Standards and Recommended Practices

Approved American National Standards

The American National Standards Institute approved two American National Standards on March 8, 1988: ANSI/SMPTE 119-1988, Motion-Picture Film (70-mm) — Perforated 65-mm, KS-1870; and ANSI/SMPTE 165-1988, Motion-Picture Film (35-mm) — Perforated 8-mm Type S, 5R (1-3-5-7-0). Copies of the standards are available for a nominal fee from the American National Standards Institute, 1430 Broadway, New York, NY 10018.

Approved SMPTE Recommended Practices

Two SMPTE Recommended Practices were approved by the Society's Executive Committee for Standards Approval: RP 149-1988, Dimensions of Transverse Cemented Splices on 16-mm and 8-mm Type R Motion-Picture Film; and RP 150-1988, Channel Assignments and Test Leader for Magnetic Film Masters Intended for Transfer to Video Media Having Stereo Audio. SMPTE Recommended Practices are available from Society Headquarters for $3.00 each.

Proposed SMPTE Recommended Practice

Published here for a trial period and public review is a Proposed SMPTE Recommended Practice: RP 151, Lubrication of 35-mm Motion-Picture Prints for Projection. Copies of the proposal are available from Society Headquarters for $3.00 each. The proposal will be submitted to the Society's Executive Committee for Standards Approval if no adverse comments are received from publication. Comments should be addressed to Sherwin H. Becker prior to October 1, 1988.

Reaffirmed SMPTE Recommended Practices

The Society's Executive Committee for Standards Approval approved reaffirmation of two SMPTE Recommended Practices: RP 53-1983, Scene-Change Methods for Printing 35-mm, 16-mm and 8-mm Type S Motion-Picture Film; and RP 112-1983, Reference Carrier Frequencies, Pre-emphasis Characteristic and Audio and Control Signals for ½-in Type H Helical-Scan Video Tape Cassette Recording. The practices may be purchased from Society Headquarters for $3.00 each.

— Sherwin H. Becker, Director of Engineering

ANSI/SMPTE 119-1988
Revision and Redesignation of
ANSI PH22.119-1981

American National Standard for motion-picture film (70-mm)—perforated 65-mm, KS-1870

Approved March 8, 1988 Sponsor: Society of Motion Picture and Television Engineers

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).

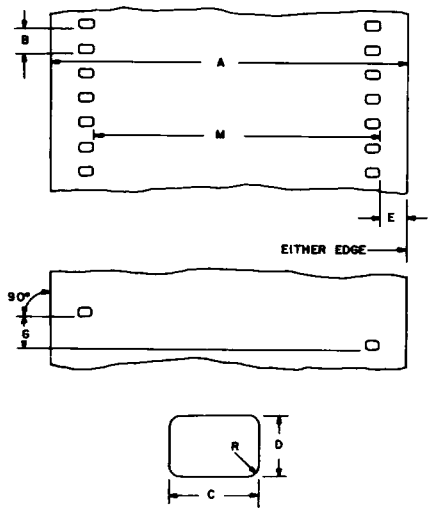
2. Referenced American National Standards

This standard is intended for use in conjunction with the following American National Standards:

ANSI/SMPTE 145-1988, Motion-Picture Film (65-mm)—Perforated KS

ANSI/SMPTE 223M-1985, Motion-Picture Film—Safety Film

ANSI PH1.10-1981 (R1986), Dimensions for Unperforated and Perforated Photographic Film in Rolls, Including Leaders and Trailers, for Aerial and Related Uses



	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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3. Dimensions

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

3.2 The dimensions pertain to a safety film as defined in ANSI/SMPTE 223M-1985.

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

3.4 A frameline location identifier, i.e., a punched perforation, an inked spot, or a latent image, shall be positioned at an interval of every five perforations along one edge, as shown in the figure. (The identifier is used for positioning audio records on release prints.)

NOTE: 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

(This Appendix is not part of the American National Standard, but is included for information 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-in (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 ANSI/SMPTE 145-1988.

Note that the 70-mm film used with 65-mm negative differs in its dimensions from the two films described by ANSI PH1.10-1981. The perforations have the same size and pitch as those described by ANSI PH1.10-1981, 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.

ANSI/SMPTE 165-1988
Revision and Redesignation of
ANSI PH22.165-1981

American National Standard for motion-picture film (35-mm)—perforated 8-mm type S, 5R (1-3-5-7-0)

Approved March 8, 1988

Sponsor: Society of Motion Picture and Television Engineers

1. Scope

This standard specifies the cutting and perforating dimensions for 35-mm motion-picture film with four rows of 8-mm Type S perforations and one row of special perforations having a perforation pitch of either 0.1664 or 0.1667 in (4.227 or 4.234 mm). The film stock described in this standard is intended for the production of prints. The width of the 8-mm strip after processing and slitting is also specified.

2. Referenced American National Standards

This standard is intended for use in conjunction with the following American National Standards:

ANSI PH22.75-1975 (R1982), Designation of A and B Windings for Motion-Picture Raw Stock

ANSI/SMPTE 223M-1985, Motion-Picture Film—Safety Film

3. Dimensions

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

3.2 The dimensions pertain to a safety film as defined in ANSI/SMPTE 223M-1985.

3.3 Except for Dimensions A′ and E′, dimensions apply at the time of cutting and perforating for film adjusted to a temperature of 23°C ± 1°C (nominally converted to 73°F = 2°F) and a relative humidity of 50 ± 2 percent. The manufacturer may indicate other nominal humidity conditions under which the dimensions apply.

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, and the perforation pitch without the decimal point.

The numerals (1-3-5-7-0) have been added to the title of this standard to specify how the rows of perforations are placed on the film. The designation is necessary only when the film stock is wider than its end use and more than one combination of perforation rows is possible. For 8-mm Type S perforations on 35 mm-width film, a maximum of four usable rows of perforations is possible. The perforation rows shall be numbered starting at the reference edge. The reference edge is the edge nearest to that row of perforations which is retained in one of the 8-mm strips that may be generated by appropriate slitting of the parent 35-mm film. A row of perforations which is discarded will always be given the number 0. Negative or intermediate films which are not slit may contain a 0-numbered row of perforations if that perforated row corresponds to the discard row of perforations on the subsequent print stock. For all films with nonsymmetrical perforation rows, there can be two different windings for the same numbered rows of perforations. Film perforated 1-0 would be 1-0 regardless of winding, but depending upon the location of the reference edge, the winding could be A or B, according to ANSI PH22.75-1975.

NOTE 2: 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.

NOTE 3: Notwithstanding accumulation of tolerances, Dimensions A′ and E′ shall be as specified.

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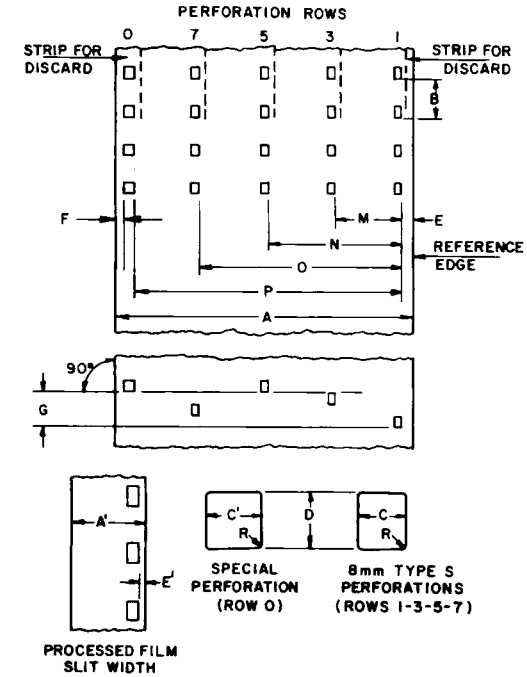

	Dimensions	Inches	Millimeters
A	Film width	1.377 ± 0.001	34.975 ± 0.025
A′	Film width after processing and slitting	0.314 ± 0.002	7.98 ± 0.05
B	Perforation pitch (long)	0.1667 ± 0.0004	4.234 ± 0.010
B′	Perforation pitch (short)	0.1664 ± 0.0004	4.227 ± 0.010
C	Perforation width	0.0360 ± 0.0004	0.914 ± 0.010
C′	Special perforation width	0.0450 ± 0.0004	1.143 ± 0.010
D	Perforation height	0.0450 ± 0.0004	1.143 ± 0.010
E	Edge to perforation	0.050 ± 0.002	1.27 ± 0.05
E′	Edge to perforation after processing and slitting	0.020 ± 0.002	0.51 ± 0.05
F	Edge to perforation	0.031 nom	0.79 nom
G	Perforation skewness	0.0015 max	0.038 max
L	100 consecutive perforation pitches (long)	16.670 ± 0.017	423.42 ± 0.43
L′	100 consecutive perforation pitches (short)	16.640 ± 0.017	422.66 ± 0.43
M	Lateral perforation displacement	0.314 ± 0.001	7.98 ± 0.03
N	Lateral perforation displacement	0.628 ± 0.001	15.95 ± 0.03
N-M	Functional tolerance	0.314 ± 0.001	7.98 ± 0.03
O	Lateral perforation displacement	0.942 ± 0.001	23.93 ± 0.03
O-N	Functional tolerance	0.314 ± 0.001	7.98 ± 0.03
P	Lateral perforation displacement	1.251 ± 0.001	31.78 ± 0.03
P-O	Functional tolerance	0.309 ± 0.001	7.85 ± 0.03
R	Radius of perforation fillet	0.005 ± 0.001	0.13 ± 0.03

Appendix

(This Appendix is not part of the American National Standard, but is included for information only.)

A1. The dimensions given in this standard, excluding Dimensions A' and E', 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 that seem much alike in wording. The difference lies in the longitudinal pitch which is either 0.1664 or 0.1667 in (4.227 or 4.234 mm). In general, the longer pitch is for print stock and the shorter pitch is for negative or intermediate stock.

The choice of pitch for negative or intermediate motion-picture film depends, within certain limits, on the type of printer to be used. Where release 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 the time of printing (sprocket-type contact printer), there are three major considerations involved in choosing the pitch. These considerations are: (1) the sprocket diameter and tooth engagement, (2) the film thickness and (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 72-tooth sprocket (circumference of about 12 in [305 mm]) with film 0.0055 to 0.0065 in (0.140 to 0.165 mm) 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 in the vertical axis of 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 derived from Dimension L of the intermediate 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 or intermediate stock is 0.1664 in (4.227 mm).

Low-shrinkage 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 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 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. The tolerance for the slit width after processing was established to provide the laboratory with the maximum flexibility for the least critical application of commercial 8-mm Type S prints. For some commercial applications, such as photographic sound use, it will be necessary for the laboratory to consider much tighter tolerances. For these more critical uses, film shrinkage characteristics must be taken into account, and the film slit within ± 0.001 in (0.03 mm) variability.

SMPTE RECOMMENDED PRACTICE

RP 149–1988

Dimensions of Transverse Cemented Splices on 16-mm and 8-mm Type R Motion-Picture Film

1. *Scope*

   1.1 Specifications. This practice specifies the dimensions of transverse cemented splices on 16-mm and 8-mm Type R motion-picture film.

   1.2 Types. Two types of splices are specified: a laboratory splice for professional applications and a projection splice for release prints and consumer or amateur reversal films.

   1.3 Excepted Splicers. It is not intended that this practice be prejudicial to diagonal, scarf, or tape splicers.

2. *Dimensions*

   2.1 Specifications. The dimensions shall be as given in the figures and tables.

   2.2 Film Width at Splice. Film width at the splice shall not exceed 0.317 in (8.05 mm) for 8-mm Type R film and 0.630 in (16.00 mm) for 16-mm film. If the film has been widened during scraping, the extra width shall be removed.

   2.3 Lateral Offset for Perforation Overlap. Perforation overlapping shall not be offset laterally by more than 0.002 in (0.05 mm).

   2.4 Lateral Offset for Film Edges. Edges of the two spliced films shall not be offset laterally by more than 0.002 in (0.05 mm) unless a difference in the lateral shrinkage of the two strips makes it impossible to maintain the tolerance. Shoulders formed by such misalignment shall be beveled after the cement has dried.

   2.5 Angle between Edges. In the plan view, the angle between the respective edges of the spliced films shall be 180° ± 4'. Thus, the spliced film shall be aligned to the extent that, when one portion of the film is placed against a straightedge, the other portion will not deviate more than 0.006 in (0.15 mm), which is the approximate film thickness, in 6 in (152 mm).

Approved March 28, 1988