

SMPTE RECOMMENDED PRACTICE

Installation of Gain Screens



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1 Scope

This practice specifies the optimum installation parameters for gain screens used in motion-picture theaters.

2 Considerations

2.1 A gain screen is any screen surface with a gain of 1.1 or more. Gain determination of screens is specified in SMPTE RP 94.

2.2 The effect of the screen gain is reduced when the angle of viewing is increased away from the major reflected rays (see annex A.4).

2.3 When the light projection is perpendicular to the screen surface, the effect of gain diminishes in every direction away from the perpendicular condition to the screen center.

2.4 Specular screens follow the physical law; i.e., the angle of incidence equals the angle of reflection.

3 Formulas

3.1 Radius of screen

The screen shall be curved when installed to a radius of:

$$\frac{\text{Projection distance} + \text{Distance between screen and audience center}}{2}$$

3.2 Degree of tilt

To have maximum gain aimed at the center of the audience, the screen shall be tilted as follows:

$$\frac{\text{Projection angle to screen center}}{2}$$

Annex A (informative)

Additional data

A.1 With gain screens, it is best to locate the audience inside the one-half maximum gain angles; good audience coverage can be attained if the audience boundaries are defined by the angles at which the gain is no less than that necessary to provide the recommended screen luminance (see SMPTE 196M).

A.2 Retroflective or beaded-type screens shall be avoided unless the projector is in the center of the audience.

A.3 Higher gain screens (1.5 and higher), and all silver screens should be installed in curved form to avoid the objectionable hot-spot.

A.4 Nearly all gain screens have a mirror effect, which causes the angle of projection reaching the sides of the screen to be reflected toward the walls unless the installation is in curved form.

A.5 Where the audience seating is wider than the screen width, consideration should be given to a ray-trace of reflected light from the gain screen, so that the light properly reaches the side seats across the middle rows. Ray-tracing can be done by hand drawing or by computer and may differ from the formulas given in 3.1 and 3.2, especially with shorter focal length lenses, such as the range of 50-mm to 75-mm focal length for 35-mm anamorphic projection from a rear projection booth

A.6 Use of a curved screen with vertical projection angles greater than 8° requires consideration of curvilinear distortion, and may require adjustment of screen masking.

Annex B (informative)

Bibliography

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

SMPTE RP 94-2000, Gain Determination of Front Projection Screens

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