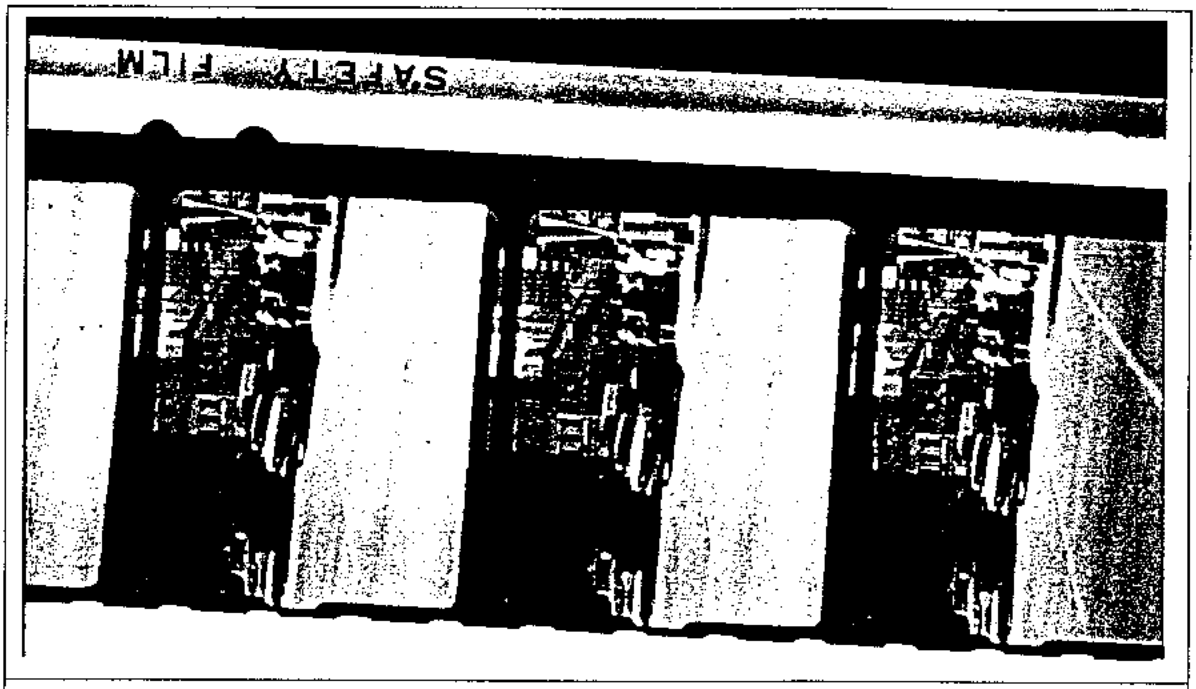

Figure 2-14 The Two Half Moons Seen Under the Marking SAFETY FILM are "Printer Drum or Printer Sprocket Notches. See Text. (Neg. 4568, Frame 15A)

Printer drum notch(s): The "Double Half Moons" seen in Figure 2-12 are visible and reappear with a frequency equivalent to the printer sprocket circumference. This type of notch code was sometimes used to identify printers of the same type within a laboratory to facilitate tracing printer problems. A similar, but singular, notch code was seen in the Nix print – see Figure 2-3. We were not able to attach any unique significance to its presence on the films examined.

Comment:

Color Balance: The orange color balance of the Muchmore film, if present on the original, may be attributed to a film taking error. Because it was typical to "build-in" filters in the camera for taking convenience, the Wratten 85, Type A tungsten to daylight conversion filter was sometimes switched-in – inadvertently – while daylight film was loaded in the camera. If this were done, the result would be an orange and darker than normal film.

Part 3.

Motion Picture Optical Printing Technology

It is not within the scope or purpose of this technical report to explain the printing practice and technique of optical "blow-up" printing. However, some readers of this report may wish to obtain a working knowledge of the fundamentals of optical printing as they apply to the 35mm blow-ups made of the Zapruder, Nix and Muchmore films. To provide a starting point of acquiring a working knowledge of the terminology and equipment involved, three documents are appended to this report. The articles by Hall and Schmit are intentionally vintage the late 60's, assuming that readers of this report would prefer an understanding of the technology near that time period.

1. EASTMAN Professional Motion Picture Films, Kodak Publication H1, CAT 155 280. See pages 80 through 91.

2. Hall, Jack P. FILM PRINTING, BLACK AND WHITE AND COLOR, PROCEEDINGS, Laboratory Handling of Long Films, SMPTE 1971, pp. 141-158.

3. Schmit, Joseph W. OPTICAL PRINTING TECHNIQUE, PROCEEDINGS, Laboratory Handling of Long Films, SMPTE 1971, pp. 159-178. (Note: Excellent bibliographical references.)