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SMPTE STANDARD

SMPTE 7-2004
Revision of
SMPTE 7-1999

for Motion-Picture Film (16-mm) — Camera Aperture Image and Usage

1 Scope

1.1 This standard specifies the dimensions of the camera aperture image and its relative position to the reference edge and the perforations of 16-mm motion-picture film. The location of the perforations is based on dimensions given in SMPTE 109.

1.2 This standard also specifies the position of the emulsion and the frame rate for 16-mm motion-picture film perforated one or two edges.

2 Film position

Except for special processes, the emulsion shall be toward the camera lens.

3 Dimensions

3.1 The dimensions shall be as given in figure 1 and table 1 and shall apply to measurements of the aperture image as formed on freshly exposed and processed film.

3.2 The angle between the vertical and horizontal edges of the aperture image shall be 90° ± ½° to each other.

4 Frame rate

4.1 The standard frame rate for motion-picture photography is 24 frames per second. However, it is recognized that nonstandard frame rates are sometimes used for specific applications. For example: 24, 25, or 30 frames per second may be used for motion pictures intended for television; higher or lower frame rates may be used for special effects and analysis; and nonstandard rates may be used for special motion-picture systems. The use of nonstandard frame rates requires notification and agreement of all parties concerned with the use of the particular film.

NOTES

1 Dimension B, vertical height of aperture, must be maintained in order to ensure a real (unexposed) frameline in the projector. Close control of the tolerances given for dimension B is necessary to enable dimensions F and H to be held within satisfactory limits. These are the distances from the lower edge of the perforation to the horizontal edges of the framelines. Dimensions F and H represent the maximum conditions which can be tolerated due to misalignment of the horizontal centerline of the aperture opening and the optical centerline of the photographic lens. Dimensions B, F, G, and H shall be measured to lines that are at right angles to the reference edge of the film and through a point where the radius (dimension R) is tangent to the horizontal framelines (see figure 1).

2 The centerlines of the aperture image are normally on the optical center of the camera. The optical axis of the camera is defined as the mechanical axis or centerline of the sleeve or other device for holding the camera lens. Except for manufacturing tolerances, it coincides with the optical axis of the lens.

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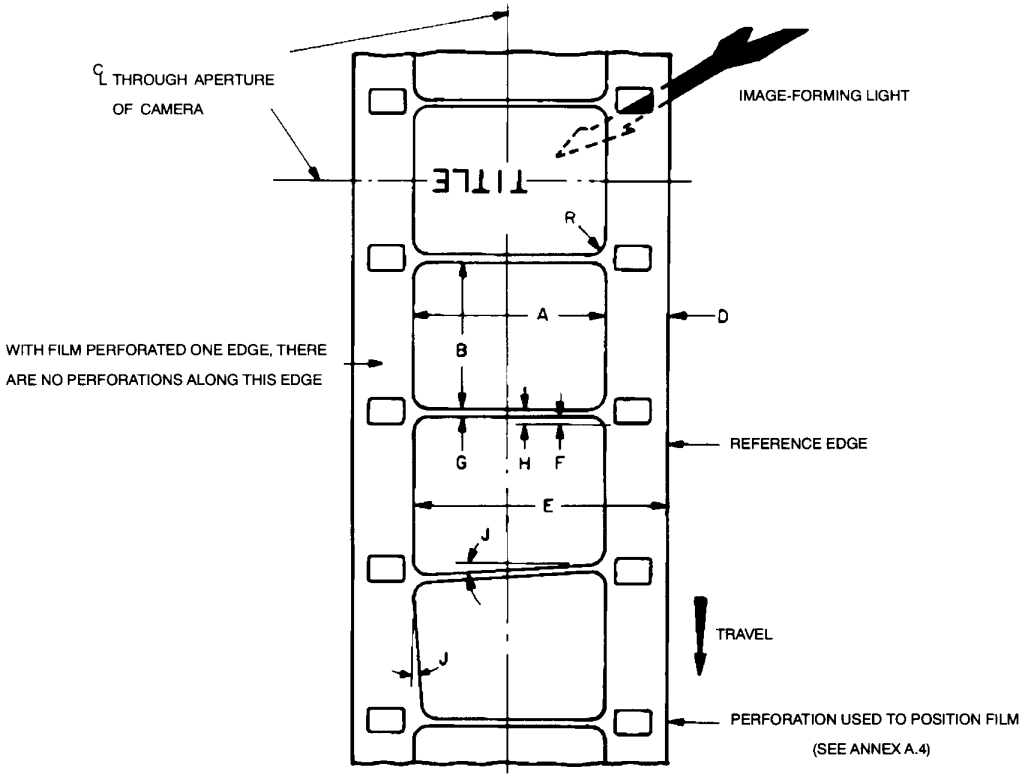
3 Dimension J shows the limits by which the frameline may be out of square with the reference edge of the film, but, at all times, this should be confined within the area designated by dimension G.



Film as seen from inside camera looking toward
camera lens; emulsion away from observer

Figure 1 – Camera aperture image

Table 1 – Specifications

Dimensions[1]	Inches		Millimeters	
A	0.404	nom	10.26	nom
B	0.295	+ 0.004 – 0.003	7.49	+ 0.10 – 0.07
D	0.116	max	2.95	max
E	0.512	min	13.00	min
F	0.018	min	0.46	min
G	0.001 0.008	min max	0.03 0.20	min max
H	0.032	max	0.81	max
J		± 1/2°		± 1/2°
R	0.015	max	0.38	max

[1]See notes.

Annex A (informative)
Additional data

A.1 If the aperture plate is not in the plane of the emulsion, the physical dimensions of the aperture in the camera will be slightly different from the dimensions given in figure 1. The exact amount of this difference will depend upon the f-number and focal length of the camera lenses used and upon the distance between the emulsion and the physical aperture. This separation should be no greater than is necessary to prevent scratching of the film.

A.2 It is the intent of this standard to provide a camera image such that the exposed area will always be larger than the area of the projector aperture. This standard meets this objective without causing double exposure of the area between frames.

A.3 Dimension G, the distance between adjacent framelines, has been limited carefully so as to make it possible to keep both framelines masked simultaneously by the projector aperture. In addition, dimensions F and H have been established to limit the distance that any part of the frameline can depart from the bottom edge of the perforations. This is to minimize the necessity for frequent adjustment of the framing device on the projector.

A.4 The pull-down claw is located at the plus-3 perforation (see figure 1) with respect to the projector or camera aperture. The reason for selecting the plus-3 perforation for positioning is to obtain the positioning perforation as close as possible to the image being photographed, yet not so close as to interfere with the optical system and gate structure.

Annex B (informative)
Bibliography

SMPTE 109-2003, Motion-Picture Film (16-mm) — Perforated 1R and 2R