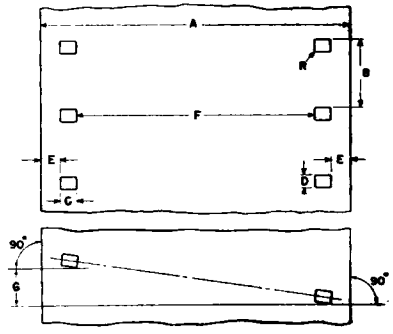
Proposed American Standard Dimensions for

35mm Motion-Picture Film, Perforated 32mm, 2R-3000

PH22.138

1. Scope

This standard specifies the dimensions of 35-mm motion-picture film having two rows of 16mm type perforations, one row near each edge of the 35mm film and a perforation length pitch of 0.3000 in.



2. Dimensions

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

2.2 These dimensions pertain to a safety film as defined in Appendix A5.*

2.3 These dimensions apply to material immediately after cutting and perforating.

2.4 Dimension L represents the length of any 100 consecutive pitch intervals.

Dimension		Inches	Millimeters
A	Film width	1.377 ± 0.001	34.975 ± 0.025
B	Length pitch	0.3000 ± 0.0005	7.620 ± 0.013
C	Perforation width	0.0720 ± 0.0004	1.829 ± 0.010
D	Perforation height	0.0500 ± 0.0004	1.270 ± 0.010
E	Edge to perforation	0.096 ± 0.002	2.44 ± 0.05
F	Width between perforations	1.041 ± 0.002	26.44 ± 0.05
G	Perforation skewness	0.001 max	0.025 max
L	Length pitch (100 consecutive pitch intervals)	30.00 ± 0.03	762.0 ± 0.8
R	Radius of perforation fillet	0.010 ± 0.001	0.25 ± 0.03

NOTES

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, the perforation shape (BH, KS, DH, or CS) or the number of rows of perforations (1R, 2R or 4R), depending upon which is the significant factor, and the perforation pitch without the decimal point.

2. The dimensions in the inch system are the fundamental standard. The dimensions in the metric system are practical approximations based on American Standard Inch-Millimeter Conversion for Industrial Use, B48.1-1933, reaffirmed in 1947, providing a conversion factor of 1 inch = 25.4 millimeters.

American Standards

Four proposed film dimensions standards, developed by the SMPTE Film Dimensions Committee and approved by the Standards Committee, are published here for a trial period. Comments should be addressed to Alex E. Alden at Society Headquarters prior to October 15, 1962. If no adverse criticism is received by that date, the proposals will be submitted to ASA Sectional Committee PH22 for further processing.

Three of these standards, PH22.5, Proposed American Standard Dimensions for 16mm Motion-Picture Film, 2R-3000; PH22.12, Proposed American Standard Dimensions for 16mm Motion-Picture Film, 1R-3000; and PH22.17, Proposed American Standard Dimensions for 16mm Motion-Picture Film, Perforated 8mm, 2R-1500, are technically the same as the previous issues. The appendix has been enlarged to incorporate tutorial data concerning perforating and shrinkage problems. PH22.138, Proposed American Standard Dimensions for 35mm Motion-Picture Film, Perforated 32mm, 2R-3000, is a new proposed standard. The standard is one of a group giving the dimensions of 32mm film which will eventually be slit to 16mm width.

Notice of Proposed Withdrawal Action

In keeping with the philosophy that an American Standard should reflect the state of the art, and that outdated or unused standards should be removed, the Sound Committee recommended that PH22.82-1951, American Standard Sound Transmission of Perforated Projection Screens, be withdrawn. (Published in SMPTE August 1951 Journal, page 171.)

Both the Standards Committee and ASA Sectional Committee PH22 reviewed the opinions of the engineers who deliberated a revision of this standard, and were in accord that there appears to be no interest on the part of American industry to upgrade or to retain this standard. Both committees, consequently, recommended the withdrawal of the present outdated document. In the event that the staff engineer's office receives no adverse comments by November 1, 1962, this recommendation will be submitted to the American Standards Association for withdrawal action.
A.E.A.

APPENDIX A

* For Appendixes A1 through A4 see PH22.5.

A5. This film is to be made on safety base complying with American Standard Specifications for Safety Photographic Film, PH1.25-1956. Nitrate film should not be used because this film may be slit to the 16mm width and used on 16mm projectors with subsequent danger of fire. It should be noted that it has always been a firm policy of American film manufacturers to coat 16mm film on safety base.

A6. When this film is used in the ultimate production of 16mm film, it is important that this 16mm film does not exceed 0.630 in. in width at time of use.

Proposed American Standard Dimensions for

16mm Motion-Picture Film, 2R-3000

PH22.5

Revision of PH22.5-1958

1. Scope

This standard specifies the cutting and perforating dimensions for 16mm motion-picture film with perforations along both edges and a perforation length pitch of 0.3000 in.

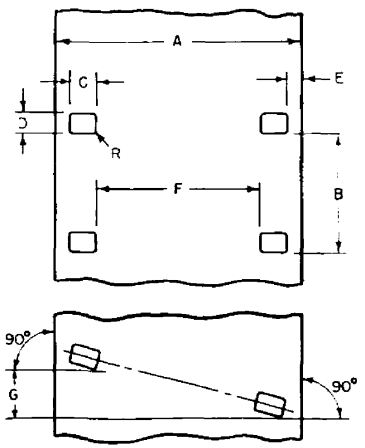
2. Dimensions

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

2.2 These dimensions pertain to a safety film as defined in Appendix A5.

2.3 These dimensions apply to material immediately after cutting and perforating.

2.4 Dimension L represents the length of any 100 consecutive pitch intervals.



	Dimensions	Inches	Millimeters
A	Film width	0.628 ± 0.001	15.950 ± 0.025
B	Length pitch	0.3000 ± 0.0005	7.620 ± 0.013
C	Perforation width	0.0720 ± 0.0004	1.829 ± 0.010
D	Perforation height	0.0500 ± 0.0004	1.270 ± 0.010
E	Edge to perforation	0.0355 ± 0.0020	0.90 ± 0.05
F	Width between perforations	0.413 ± 0.001	10.49 ± 0.03
G	Perforation skewness	0.001 max	0.025 max
L	Length pitch (100 consecutive pitch intervals)	30.00 ± 0.03	762.0 ± 0.8
R	Radius of perforation fillet	0.010 ± 0.001	0.25 ± 0.03

NOTES

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, the perforation shape (BH, KS, DH, or CS) or the number of rows of perforations (1R, 2R or 4R), depending upon which is the significant factor, and the perforation pitch without the decimal point.

2. The dimensions in the inch system are the fundamental standard. The dimensions in the metric system are practical approximations based on American Standard Inch-Millimeter Conversion for Industrial Use, B48.1-1933, reaffirmed in 1947, providing a conversion factor of 1 inch = 25.4 millimeters.

APPENDIX A

(This Appendix is not a part of Proposed American Standard Dimensions for 16mm Motion-Picture Film, 2R-3000, PH22.5, but is included to facilitate its use.)

A1. The dimensions given in this standard represent the practice of film manufacturers in that the dimensions and tolerances are for film immediately after perforation. The punches and dies themselves are made to tolerances considerably smaller than those given, but since film is a plastic material the dimensions of the slit and perforated film never agree exactly with the dimensions of the slitters, punches and dies. Film can shrink or swell due to loss or gain in moisture content or can shrink due to loss of solvent. These changes invariably result in changes in the dimensions during the life of the film. The change is generally uniform throughout a roll.

A2. It will be noted that among the various standards for slitting and perforating film stock there are often two standards which seem much alike in wording. The difference lies in the longitudinal pitch which is sometimes 0.1870 in. (or 0.3000 in.) and sometimes 0.1866 in. (or 0.2994 in.). In general, the longer pitch is for print stock and the shorter pitch is for negative stock.

The choice of pitch for negative motion picture films depends, within certain limits, on the type of printer to be used. In the case where step-printers are used, and the film is stationary when exposed, the choice of pitch is not strictly limited. In the case where the film moves continuously over a cylindrical surface at time of printing (sprocket-type printer), there are three major considerations involved in choosing the pitch. These considerations are: (1) the sprocket diameter, (2) the film thickness, (3) the film shrinkage and the rate at which shrinkage occurs.

Maximum steadiness and definition are secured on a sprocket-type printer when the negative is somewhat shorter in pitch than the positive stock in the approximate proportion of the thickness of the film to the radius of curvature. For printing on a 64-tooth 35mm sprocket or a 40-tooth 16mm sprocket (both of which have a circumference of about 12 in.) and with film 0.0055 in. to 0.0065 in. thick, the optimum pitch differential is 0.3 percent. The use of the ideal pitch differential for the negative would minimize slippage between the positive stock and negative during the printing operation, thus reducing the amount of blurring and jumping of horizontal lines in the picture or sound image that otherwise can take place. (This error is to be differentiated from the jump caused by nonuniformity of successive pitches, Dimension B.)

Experience has shown that the average pitch, Dimension L, of the negative can vary ±0.1 percent from the ideal of a pitch, which is 0.3 percent shorter than the positive stock, without the blurring of picture and sound image being easily detected.

For many years this desired difference in pitch was caused by the shrinkage of the negative film during processing and aging. Current film bases shrink less than the earlier ones and hence a shorter initial pitch becomes desirable. To satisfy this requirement for picture or sound negatives, it is common manufacturing practice to set the aim for the pitch at a value 0.2 percent shorter than the positive stock onto which they will be printed. The additional shrinkage that occurs during processing and the aging that takes place before the release prints are made then brings the pitch differential close to the optimum and desired value of 0.3 percent. Accordingly, the pitch chosen for the negative stock is 0.1866 in. or 0.2994 in. depending on whether the film width is 35 mm or 16 mm.

Low-shrink negative film perforated to these dimensions should not thereafter shrink appreciably more than 0.2 percent under normal use conditions, and for a reasonable life span, so that the optimum pitch differential from the positive stock of 0.3 ± 0.1 percent is maintained. (The film should be measured after equilibration with air at 70 F and 55 percent relative humidity or at the conditions prevailing at the time of perforating.)

A3. The uniformity of pitch, margin and hole size (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 sprocket hole to the next. Actually it is the maximum variation from one sprocket hole to the next within any small group of consecutive perforations that is important.

A4. The optimum width for 16mm film (which often goes through channels of fixed size) is controlled by the shrinkage characteristics of the films involved. Thus in times past there have been standards for the width of 16mm stock of the "usual" shrinkage and for stock of "low shrinkage" characteristics. The purpose was to obtain films of approximately the same width regardless of the type of film base during their useful life. This standard is based on the values adapted to "low-shrink" film base since nearly all films now manufactured in the U.S. meet the definition noted below.

For the purpose of choice of width, low-shrinkage film base is film base which when coated with emulsion and any other normal coating treatment, perforated, kept in the manufacturer's normal commercial packings for six months at 65 F to 75 F, exposed, processed and stored exposed to air for a period not to exceed 30 days at 65 F to 75 F and 50 percent to 60 percent relative humidity, and measured under like conditions of temperature and humidity, shall have shrunk not more than 0.2 percent from its original dimension at the time of perforating.

This definition of low-shrinkage film stock has been found by experience to be useful as a guide to film manufacturers in slitting their stock. Departure from this definition shall not be cause for rejection of the stock. Note that this definition of shrinkage differs from the criterion applying to the choice of longitudinal pitch, where greater periods of time are involved and where short-time tests can be deceptive.

Allowance has been made in arriving at these values for the common tendency of film to expand when exposed to high relative humidity. Allowance should be made for this factor in equipment design and in no case should the equipment design fail to accommodate a film of 0.630-in. width.

A5. This film is to be made on safety base complying with American Standard Specifications for Safety Photographic Film PH1.25-1956.

Proposed American Standard Dimensions for

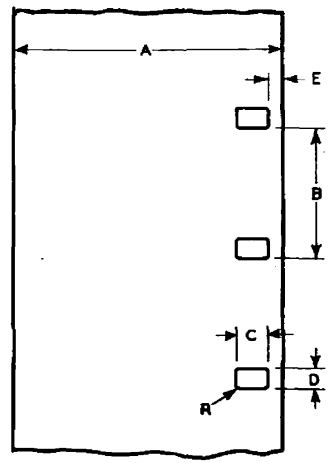
16mm Motion-Picture Film, 1R-3000

PH22.12

Revision of PH22.12-1953

1. Scope

This standard specifies the cutting and perforating dimensions of 16mm motion-picture film with perforations along one edge and a perforation length pitch of 0.3000 in.



2. Dimensions

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

2.2 These dimensions pertain to a safety film as defined in Appendix A5.*

2.3 These dimensions apply to material immediately after cutting and perforating.

2.4 Dimension L represents the length of any 100 consecutive pitch intervals.

Dimension	Inches	Millimeters
A Film width	0.628 ± 0.001	15.950 ± 0.025
B Length pitch	0.3000 ± 0.0005	7.620 ± 0.013
C Perforation width	0.0720 ± 0.0004	1.829 ± 0.010
D Perforation height	0.0500 ± 0.0004	1.270 ± 0.010
E Edge to perforation	0.0355 ± 0.0020	0.90 ± 0.05
L Length pitch (100 consecutive pitch intervals)	30.00 ± 0.03	762.0 ± 0.8
R Radius of perforation fillet	0.010 ± 0.001	0.25 ± 0.03

NOTES

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, the perforation shape (BH, KS, DH, or CS) or the number of rows of perforations (1R, 2R or 4R), depending upon which is the significant factor, and the perforation pitch without the decimal point.

2. The dimensions in the inch system are the fundamental standard. The dimensions in the metric system are practical approximations based on American Standard Inch-Millimeter Conversion for Industrial Use, B48.1-1933, reaffirmed in 1947, providing a conversion factor of 1 inch = 25.4 millimeters.

* See Appendix to PH22.5, which pertains also to PH22.12.

NOT APPROVED

Proposed American Standard Dimensions for

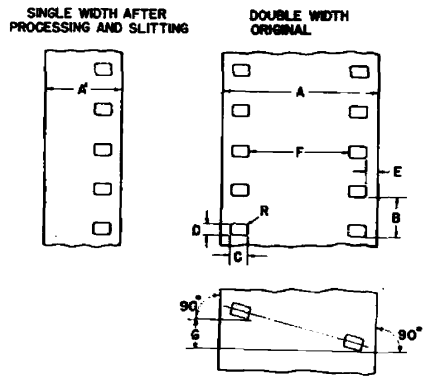
16mm Motion-Picture Film, Perforated 8mm, 2R-1500

PH22.17

Revision of PH22.17-1954

1. Scope

This standard specifies the cutting and perforating dimensions of 16mm motion-picture safety film as well as the width of 8mm motion-picture film after processing and slitting.



2. Dimensions

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

2.2 These dimensions pertain to a safety film as defined in Appendix A5.*

2.3 Except for Dimension A', these dimensions apply to raw stock immediately after cutting and perforating.

2.4 Dimension L represents the length of any 100 consecutive pitch intervals.

Dimension	Inches	Millimeters
A Film width	0.628 ± 0.001	15.950 ± 0.025
A' Film width after slitting	0.314 ± 0.002	7.98 ± 0.05
B Length pitch	0.1500 ± 0.0005	3.810 ± 0.013
C Perforation width	0.0720 ± 0.0004	1.829 ± 0.010
D Perforation height	0.0500 ± 0.0004	1.270 ± 0.010
E Edge to perforation	0.0355 ± 0.0020	0.90 ± 0.05
F Width between perforations	0.413 ± 0.001	10.49 ± 0.03
G Perforation skewness	0.001 max	0.025 max
L Length pitch (100 consecutive pitch intervals)	15.000 ± 0.015	381.00 ± 0.38
R Radius of perforation fillet	0.010 ± 0.001	0.25 ± 0.03

NOTES

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, the perforation shape (BH, KS, DH, or CS) or the number of rows of perforations (1R, 2R or 4R), depending upon which is the significant factor, and the perforation pitch without the decimal point.

2. The dimensions in the inch system are the fundamental standard. The dimensions in the metric system are practical approximations based on American Standard Inch-Millimeter Conversion for Industrial Use, B48.1-1933, reaffirmed in 1947, providing a conversion factor of 1 inch = 25.4 millimeters.

* See Appendix to PH22.5, which pertains also to PH22.17.

NOT APPROVED