

leaders were further refined. A thorough review of the 35-mm film reels and the immediate revision of PH22.4 are planned, with the creation of two or three new standards for special purpose shipping or large-capacity reels. A revision to the larger reel spinning is incorporated in this program. Revision of the 35/70 reels standard has been balloted, and final modifications are underway.

The further review of compatibility between sprocket teeth and perforations, indicates that earlier tests regarding the gate alignment and the intermittent sprocket were satisfactory but incomplete. Further tests for upper and lower sprockets, in regard to a proposed film tension practice are planned. Discussion and test inputs seem to indicate that perhaps the increased film tension, and misalignment away from the gate and intermittent area, may be the main cause for film damage to the perforation area of the film. Plans to evaluate this are underway, to indicate the next area of effort in this continuing study.

Review of the non-anamorphic 35-mm format have led to a proposed modification of the existing standard, to permit use of a release print "matte," probably limited to 1.66 ratio space. Surveys are planned to determine the typical practice for the different non-anamorphic formats, as regards to existing theater equipment installations. Which ratios are most common, how near are theater formats to existing standards; how many formats can be used in various theaters?

The five-year rulings by ANSI, regarding standards which are expiring, have been given priority attention. A survey of Committee responsibility for standards, films, and RPs has been made, and distributed. Cooperation from other organizations, such as NATO, AMPTP, and TEA, is recognized, and appreciated.

Proposal for a viewing angle practice, has been made, plus review of illumination requirements on large screen situations. The Film Projection Practices Committee is considering the reorganization concept, however, the transition is not planned for 1975.

15 November 1974

G. M. BERGGREN  
*Chairman*

## ISO/TC 36 Preparatory Working Group-3

Preparatory Working Group-3, Sound Recording and Reproducing of ISO Technical Committee 36 on Cinematography held a three-session meeting concurrently with the 116th SMPTE Technical Conference in Toronto, Canada. Participating in the meeting were specialists from Canada, Denmark, the United Kingdom, the USA and the USSR.

The Working Group under the Chairmanship of the specialist from the United Kingdom, A. W. Lumkin of E. M. I. Elstree Studios, considered a nine-point agenda and arrived at agreements on the following subjects:

(1) specification for Six-Track Magnetic Sound Records on 70-mm Motion-Picture Release Prints to be circulated as a Draft International Standard; (2) specifications for picture images and photographic sound record on 35-mm motion-picture release prints to be circulated as a Draft International Standard; (3) a standard electro-acoustic response of motion-picture control rooms and indoor theaters to be circulated as a Draft International Standard; (4) dimensions for a photographic sound record on 8-mm Type S motion-picture film, to be circulated as an ISO Draft Proposal; (5) a standard method of measuring the modulation factor of photographic type sound level test films, to be circulated as an ISO Draft Proposal; (6) the preparation of proposals for specifications covering photographic sound test films; (7) the preparation of proposals for specification covering magnetic sound test films; and (8) the development for a time code for use with motion-picture sound recording.

The work noted was assigned to Preparatory Working Group-3 by Technical Committee 36 at its recent Plenary Meeting held at Colonial Williamsburg, Va. in December 1973. The next Plenary Meeting of ISO/TC 36 is being planned for the Spring of 1976 to be held in Paris, France.

A. W. LUMKIN  
*Chairman*

## standards and recommended practices

### Approved American National Standards

On 19 August 1974, the American National Standards Institute approved three American National Standards.

PH22.93-1974, Dimensions for 35 mm Motion-Picture Film Perforated BH; PH22.102-1974, Dimensions for 35 mm Motion-Picture Film, CS-1870; and PH22.139-1974, Dimensions for 35 mm Motion-Picture Film Perforated KS, implement agreement to consolidate standards that are similar in format and dimensioning. PH22.93-1974 combines the specifications of PH22.93 and PH22.34 applicable to 35 mm film having a BH perforation and a perforation pitch of either 0.1870 or 0.1866

inch. PH22.139-1974 consolidates the revision of PH22.139 and PH22.36 for the same reasons. The revisions do not reflect a change in specifications.

Inasmuch as compliance with American National Standards is purely voluntary, standards will become truly effective 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. — Alex E. Alden, *Staff Engineer*

# American National Standard dimensions for 35 mm motion-picture film perforated BH

Approved August 19, 1974 Secretariat: Society of Motion Picture and Television Engineers, Inc.

Page 1 of 2 pages

## 1. Scope

This standard specifies the cutting and perforating dimensions for 35 mm motion-picture film with a BH-type perforation and a perforation pitch of either 0.1866 or 0.1870 in (4.740 or 4.750 mm).

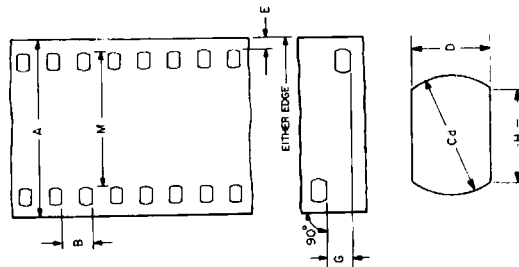
## 2. Dimensions

2.1 The dimensions shall be as given in the figure and table.

2.2 The dimensions pertain to a safety film as defined in American National Standard Specifications for Motion-Picture Safety Film, PH22.31-1967 (R1973).

2.3 The dimensions apply at the time of cutting and perforating for film adjusted to a temperature of  $23 \pm 1^\circ\text{C}$  (nominally converted to  $73 \pm 2^\circ\text{F}$ ) and a relative humidity of  $50 \pm 2$  percent. The manufacturer may indicate other nominal temperature and humidity conditions under which the dimensions apply.

2.4 Dimension H is a calculated value.



Dimensions	Inches	Millimeters
A Film width	1.377 ± 0.001	34.975 ± 0.025
B Perforation pitch (long)	0.1870 ± 0.0004	4.750 ± 0.010
B' Perforation pitch (short)	0.1866 ± 0.0004	4.740 ± 0.010
C Perforation width (diameter)	0.1100 ± 0.0004	2.794 ± 0.010
D Perforation height	0.0730 ± 0.0004	1.854 ± 0.010
E Edge to perforation	0.079 ± 0.002	2.01 ± 0.05
G Perforation misalignment	0.001 max	0.03 max
H Perforation chord width (BH perforation)	0.082 calculated	2.08 calculated
L 100 consecutive perforation pitches	18.700 ± 0.015	474.98 ± 0.38
L' 100 consecutive perforation pitches	18.660 ± 0.015	473.96 ± 0.38
M Lateral perforation displacement	1.109 ± 0.001	28.17 ± 0.03

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NOTE 1: The title of this standard was established by the application of a nomenclature system developed for all film dimension standards. Each title provides an indication of the film width, a code designation for the perforation shape (BH, KS, DH or CS) or the number of rows of perforations (1R, 2R, etc.), depending upon which is the significant factor, or the perforation pitch without the decimal point.

NOTE 2: The metric values in the table of dimensions are converted from the inch values in accordance with conversion principles outlined in American National Standard Metric Practice Guide, Z39.1-1973. The metric conversion of Dimension A is purposely chosen and shown to three decimal places to prevent the maximum width dimension from exceeding 35 mm.

## Appendix

(The Appendix is not a part of this American National Standard, but is included for information purposes only.)

A1. The user is reminded that, as a plastic, film can change dimensions temporarily due to moisture or temperature, or permanently due to solvent loss or strain effect.

A2. Film for positive use has a longitudinal pitch 0.2 percent longer than its companion negative. Shrinkage of the negative during aging and processing prior to printing will generally not exceed 0.2 percent. Thus, the negative stock is expected to be  $0.3 \pm 0.1$  percent shorter than the positive. This difference will minimize slippage between the two on the 12-inch (305-mm) circumference sprocket of the printer, assuming a film thickness of 0.0055 to 0.0065 in (0.140 to 0.165 mm).

A3. The uniformity of pitch, hole size and margin (Dimensions B, C, D and E) is an important variable affecting steadiness. Variations in these dimensions, from roll to

roll, are of little significance compared to variations from one perforation to the next within any small group of consecutive perforations. As an example, the uniformity of the margin is uniquely critical for optical printing. During the printing process, the placement of the image on the film is usually with respect to successive lateral pairs of perforations at one-frame intervals. During subsequent projection, however, the portion of the image projected is usually located, not by these perforations, but by the edge of the film. The lateral steadiness of the projected image is, therefore, directly related to the frame-to-frame uniformity of the margin.

A4. For historical background on the development of this standard, refer to A. J. Miller and A. C. Robertson, "Motion-picture film — its size and dimensional characteristics," Jour. SMPTE, 74: 3-11, Jan. 1965.

# American National Standard dimensions for 35 mm motion-picture film, CS-1870

Approved August 19, 1974 Secretariat: Society of Motion Picture and Television Engineers, Inc.

## 1. Scope

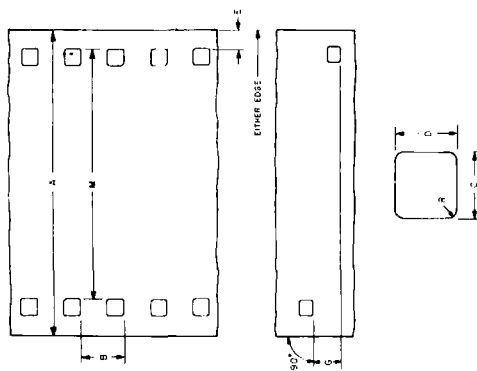
This standard specifies the cutting and perforating dimensions for 35 mm motion-picture film with a CS-type perforation and a perforation pitch of 0.1870 in (4.750 mm).

## 2. Dimensions

2.1 The dimensions shall be as given in the figure and table.

2.2 The dimensions pertain to a safety film as defined in American National Standard Specifications for Motion-Picture Safety Film, PH22.31-1967 (R1973).

2.3 The dimensions apply at the time of cutting and perforating for film adjusted to a temperature of  $23 \pm 1^\circ\text{C}$  (nominally converted to  $73 \pm 2^\circ\text{F}$ ) and a relative humidity of  $50 \pm 2$  percent. The manufacturer may indicate other nominal temperature and humidity conditions under which the dimensions apply.



Dimensions	Inches	Millimeters
A Film width	1.377 ± 0.001	34.975 ± 0.025
B Perforation pitch	0.1870 ± 0.0004	4.750 ± 0.010
C Perforation width	0.0780 ± 0.0004	1.981 ± 0.010
D Perforation height	0.0730 ± 0.0004	1.854 ± 0.010
E Edge to perforation	0.086 ± 0.002	2.18 ± 0.05
G Perforation misalignment	0.001 max	0.03 max
L 100 consecutive perforation pitches	18.700 ± 0.015	474.98 ± 0.38
M Lateral perforation displacement	1.127 ± 0.001	28.63 ± 0.03
R Radius of perforation fillet	0.013 ± 0.001	0.33 ± 0.03

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NOTE 1: The title of this standard was established by the application of a nomenclature system developed for all film dimension standards. Each title provides an indication of the film width, a code designation for the perforation shape (BH, KS, DH or CS) or the number of rows of perforations (1R, 2R, etc.), depending upon which is the significant factor, or the perforation pitch without the decimal point.

NOTE 2: The metric values in the table of dimensions are converted from the inch values in accordance with conversion principles outlined in American National Standard Metric Practice Guide, Z210.1-1973. The metric conversion of Dimension A is purposely chosen and shown to three decimal places to prevent the maximum width dimension from exceeding 35 mm.

## Appendix

(The Appendix is not a part of this American National Standard, but is included for information purposes only.)

A1. The user is reminded that, as a plastic, film can change dimensions temporarily due to moisture or temperature, or permanently due to solvent loss or strain effect.

A2. Film for positive use has a longitudinal pitch 0.2 percent longer than its companion negative. Shrinkage of the negative during aging and processing prior to printing will generally not exceed 0.2 percent. Thus, the negative stock is expected to be  $0.3 \pm 0.1$  percent shorter than the positive. This difference will minimize slippage between the two on the 12-inch (305-mm) circumference sprocket of the printer, assuming a film thickness of 0.0055 to 0.0065 in (0.140 to 0.165 mm).

A3. The uniformity of pitch, hole size and margin (Dimensions B, C, D and E) is an important variable affecting steadiness. Variations in these dimensions, from roll to roll, are of little significance compared to variations from one perforation to the next within any small group of consecutive perforations. As an example, the uniformity of the margin is uniquely critical for optical printing. During the printing process, the placement of the image on the film is usually with respect to successive lateral pairs of perforations at one-frame intervals. During subsequent projection, however, the portion of the image projected is usually located, not by these perforations, but by the edge of the film. The lateral steadiness of the projected image is, therefore, directly related to the frame-to-frame uniformity of the margin.

A4. Most 35 mm motion-picture films produced prior to 1954 were perforated with two rows of perforations, each perforation being 0.110 x 0.078 inch for positive film or 0.110 x 0.073 inch for negative film or both. Such film, in addition to carrying the picture, accommodates a single sound record between one row of perforations and the picture frame. The desire to reproduce multichannel

sound on the same film that carries the picture image, without reducing the image size, led to the use of smaller perforations on positive film. Films perforated to this smaller perforation standard have wider margins (Dimension E) and wider usable film areas between the rows of perforations than positive films perforated to American National Standard Dimensions for 35 mm Motion-Picture Film, DH-1870, PH22.1-1964 (R1969), and American National Standard Dimensions for 35 mm Motion-Picture Film Perforated KS, PH22.139-1974. This permits the placement of a magnetic coating for the multichannel sound record along both edges just outside the perforations and along both sides of the picture just inside the perforations.

A5. It should be noted particularly that film made to this standard will not fit over pins and sprocket teeth designed to fit film perforated to the following American National Standards: Dimensions for 35 mm Motion-Picture Film, DH-1870, PH22.1-1964 (R1969); Dimensions for 35 mm Motion-Picture Film Perforated KS, PH22.139-1974, and Dimensions for 35 mm Motion-Picture Film Perforated BH, PH22.93-1974.

The perforation hole size shown in the American National Standards listed above is 0.073 x 0.110 inch, except for PH22.139 which has 0.078 x 0.110-inch holes. This standard, PH22.102, has a hole size of 0.073 x 0.078 inch. Films with holes of this size would be damaged at the perforation edges when run on sprockets or pins of equipment designed for the larger holes: American National Standard Dimensions for 16-Tooth 35 mm Motion-Picture Projector Sprockets, PH22.35-1962 (R1969), describes projector sprockets suitable for any of the perforations listed, regardless of the perforation size.

A6. For historical background on the development of this standard, refer to A. J. Miller and A. C. Robertson, "Motion-picture film — its size and dimensional characteristics," Jour. SMPTE, 74: 3-11, Jan. 1965.

# American National Standard dimensions for 35 mm motion-picture film perforated KS

Approved August 19, 1974  
Secretariat: Society of Motion Picture and Television Engineers, Inc.

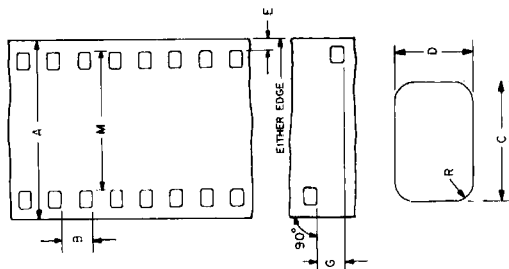
Page 1 of 2 pages

## 1. Scope

This standard specifies the cutting and perforating dimensions for 35 mm motion-picture film with a KS-type perforation and a perforation pitch of either 0.1866 or 0.1870 in (4.740 or 4.750 mm).

## 2. Dimensions

- 2.1 The dimensions shall be as given in the figure and table.
- 2.2 The dimensions pertain to a safety film as defined in American National Standard Specifications for Motion-Picture Safety Film, PH22.31-1967 (R1973).
- 2.3 The dimensions apply at the time of cutting and perforating for film adjusted to a temperature of  $23 \pm 1^\circ\text{C}$  (nominally converted to  $73 \pm 2^\circ\text{F}$ ) and a relative humidity of  $50 \pm 2$  percent. The manufacturer may indicate other nominal temperature and humidity conditions under which the dimensions apply.



Dimensions	Inches	Millimeters
A Film width	1.377 ± 0.001	34.975 ± 0.025
B Perforation pitch (long)	0.1870 ± 0.0004	4.750 ± 0.010
B' Perforation pitch (short)	0.1866 ± 0.0004	4.740 ± 0.010
C Perforation width	0.1100 ± 0.0004	2.794 ± 0.010
D Perforation height	0.0780 ± 0.0004	1.981 ± 0.010
E Edge to perforation	0.079 ± 0.002	2.01 ± 0.05
G Perforation misalignment	0.001 max	0.03 max
L 100 consecutive perforation pitches	18.700 ± 0.015	474.98 ± 0.38
L' 100 consecutive perforation pitches	18.660 ± 0.015	473.96 ± 0.38
M Lateral perforation displacement	1.109 ± 0.001	28.17 ± 0.03
R Radius of perforation fillet	0.020 ± 0.001	0.51 ± 0.03

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