mann (N. V. Philips, Holland) with comments by M. Samuelson (Samuelson Film Services).

Discussion on Single Camera and Multi-Camera Lighting Methods, conducted by Jim Richards (BBC); Bill Lee (Thames Television); and Jack Cardiff and Ossie Morris (Directors of Photography).

6. Electronic Reproduction of Film

"Two Years Experience with Color Negative Film Transmission," L. H. Griffiths (BBC).

"16mm Film Production in United Kingdom Independent Television," Norman Green (I.T.C.A.).

"Preprogramed and Automatic Color Correction for Telecine," D. J. Kitson and D. T. Wright (BBC).

"Improved Cathode-Ray Tubes for Flying-Spot Scanner," D. H. Bramall (Rank Electronic Tubes) and P. W. Blaxtan (Rank Precision Industries).

"A System Using Color Television for the Quality Assessment of Color Negative Film," R. Godden (Kodak Ltd.).

"Improved Telecine Image Quality: The Influence of Black Level," Henry A. Barrett, Richard E. Bartow, Robert C. Lovick and John C. Norris (Eastman Kodak Co.).

"New Concepts in Telecine Design," D. Pay (Marconi Communications).

"The Present Design and Future Development of Telecine," J. R. Sanders and J. O. Drewery (BBC).

"Requirements for Telecine Systems," M. V. Antipin (USSR).

7. Film Plus Tape

"The Choice Between Film and Tape: A Discussion," J. H. Mewett and G. D. Cook (BBC).

"Film or Tape for Television News Gathering?" J. A. Flaherty (CBS).

"The Use of Television Techniques in Motion-Picture Feature Production," I. N. Alexander (USSR).

"Computer Animation — Some New Antics," Alan Kitching (Grove Park Studio, London).

8. Who Profits From Training?

This session consisted of a major review of education and training for film and television. The speakers were: Colin Young (National Film School); John Tasker (Thames Television Ltd.); Paul Read (Kodak Ltd.); and Gerald Graham (National Film Board of Canada).

standards and recommended practices

Draft American National Standards

Four Draft American National Standards, which are revisions of previous issues, are published here for a trial period and public review: PH22.1, Dimensions for 35mm Motion-Picture Film, DH-1870; PH22.93, Dimensions for 35mm Motion-Picture Film Perforated BH; PH22.102, Dimensions for 35mm Motion-Picture Film, CS-1870; and PH22.139, Dimensions for 35mm Motion-Picture Film Perforated KS, implement agreement by the Society's Film Dimensions Committee to consolidate standards that are similar in format and dimensioning. PH22.93 combines the specifications of PH22.93 and PH22.34 applicable to 35mm film having a BH perforation and a perforation pitch of either 0.1870 or 0.1866 inches. PH22.139 consolidates the revision of PH22.139 and PH22.36 for the same reasons. The proposed revisions do not reflect a change in specifications.

Comments should be addressed to Alex E. Alden, Staff Engineer, at Society Headquarters prior to 1 December 1973. The proposals have been submitted to American National Standards Committee PH22. All comments received through *Journal* publication will be reviewed before conclusion of action by that Committee. — Alex E. Alden, *Staff Engineer*

Draft American National Standard

Dimensions for 35 mm Motion-Picture Film, DH-1870

PH22.1

Revision of PH22.1-1964

1. Scope

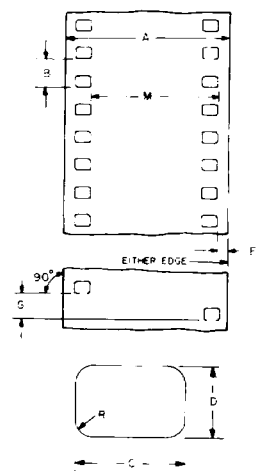
This standard specifies the cutting and perforating dimensions for 35 mm motion-picture film with a DH-type perforation and a perforation pitch of 0.1870 inch.

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, PH22.31-1973 (R-1967).

2.3 The dimensions apply at the time of cutting and perforating for film adjusted to a temperature of 23 ± 1°C (nominally converted to 73 ± 2°F) and a relative humidity of 50 ± 2 percent. The manufacturer may indicate other nominal 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	0.1100 ± 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 skewness	0.001 max	0.03 max
L	100 consecutive perforation pitches	18.700 ± 0.015	474.98 ± 0.38
M	Lateral perforation displacement	1.109 ± 0.001	28.17 ± 0.03
R	Radius of perforation fillet	0.013 ± 0.001	0.33 ± 0.03

THIS PROPOSAL IS PUBLISHED FOR COMMENT ONLY

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 Practice for Inch-Millimeter Conversion for Industrial Use, B48.1-1947 (R-1933). 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 ± 0.1 percent shorter than the positive. This difference will minimize slippage between the two on the 12-inch 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.

Draft American National Standard

Dimensions for 35 mm Motion-Picture Film Perforated BH

PH22.93

Revision and consolidation of PH22.93-1964 and PH22.34-1964

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 inch.

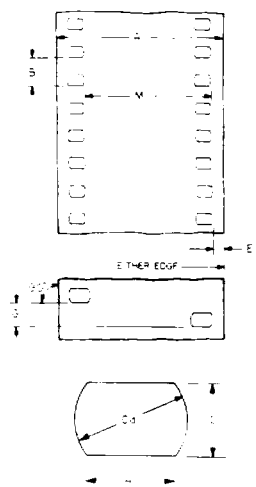
2. Dimensions

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, PH22.31-1973 (R-1967).

2.3 The dimensions apply at the time of cutting and perforating for film adjusted to a temperature of 23 ≐ 1°C (nominally converted to 73 ≐ 2°F) and a relative humidity of 50 ≐ 2 percent. The manufacturer may indicate other nominal 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 skewness	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

THIS PROPOSAL IS PUBLISHED FOR COMMENT ONLY

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 Practice for Inch-Millimeter Conversion for Industrial Use, B48.1-1947 (R-1933). 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 ≐ 0.1 percent shorter than the positive. This difference will minimize slippage between the two on the 12-inch 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.

Draft American National Standard

Dimensions for 35 mm Motion-Picture Film, CS-1870

PH22.102

Revision of
PH22.102-1964

1. Scope

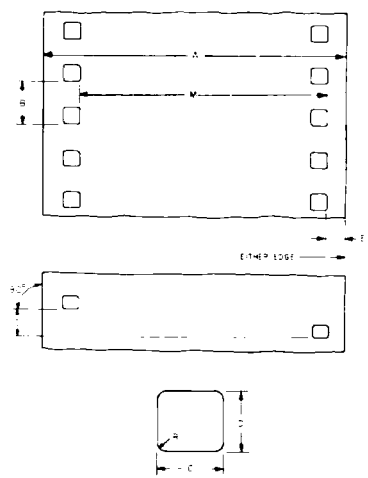
This standard specifies the cutting and perforating dimensions for 35 mm motion-picture film with a CS-type perforation and a perforation pitch of 0.1870 inch.

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, PH22.31-1973 (R-1967).

2.3 The dimensions apply at the time of cutting and perforating for film adjusted to a temperature of 23 ± 1°C (nominally converted to 73 ± 2°F) and a relative humidity of 50 ± 2 percent. The manufacturer may indicate other nominal 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 skewness	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

THIS PROPOSAL IS PUBLISHED FOR COMMENT ONLY

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 Practice for Inch-Millimeter Conversion for Industrial Use, B48.1-1947 (R-1933). 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 ± 0.1 percent shorter than the positive. This difference will minimize slippage between the two on the 12-inch 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 Draft American National Standard Dimensions for 35 mm Motion-Picture Film, DH-1870, PH22.1, and Draft American National Standard Dimensions for 35 mm Motion-Picture Film Perforated KS, PH22.139. 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 Draft American National Standards: Dimensions for 35 mm Motion-Picture Film, DH-1870, PH22.1; Dimensions for 35 mm Motion-Picture Film Perforated KS, PH22.139, and Dimensions for 35 mm Motion-Picture Film Perforated BH, PH22.93.

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, PH22.35-1969 (R-1962), 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.

Draft American National Standard

Dimensions for 35 mm Motion-Picture Film Perforated KS

PH22.139

Revision and consolidation of PH22.139-1964 and PH22.36-1964

1. Scope

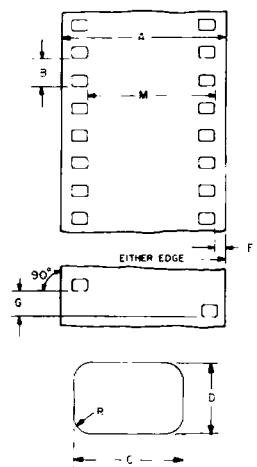
This standard specifies the cutting and perforating dimensions for 35 mm motion-picture film with a KS-type perforation and a perforation pitch of either 0.1866 or 0.1870 inch.

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, PH22.31-1973 (R-1967).

2.3 The dimensions apply at the time of cutting and perforating for film adjusted to a temperature of 23 ± 1°C (nominally converted to 73 ± 2°F) and a relative humidity of 50 ± 2 percent. The manufacturer may indicate other nominal 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 skewness	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

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 Practice for Inch-Millimeter Conversion for Industrial Use, B48.1-1947 (R-1933). 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 ± 0.1 percent shorter than the positive. This difference will minimize slippage between the two on the 12-inch 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.