

brought about by the incorporation of a reversal intermediate print film, an ad hoc committee was formed (chaired by Robert Colburn). The Committee is to consider the possible revision of the recommended emulsion position clause of the combined documents for 16 mm Projection Practice, PH22.10 and PH22.-16.

The Staff Engineer also reported pending five-year reviews on the Projector Usage of Super 8, PH22.155, and the Specifications for Camera Spindles, SMPTE RP 24. Any SMPTE members desiring to contribute to the business of the 16 and 8 mm Engineering Committee or participate in the activities of its ad hoc committees are requested to contact the SMPTE Staff Engineer or the Chairman.

R. J. ZAVADA
Chairman

Video Tape Recording Committee

THIS COMMITTEE, formed in 1958, has been concerned solely with matters affecting the interchangeability of video tapes, both quadruplex and helical. Success with helical standardiza-

tion has eluded the Committee, but there are now 11 approved American National Standards and nine approved SMPTE Recommended Practices dealing with quadruplex recording.

The past year has seen progress in three areas of concern. Excellent progress has been made in drafting a proposal for an editing and control code for quadruplex recording. A variety of manufacturers had introduced equipment, and there was the threat of chaos, since each employed a different coding technique; however, through the outstanding cooperation of users and manufacturers, basic agreement has been reached on a code. Work has also begun and some success achieved on the task of generating a "Glossary of Video Tape Recording Terms." The first group of terms was published in the June 1970 issue of the *Journal* of the SMPTE, and a second group will be published shortly. The results are not yet visible, but will be shortly, of extensive work done by a subcommittee on tape transport geometry. Extensive background work has been done on measuring such things as guide radius and contouring of the entrance point of the guide. The effect of variations in these regions is subtle, and physical measurement of the guide is difficult. Cooperation has been excellent, and it is hoped that a series of proposals will be drafted next year.

C. E. ANDERSON
Chairman

standards and recommended practices

Approved American National Standards

On October 9, 1970, the American National Standards Institute approved two American National Standards which are published here for your information:

PH22.124-1970, Specifications for Screen Luminance for Indoor Motion-Picture Theaters (revision of ANSI PH22.124-1961).

PH22.177-1970, Dimensions of Magnetic Striping of 35mm Motion-Picture film for Four-Track Magnetic Sound Release Prints.

It should be noted that the luminance tolerance specified in PH22.124 has been narrowed to ± 2 footlamberts and the standard broadened to include multiple projector adjustment.

Inasmuch as compliance with American National Standards is purely voluntary, these standards will become truly effective only when broad publicity is given to their existence. ANSI and SMPTE would appreciate any personal influence to promote the use of these standards where such action is appropriate. Copies of the standards may be obtained for a nominal fee from the American National Standards Institute, 1430 Broadway, New York, NY 10018. — A.E.A.

American National Standard specifications for screen luminance for indoor motion-picture theaters

Approved October 9, 1970

Sponsor: Society of Motion Picture and Television Engineers, Inc.

Page 1 of 2 pages

1. Scope

This standard specifies the luminance level on the projection screen for indoor theaters.

2. Purpose

The purpose of this standard is to specify luminance levels at which tone scale, contrast, and pictorial quality of the projected image from release prints will be of the quality anticipated during their production.

3. Measurement

3.1 Measurement of screen luminance and color of projection light is made with the projector in complete operation with its lens set at focus position, but with no film in the aperture.

3.2 Screen luminance shall be measured with a photometer having the spectral luminous efficiency of the standard observer (photopic vision), as defined in Section 3.7.2 of American National Standard Nomenclature and Definitions for Illuminating Engineering, Z7.1-1967. The acceptance angle of the photometer shall be 2 degrees or less (See Appendix A5).

4. Luminance Level

4.1 The distribution of projection illumination shall be symmetrical about the geometric center

of the screen, and the luminance shall be 16 ± 2 footlamberts (fL) [55 ± 7 candelas per square meter (cd/m^2)], as measured from a position on the seating area centerline.

4.2 The luminance for any point on the horizontal axis within the distance of 5 percent of the screen width from the side edges shall not be less than 10 fL ($34 \text{ cd}/\text{m}^2$), as measured from either of two points in the middle row of the auditorium opposite the edges of the screen and one half the screen width from the center of the auditorium.

5. Multiple Projector Adjustment

5.1 The resultant luminance from all projectors intended for use in the continuous viewing of material of a similar format shall not vary by more than 2 fL ($7 \text{ cd}/\text{m}^2$), as measured in 4.1 above.

5.2 The resultant luminance from projectors intended for use in a sequential system of viewing material of different formats shall not vary by more than 4 fL ($14 \text{ cd}/\text{m}^2$), as measured in 4.1 above.

5.3 The apparent color of the projection light from projectors intended for interchangeably sequential operation shall be consistent within a range of no more than 400°K.

Appendix

(The Appendix is not a part of this American National Standard, but is included to facilitate its use.)

A1. Standard Luminance

Possible luminance levels are limited by a minimum value below which the visual process becomes less efficient, and by a maximum value above which flicker becomes objectionable. Permissible luminance range is limited by the criterion that a good release print must provide acceptable quality when projected at any luminance within the range.

A2. Other Variables

In addition to the luminance distribution, the pictorial quality of projected pictures is influenced by the color of the projection light, the color and characteristics of the screen surface, the presence of stray light, the nature of the surround, and other factors not presently described by standards. It should be noted that stray light, the use of light-colored framing, and the adaptation of unmasked screens may contribute to reflections on the screen which will affect contrast.

Stray light includes non-image-forming light, such as lens flare, re-reflected projection light, ambient light, etc. Since the factors responsible for such stray light do not change unexpectedly, it will usually be sufficient to make stray light measurements at intervals. Stray light can be measured by comparing the screen luminance with the luminance of the image of an opaque test object placed in the center of the projector aperture. The test object preferably should have a diameter of 0.050 in. (5 percent of frame width) and should not exceed 0.100 in. The balance of the projected beam is attenuated by any suitable neutral density film that produces through the normal projection system an average screen luminance equal to 10 percent of the luminance of the screen as defined in 4.1. All sources of illumination in the auditorium, such as exit and aisle light, shall be used in their normal manner while stray light is being measured. Adjustment of stray light conditions should cause the measurement of luminance to be no more than 0.5 percent of the screen luminance at the center of the screen as measured in 4.1.

A3. Directional Screens

Matte white screens will show substantially constant measurements at any one specific area on the screen for measurements from any location in the theater. Directional screens have been designed to produce specific patterns which reflect the projection light in a controlled manner to the useful areas of the auditorium. It is intended that the standard apply to either matte white or directional screens regardless of whether they are curved or flat.

A maximum permissible variation is given in 4.2. In a particular theater, this condition can be met by several procedures, including one or more of the following: choice of a screen with a suitable reflection pattern; limitation of the seating area so that no patron views the picture from an angle at which the luminance is outside the tolerance of the standard, and screen curvature. No stray light or illuminated area with a luminance in excess of 1 fL ($3.4 \text{ cd}/\text{m}^2$) shall be visible from the standard observing area.

A4. Release Prints

Release prints intended for viewing in theaters adjusted in accordance with this standard should be examined or checked under the conditions specified in American National Standard Screen Luminance and Viewing Conditions for 35mm Review Rooms, PH22.133-1963 (Reaffirmed 1969).

A5. Luminance Photometer

The measurement of luminance with uncertainty of less than 10 percent requires a good photometer. Since there are no true Lambertian surfaces, and even the theoretical "matte screens" may depart by more than 10 percent, the brightness will vary with the angle of observation. A photometer having a large field angle will indicate the average luminance within its field, and if this includes a large area of the screen (or of the screen and surround), this average may be substantially different from the observed brightness. It has been found that within the geometric restrictions under which photometers are used in theaters, their luminance indication correlates well with the observed brightness if the field angle of the photometer is about 2 degrees or less.

A photometer having a small field angle may receive light from such a small screen area as to detect luminance differences due to defects in the screen, imaging of the projection source, etc. When measuring the luminances required in 4.2, the luminances of immediately adjacent areas should be observed to be sure the reading is relevant.

The influences of surround brightnesses on the measured luminance must be excluded. Smoke, dust, and atmospheric haze have an obvious effect on the measurement. But flare and reflections within the optical system of the photometer may cause large errors that are difficult to isolate. One method of checking the instrument consists of measuring the luminance of a dark surface both with and without an adjacent bright source. These measurement errors are functions of both the instrument and of the directional luminances of the theater. They cannot be removed by calibration unless the photometer is separately calibrated for each type of installation to be encountered.

The manufacturer of the photometer should specify the errors to be expected from the above and other causes, and prescribe the limiting conditions for reliable use of the instrument.

A6. Conversion of Units

Screen luminance in the U.S. is customarily measured in footlamberts, although in the International System of Units (SI Units), the candela per square meter is the preferred unit. One candela per square meter equals 0.2919 footlamberts; 1 footlambert equals 3.426 candelas per square meter. The name "nit" is sometimes applied to the unit of luminance instead of candela per square meter.



American National Standard dimensions of magnetic striping of 35mm motion-picture film for four-track mag- netic sound release prints

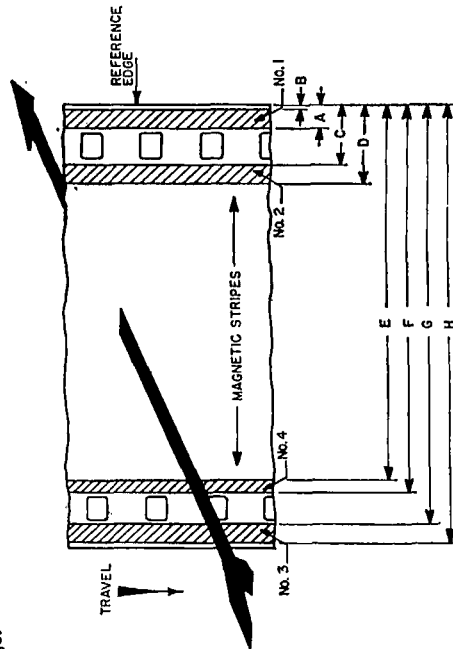
Approved October 9, 1970

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Page 1 of 2 pages

1. Scope

This standard specifies the location and dimensions of the magnetic recording stripes on 35mm motion-picture film used for four-track magnetic sound release prints having an anamorphic-type picture image.



AS SEEN FROM INSIDE PROJECTOR LAMPHOUSE
LOOKING TOWARD THE LENS

Dimensions	Inches	Millimeters
A	0.072 ± 0.003	1.83 ± 0.08
B	0.008 max	0.20 max
C	0.179 ± 0.003	4.55 ± 0.08
D	0.242 ± 0.003	6.15 ± 0.08
E	1.169 ± 0.003	29.70 ± 0.08
F	1.207 ± 0.003	30.66 ± 0.08
G	1.306 ± 0.003	33.17 ± 0.08
H	1.369 min.	34.77 min.

CAUTION NOTICE: This American National Standard may be revised or withdrawn at any time. The procedures of the American National Standards Institute shall be followed in all instances. This standard is subject to revision without notice. It is the responsibility of the user to obtain the latest edition. This standard was approved for publication on October 9, 1970. It supersedes the American National Standard PH22.177-1964. For information on obtaining this standard, contact the American National Standards Institute, 1430 Broadway, New York, N.Y. 10018.

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2. Dimensions

2.1 The location and dimensions of the recording stripes shall be as specified in the figure and table.

2.2 The magnetic stripes shall be on the side of the film which is away from the light source when used on a projector arranged for direct front projection on a reflection-type screen.

3. Film Stock

The film stock used shall be safety type, cut and perforated in accordance with American National Standard Dimensions for 35mm Motion-Picture Film, CS-1870, PH22.102-1964 (Reaffirmed 1969).

Appendix

(The Appendix is not a part of this American National Standard, but is included to facilitate its use.)

A1. The dimensions specified in this standard are predicted on the use of unshrunk film. It is recognized, however, that some shrinkage may occur when striping a processed print. Specific measurements should take into account the overall width of the film as specified by Dimension A in American National Standard PH22.102-1964. Should the film width fall outside the permissible tolerance, all dimensions specified in this standard may be multiplied by the ratio of nominal dimensions determined as follows:

$$\frac{\text{Measured width}}{\text{Specified width}} = \text{Ratio of nominal dimensions}$$

A2. The outer edge of the magnetic striping ideally should be coincident with the edge of the film and, for this reason, Dimension B is specified as maximum and Dimension H as minimum.

A3. Prints conforming to this standard are prepared in accordance with American National Standard Specifications for Projector Usage of 35mm Release Prints with Four-Track Magnetic Sound Records, PH22.103-1966, and American National Standard Dimensions of Four-Track Magnetic Sound Records for 35mm Release Prints, PH22.137-1963 (Reaffirmed 1969).