

# Meeting of the International Organization for Standardization — October 11 — 23 — Milan, Italy

On May 10, the Photographic Standards Board of the American Standards Association called a meeting of the USA Committees on ISO/TC 36 and ISO/TC 42. These groups are responsible for advising the ASA on Photography and Motion-Picture standardization on the international level. The meeting marked the beginning of preparations for the international meeting of ISO (International Organization for Standardization,) to be held October 11–23 in Milan, Italy. The meetings being together representatives of more than 30 countries to resolve the technical differences which tend to hamper international exchange of supplies and equipment. The work which came out of the last TC 36 meeting in 1961 has been continued by interim working groups formed at that meeting. Although activities are generally carried on by correspondence, more can be done at the conference table where questions can be quickly resolved.

The Milan meeting has been scheduled to coincide with the Eleventh Annual Meeting of MIFED (International Film, TV-Film and Documentary Market) at the Milan Fair enabling the delegates to visit this important equipment show. The SMPTE, as sponsor of national motion picture standardization, is again taking the initiative in organizing the USA delegation for motion pictures, and assisting the ASA in the

many preparations necessary to assure a successful and productive meeting. Since standardization in the USA, contrary to that in Europe, is entirely voluntary, it is financed by private funds. Many of organizations, which appreciate the importance of the USA's maintaining its leadership, assist in sharing the expense.

As in 1961, the SMPTE Engineering Vice-President Dr. Deane R. White of E. I. du Pont de Nemours & Co. and the chairman of the ASA Sectional Committee PH22, Robert E. Birr, of the General Electric Co. are responsible for organizing the USA Delegation on Motion Pictures. This insures the best possible representation for the motion-picture and television industries.

Organization of the ISO/TC 42 Delegation on Photography is under the chairman of the ASA Photographic Standards Board, Paul A. Arnold of General Aniline and Film Corp. Mr. Arnold is working closely with key photographic engineers including V. J. Moyes, Eastman Kodak Company; M. G. Anderson, Kalvar Corporation; J. L. Forrest, General Aniline and Film Corporation; R. N. Linhart, E. I. du Pont de Nemours & Company; D. C. Holmes, Library of Congress; G. C. Paffenbarger, National Bureau of Standards; and J. G. Mulder, Eastman Kodak Company.—*Alex E. Alden, SMPTE Staff Engineer.*

## standards and recommended practices

### Approved American Standards

Published here for your information are four American Standards approved on April 14, 1965 by the American Standards Association. PH22.71-1965, Dimensions for 32mm Motion-Picture Film, 2R-3000, and PH22.72-1965, Dimensions for 32mm Motion-Picture Film, 4R-3000 are in fact, a complete reaffirmation of the technical information differing from the previous versions only in an editorial manner. PH22.141-1965, Dimensions for 32mm Motion-Picture Film, 2R-2994, and PH22.142-1965, Dimensions for 32mm Motion-Picture Film, 4R-2994 are two new standards specifying the dimensions of short-pitch versions of PH22.71 and PH22.72.

Inasmuch as compliance with American Standards is purely voluntary, these standards will become truly effective if very broad publicity is given to their existence. The ASA and the SMPTE would appreciate any personal influence to promote the use of these standards where such action is appropriate and proper. Copies of the Standards may be obtained for a nominal fee from the American Standards Association, 10 East 40th Street, New York City, 10016. — *A.E.A.*

### Proposed SMPTE Recommended Practices

Two Proposed Recommended Practices are published here for a trial period and public review. Comments should be addressed to Alex E. Alden, Staff Engineer, at Society Headquarters prior to July 27. If no adverse criticism is received by that date, the proposals will be submitted to the Board of Governors for approval. RP 19 and 20 reflect the technical specifications for test films currently supplied by the Society as REG-8 and REG-16. — *A.E.A.*

### American Standard Reaffirmed

American Standard PH22.108-1958, Four Magnetic Sound Records on 35mm Film, was reviewed by the Society's Sound Committee and ASA Sectional Committee PH22 and was reaffirmed without change by the American Standards Association on April 12, 1965. The standard was previously published in the June 1958 Journal. — *A.E.A.*

# 32mm Motion-Picture Film, 2R-3000

ASA  
 Reg. U.S. Pat. Off.  
**PH22.71-1965**

Revision of  
 PH22.71-1957

\*UDC 778.534/771.531.3

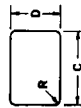
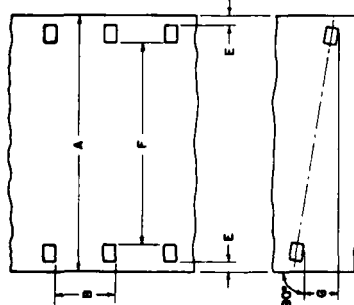
Page 1 of 3 pages

## 1. Scope

This standard specifies the cutting and perforating dimensions for 32mm motion-picture film having two rows of 16mm-type perforations, one row near each edge, and a perforation 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 perforation pitch intervals.



Dimensions	Inches	Millimeters
A Film width	1.256 ± 0.001	31.900 ± 0.03
B Perforation 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	0.902 ± 0.051
F Width between perforations	1.041 ± 0.002	26.44 ± 0.05
G Perforation skewness	0.001 max	0.03 max
H 100 consecutive perforation pitch intervals	30.00 ± 0.03	762.0 ± 0.8
I Radius of perforation fillet	0.010 ± 0.001	0.25 ± 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 or 4R), depending upon which is the significant factor, and 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 Standard Practice for Inch-Millimeter Conversion for Industrial Use, B48.1-1933 (Reaffirmed 1947).

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\*Universal Decimal Classification

Printed in USA  
 ASA12466/50

## Appendix

This Appendix is not a part of American Standard Dimensions for 32mm Motion-Picture Film, 2R-3000, PH22.71-1965, 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 stock 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 stock 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 car 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 either 0.2994 in. or 0.3000 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. Where step-primers are used, and the film is stationary when exposed, the choice of pitch is not strictly limited. 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 stock 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 40-tooth 32mm sprocket (circumference of about 12 in.) with film 0.0055 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. (This error is to be differentiated from the jump caused by nonuniformity of successive pitches, Dimension B.)

Experience has shown that the average pitch of the negative can vary ± 0.1 percent from the ideal pitch, which is 0.3 percent shorter than the positive stock, without 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 aim for a pitch 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 bring the pitch differential close to the optimum and desired value of 0.3 percent. Accordingly, the pitch chosen for the negative stock is 0.2994 in.

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, 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 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 adopted 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 to 75 F, exposed, processed and stored exposed to air for a period not to exceed 30 days at 65 to 75 F and 50 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 16mm equipment 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 (Reaffirmed 1962).

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 16mm equipment 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 (Reaffirmed 1962).

American Standard Dimensions for

32mm Motion-Picture Film, 4R-3000

ASA  
 Reg. U.S. Pat. Off.  
 PH22.71-1965  
 Revision of  
 PH22.71-1957

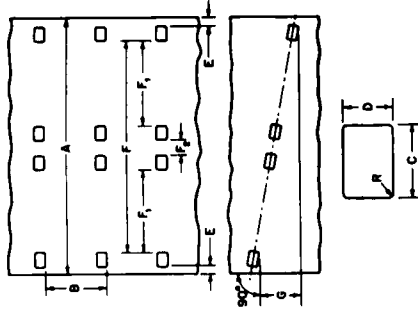
\*UDC 778.534:71.531.3

1. Scope

This standard specifies the cutting and perforating dimensions for 32mm motion-picture film having four rows of 16mm-type perforations and a perforation 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 perforation pitch intervals.



Dimensions	Inches	Millimeters
A Film width	1.256 ± 0.001	31.900 ± 0.03
B Perforation 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	0.902 ± 0.051
F <sub>1</sub> Width between outer and center perforations	1.041 ± 0.002	26.44 ± 0.05
F <sub>2</sub> Width between center perforations	0.413 ± 0.001	10.49 ± 0.03
G Perforation skewness	0.071 ± 0.001	1.80 ± 0.03
L 100 consecutive perforation pitch intervals	0.001 max 30.00 ± 0.03	0.03 max 762.0 ± 0.8
R Radius of perforation fillet	0.010 ± 0.001	0.25 ± 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 or 4R), depending upon which is the significant factor, and 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 Standard Practice for Inch-Millimeter Conversion for Industrial Use, B48.1-1933 (Reaffirmed 1947).

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 ASA1965/06

**Appendix**

(This Appendix is not a part of American Standard Dimensions for 32mm Motion-Picture Film, 48-2000, PH22.72-1965, but it 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 stock 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 stock 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 either 0.2994 in. or 0.3000 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. Where step-printers are used, and the film is stationary when exposed, the choice of pitch is not strictly limited. 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 stock 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 40-tooth 32mm sprocket (circumference of about 12 in.) with film 0.0055 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. (This error is to be differentiated from the jump caused by nonuniformity of successive pitches, Dimension B.)

Experience has shown that the average pitch of the negative can vary  $\pm 0.1$  percent from the ideal pitch, which is 0.3 percent shorter than the positive stock, without 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 aim for a pitch 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 bring the pitch differential close to the optimum and desired value of 0.3 percent. Accordingly, the pitch chosen for the negative stock is 0.2994 in.

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  $0.3 \pm 0.1$  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, 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 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 to 75 F, exposed, processed and stored exposed to air for a period not to exceed 30 days at 65 to 75 F and 50 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.

American Standard Dimensions for

**32mm Motion-Picture Film, 2R-2994**

**1. Scope**

This standard specifies the cutting and perforating dimensions for 32mm motion-picture film having two rows of 16mm-type perforations, one row near each edge, and a perforation pitch of 0.2994 in.

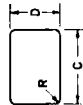
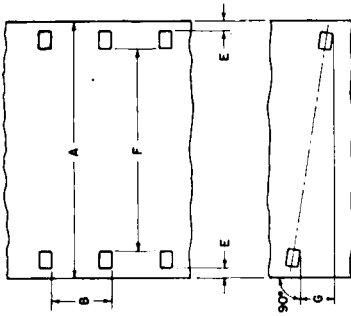
**2. Dimensions**

**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 perforation pitch intervals.



Dimensions	Inches	Millimeters
A Film width	1.256 $\pm$ 0.001	31.900 $\pm$ 0.03
B Perforation pitch	0.2994 $\pm$ 0.0005	7.605 $\pm$ 0.013
C Perforation width	0.0720 $\pm$ 0.0004	1.829 $\pm$ 0.010
D Perforation height	0.5000 $\pm$ 0.0004	1.270 $\pm$ 0.010
E Edge to perforation	0.0355 $\pm$ 0.0020	0.902 $\pm$ 0.051
F Width between perforations	1.041 $\pm$ 0.002	26.44 $\pm$ 0.05
G Perforation Skewness	0.001 max	0.03 max
L 100 consecutive perforation pitch intervals	29.94 $\pm$ 0.03	760.5 $\pm$ 0.8
R Radius of perforation fillet	0.010 $\pm$ 0.001	0.25 $\pm$ 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 or 4R), depending upon which is the significant factor, and 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 Standard Practice for Inch-Millimeter Conversion for Industrial Use, B48.1-1933 (Reaffirmed 1947).

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International Decimal Classification

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## Appendix

This Appendix is not a part of American Standard Dimensions for 32mm Motion-Picture Film, 28.2994, PH22.141-1965, 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 stock 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 stock 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 either 0.2994 in. or 0.3000 in. In general, the longer pitch is for print stock and the shorter pitch is for negative stock.

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Experience has shown that the average pitch of the negative can vary  $\pm$  0.1 percent from the ideal pitch, which is 0.3 percent shorter than the positive stock, without 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 aim for a pitch 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 bring the pitch differential close to the optimum and desired value of 0.3 percent. Accordingly, the pitch chosen for the negative stock is 0.2994 in.

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  $0.3 \pm 0.1$  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, 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 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.

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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 16mm equipment 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 (Reaffirmed 1962).

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.

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**A5.** This film is to be made on safety base complying with American Standard Specifications for Safety Photographic Film, PH1.25-1956 (Reaffirmed 1962).

# 32mm Motion-Picture Film, 4R-2994

ASA  
R. C. I. N. Pat. Off.  
PH22.142-1965

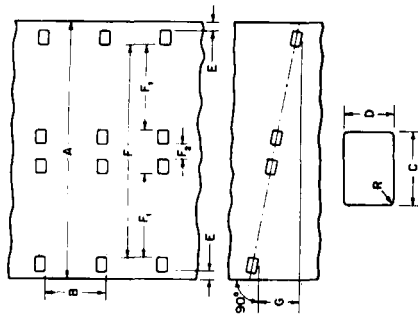
UDC 778.534:771.531.3

## 1. Scope

This standard specifies the cutting and perforating dimensions for 32mm motion-picture film having four rows of 16mm-type perforations and a perforation pitch of 0.2994 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 A.5.
- 2.3 These dimensions apply to material immediately after cutting and perforating.
- 2.4 Dimension L represents the length of any 100 consecutive perforation pitch intervals.



Dimensions	Inches	Millimeters
A Film width	1.256 ± 0.001	31.900 ± 0.03
B Perforation pitch	0.2994 ± 0.0005	7.605 ± 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	0.902 ± 0.051
F Width between perforations	1.041 ± 0.002	26.44 ± 0.05
F <sub>1</sub> Width between outer and center perforations	0.413 ± 0.001	10.49 ± 0.03
F <sub>2</sub> Width between center perforations	0.071 ± 0.001	1.80 ± 0.03
G Perforation skewness	0.001 max	0.03 max
L 100 consecutive perforation pitch intervals	29.94 ± 0.03	760.5 ± 0.8
R Radius of perforation fillet	0.010 ± 0.001	0.25 ± 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 or 4R), depending upon which is the significant factor, and 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 Standard Practice for Inch-Millimeter Conversion for Industrial Use, B48.1-1933 (Reaffirmed 1947).

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

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## Appendix

(This Appendix is not a part of American Standard Dimensions for 32mm Motion-Picture Film, 4R-2994, PH22.142-1965, 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 stock 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 stock 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 either 0.2994 in. or 0.3000 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. Where step-primers are used, and the film is stationary when exposed, the choice of pitch is not strictly limited. 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 stock 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 40-tooth 32mm sprocket (circumference of about 12 in.) with film 0.0055 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. (This error is to be differentiated from the jump caused by nonuniformity of successive pitches, Dimension B.)

Experience has shown that the average pitch of the negative can vary ± 0.1 percent from the ideal pitch, which is 0.3 percent shorter than the positive stock, without 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 aim for a pitch 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 bring the pitch differential close to the optimum and desired value of 0.3 percent. Accordingly, the pitch chosen for the negative stock is 0.2994 in.

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, 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 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 to 75 F, exposed, processed and stored exposed to air for a period not to exceed 30 days at 65 to 75 F and 50 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.

# Specifications for 8mm Registration Test Film

**1. *Notes***

- 1.1 This recommended practice specifies the subject material and the dimensions and location of the subject material for an 8mm test film of high accuracy to assist the user in achieving several quantitative visual tests (See appendix).
- 1.2 The film can be used to test motion-picture projectors and printers.

**2. *Dimensions***

- 2.1 The dimensions and location of the target areas shall be as specified in Figs. 1, 2, 3 and 4. The patterns in Figs. 3 and 4 appear in the five circular areas of the test pattern shown in Figs. 1 and 2.

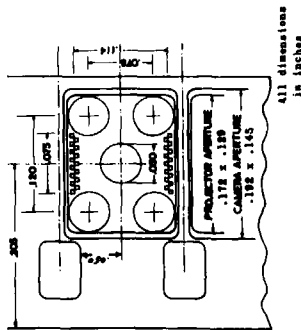


Fig. 2

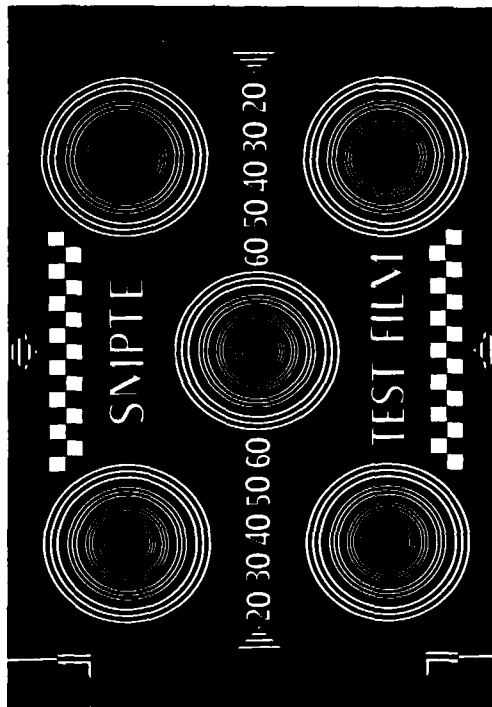


Fig. 1

**3. *Description***

- 3.1 The test film shall be produced as a camera original film photographed on high-contrast, high-definition, positive-type motion-picture stock made in accordance with American Standard Dimensions for 16mm Motion-Picture Film, Perforated 8mm, 2R-1300, PH22-17-1965.
- 3.2 The diffuse density of the background area shall be  $1.80 \pm 0.10$ .
- 3.3 The camera and projector image areas shall be in accordance with American Standard Dimensions of 8mm Motion-Picture Camera Aperture Image, PH22-19-1961, and American Standard

Projected Image Area of 8mm Motion-Picture Film, PH22-20-1957.

3.4 The resolution targets shall be photographed in a magnification which results in the concentric rings reading in lines per millimeter on the film (20, 30, 40, 50 and 60). The rosette in the center shall indicate a measurement from 60 to 240 lines per millimeter.

*Note:* A test film made in accordance with this recommended practice is available from the Society of Motion Picture and Television Engineers and is identified as REG-8.

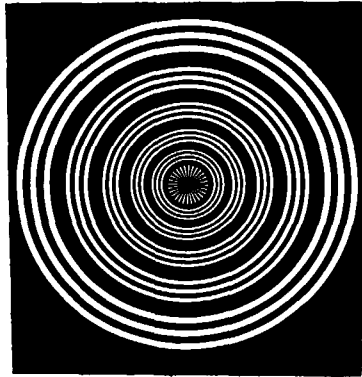


Fig. 3

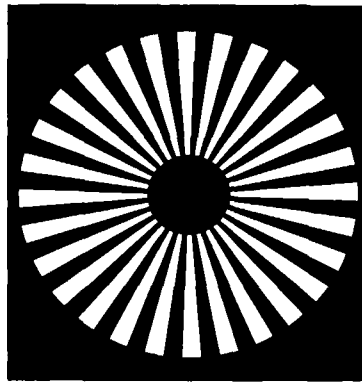


Fig. 4

**Appendix**

(This Appendix is not a part of Proposed SMPTE Recommended Practice RP 19, Specifications for 8mm Registration Test Film, but is included to facilitate its use.)

1. The following quantitative visual tests can be performed:
  - (a) projector steadiness
  - (b) projector aperture alignment
  - (c) projector shutter adjustment (travel/ghost)
  - (d) projector framing accommodation
  - (e) projector focusing
  - (f) optical printer alignment
  - (g) optical projector focusing
  - (h) contact printer resolution
  - (i) contact printer weave
  - (j) contact printer double-exposure alignment
  - (k) contact printer (step) steadiness
2. If the film is projected to 30 x 40 in., it will be enlarged 290 times.
3. Resolution targets are spaced one in the center and one in each of the four corners. The outside diameter of target on the film is 50 mils and will fill the area covered by an average microscope using a 10X objective.
4. The white blocks are 5 mils square and will quickly indicate travel ghost caused by incorrect shutter adjustment. They also provide a quick check on the ability to frame above and below center position.
5. The triangular areas in the centers of the vertical and horizontal framelines can be used to measure jump and weave and aperture misalignment. Each line in these areas is 1 mil (0.001 in.) wide. The lines are spaced 1 mil apart.

