standards and recommended practices

Proposed American Standards

The proposals published here have been approved by the engineering and Standards Committees and are submitted for a three-month trial period:

PH22.132, 16mm 400-Cycle Signal Level Test Film, Magnetic Type, 1R-3000

PH22.133, Screen Luminance and Viewing Conditions for 35mm Review Rooms

Proposed American Standard PH22.132 is the result of an ad hoc committee study coordinated by Ellis W. D'Arcy of the Society's Sound Committee. It is intended that the specifications describe the test film presently offered by the Society as M16SL as accurately as possible.

Initiated by the Screen Brightness Committee, PH22.133 is a step toward providing a logical small group of screen brightness standards and an attempt to suggest how the variations in practice found in the industry can be reduced.

All comments should be addressed to Alex E. Alden, Staff Engineer, at Society Headquarters prior to February 15, 1962. If no adverse comments are received prior to that date, the proposals will be submitted to ASA Sectional Committee PH22 for further processing.—*A. E. Alden,* Staff Engineer

Approved American Standards

The two new American Standards approved by the American Standards Association on November 10, 1961 are published here for your information.

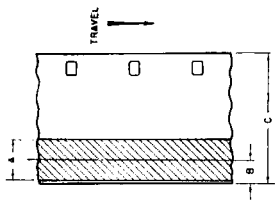
The revision of PH22.2-1961, 35mm Photographic Sound Motion-Picture Film Usage in Camera, is substantially a reaffirmation of the 1954 issue, differing only in the relationship between photographic sound and picture. The 1954 issue specified this at 20 frames ± 1 1/2 frame, the new standard indicates the distance may vary and only the positive print must be in accordance with American Standard Photographic Sound Record on 35mm Prints, PH22.40.

PH22.126-1961, 16mm Multi-Azimuth Test Film, Magnetic Type, is a new standard. The Society's Sound Committee recognized the need for a film which could be used for determining the azimuth adjustment of a magnetic reproduce head without disturbing its adjustment.—*A.E.A.*

Proposed American Standard

16mm 400-Cycle Signal Level Test Film, Magnetic Type, Perforated IR-3000

PH22.132



Dimension	Inches	Millimeters
A	0.200 ± 0.002	5.08 ± 0.05
B	0.103 ± 0.002	2.62 ± 0.05
C	0.630 nom	16 nom

1. Scope

This standard specifies a 400-cycle signal level magnetic test film for use in controlling magnetic sound recording levels and standardizing methods of signal-to-noise measurements on 16mm magnetic sound systems.

2. Test Film

2.1 Dimensions of Sound Record. The location and dimensions of an originally recorded sound record shall be in accordance with American Standard 200-Mil Magnetic Sound Record on 16mm Film Base Perforated One Edge, PH22.97-1956.

2.2 Test Frequencies. The recorded frequency shall be 400 ± 4 cycles per second.

2.3 Mean Film Speed. The recording and reproducing film speed shall be at a mean film rate of 24 perforations per second with a tolerance of ±1 percent, or approximately 36 ft per minute.

2.4 Distortion. The total harmonic distortion of the recorded frequency shall not exceed 1 percent.

2.5 Permissible Flutter. The total flutter shall be less than ±0.07 percent, as measured in accordance with American Standard Method for Determining Flutter Content of Sound Recorders and Reproducers, Z57.1-1954.

2.6 Recorded Signal Level. The magnetic record shall have a recorded intensity of 10 ± 0.5 gauss which is to be determined by the method of calibration specified in 3.1.

2.7 Film Stock. The film stock used for the test film shall be cut and perforated in accordance with American Standard Dimensions for 16mm Film, Perforated One Edge, PH22.12-1953.

2.8 Film Identification. Each test film shall be provided with a suitable leader, title, and trailer, and shall be accompanied by a calibration of the level of the frequency recordings.

3. Calibration

3.1 The film shall be calibrated in accordance with the inductive loop method as described in the following reference:

Robert Schwartz, "Absolute measurement of signal strength on magnetic recordings: phase II," *Jour. SMPTE,* 66: 119-122, Mar. 1957.

NOT APPROVED

3.2 Calibration Tolerance. The calibration tolerance shall be within ±½ db of the true signal level.

4. Revision of American Standards Referred to in This Document

When the following American Standards referred to in this document are superseded by a revision approved by the American Standards Association, Incorporated, the revision shall apply:

American Standard Dimensions for 16mm Film, Perforated One Edge, PH22.12-1953;

American Standard 200-Mil Magnetic Sound Record on 16mm Film Base Perforated One Edge, PH22.97-1956;

American Standard Method for Determining Flutter Content of Sound Recorders and Reproducers, Z57.1-1954.

NOTE: A test film in accordance with this standard is available from the Society of Motion Picture and Television Engineers.

Proposed American Standard

Screen Luminance and Viewing Conditions for 35mm Review Rooms

PH22.133

1. Scope

This standard specifies the luminance (brightness) of the projection screen and viewing conditions for all 35mm review rooms.

2. Definitions

2.1 The measurements of screen luminance and of color of projection light are made with the projector in complete operation but with no film in the aperture.

2.2 The measurement of stray light is made by projecting onto the center of the screen an image of an opaque test object placed at 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 measured in 2.1. All sources of illumination in the auditorium, such as exit and aisle light, shall be used in their normal manner. The stray light level on the screen is the measured luminance in the sharply focused image of the opaque test object.

3. Luminance Level

3.1 The screen luminance distribution shall be symmetrical about the geometric center of the screen.

3.2 The luminance at the center of the screen shall be 16 ± 2 foot lamberts (55 ± 7 nits) and shall be uniform over the standard observing area (as defined in 4.1).

3.3 The luminance at a distance 5 percent of the screen width from the side edges of the screen, and on its horizontal axis, shall be 80 ± 10 percent of the center luminance as prescribed and measured in 3.2 above.

3.4 Light reflected from the screen shall approximate black-body spectral distribution at a color temperature of 5400K ± 400K.

3.5 The stray light level on the screen measured as described in 2.2 shall be no more than 0.4 percent of the screen luminance at the center of the screen.

4. Viewing Conditions

4.1 The standard observing area, within which all observers shall be seated during use of the facilities as a review room, shall be:

(1) Within the limits of 15 degrees on each side of a perpendicular to the midpoint of the screen as a center, in both the horizontal and vertical planes;

(2) Within the limits of 3 ± 1 picture heights from the screen.

4.2 No stray light or illuminated area with a luminance in excess of 1 foot-lambert (3.4 nits) shall be visible from the standard observing area.

4.3 Observers should have an accommodation period of 5 minutes to the brightness level of normal stray light in the review room.

5. Measurement

Screen luminance shall be measured with a photometer having the spectral sensitivity of a standard observer as specified by the Inter-

national Commission on Illumination in 1931. The acceptance angle of the photometer shall be as small as is practical, and shall be so used that it accepts light from a screen area no larger than a circle whose diameter is 10 percent of the screen width.

APPENDIX

(This Appendix is not a part of Proposed American Standard Screen Luminance and Viewing Conditions for 35mm Review Rooms, PH22.133, but is included to facilitate its use.)

A1. Review Rooms

During the preparation of motion pictures the producer, the motion-picture film laboratory personnel, and others examine the film many times from the original test shots through many stages to the final release prints. The films are projected in a specialized theater known as a "review room." These installations are designed to permit judgments of projected picture quality and determinations of the suitability and acceptability of release prints, daily and work prints, production tests, printer and processing tests, etc. The rooms are constructed to accommodate a small reviewing group of usually 10–20 people. The actual picture size may be small or large depending upon the space available, but the viewing conditions are chosen to duplicate as nearly as possible actual theater viewing from the most desirable seating locations. All of the viewing conditions are capable of precise control and it is generally practical in review rooms to hold these variables to a minimum tolerance.

A2. "Normal Print"

To provide interchangeability in motion-picture projection, it is desirable that print quality conform to that of a "normal print" so that theaters can be set to operate at known projection conditions, and will thereby be able to exhibit projected pictures of good pictorial quality. It has not been possible to specify this "normal print" in terms of its optical density and other objective measurements because of the difficulties of specifying artistic quality in scientific terms. Accordingly, the "normal print" is defined as that print which conveys the desired artistic impression when projected under review room conditions as described by this standard.

A3. Theatrical Projection

Standards for theater screen luminance, such as American Standard Screen Brightness for 35mm Motion Pictures, PH22.39-1953, and others under study are intended to reproduce for the theater audience the same artistic impression given in the review room. It is anticipated that there shall be only one review room condition, but that there may be several theater conditions—providing identical pictorial impressions under such widely different viewing conditions as exist in indoor theaters, drive-in theaters, auditoriums, etc.

A4. Drive-In Theater Projection

In the case of drive-in theater application, it is recognized that lighter prints are desirable.

A5. Meter Acceptance Angle

The maximum permissible acceptance angle of the luminance photometer will depend upon the instrument design and method of use, the size of the screen, and other factors. The acceptance angle of a suitable instrument must be such that a reduction in this angle (followed by necessary recalibration) does not change the magnitude of any reading specified in Section 2 by more than $\pm$ 5 per cent. The limiting conditions for the reliable use of such meters should be included in the manufacturer's specifications.

A6. Stray Light

Stray light, as defined in 2.2, includes non-image-forming light, such as lens flare, rereflected 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. The two measurement procedures recommended for securing the proper screen image are as follows: (1) prepare a test film with an average light transmission of 10 percent, having in the center of each frame a black, circular test object of density 3.0 or greater, or (2) mount in the projector an opaque heat-resisting disk as a test object, locating it at the center of the aperture, between the aperture plane and the projection lens and within $^1/_{16}$ in. or less of the film plane; simultaneously project a film which has been printed to give a uniform transmission of 10 percent.

A7. Conversion of Units

Screen luminance in the U.S. is customarily measured in foot-lamberts, although in international usage, the nit is the preferred unit. One nit = 0.2919 foot-lamberts; 1 foot-lambert = 3.426 nits.

A8. Image Luminance

Note that this standard specifies screen luminance with the projector operating and no film in the aperture. When films are projected, the average image luminance will be considerably below this level, and will approximate the conditions of 2.2 for measurement of stray light.

American Standard

35mm Photographic Sound Motion-Picture Film, Usage in Camera

ASA
Reg. U. S. Pat. Off.

PH22.2-1961
Revision of PH22.2-1954

*UDC 778.534.45

1. Scope

This standard specifies the location of the photographic emulsion, the rate of exposure, and the relationship between photographic sound and picture of 35mm sound motion-picture film in single system cameras.

2. Position of Emulsion

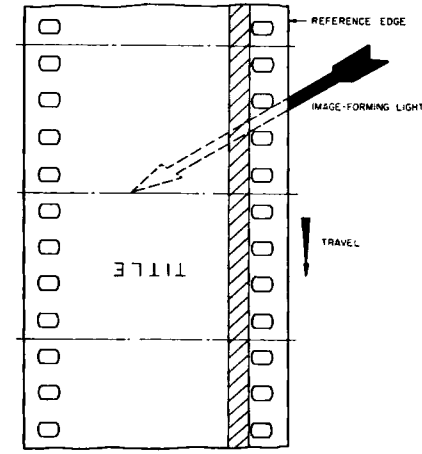
Except for special processes, the emulsion shall be toward the camera lens as shown in the diagram.

3. Rate of Exposure

The rate of exposure shall be 24 frames per second.

4. Relationship Between Photographic Sound and Picture

The separation of the picture and corresponding photographic sound as recorded in the camera is dependent upon the camera design and varies widely among camera models. When prints are made, the picture-sound separation shall be in accordance with American Standard Photographic Sound Record on 35mm Prints, PH22.40-1957. The location and dimensions of the photographic sound record shall also be in accordance with PH22.40-1957.



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

5. Revision of American Standard Referred to in This Document

When the following American Standard referred to in this document is superseded by a revision approved by the American Standards Association, Incorporated, the revision shall apply:

American Standard Photographic Sound Record on 35mm Prints, PH22.40-1957

Approved November 10, 1961, by the American Standards Association, Incorporated
Sponsor: Society of Motion Picture and Television Engineers

* Universal Decimal Classification

Printed in U.S.A.
ASA3/4M1161/40

American Standard

16mm Multi-Azimuth Test Film, Magnetic Type

ASA
Reg. U.S. Pat. Off.

PH22.126-1961

*UDC 771.531.3:681.84.083

1. Scope

This standard specifies a test film to be used for determining the azimuth alignment of a magnetic reproducer head without disturbing its adjustment.

2. Test Film

2.1 The test film shall have an original sound record having a wave shape that is approximately sinusoidal. The frequency of the sound record shall be approximately 7000 cps when the film travel rate is 24 perforations per second (approximately 36 ft per minute).

2.2 The recording shall be made at 100-percent modulation level with a tolerance of +0 −2 db. 100-percent modulation is defined as the recording head current at which 3 percent total harmonic distortion occurs at a signal frequency of 1000 cps.

2.3 The location and dimensions of the sound record shall be as given in the diagram and in Table 1.

2.4 The sound record shall be recorded in such a manner as to produce sequential steps recorded at calibrated deviations from the perpendicular to the direction of film travel.

2.5 This test film shall have a total of 11 steps, which, when reproduced on a properly aligned reproducer, will give output indications varying from minimum at the first step to maximum at the sixth step and back to minimum at the 11th step. The sixth step shall be a recording whose azimuth is perpendicular to the direction of film travel within ±1 minute of arc. The azimuth of all other steps shall be within ±0.5 db of specified deviation for each step, as shown in the diagram and Table 1, excepting those of infinite loss.

2.6 The deviation in azimuth for the various steps shall be as shown in the diagram and in Table 2.

Table 1. Computed Signal Outputs in Decibels Relative to the Output of Step 6, For Three Widths of Playback Heads.

Step No.	Footage*	Azimuth	Reproduce Head Width 0.200"	0.085"	0.050"
1	0.0	40′	†db	−28.0db	−5.0db
2	2.5	20′	−∞	−3.5	−1.2
3	5.0	10′	−5.0	−0.9	−0.3
4	7.5	5′	−1.0	−0.2	−0.07
5	10.0	2.5′	−0.3	−0.05	−0.02
6	12.5	0′	0	0	0
7	21.0	−2.5′	−0.3	−0.05	−0.02
8	23.5	−5′	−1.0	−0.2	−0.07
9	26.0	−10′	−5.0	−0.9	−0.3
10	28.5	−20′	−∞	−3.5	−1.2
11	31.0	−40′	†	−28.0	−5.0

* Footage measured from the start of Step No. 1 to the start of the step indicated.
† Disregard measured values for these steps since the readings are influenced by secondary maxima.

The computed, theoretical signal outputs in Table 1 are relative to the output of Step 6, calculated from the relationship

$$\text{Output (db)} = 20 \log_{10} \frac{\text{Sin } \frac{W\theta\pi}{\lambda}}{\frac{W\theta\pi}{\lambda}}$$

where λ = Wavelength
θ = Angle of Misalignment (Radians)
W = Head Width (Reproducer)

Table 2

Step 1	= 40	minutes of arc from perpendicular
Step 2	= 20	" " " " "
Step 3	= 10	" " " " "
Step 4	= 5	" " " " "
Step 5	= 2.5	" " " " "
Step 6	= 0	" " " " "
Step 7	= 2.5	" " " " "
Step 8	= 5	" " " " "
Step 9	= 10	" " " " "
Step 10	= 20	" " " " "
Step 11	= 40	" " " " "

Approved November 10, 1961, by the American Standards Association, Incorporated
Sponsor: Society of Motion Picture and Television Engineers

* Universal Decimal Classification

Printed in U.S.A.
ASA3/4M1161/40

3. Film Stock

3.1 The film stock used shall be of safety type, cut and perforated in accordance with American Standard Dimensions for 16mm Film, Perforated One Edge, PH22.12-1953 (note Section 6, below).

3.2 The dimensions of the magnetic coating are not specified herein but should be sufficiently wide to permit the placement of a sound record in accordance with this standard.

4. Film Length

4.1 This test film shall have a 6-foot head and tail leader.

4.2 Azimuth Step 6 shall be 8 feet in length and all others of 2-foot length, with no-signal spaces of 6-inch length between adjacent steps.

4.3 The total length of this test film, including leaders, sound record and signal breaks, shall be 45 feet.

5. Identification

Each test film shall have suitable identification markings.

6. Revision of American Standard Referred to in This Document

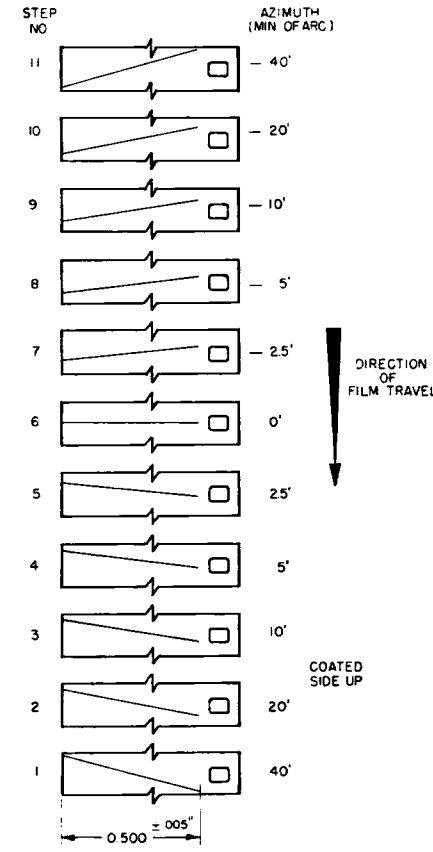
When the following American Standard referred to in this document is superseded by a revision approved by the American Standards Association, Incorporated, the revision shall apply:

American Standard Dimensions for 16mm Film, Perforated One Edge, PH22.12-1953

APPENDIX

(This Appendix is not a part of American Standard 16mm Multi-Azimuth Test Film, Magnetic Type, PH22.126-1961, but is included to facilitate its use.)

This test film is designed to indicate whether the azimuth of a reproduce head has been set accurately, by the measurement of relative outputs from a test film of known geometry and accuracy. Step 6 on this film



has been made with true azimuth and it therefore becomes the prime reference with all other steps considered relative to it. A practical maximum error in the azimuth of the recording at Step 6 has been defined in 2.5 as 0° ± 1′; this specification therefore controls the manufacturing excellence of the test film and establishes one limit on the precision of measurements with it.

Since the user of the film will measure the relative output of the various steps in decibels deviation from Step 6, the precision of the azimuth settings for these steps is defined in 2.5 as ± 0.5 db from the relative output levels of Table 1. This figure is, therefore, a practical measure of significant variations. The manufacturer of the test film will set up his equipment in accordance with Table 2, but will determine that the film meets the performance specifications of Table 1 and 2.5.