ANSI/SMPTE 165-1994
Revision of
ANSI/SMPTE 165-1988

SMPTE STANDARD

for Motion-Picture Film (35-mm) — Perforated 8-mm Type S, 5R (1-3-5-7-0)

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 in or 0.1667 in (4.227 mm 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 Dimensions

2.1 The dimensions shall be as given in figure 1 and table 1.

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

2.3 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)%. The manufacturer may indicate other nominal temperature and humidity conditions under which the dimensions apply.

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, 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/SMPTE 75M.

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.

3 Notwithstanding accumulation of tolerances, dimensions A′ and E′ shall be as specified.

American National Standard

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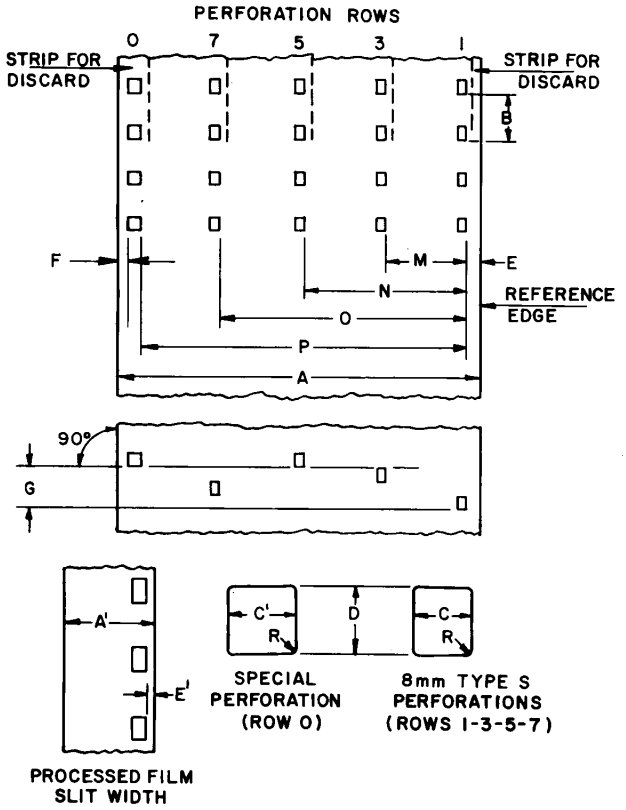

Figure 1 – 35-mm film perforated 8-mm type S

Table 1 – Specifications

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

Annex A (informative)
Additional data

A.1 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.

A.2 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 in or 0.1667 in (4.227 mm 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 in to 0.0065 in (0.140 mm to 0.165 mm) thick, the optimum pitch differential is 0.3%. 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% from the ideal pitch, which is 0.3% 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% 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%. 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% 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% is maintained. (The film should be measured after equilibration with air at the conditions prevailing at the time of perforating.)

A.3 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.

A.4 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.

Annex B (informative)
Bibliography

ANSI/SMPTE 75M-1994, Motion-Picture Film — Raw Stock — Designation of A and B Windings

ANSI/SMPTE 223M-1996, Motion-Picture Film — Safety Film