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A Stable document is "In Force", and not deprecated or withdrawn.

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SMPTE 233-2003
Revision of
ANSI/SMPTE 233-1998

SMPTE STANDARD

for Motion-Picture Film (16-mm) — Projectable Image Area and Projector Usage

1 Scope

1.1 This standard specifies the maximum dimensions of the film image area intended for projection from a 16-mm motion-picture film perforated one or two edges as specified in ANSI/SMPTE 109, and the placement of this area relative to the perforations and the reference edge of the film.

1.2 This standard also specifies the position of the emulsion and the rate of projection for 16-mm motion-picture film perforated one or two edges, and the projector thread-up distance between audio and picture for 16-mm motion-picture
film with audio.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent edition of the standards indicated below.

SMPTE 41-1999, Motion-Picture Film (16-mm) — Prints — Photographic Audio Records

SMPTE 112-1999, Motion-Picture Film (16-mm) — 100-Mil Magnetic Audio Record

3 Dimensions

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

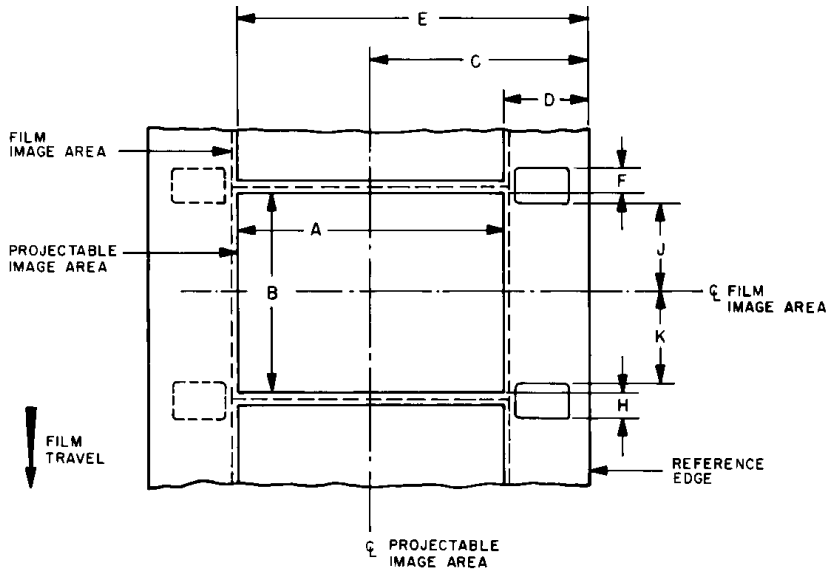
3.2 The angle between the horizontal edges of the image area and the reference edge of the film shall be 90° ± 1/2°.

4 Relationship to other standards

4.1 This standard may be used as the basis for establishing picture areas from original photography for final viewing because it presents a description of the picture area on the projection print that is usable for the indicated purposes of the print (which is of primary importance because the projection print is the most commonly interchanged item). (See annex A.2.)

4.2 The following documents define image areas for other important phases of motion-picture operations, and are consistent with one another under currently acceptable commercial practice: SMPTE 7, ANSI/SMPTE 48, SMPTE 96, SMPTE RP 27.3, SMPTE RP 65.

Approved
October 20, 2003



PROJECTABLE AREA ON FILM AS SEEN LOOKING
THROUGH THE FILM TOWARD THE LENS

Figure 1 – Projectable image area on film as seen looking through the film toward the lens

Table 1 – Dimensions

Dimensions	Inches	Millimeters
A	0.380 ref	0.380 ref
B	0.286 max	0.286 max
C	0.314 ref	0.314 ref
D	0.122 min	0.122 min
E	0.506 max	0.506 max
F = H	within 0.014	within 0.014
J = K	nominally equal	nominally equal

5 Emulsion position

For original reversal film, the emulsion side shall be toward the projection lens. For prints, the emulsion position is dependent upon the process of preparation and either emulsion to light source or emulsion to projection lens orientation may be encountered. (See figure 2 and note 5.) The actual emulsion position should be indicated on the leader and the film container by notation or diagram.

6 Projection rate

The standard frame rate for motion-picture projection 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/s 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. A rate of 18 frames/s is often used for amateur silent films. The use of nonstandard frame rates requires notification and agreement of all parties concerned with the use of the particular film.

7 Relationship between audio and picture

The projection thread-up for motion-picture films containing an audio record shall place the audio-scanning point ahead (in the direction of film travel) of the center of the picture being projected. Counting the frame in the projector aperture as zero, the audio-scanning point shall be opposite the center of the 26th frame for photographic audio or the 28th frame for magnetic audio, as specified in SMPTE 41 and SMPTE 112. If there is a significant distance between the average observer and the loudspeaker when the audio record is reproduced, the distance from the center of the projected aperture to the audio-scanning point may need to be shortened in the projector thread-up to bring the picture and audio into synchronization for the average observer (because of the slower rate of travel of audio compared to that of light). If the average loudspeaker-to-audience distance is greater than 50 ft (15 m), the projector thread-up distance between projected picture and audio scan should be shortened by one frame for each nominal 50 ft of distance from loudspeaker to average audience.

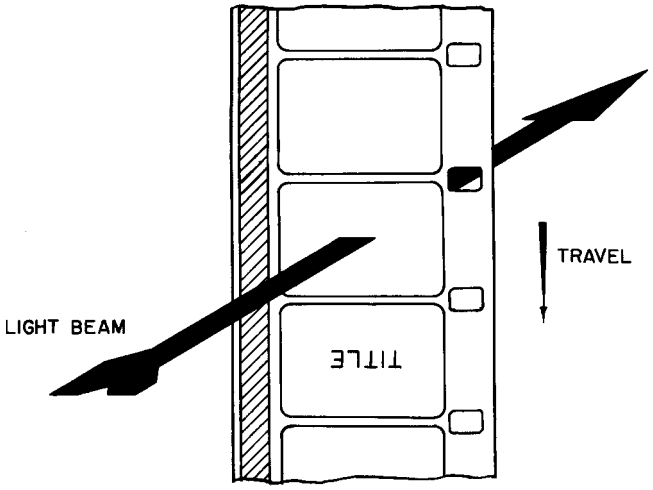


Figure 2 – Film as seen from projector light source looking toward lens

NOTES

1 Camera and printer apertures

The actual image on the film is significantly larger than the maximum area intended for projection, so that in placement of the images throughout the sequence of films, the tolerance is not restrictive of commercial practice. Upper limits have been established through consideration of good practice in avoiding overlap, encroachment upon areas reserved for audio records, flare from perforation edges, etc. Lower limits are similarly related to the avoidance of image effects at a defined edge, tolerances in film positioning, etc.

2 Projector aperture

Dimensions B, D, and E in table 1 define the maximum image area on the film that is available for projection. They do not define the opening in the aperture plate of a projector. The size of this opening may differ from dimensions A and B, for example, because of the physical separation necessary between the aperture plate and the film to avoid scratching the film, or the slant of the marginal rays accepted by the lens.

3 Actual projected area

It is recognized that, in many cases, the actual film image area that is projected may be smaller than the projectable maximum and, in some cases, may be nonrectangular (for example, an irregular four-sided figure bound by either straight or curved lines). Such departures may result from equipment considerations such as slight inconsistencies among lenses, screen sizes, etc; from geometric limitations such as the screen surface being at an angle other than 90° from the

projection axis, or being nonplanar, or both; and from aesthetic considerations such as pictorial composition within more restrictive image limits. In the absence of specific instructions to the contrary, it is intended that the actual projected film image area be the largest appropriately-shaped figure that can be inscribed within the specified dimensions.

When the picture outline on the screen is defined by the projector aperture, it is customary to round the corners of the projected film area. A maximum corner radius of 0.020 in (0.51 mm) at the film plane is recommended.

4 Film perforations

Film intended for projection with this image area is normally perforated as specified in ANSI/SMPTE 109.

5 Contact prints

When a relatively small number of prints is required, contact prints are often made from 16-mm original materials, resulting in the emulsion position toward the light source. The majority of 16-mm release prints are printed by contact from a 16-mm intermediate or by reduction from a 35-mm intermediate in order to protect the originals. The resulting prints generally have the emulsion side toward the projection lens. This permits intercutting of prints and originals without requiring a change of picture or sound focus during projection.

Annex A (informative)
Additional data

A.1 Centerlines

The centerlines of the image area are given for convenience in interpreting the standard, facilitating such applications as the optical design of equipment, and assisting in the understanding of suitable mechanical embodiments related to projectable image area.

A.2 Projectable image area

Essentially, the entire image within the maximum established by this standard will be transferred in such operations as reduction or enlargement printing (SMPTE RP 65), for television broadcasting (SMPTE 96), etc. Since the entire area will be presented, it is important that the projectable area include only material that meets recognized standards for technical and artistic excellence.

A.3 Image area for television

It is recognized that home television receivers are adjusted to show a distribution of picture sizes, ranging downward from the maximum. Guides to picture composition, based upon a statistical survey of receivers in use, are presented in SMPTE RP 27.3. Note that some portion of the audience will see the entire transmitted area, but for certainty in presentation of critical information over broadcast television, such information should be confined to a smaller, central area.

Annex B (informative)
Bibliography

ANSI/SMPTE 48-1995, Motion-Picture Film (16-mm) — Picture and Sound Contact Printing — Printed Areas

ANSI/SMPTE 109-1998, Motion-Picture Film (16-mm) — Perforated 1R and 2R

SMPTE 7-1999, Motion-Picture Film (16-mm) — Camera Aperture Image and Usage

SMPTE 96-1999, Television — 35- and 16-mm Motion-Picture Film — Scanned Image Area

SMPTE RP 27.3-1989, Specifications for Safe Action and Safe Title Areas Test Pattern for Television Systems

SMPTE RP 65-2000, Motion-Picture Enlargement/Reduction Ratios