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SMPTE RECOMMENDED PRACTICE

RP 82-2004
Revision of RP 82-1995

Specifications for 16-mm Projector Alignment and Screen Image Quality Test Film

Introduction

This test film is designed to provide the same degree of performance evaluation for 16-mm projection systems that is presently available for 35-mm projection systems utilizing SMPTE Recommended Practice RP 40. It is also intended as an engineering tool to permit quantitative measurements of projector adjustments that affect the visual image.

1 Scope

1.1 This practice describes the artwork and dimensions for constructing a test chart to be used as the original subject for the manufacture of the test film.

1.2 The practice also describes the types of photographic materials and densitometry necessary to manufacture the film.

2 Normative references

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

SMPTE 7-2004, Motion-Picture Film (16-mm) — Camera Aperture Image and Usage

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

3 Description

3.1 The test pattern on the film shall be as shown in figures 1 and 2.

3.2 The background checkerboard pattern provides a 50% transmission of the incident radiant energy, which is more nearly consistent with the projection performance of an average release print. The pattern also provides a quick reference for overall image focus and quality.

3.3 The resolution charts are modified high-contrast NBS resolution charts with a luminance ratio of 100:1 which have been trimmed to exclude low-order resolution below 34 lines per millimeter (see figure 3).

3.4 The wedge steps placed on each side and above and below the center resolution chart are designed to measure quantitatively vertical image unsteadiness and horizontal weave. The actual length of the wedges and their placement around the center resolution chart are not critical, but the total width of the wedge shall be 20% of the total width of the wedge. (One square equals 1% of the image height.)

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3.5 The diamond patches (dimension E) are to be inserted as a densitometric control in the exposure and processing of the original test film.

3.6 The test chart shall be photographed as a 16-mm camera original on a film manufactured in accordance with SMPTE 109. The film shall be capable of a modulation transfer of at least 80% at 80 lines per millimeter when exposed to a high-contrast resolution chart at a reduction ratio of 25:1 and then properly processed. In preparation, the film shall be used in such equipment and with such procedures as will maintain optimum resolution and steadiness.

3.7 The chart shall be photographed with a camera aperture as specified in SMPTE 7.

3.8 The test film shall be produced as a 16-mm camera original.

3.9 The vertical centerline of the pattern shall be 0.314 in ± 0.002 in (7.98 mm ± 0.05 mm) from the reference edge of the film shown in SMPTE 7.

4 Dimensions

4.1 The dimensions of the original test chart shall be 25X the dimensions listed in figure 2. (This requirement is necessary because the NBS resolution test charts are designed for a 25X reduction.)

4.2 The original or 1:1 copy of the NBS resolution test charts shall be cropped as specified in figure 3. The modification shall be similar to that illustrated in figure 4.

4.3 The modified NBS resolution test charts shall be placed on the original test chart as specified by the dimensions in figure 2.

4.4 The diamond patches (dimension E) shall be at least the dimensions specified in figure 2 in order to be readable in current 1-mm aperture densitometers after a 25X reduction.

4.5 The checkerboard background on the test chart shall contain 100 squares vertically and 134 horizontally.

4.6 The horizontal and vertical lines indicating 5% and 10% reductions in image length or height shall be placed on the test target in accordance with the dimensions specified in figure 2.

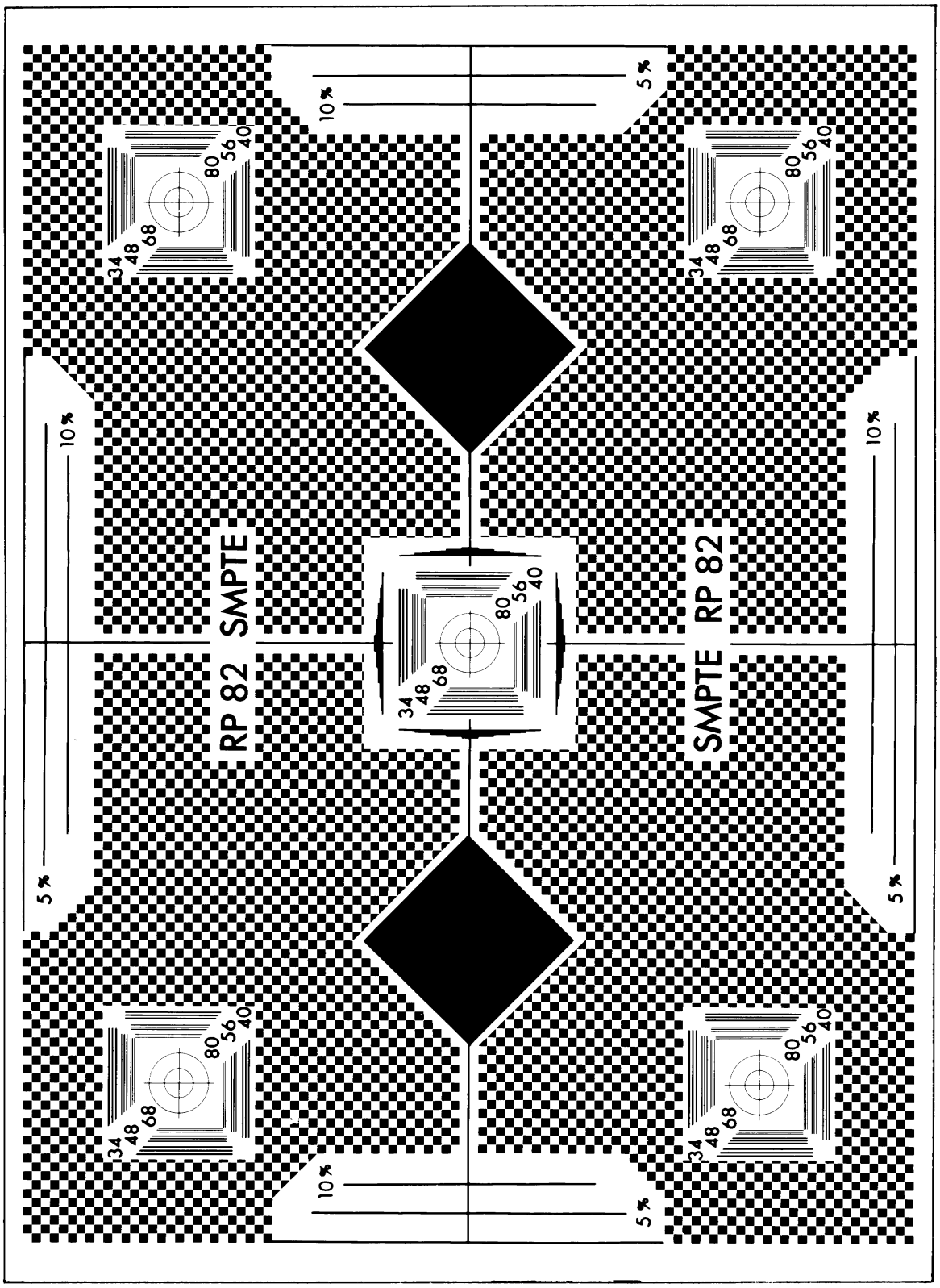

Figure 1 – Reproduction of test chart

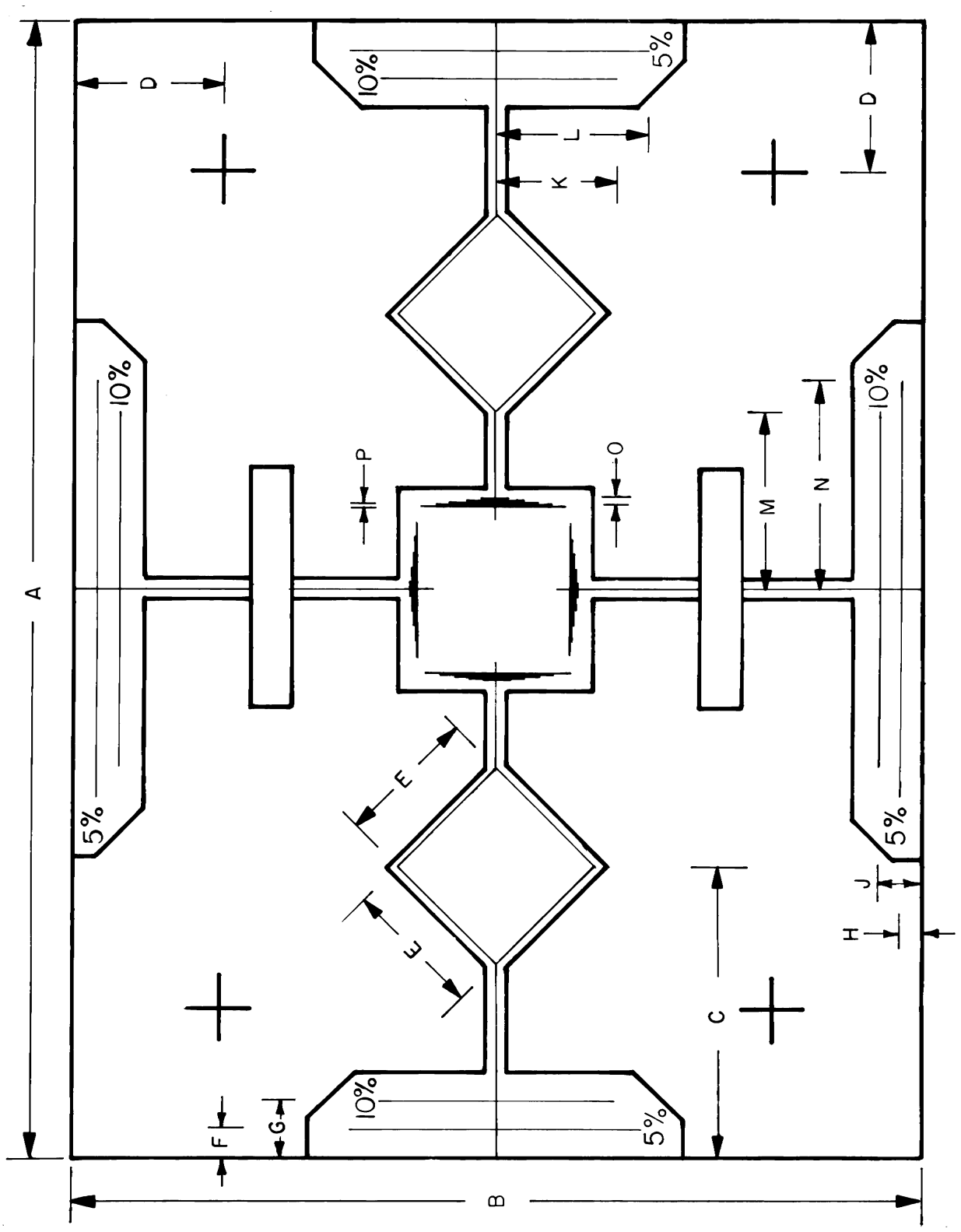

Figure 2 – Pattern dimensions

Table 1 – Specifications

Dimensions	Inches	Millimeters
A	0.380 ± 0.002	9.65 ± 0.05
B	0.285 ± 0.001	7.24 ± 0.03
C	0.10 nom	2.5 nom
D	0.05 nom	1.3 nom
E	0.0475 nom	1.206 nom
F	0.0095 ± 0.0005	0.241 ± 0.013
G	0.0190 ± 0.0005	0.483 ± 0.013
H	0.0071 ± 0.0005	0.180 ± 0.013
J	0.0142 ± 0.0005	0.361 ± 0.013
K	0.04 nom	1.0 nom
L	0.05 nom	1.3 nom
M	0.06 nom	1.5 nom
N	0.07 nom	1.8 nom
O[1)]	0.00285	0.0724
P[1)]	0.00057	0.0145

[1)]Derived from 3.4.

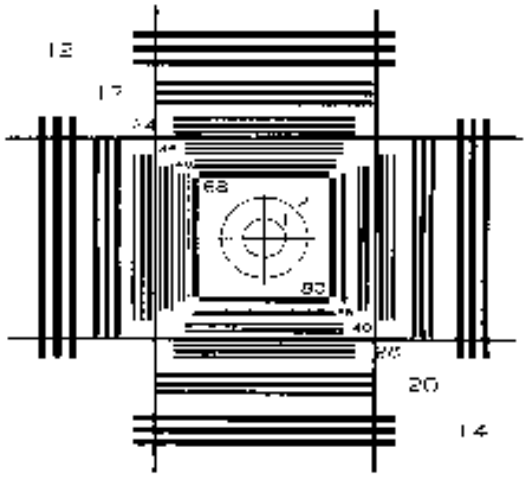

Figure 3 – Modified NBS resolution test chart

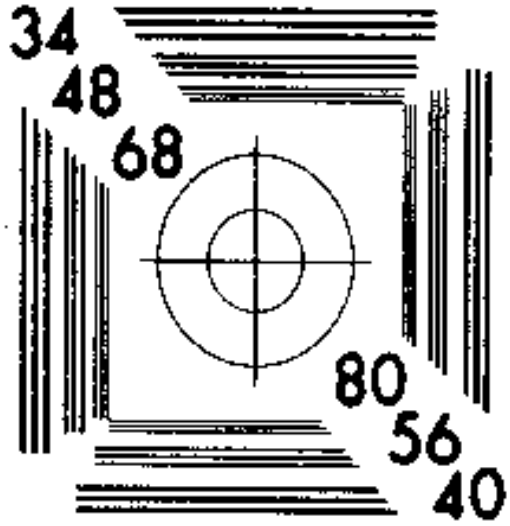

Figure 4 – Detail of resolution target

Annex A (informative)
Additional data

A.1 It has been found that producing test films with resolution at 80 lines per millimeter requires careful selection of the materials and equipment used, and careful control of the operations. Inasmuch as a measuring tool should be better than the system it is designed to measure, it is desirable that the test film meet the specifications detailed herein, although normal theatrical program release prints will not usually meet these specifications.

A.2 The camera used to photograph the high-contrast test target must have a lens of suitable design and correction to provide an image of sufficient resolution to allow a modulation transfer of at least 80% at 80 lines per millimeter on the processed film image over the entire field. The camera mechanism must provide steady images, preferably ensured by pin registration.

A.3 Image densities referred to in this annex are intended for a more precise definition of one system shown to be applicable, and are measured in accordance with ISO 5-2. Selection of a film for producing the test film must take into consideration the requirements of 3.6.

A study of many film products indicates that a high-contrast panchromatic film is applicable but, for adequate control of line widths, resolution, etc., there must be careful control of both exposure and processing. Quality control may be achieved conveniently by inserting a gray patch having a density of about 0.94 on the film when all the conditions have been met. For a reflective target and for film processed as recommended to a Ib control gamma of 3.3, this has been achieved with a gray patch having a reflectance of 32%. For a transmission target, a gray area of a different density may be needed to provide the identical test films.

A.4 If constructing an original reflecting test chart with a negative image is desirable, it should be pointed out that negative NBS resolution test charts are unavailable. However, they can be manufactured from an original positive by a competent graphic arts studio familiar with the requirements of size and resolution.

Annex B (informative)
Bibliography

ISO 5-2:2001, Photography — Density Measurements — Part 2: Geometric Conditions for Transmission Density

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