

Letters to the Editor

Re: Exposure Measurement by Incident Light

The article "On Photographic Exposure and Exposure Meters" by Moon and Spencer in the December 1954 *Journal* contains much valuable information and leads to conclusions worthy of serious thought. However, its strong condemnation of the incident light measuring method ("The scheme is inherently wrong . . .") prompts one who has found the method useful to come to its defense.

As the authors point out, there is no single value for the "correct" exposure in any situation; therefore, no one metering method will always work perfectly when used by a robot. For various subjects the photographer should choose between various methods and should use his experience in interpreting the results. Let us consider an over-simplified type of situation in which the incident light metering method is the only inherently right procedure.

Suppose we are photographing a flat subject with a matte surface (for instance, a large water-color painting). Also suppose we are using a process which, without possibility of intermediate adjustment, gives a positive image and this image has a gamma of 1.0. Let's assume our photographer wants to make his picture look like the original — mainly light if the original is a light picture, or mainly dark if the original is a dark picture.

It is easy to see that metering this subject by the reflected light method would tend to shift the reproduction toward the middle of the tone scale of the process so that light subjects would be darkened and dark subjects would be lightened. This is true whether we use the method of measuring the lightest and darkest significant areas or whether we use an integrating type meter. In a transparency to be viewed alone in the dark the shift would cause no trouble, of course. But, if the final product is a print, this shift would make the picture look too light or too dark as compared with the original.

If the exposure is calculated from a measurement of the illuminance on the original, it is independent of the reflectance characteristics of this original. From knowledge of the process curve an exposure can be chosen which will make the final print match the original subject, density for density (except in the toe and shoulder), no matter whether the original is light or dark.

This metering method, like others, has its pitfalls in actual practice. Reversal processes don't all have 1.0 gamma and do have toes and shoulders. Solid objects do cast shadows on each other. The photographer still has to use his judgment and experience.

But the fact remains that many common photographic situations are nearly enough alike that described above so that the in-

cident light metering method is a good, valid method for use in them and is often much better than other methods.

March 25, 1955

George Ehrenfried
(Polaroid Corporation
Cambridge 39, Mass.)

Reply to the Letter Above

Mr. Ehrenfried has suggested — quite rightly — that it is possible to obtain correct exposure by measurement of incident light instead of reflected light. Certainly there can be no quarrel with this conclusion. In fact, thousands of successful photographs are taken every day without benefit of any measurement or calculation.

But if we use measurement at all, why not measure the pertinent quantity? In all cases, the pertinent quantity is the *light reflected from the scene* toward the camera, not the light incident on the scene. This is true even for the highly artificial example considered by Mr. Ehrenfried. If he wishes to underexpose the dark picture and overexpose the light picture, he can obtain such effects equally well with the reflected-light method.

Any method of exposure calculation — or mere guessing — gives satisfactory results sometimes. But we claim that the incident-light method, since it measures a quantity that is only remotely related to the light on the film, is basically fallacious.

May 19, 1955

Parry Moon
Domina Eberle Spencer

motion-picture standards

Revision of Two American Standards

Proposed revisions of American Standards Z22.9-1946, Emulsion Position in Camera for 16mm Silent Motion Picture Film, and Z22.10-1947, Emulsion Position in Projector for Direct Front Projection of 16mm Silent Motion Picture Film, are published here for a three-month period of trial and criticism. All comments should be sent to Henry Kogel, SMPTE Staff Engineer, prior to October 15, 1955. If no adverse comments are received, these proposals will then be submitted to American Standards Association's Sectional Committee PH22, for further processing as American Standards.

The subject matter of these standards was first proposed for standardization around 1932 and then only for 16mm film with perforations along one edge, 16mm sound film. This became an SMPTE standard in 1934. In 1941, standards for both 16mm film with perforations along one edge and along both edges were approved by both the Society and ASA. About that time, technical advances in the methods of processing 16mm film made it commercially advantageous, in certain applications, to process 16mm prints so that when projected, the emulsion side of the film was in the nonstandard position or

facing the light source rather than the lens. A more detailed explanation of this situation may be had by reference to a paper by W. H. Offenhauser published in the August 1942 *Journal* and to a report by J. A. Maurer published in the December 1947 *Journal*. The Maurer report was the basis for the action taken in 1946-1947 by Sectional Committee Z22 (reconstituted in 1950 as PH22) to reaffirm these standards with only minor editorial modifications.

A few years later, the widespread use of 16mm sound film as source material for television and the fact that this film was not supplied uniformly with the emulsion in the standard position forced the Society to take a new look at this question. On the surface, the nonuniformity of end product in an area where a standard was supposed to prevail appeared so anomalous as to occasion the 16 & 8mm Committee to take steps to completely withdraw Z22.10-1947 for silent film and Z22.16-1947 for sound film.

However, before this action was concluded, the Society conducted an open forum on this question during the 70th Convention in Hollywood on October 17, 1951. Data supplied at this forum indicated that the situation was not as bad as it had appeared. Well over 80% of the film then used in television was supplied with the

emulsion in the standard position and the general consensus was that the solution lay in the direction of continuing the existing standard with efforts made to encourage all concerned to order and supply 16mm prints with the emulsion in the standard position. A few mimeograph copies of the verbatim report of this forum are available and may be had upon request.

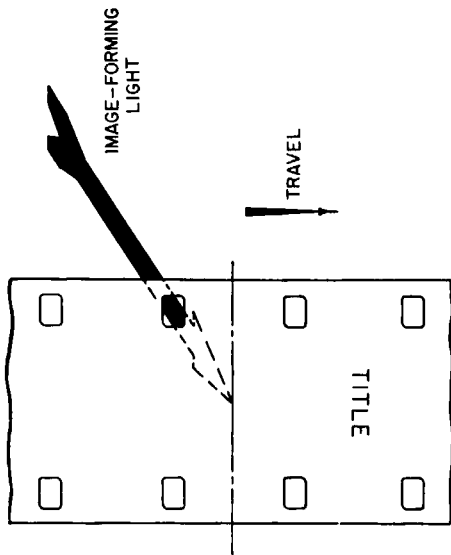
Based on those conclusions the 16 & 8mm Committee reversed its previous position and took steps to reaffirm the two standards. This process was delayed by the introduction of a new question: that the projection rate for silent film be increased to 18 frames per second while maintaining the camera rate at 16 frames per second. The argument for the increased projection rate was predicated on the need to solve the flicker problem which was becoming more and more objectionable as the brightness level advanced. This argument finally prevailed and the draft standards were unanimously approved by both the 16 & 8mm Committee and the Standards Committee. It should be noted that these standards differ from the 1946 and 1947 versions by the addition of an explanatory appendix, a change in title and in the case of PH22.10, an increase in the rate of projection from 16 to 18 frames per second. — H.K.

16mm Film Perforated Along Two Edges, Usage in Camera

(Second Draft)

PH22.9

Rev. 222.9-1946



Drawing shows film as seen from inside the camera looking toward the camera lens.

1. Position of the Emulsion

1.1 Except for special processes, the emulsion shall be toward the camera lens.

2. Rate of Exposure

2.1 The normal rate of exposure shall be 16 frames per second.

APPENDIX

Section 2.1 giving the normal rate of exposure as 16 frames per second is in apparent contradiction with Section 2.1 of PH22.10 which specifies a normal projection rate of 18 frames per second. In modern 16mm practice, however, 16mm film perforated along two edges is used primarily in the amateur field; cameras designed for the amateur are usually spring wound, portable, and not closely governed in taking speed. Variations from 18-14 frames per second at least are commonly observed. It is not customary to design amateur projectors which will reproduce exactly the taking speed and as a matter of fact it has been found that for amateur cinematography this exact speed reproduction is not necessary. Projection at 18 frames does not detract objectionably from films exposed at 16 frames or even at 14 frames and it has the advantages discussed in PH22.10. Therefore, the camera speed of 16 frames per second is regarded as an aim to which considerable tolerances will normally apply. Pictures taken in cameras having this speed tolerance, as well as pictures taken in cameras having constant-speed motors governed at 16 frames per second, will show some change in the velocity of movements when projected at 18 frames per second, but this is not considered objectionable.

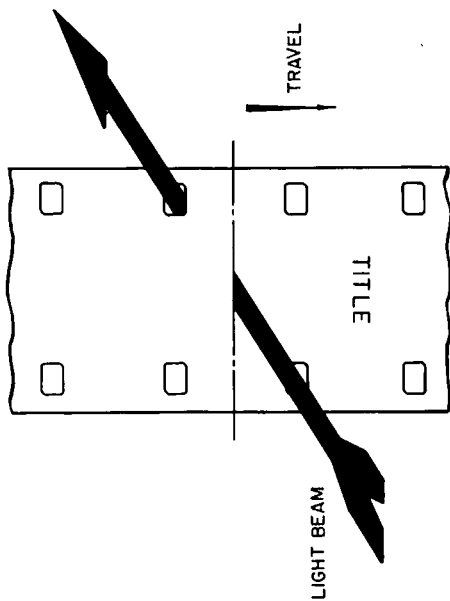
NOT APPROVED

16mm Film Perforated Along Two Edges, Usage in Projector

(Second Draft)

PT22.10

Rev. 222.10-1947



Drawing shows film as seen from the light-source in the projector.

1. Position of the Emulsion

1.1 Except for special processes, the emulsion shall be toward the projection lens. This applies to direct projection on a reflecting screen. If a translucent screen is used, or if the image is reversed left for right by other optical features, the film can be turned around so that the emulsion is toward the projection lamp.

2. Rate of Projection

2.1 The rate of projection shall be 18 frames per second.

NOTE: In projectors having a fixed rate of projection, the projection rate shall be 18 frames per second with a tolerance appropriate for the use to which the projection at this rate is to be put. Projectors having manually adjustable speed shall be capable of reaching a projection rate of at least 18 frames per second.

APPENDIX

In modern 16mm projection practice the use of film perforated along two edges is primarily confined to the amateur field. This equipment is usually portable, the available screen sizes are frequently limited with many common screens small in size and of high gain, and many of the projectors have a high light output. Under these conditions it has been observed that frequently very high screen brightnesses are obtained and that the audience is usually aware of flicker before they are aware of changes in the pictorial quality of the projected pictures. It has been industry practice, therefore, to extend the flicker threshold by choosing as high a projection rate (and, therefore, as high a flicker frequency) as is practicable. A projection rate of 18 frames per second and a corresponding flicker frequency of 54 cycles per second (obtained with a 3-blade shutter) has been found by experience to be an acceptable compromise.

NOT APPROVED