AN ABRIDGMENT

35mm to 70mm Print-up ASC Recommendations #15, #16 and #17

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Edit. Note: This abridgment, prepared with the assistance of Walter Beyer, Head, Engineering Research, Universal City Studios, Inc., 100 Universal Plaza, Universal City, Calif. 91608, is published for the general information of *Journal* readers; the status of the information below is that of material reprinted from *American Cinematographer* for January 1968, by permission of the American Society of Cinematographers, Inc., 1782 North Orange Dr., Hollywood, Calif. 90028.

Introduction

The following ASC Recommendations were prepared in view of the rapidly increasing number of 70mm release prints made from pictures originally produced and photographed in 35mm, mostly in the 2:1 anamorphic systems such as CinemaScope, Panavision 35, Franscope, and Wide Screen 1.85:1.

There is no doubt that the 70mm release print is desirable for enhancing the technical perfection of motion-picture presentation both in the indoor theaters and, even more so, for drive-ins.

How does this now tie in with the 35/70mm print-up situation on hand as condensed in the following ASC Recommendations?

The answer lies in an intelligent combination of outstanding technological advancements to a new system.

Quite a number of extraordinary developments have been made in emulsion technology for negative and positive rawstocks. Liquid-gate printing techniques paired with refinements in the preparation of dupes and the availability of better optics for cameras and every phase of image transfers in printers has reversed the viewpoint for the need of the "large area" negative.

In summary, the 35mm original negative has a very high quality that remains unchanged regardless of the type of print made from it. This high quality, however, undergoes quite a noticeable change and is spoiled in the theater when the 35mm contact or 1B print is overmagnified on the big screen.

Contrary to that, this original quality is absolutely sufficiently retained on the 70mm print during the print-up process which is done by the liquid-gate method through a very high-quality lens. Then, this 70mm print is shown in the theater with much less magnification through linear lenses of the good middle-range focal length, thus displaying the quality from the original 35mm negative better from 70mm than the screen image stemming from an over-magnified 35mm print.

Figure 1, applicable to Recommendation #15, illustrates by means of film clippings the basic principles involved and specified in all three ASC Recommendations; but it should not be considered part of these Recommendations themselves.

This Introduction can best be concluded with the following list of picture titles from productions in 35mm that have been already released, are now in the process of release, or are being ear-marked for print-up from 35mm to 70mm for road show engagements in the American and/or foreign market:

The Carpetbaggers; The Cardinal; The Great Race; Marriage on the Rocks; Becket; Is Paris Burning? (B&W); *The Professionals; Doctor Zhivago; Around the World Under the Sea; Operation Crossbow; Unsinkable Molly Brown; The Sand Pebbles; The Dirty Dozen; Camelot; Gone With the Wind; Far from the Madding Crowd; Funny Girl; The Comedians; Oliver; San Sebastian; More than a Miracle; In Harm's Way* (B&W); *Guess Who's Coming to Dinner; Sweet Charity;* etc.

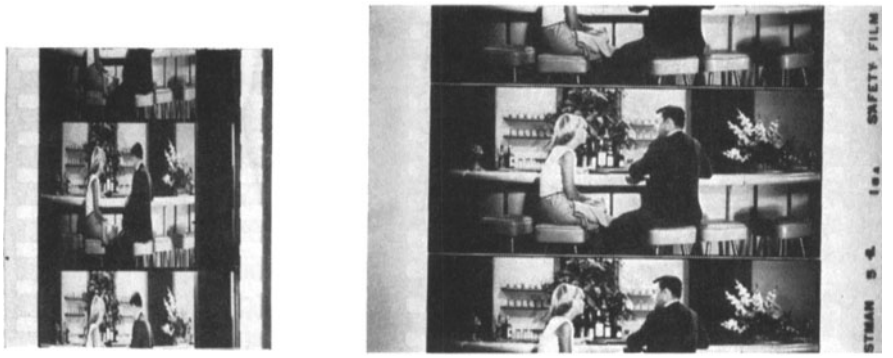

Fig. 1. Sample film clips showing (at left) 35mm anamorphic original photography and (at right) 70mm roadshow print-up.

35mm Composition Area and Ground-Glass Markings for Print-up

FROM 2:1 ANAMORPHIC CAMERA ORIGINALS TO 70MM RELEASE PRINTS

ASC Recommendation #15

This Recommendation specifies the ground-glass and/or finder markings for a 35mm camera using 2:1 anamorphic lenses during production such as known under the trade names CinemaScope, Panavision 35, Franscope, etc.

The basic ground-glass markings for the 2.35:1 composition aspect ratio for the 35mm release print shall remain valid as established in ASC Recommendation #9 under "B," issued May, 1962.

All dimensions related to the 70mm projected image area shall remain valid as established in ASC Recommendation #14, issued August, 1966.

Detailed information referred to in the last two paragraphs above shall be found in *American Cinematographer Manual*, pp. 599, 610–611, and 64–73 respectively.

The dimensions of that area inside a ground-glass of a 35mm camera for 2:1 anamorphic photography in a 2.35:1 aspect ratio shall be 0.753 in.

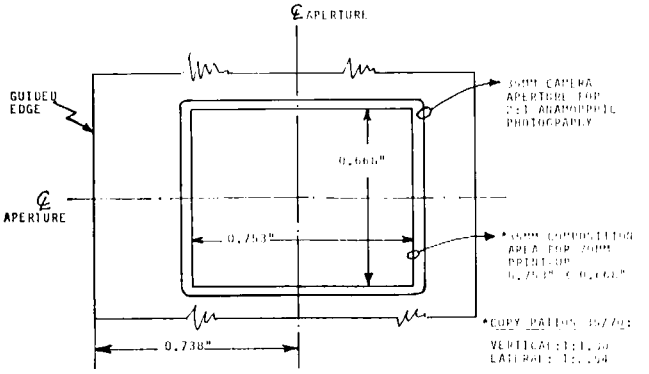

Fig. 2. ASC Rec. #15: 35mm composition area and ground-glass markings for print-up from 2 : 1 anamorphic camera originals to 70mm release prints.

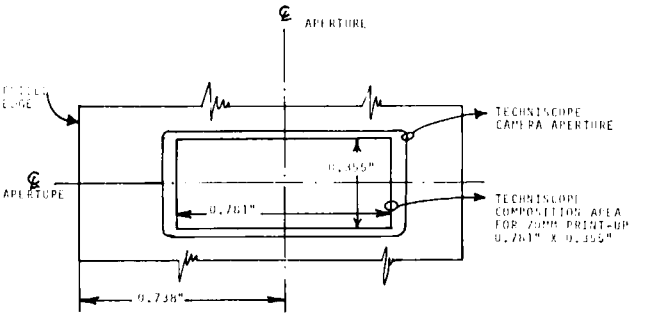

Fig. 3. ASC Rec. #16: 35mm composition area and ground-glass markings for print-up from Techniscope linear (flat) camera originals to 70mm release prints.

× 0.668 in. on Academy centerline in accord with Fig. 2 and data below.

The aspect ratio of the above area equals 0.753 in.: 0.668 in. = 1.12 : 1 which, when unsqueezed during print-up becomes an aspect ratio of 2.24 in close accord with the aspect ratio required for the 70mm release medium.

The above dimensions are based on the copy ratios of presently used print-up lenses having a vertical ratio of 1 : 1.30 and a lateral ratio of 1 : 2.54.

Application of these dimensions in conjunction with these copy ratios deliver proof of accord with established standards for the 70mm projected image area of 1.913 × 0.868 in. as follows:

Lateral Copy Ratio:
2.54 in. × 0.753 in. = 1.913 in.
Vertical Copy Ratio:
1.30 in. × 0.668 in. = 0.868 in.
(See ASC Recommendation #14.)

The use of the above recommended composition area merely suggests to keep major action within these specified boundaries to safeguard a standard 70mm projected image area without the need of filing new and/or nonstandard projector apertures in the theater.

The minor restrictions of this area have no bearing on the 35mm prints for general release since the original 2.35 : 1 composition area plus the entire 35mm camera aperture area of 0.868 in. × 0.735 in. must remain protected from pictorial imperfections anyway.

The skillful use of this 35mm to 70mm print-up technique permits an economic extension of a 35mm produced picture into 70mm road show release prints.

The preferred method of preparing 70mm prints from 35mm camera originals is a direct optical liquid-gate print-up from negative to release print stock. In case of B&W operations, or if a color picture stems from separations, it is essential to avoid multiple runs through the printer and, therefore, dupes are prepared from which the final print is made.

As of date of issuance of this Recommendation, more than 30 pictures have been produced in 35mm and released in 70mm basically using the above-stated dimensions and copy ratios.

35mm Composition Area and Ground-Glass Markings for Print-up FROM TECHNISCOPE LINEAR (FLAT) CAMERA ORIGINALS TO 70MM RELEASE PRINTS

ASC Recommendation #16

This Recommendation specifies the ground-glass and/or finder markings for a Techniscope camera using linear lenses during production and producing a non-squeezed (flat) negative in an aspect ratio of 2.35 : 1.

The basic ground-glass markings for the entire Techniscope system for the 35mm theatrical, TV and 16mm prints shall remain valid as established in ASC Recommendation #13, issued July, 1964.

All dimensions related to the 70mm projected image area shall remain valid as established in ASC Recommendation #14, issued August, 1966.

Detailed information referred to in the two paragraphs above shall be found in *American Cinematographer Manual,* pp. 606–611, and 66–73, respectively.

The dimensions of that area inside a ground-glass of a 35mm Techniscope camera for linear (flat) photography in a 2.35 : 1 aspect ratio shall be 0.781 in. × 0.355 in. on Academy center-line in accord with Fig. 3.

The aspect ratio of the above area equals 0.781 in.: 0.355 in. = 2.2 : 1 which is perfect in accord with the aspect ratio required for the 70mm release medium.

The above dimensions are based on a linear copy ratio of 1.2.45.

Application of the dimensions in the first paragraph in conjunction with this copy ratio deliver proof of accord with the established standards for 70mm projected image area of 1.913 in. × 0.868 in. as follows:

Copy Ratio:
2.45 in. × 0.781 in. = 1.913 in.
Copy Ratio:
2.45 in. × 0.355 in. = 0.868 in.
(See ASC Recommendation #14.)

The use of the above recommended composition area merely suggests to keep major action within these specified boundaries to safeguard a standard 70mm projected image area without the need of filing new and/or nonstandard projector apertures in the theater.

The minor restrictions of this area have no bearing on the 35mm prints for general release. The original 2.35 : 1 composition area plus the entire Techniscope camera aperture of 0.868 in. × 0.373 in. must remain protected from pictorial imperfections anyway.

The skillful use of this Techniscope to 70mm print-up technique permits a further economic application of this system to the 70mm road show release print method.

The preferred method of preparing 70mm prints from Techniscope 35mm camera originals is a direct optical liquid-gate print-up from the negative to the release print stock.

This Recommendation is based on proof by extensive and most exhaustive print-up tests and demonstra-

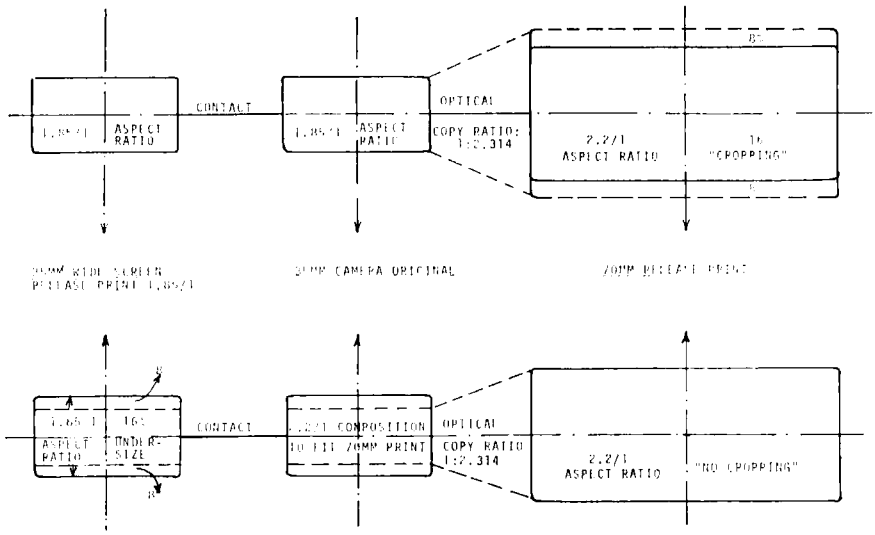

Fig. 4. ASC Rec. #17: 70mm print-up from 35mm wide-screen camera original, with negative-positive printing for 35mm general use; see Sec. A text of Rec. #17 for detailed dimensions.

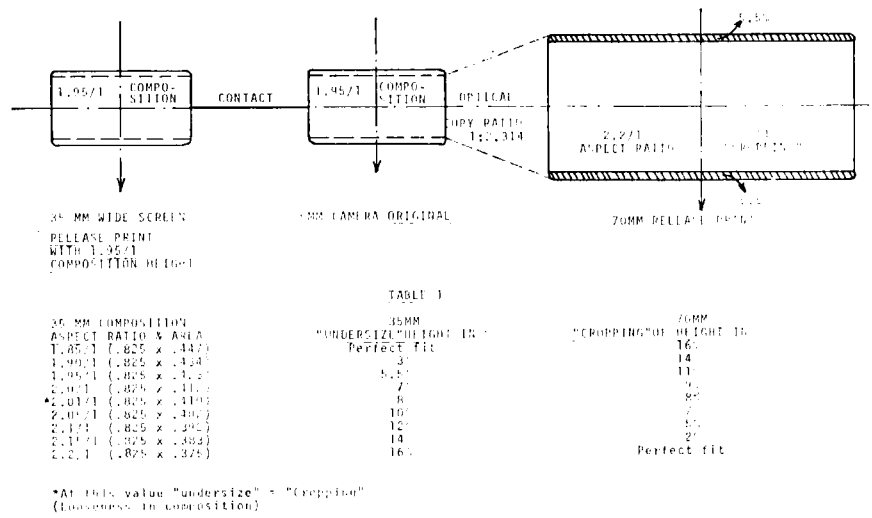

Fig. 5. ASC Rec. #17: 70mm print-up from 35mm full-screen camera original by Technicolor dye-transfer printing for 35mm general release.

tions and represents at the time of issuance a supplement to ASC Recommendation #13 in which this type of 70mm print is already listed under #8 *American Cinematographer Manual*, p. 610. No change is to be expected in the above specifications that are thus fully valid for future reference.

35mm Composition Area and Ground-Glass Markings for Print-up

FROM 1.85 : 1 WIDE SCREEN CAMERA ORIGINALS TO 70MM RELEASE PRINTS

ASC Recommendation #17

This Recommendation is presented in two parts depending on the preparation of the 35mm general release prints — either: (1) Negative-Positive printing for 35mm release; or (2) Technicolor dye-transfer (1B) printing for 35mm release from full-screen production negative.

The basic ground-glass markings for the 35mm cameras for 1.85:1 wide-screen production both for contact release and/or full screen to academy 1B printing shall remain valid as established in ASC Recommendations #9 and #10 issued May and October, 1962.

All dimensions related to the 70mm projected image area shall remain valid as established in ASC Recommendation #14, issued August, 1966.

Detailed information referred to in the two paragraphs above shall be found in *American Cinematographer Manual*, pp. 598–602, and 64–73, respectively.

Both methods (1) and (2) are used and shall be presented in a descriptive form due to the need for explanatory text arising from the difference in aspect ratios of this method as compared to the modes presented in ASC Recommendations #15 and #16.

This Recommendation is at the time of first issuance intended to be an informative proposal even though all dimensions refer to and lead to workable follow-through of 35mm wide-screen to 70mm printing as is proven by various pictures already in release.

A. 70mm Print-up From 35mm Wide-Screen Camera Original, With Negative-Positive Printing for 35mm General Release

This 35mm production and 70mm print-up method deserves careful consideration concerning the discrepancy between the 1.85:1 aspect ratio in the 35mm stage vs. the 2.2:1 aspect ratio of the standardized 70mm projected image.

Figure 4 shows this situation if no change is made to deviate from the 70mm standards. The upper left part presents the 35mm negative-positive 1.85:1 standards, as done for years, and to the right is the 70mm print-up image area and the relative cropping that would occur with a straight linear copy ratio of 2.314.

(35mm 1.85/1 aspect ratio = 0.825 in. × 0.447 in.; 70mm 2.2/1 aspect ratio = 1.913 × 0.868 in.; 0.825 in. × 2.314 = 1.913; 0.447 in. × 2.314 = 1.03 in. 1.03 in. = 16% "cropping" over 0.868 in. of 70mm standard.)

The lower left drawing shows that when composing 2.2:1 inside the 1.85:1 area, the 70mm print-up to the right fits perfectly, but the 35mm print is now composed "under-size" or too loose, resulting in lack of intimacy on the big screen and more though for future TV release.

One can now approach a compromise between these extremes as presented on drawing in Fig. 5 where the case of a 1.95:1 composition during 35mm production is shown as well as Table 1, included with Fig. 5, which shows the percent changes in 70mm "cropping" vs. 35mm "undersize" in composition.

(35mm 2.2/1 aspect ratio = 0.825 in. × 0.375 in. 0.375 in. composition height = 16% undersize or loose height as compared to the 0.447 in. standard 1.85 height.)

Note: It should be stated right here that there are possibilities to get around these conditions by way of accommodating action during transfer onto 70mm by vertical scanning during printing or during preparation of a scanned dupe. Such methods are, of course, costly and only warranted

for special 70mm print-ups of outstanding classics from earlier productions, even composed in the 1.33:1 aspect ratio as, for instance, *Gone With The Wind*, etc. It would exceed the scope of this Recommendation to describe all possibilities which will be explored and used by the different laboratories or optical departments of various studios.

In order to illustrate what happens if we depart from the 70mm projected image standards, Fig. 6 shows a straight 1.85:1 print-up from 35mm to a "nonstandard" 1.85:1 70mm print.

Retaining the 0.868 in. image height on the 70mm print, the projected width of 1.85:1 image becomes 1.605 in. instead of 1.913 in. The entire 35mm composition is now transferred perfectly to a 1.85:1 70mm print that has now a loss of 16% in width on the screen in the theater.

Since 70mm is shown with six-channel magnetic sound, five stage speakers are behind the screen. The utmost left and right speakers are already partly behind the side masking now. A 16% width reduction on — for instance — a 50-ft screen means an 8 ft or 4 ft more masking toward screen center on each side, practically covering these speakers. This is only one of many reasons not to deviate from the 70mm standards.

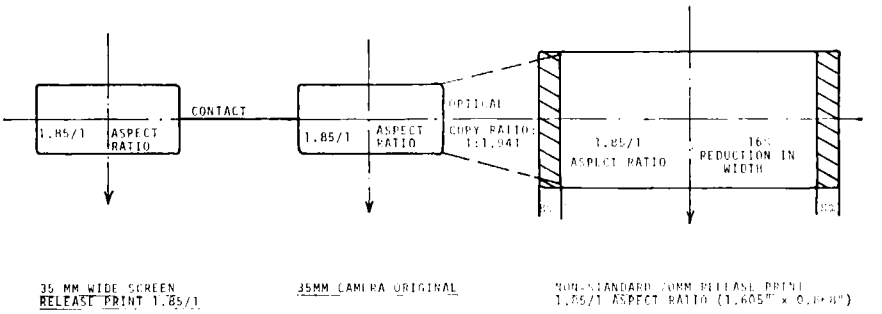

Fig. 6. ASC Rec. #17: straight 1.85 : 1 print-up from 35mm to nonstandard 70mm release print.

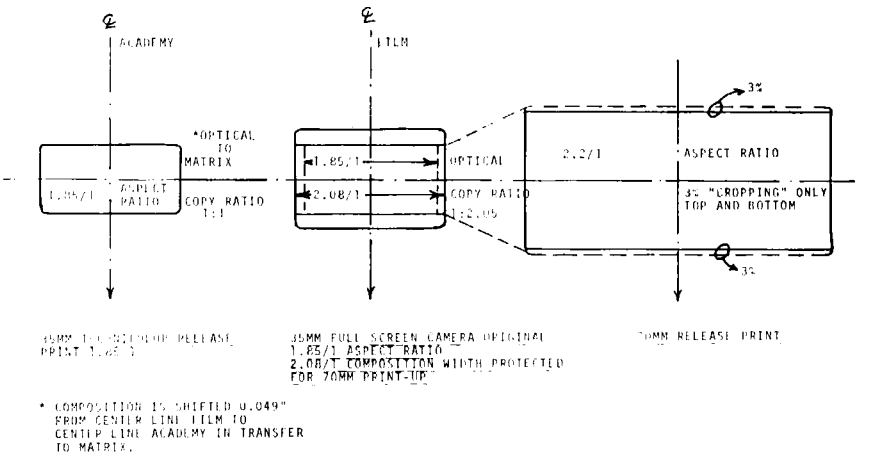

Fig. 7. ASC Rec. #17: 70mm print-up from 35mm full-screen camera original by Technicolor dye-transfer printing for 35mm general release; see Sec. B text of Rec. #17 for detailed dimensions.

B. 70mm Print-up From 35mm Full-Screen Camera Original by Technicolor Dye-Transfer Printing for 35mm General Release

This 35mm production and 70mm print-up method by way of full-screen photography is best suited to overbridge the aspect ratio discrepancy between 35mm 1.85/1 and 70mm 2.2/1.

The flow chart in Fig. 7 is used to illustrate this method as follows:

The 35mm full-screen camera aperture is 0.980 in. × 0.735 in. (ASC Rec. #10) shown in the center.

Inside that area a 35mm picture for 70mm print-up is composed in an area of 0.931 in. × 0.447 in. This represents an aspect ratio of already 2.08/1. However, two dotted lines are provided vertically at a distance of 0.825 in. which represents the width of the 1.85/1 aspect ratio.

Thus, there now exists a 2.08/1 composition area with dotted safety lines for keeping major action within the 1.85/1 area. This is — as in any wide-screen system a *minor* limitation since width is way more flexible than height — not only on the set but likewise on the screen. In practice the protection for major action in width is only 0.931 in. minus. 0.825 in. or 0.053 in. on each side. No story-telling action will ever even fit in these gaps.

Having produced the 35mm picture in this method the negative is now a double-purpose piece of camera original: The 2.08/1 35mm composition area is now optically printed-up to 70mm with a copy ratio of 1:2.05 and only a negligible height loss of 3% on top and bottom will occur. This is within the plus–minus tolerances of allowed freedom during 35mm production head clearance anyway.

The 35mm print for general release is prepared by transferring the correct 1.85/1 area of 0.825 in. × 0.447 in. in a 1:1 copy ratio from the full-screen negative onto the matrix for the Technicolor dye-transfer process. The release prints are made in this method as usual with no compromise in either height or width whatsoever.

The shifting of composition from centerline film (full screen) to Academy centerline (standard release print) of 0.049 in. is normal procedure with this system. (See ASC Rec. #10.)

It is advisable to contact Technicolor prior to a 35/70 production in regard to the 35mm prints for general release since the printer requires a minor resetting from the usual 1:1.129 copy ratio to a straight 1:1.0 image transfer.

It is hoped that the above ASC Recommendation #17 in its Parts A and B will be helpful guidance for 1.85/1 wide-screen productions and aid in proper planning of composition considerations to avoid disappointments and expenses when it comes to the print-up stage for 70mm roadshow release.