EG 5-2003
Revision of EG 5-1994

SMPTE ENGINEERING GUIDELINE

Projected Image Quality of 70-, 35- and 16-mm Motion-Picture Projection Systems

Introduction

The Committee on Theatrical Projection Technology decided that, with the availability of appropriate test films, a guideline should be developed to assist those interested in determining the degree of acceptability of image quality regarding the apparent sharpness of the projected image. Although factors such as image contrast, color fringing, and image steadiness are not covered, their effect on apparent sharpness should be considered.

1 Scope

This guideline specifies the conditions for the determination of image sharpness of 70-, 35-, and 16-mm motion-picture projection systems. It also classifies the practical limits of acceptability of image sharpness when using projector alignment test films (see annex A.2).

2 Normative references

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

SMPTE 196M-2003, Motion-Picture Film — Indoor Theater and Review Room Projection — Screen Luminance and Viewing Conditions

SMPTE RP 105-2003, Method for Determining the Degree of Jump and Weave in 70-, 35- and 16-mm Motion-Picture Projected Images

3 Test conditions

This guideline is based on the assumption that the classifications specified are those to which the projection system has been adjusted as specified in SMPTE RP 105; and that the screen luminance has been adjusted to be in accord with SMPTE 196M.

4 Definitions

4.1 Resolution is the apparent sharpness determined by the ability of a system to reproduce a specified number of equally spaced black lines and white spaces in groups which are at right angles to each other. (Resolution is described by counting line pairs, a black line and a white space, as a single unit.)

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4.2 The viewer's impression of resolution is related to the apparent size of the screen image. The apparent size of the screen image may be divided into three classifications:

Large: A large appearing screen image is one which is viewed from a distance of 3.7 screen heights or less (vertical field of vision is 15° or greater).

Medium: A medium appearing screen image is one which is viewed from a distance of 3.7 to 5.7 screen heights (vertical field of vision is between 10° and 15°).

Small: A small appearing screen image is one which is viewed from a distance of greater than 5.7 screen heights (vertical field of vision is 10° or less).

5 Method

Project an appropriate test film containing resolution targets calibrated in line pairs per millimeter (see A.2) for each format (lens) being used.

Examine the projected image closely (see A.1). Note that horizontal line pairs are sometimes affected by system unsteadiness (jump) to a degree which makes them appear to have lower resolution. Anamorphic lenses should be adjusted (using the distance ring) to have minimum astigmatism, such that horizontal and vertical lines come into focus at the same focus setting.

A line pair is considered to be clearly recognizable when the individual lines in the pattern can be clearly distinguished and the number of lines seen in the pattern is the same as the number of lines in the original target.

6 Classification

For each classification of apparent size of the screen image, the practical minimum limit of acceptability in terms of clearly recognizable lines per millimeter shall be as specified in table 1.

Table 1 – Minimum limit of acceptability

Classification	Lines per millimeter		
	Center	Sides [1)]	Corners
Large appearing screen image (Review rooms, premier theaters)	80	56	48
Medium appearing screen image (First-run theaters)	68	56	40
Small appearing screen image	56	48	40

[1)] Assumes left and right sides equivalent at same focus setting.

Annex A (informative)
Additional data

A.1 Judgment of screen image resolution must be made from areas closer to the screen than those generally considered the best for viewing and definitely not from the rear of the theater or projection room.

A.2 Appropriate test films are SMPTE 35-PA as specified in SMPTE RP 40, SMPTE 70-PA as specified in SMPTE RP 91, and SMPTE 16-PA as specified in SMPTE RP 82.

Annex B (informative)
Bibliography

SMPTE RP 40-2003, Specifications for 35-mm Projector Alignment and Screen Image Quality Test Film

SMPTE RP 82-1990, Specifications for 16-mm Projector Alignment and Screen Image Quality Test Film

SMPTE RP 91-2002, Specifications for 70-mm Projector Alignment and Screen Image Quality Test Film