

SMPTE STANDARD

SMPTE 102-2002Revision of
ANSI/SMPTE 102-1997

for Motion-Picture Film (35-mm) — Perforated CS-1870



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1 Scope

This standard specifies the cutting and perforating dimensions for 35-mm motion-picture film with a CS-type perforation and a perforation pitch of 0.1870 in (4.750 mm).

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 SMPTE 223M.

2.3 The dimensions apply at the time of cutting and perforating for film adjusted to a temperature of $23^{\circ}\text{C} \pm 1^{\circ}\text{C}$ (nominally converted to $73^{\circ}\text{F} \pm 2^{\circ}\text{F}$) and a relative humidity of $50\% \pm 2\%$. 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, or the perforation pitch without the decimal point.

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.

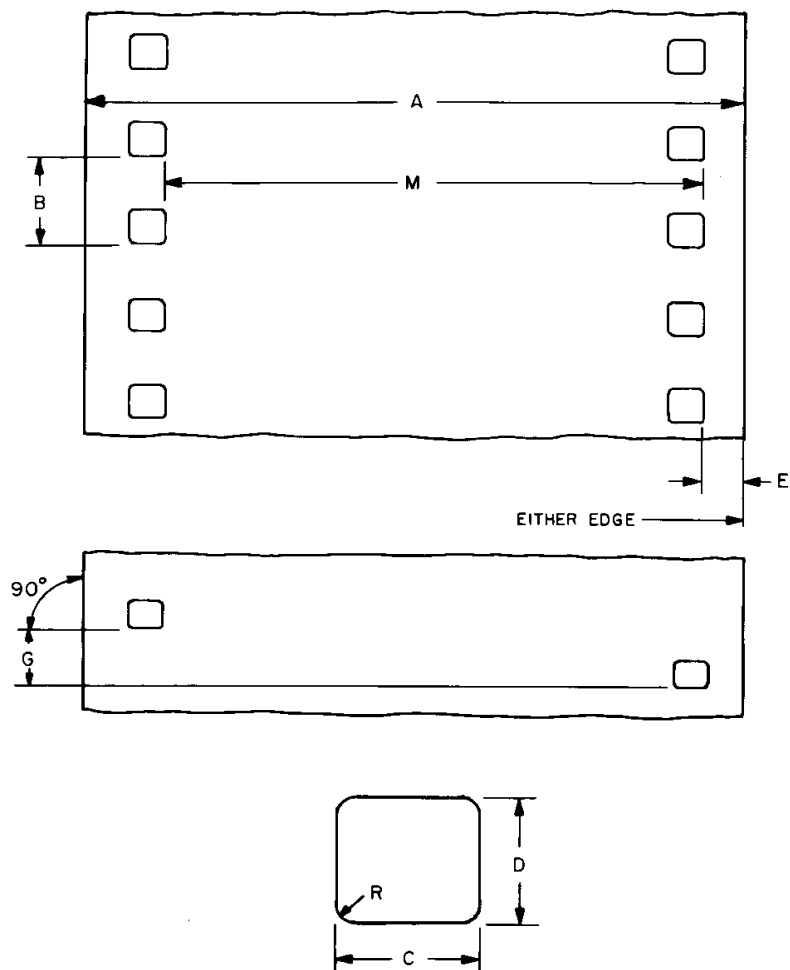


Figure 1 – Dimensions

Table 1 – Specifications

	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	0.0780 ± 0.0004	1.981 ± 0.010
D	Perforation height	0.0730 ± 0.0004	1.854 ± 0.010
E	Edge to perforation	0.086 ± 0.002	2.18 ± 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	1.127 ± 0.001	28.63 ± 0.03
R	Radius of perforation fillet	0.013 ± 0.001	0.33 ± 0.03

Annex A (informative)

Additional data

A.1 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.

A.2 Film for positive use has a longitudinal pitch 0.2% longer than its companion negative. Shrinkage of the negative during aging and processing prior to printing will generally not exceed 0.2%. Thus, the negative stock is expected to be 0.3% \pm 0.1% 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 in to 0.0065 in (0.140 mm to 0.165 mm).

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 Most 35-mm motion-picture films produced prior to 1954 were perforated with two rows of perforations, each perforation being 0.110 in x 0.078 in for positive film or 0.110 in x 0.073 in for negative film or both. Such film, in addition to carrying the picture, accommodates a single audio record between one row of perforations and the picture frame. The desire to reproduce multichannel sound on the same film that carries the picture image, without reducing the image size, led to the use of smaller perforations on positive film. Films perforated to this smaller perforation standard have wider margins (dimension E) and wider usable film areas between the rows of perforations than positive films perforated to SMPTE 237 and ANSI/SMPTE 139. This permits the placement of a magnetic coating for the multichannel audio record along both edges just outside the perforations and along both sides of the picture just inside the perforations.

A.5 It should be noted particularly that film made to this standard will not fit over pins and sprocket teeth designed to fit film perforated to SMPTE 237, ANSI/SMPTE 139, and ANSI/SMPTE 93.

The perforation hole size shown in the standards listed above is 0.073 in x 0.110 in except for ANSI/SMPTE 139 which has 0.078-in x 0.110-in holes. This standard has a hole size of 0.073 in x 0.078 in. Films with holes of this size would be damaged at the perforation edges when run on sprockets or pins of equipment designed for the larger holes. ANSI/SMPTE 242 describes projector sprockets suitable for any of the perforations listed, regardless of the perforation size.

A.6 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.

Annex B (informative)

Bibliography

ANSI/SMPTE 93-1998, Motion-Picture Film (35-mm) — Perforated BH

ANSI/SMPTE 139-1996, Motion-Picture Film (35-mm) — Perforated KS

ANSI/SMPTE 242-1993, Motion-Picture Equipment (35-mm) — Universal Intermittent Sprockets

SMPTE 223M-2001, Motion-Picture Film — Safety Film

SMPTE 237-1998, Motion-Picture Film (35-mm) — Perforated DH-1870