

## Retirement:

Editor — VICTOR H. ALLEN

*Printer:* Please delete the above from the masthead after this month's *Journal*. Although the type may not be worn out, 306X seems enough.—Ed.



Of course, with modern technology there is no printing type that gets worn out. But we cannot say "Get thee behind me, Technology." Technology has long been alongside us. It was there when this Editor's education and erosion began on the rolling farm hills near Lake Ontario. Thus, to reminisce, to bring back what was in the mind long ago:

I hear: "Son, better take the big team to work that side hill. Tractor's dangerous and it'll use up gas. Should work it across, there's little enough good soil left now."

"But I'll work in loops. I'd rather drive the tractor. When we going to get a Moline 15-30 and junk the old International 8-16?"

"You have the best two Percherons in the County. Or take the mules." (The mules: ha! The first automated system I ever met —

their standard very, very slow movement out from the harness shed and their very slow rate evenly maintained until they turned for home and the barn — then much faster gear. It was not until recently that I realized that putting a projected picture on a boom in front of those mules to keep showing the barn would have changed their gears.)

Whatever the frustration with the mules in those days, was psychology better learned then as a ward attendant at St. Lawrence State Hospital for the Insane? Perhaps it was good training, in a secure situation, for the publishing world. We were involved with dementia praecox — since then how much better has it been with the terms schizophrenia or schizoid . . . ? Or . . . depressive? Careful — this treads on the border of the technology of economics. Or is economics psychology? Are international politics another technology?

What is relevant? The wonderful technology of making paper on a Fourdrinier machine, hundreds of feet long and about as delicate as a watch. At the Dexter Sulphite Pulp & Paper Co. they welcomed a farmboy's learning soon to control the calendaring, the slitting and winding, the importance of the wire side and the grain, the troubles with coating. But now, long later, paper is not coated; it is impregnated. Can one still love paper? But one must be sure the paper for the book is grain short for the imposition layout with the printer; then when the big metropolitan bindery delivers, the opened pages will lie nicely flat.

To see the world beyond the hills and the river paper mills, technology always went along: firing an oil burner with firetube boilers and turbine to Antwerp; or firing with coal watertube boilers and compound engine to Green Bay; more glamorous, oiling an upright Worthington diesel on trips to China, Australia and India. But there was youthful disappointment not to ship out on the technologically more intriguing opposed-pistons, twin-screw Sun Doxford diesels to Africa.

Sometimes the technology was simpler: As deckhand on a freighter in the Black Sea in a blinding and deafening blizzard — see no lights; hear no bell buoys. Simply keep throwing the sounding line and always hoping the lead would go down far below the mark twain. Never mind one's freezing, stiffening hands, we'll be in Constantinople tomorrow.

Always something new: One had to learn that the nice 92-element high-school chemistry was too simple, perhaps that chemistry was physics when candidates for the B.A. at Antioch College were required to absorb a year of "Matter and Energy." Soon even for the layman it was nuclear physics.

So the world of journals and books about science and technology came as the call of the non-wild of society. The strawperson would ask "What's with being an editor?" It is being a good file clerk — putting information into shape and order so it can be retrieved by all who want it. But more: it is communicating; the end result is the information consumed. The authors' substance must be shaped and delivered to all the editor's bosses — the readers.

The matter in hand here is this effort to communicate about the communicating of communications technology. Our SMPTE interests are a very mixed bag. We have five Vice-Presidents for Affairs. And, for instance, one of these, "for Education Affairs," embraces motion-picture and TV technology in the educational process and the educational process (technology) for educating for film and TV.

Much of this has been fun — and more; but how good has it been — this being devoted to the technology of communicating technology?

This parting note must include a few words to belie the idea that the *Journal* has been or could be one man's ego trip. Those who knew the *Journal* 20 to 30 years ago and who knew Arthur C. Downes, then Chairman of the Board of Editors, were aware of the Society's strong resource in its Board of Editors who provided critical reviews, extensive guidance and detailed assistance for authors. That great service to the *Journal* and its readers has been provided for the past 20 years by Dr. Pierre Mertz and his Board who work in anonymity except for their mere listing on the inside front cover of the *Journal*. The Editor and hundreds of authors are grateful to them.

I leave to my successor and the staff the pleasant daily fare of appreciation of the Authors, the Board of Editors, Officers and Members and the Printers who all help make the *Journal*. —Ed.

## standards and recommended practices

### Approved American National Standards

On 6 March 1975, the American National Standards Institute approved five American National Standards: PH22.1-1975, Dimensions for 35-mm Motion-Picture Film, DH-1870; PH22.119-1975, Dimensions for 70-mm Motion-Picture Film Perforated 65-mm KS-1870; PH22.145-1975, Dimensions for 65-mm Motion-Picture Film Perforated KS; PH22.149-1975, Dimensions for 8-mm Type R (Regular 8) Motion-Picture Film Perforated 8-mm Type S (Super 8), IR; and PH22.151-1975, Dimensions for 16-mm Motion-Picture Film Perforated 8-mm Type S (Super 8), (1-3).

These documents have been editorially modified to conform with other similar standards and do not reflect a change in specifications.

PH22.145 and PH22.151 implement agreement to consol-

idate standards that are similar in format and dimensioning. PH22.145 combines the specifications of PH22.145 and PH22.118 applicable to 65-mm film having a KS perforation and a perforation pitch of either 0.1870 or 0.1866 inch. PH22.151 combines the specifications of PH22.151 and PH22.150 applicable to 16-mm film perforated super 8 and a perforation pitch of either 0.1664 or 0.1667 inch.

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, DH-1870

Approved March 6, 1975 Secretariat: Society of Motion Picture and Television Engineers, Inc.

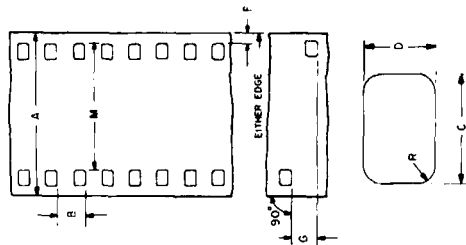
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## 1. Scope

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 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	0.1100 ± 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
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

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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 70-mm motion-picture film perforated 65-mm, KS-1870

Approved March 6, 1975

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

Page 1 of 2 pages

## 1. Scope

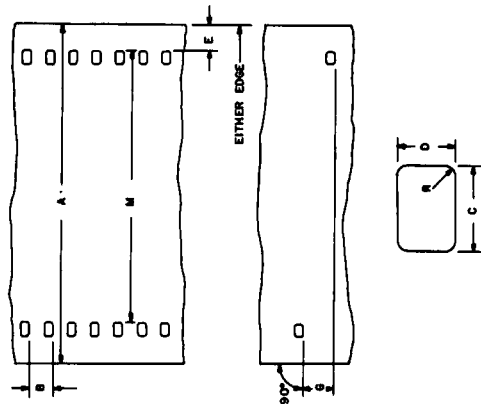
This standard specifies the cutting and perforating dimensions for 70-mm motion-picture film perforated 65-mm, with a KS-type perforation and a perforation pitch of 0.1870 in (4.750 mm).

## 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	2.754 ± 0.002	69.95 ± 0.05
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	0.0780 ± 0.0004	1.981 ± 0.010
E Edge to perforation	0.215 ± 0.003	5.46 ± 0.08
G Perforation misalignment	0.002 max	0.05 max
L 100 consecutive perforation pitches	18.700 ± 0.015	474.98 ± 0.38
M Lateral perforation displacement	2.214 ± 0.003	56.24 ± 0.08
R Radius of perforation fillet	0.020 ± 0.001	0.51 ± 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.

## 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. Film described in this standard is used in making prints from 65-mm film described in American National Standard Dimensions for 65-mm Motion-Picture Film Perforated KS, PH22.145-1975.

Note that the 70-mm film used with 65-mm negative differs in its dimensions from the two films described by American National Standard Dimensions for 70-mm Unperforated and Perforated Film for Cameras Other Than Motion-Picture Cameras, PH1.20-1970, Type I and Type II. The perforations have the same size and pitch as those described by PH1.20-1970, Type II, but the margin and distance between perforations are different. Consequently, Dimension M is the same in both 65-mm KS-1870 and KS-1866 films and also for 70-mm film perforated 65-mm, KS-1870. The increased space provided by a larger margin E is used to make room for magnetic sound records.

Note that the image usually placed on this film is five pitches high. The manufacture of the film is based on this idea and best results accrue from using this format.

A5. 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 65-mm motion-picture film perforated KS

Approved March 6, 1975

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

Page 1 of 2 pages

## 1. Scope

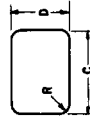
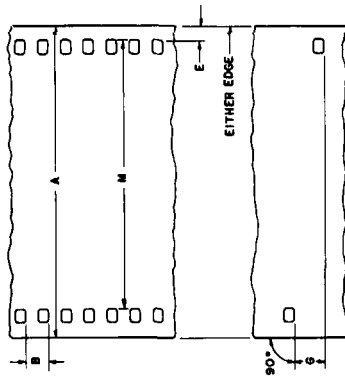
This standard specifies the cutting and perforating dimensions for 65-mm motion-picture film with a KS-type perforation and a perforation pitch of either 0.1866 or 0.1870 in (4.740 or 4.750 mm).

## 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	2.558 ± 0.002	64.97 ± 0.05
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	0.117 ± 0.003	2.97 ± 0.08
G Perforation misalignment	0.002 max	0.05 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	2.214 ± 0.003	56.24 ± 0.08
R Radius of perforation fillet	0.020 ± 0.001	0.51 ± 0.03

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**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.

**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.

## Appendix

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

One is the possibility of producing large prints by contact printing for exhibition in special theaters designed to provide the audience with a large viewing angle. The other purpose is to serve as an original from which 35-mm prints can be produced by reduction with less grain and better definition than can be obtained by making contact prints from 35-mm negatives.

Prints may be made on 70-mm film. The appropriate film is described in American National Standard Dimensions for 70-mm Motion-Picture Film Perforated 65-mm, KS-1870, PH22.119-1975. Note that the 70-mm film used with 65-mm negative differs in its dimensions from the two films described by American National Standard Dimensions for 70-mm Unperforated and Perforated Film for Cameras Other Than Motion-Picture Cameras, PH1.20-1970, Type I and Type II. The perforations have the same size and pitch as those described by PH1.20-1970, Type II, but the margin and distance between perforations are different. Consequently, Dimension M is the same in both 65-mm KS-1870 and KS-1866 films and also for 70-mm film perforated 65-mm, KS-1870. The increased space provided by a larger margin E is used to make room for magnetic sound records.

Note that the image usually placed on this film is five pitches high. The manufacture of the film is based on this idea and best results accrue from using this format.

**A5.** 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.

**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 unprocessed negative. Shrinkage of the negative during aging and processing prior to printing will generally not exceed 0.2 percent. Thus, the processed negative stock is expected to be  $0.3 \pm 0.1$  percent shorter than the unprocessed 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 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.** Film of this size is generally used as a camera negative. There are two advantages in using this larger size.

# American National Standard dimensions for 8-mm type R (regular 8) motion-picture film perforated 8-mm type S (super 8), 1R

Approved March 6, 1975 Secretariat: Society of Motion Picture and Television Engineers, Inc.

## 1. Scope

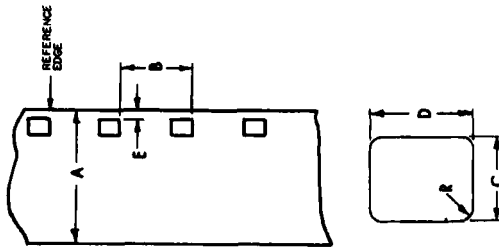
This standard specifies the cutting and perforating dimensions for 8-mm Type R (Regular 8) motion-picture film with 8-mm Type S (super 8) perforations along one edge and a perforation pitch of either 0.1664 or 0.1667 in (4.227 or 4.234 mm).

## 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	0.3140 ± 0.0015	7.976 ± 0.038
B Perforation pitch (long)	0.1667 ± 0.0004	4.234 ± 0.010
B' Perforation pitch (short)	0.1664 ± 0.0004	4.227 ± 0.010
C Perforation width	0.0360 ± 0.0004	0.914 ± 0.010
D Perforation height	0.0450 ± 0.0004	1.143 ± 0.010
E Edge to perforation	0.020 ± 0.002	0.51 ± 0.05
L 100 consecutive perforation pitches	16.670 ± 0.017	423.42 ± 0.43
L' 100 consecutive perforation pitches	16.640 ± 0.017	422.66 ± 0.43
R Radius of perforation filler	0.005 ± 0.001	0.13 ± 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.

## 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 floss or strain effect.

A2. Film for positive use has a longitudinal pitch 0.2 percent longer than its companion unprocessed negative. Shrinkage of the negative during aging and processing prior to printing will generally not exceed 0.2 percent. Thus, the processed negative stock is expected to be  $0.3 \pm 0.1$  percent shorter than the unprocessed 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: 3-1, Jan. 1965.

# American National Standard dimensions for 16-mm motion-picture film perforated 8-mm type S (super 8), (1-3)

Approved March 6, 1975  
Secretariat: Society of Motion Picture and Television Engineers, Inc.

## 1. Scope

This standard specifies the cutting and perforating dimensions for 16-mm motion-picture film with 8-mm Type S (super 8) perforations in positions 1 and 3 and a perforation pitch of either 0.1664 or 0.1667 in (4.227 or 4.234 mm). The width of the 8-mm strip after processing and slitting is also specified.

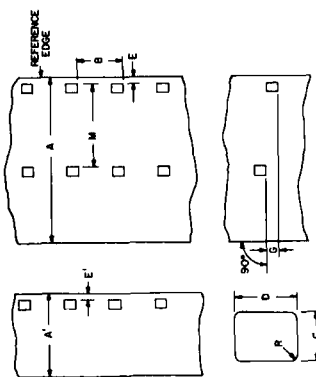
## 2. Dimensions

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 Except for Dimensions A' and E', 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

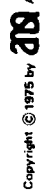
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humidity of  $50 \pm 2$  percent. The manufacturer may indicate other nominal temperature and humidity conditions under which the dimensions apply. Dimensions A' and E' apply immediately after processing and slitting.



Dimensions	Inches	Millimeters
A	$0.628 \pm 0.001$	$15.95 \pm 0.03$
A'	$0.314 \pm 0.002$	$7.98 \pm 0.05$
B	$0.1667 \pm 0.0004$	$4.234 \pm 0.010$
B'	$0.1664 \pm 0.0004$	$4.227 \pm 0.010$
C	$0.0360 \pm 0.0004$	$0.914 \pm 0.010$
D	$0.0450 \pm 0.0004$	$1.143 \pm 0.010$
E	$0.020 \pm 0.002$	$0.51 \pm 0.05$
E'	$0.020 \pm 0.002$	$0.51 \pm 0.05$
G	0.001 max	0.03 max
L	$16.670 \pm 0.017$	$423.42 \pm 0.43$
L'	$16.640 \pm 0.017$	$422.66 \pm 0.43$
M	$0.314 \pm 0.001$	$7.98 \pm 0.03$
R	$0.005 \pm 0.001$	$0.13 \pm 0.03$

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than one combination of perforation rows is possible. The perforation rows shall be numbered starting at the reference edge. The reference edge is that edge of the strip nearest to the perforations which is retained on one of the slit prints that is not discarded in any subsequent slitting. The designation 1 through 4 of 16 mm films indicates that the perforations are in row

- 1 — adjacent to the reference edge
- 2 — on the reference side of center
- 3 — on the nonreference side of center
- 4 — adjacent to the nonreference edge

when the film end is observed from the base side with the wound roll above and away from the point of observation.

There can be two different windings for the same numbered rows of perforations. This applies, however, only when the film is perforated in the 1-3 position and the designation of the film would be 1-3, regardless of winding. Winding could be A or B, depending upon the location of the reference edge. (Refer to American National Standard Designation of A and B Windings for Motion-Picture Raw Stock, PH22.75-1969.)

## 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 unprocessed negative. Shrinkage of the negative during aging and processing prior to printing will generally not exceed 0.2 percent. Thus, the processed negative stock is expected to be  $0.3 \pm 0.1$  percent shorter than the unprocessed 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.