SMPTE RP 91:2014
Revision of RP 91-2002

SMPTE RECOMMENDED PRACTICE

Specifications for 70-mm Projector Alignment and Screen Image Quality Test Film

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Approved
November 13, 2014

Foreword

SMPTE (the Society of Motion Picture and Television Engineers) is an internationally-recognized standards developing organization. Headquartered and incorporated in the United States of America, SMPTE has members in over 80 countries on six continents. SMPTE's Engineering Documents, including Standards, Recommended Practices, and Engineering Guidelines, are prepared by SMPTE's Technology Committees. Participation in these Committees is open to all with a bona fide interest in their work. SMPTE cooperates closely with other standards-developing organizations, including ISO, IEC and ITU.

SMPTE Engineering Documents are drafted in accordance with the rules given in its Standards Operations Manual

SMPTE RP 91 was prepared by Technology Committee 20F.

Intellectual Property

At the time of publication no notice had been received by SMPTE claiming patent rights essential to the implementation of this Recommended Practice. However, attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. SMPTE shall not be held responsible for identifying any or all such patent rights.

1 Scope

This practice specifies a test film for quantitative measurements of 70-mm projector alignment and screen image quality. This practice also describes the artwork and dimensions for a test chart to be used as the original subject for the manufacture of a master negative.

2 Conformance Notation

Normative text is text that describes elements of the design that are indispensable or contains the conformance language keywords: "shall", "should", or "may". Informative text is text that is potentially helpful to the user, but not indispensable, and can be removed, changed, or added editorially without affecting interoperability. Informative text does not contain any conformance keywords.

All text in this document is, by default, normative, except: the Introduction, any section explicitly labeled as "Informative" or individual paragraphs that start with "Note:"

The keywords "shall" and "shall not" indicate requirements strictly to be followed in order to conform to the document and from which no deviation is permitted.

The keywords, "should" and "should not" indicate that, among several possibilities, one is recommended as particularly suitable, without mentioning or excluding others; or that a certain course of action is preferred but not necessarily required; or that (in the negative form) a certain possibility or course of action is deprecated but not prohibited.

The keywords "may" and "need not" indicate courses of action permissible within the limits of the document.

The keyword “reserved” indicates a provision that is not defined at this time, shall not be used, and may be defined in the future. The keyword “forbidden” indicates “reserved” and in addition indicates that the provision will never be defined in the future.

Unless otherwise specified, the order of precedence of the types of normative information in this document shall be as follows: Normative prose shall be the authoritative definition; Tables shall be next; followed by formal languages; then figures; and then any other language forms.

3 Normative References

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

SMPTE ST 119:2011, Motion-Picture Film (70-mm) — Perforated 65-mm, KS-1870

SMPTE ST 185:2011, Motion-Picture Film (70-mm) — Six Magnetic Records on Release Prints — Position, Dimensions, Reproducing Speed and Identity

4 Test Film Prints

4.1 A reproduction of the test chart is shown in Figure 1.

4.2 The positive resolution charts are modified NBS resolution test charts with a luminance ratio of 100:1 (see Figure 2).

4.3 The area between the logos (SMPTE and 70-PA) is to be used to insert a gray patch, if necessary, as a densitometric control in the exposure and processing of the original negative and subsequent prints.

4.4 The test film shall be produced as a 70-mm print with a neutral image on color positive film manufactured in accordance with SMPTE ST 119.

4.5 The print shall be made of polyester non-shrink stock.

4.6 The printing shall be chosen so that, after processing, there is cancellation of the image spread in the resolution targets specified in Section 4.2 at 80 lines per millimeter. If used, the gray patch density will provide a convenient densitometric control in the exposure and processing after the characteristics of the system have been established.

4.7 The method of printing shall produce less than 0.20% (arbitrary) vertical image unsteadiness on the test print.

4.8 If the print contains magnetic stripes, they shall be in accordance with SMPTE ST 185.

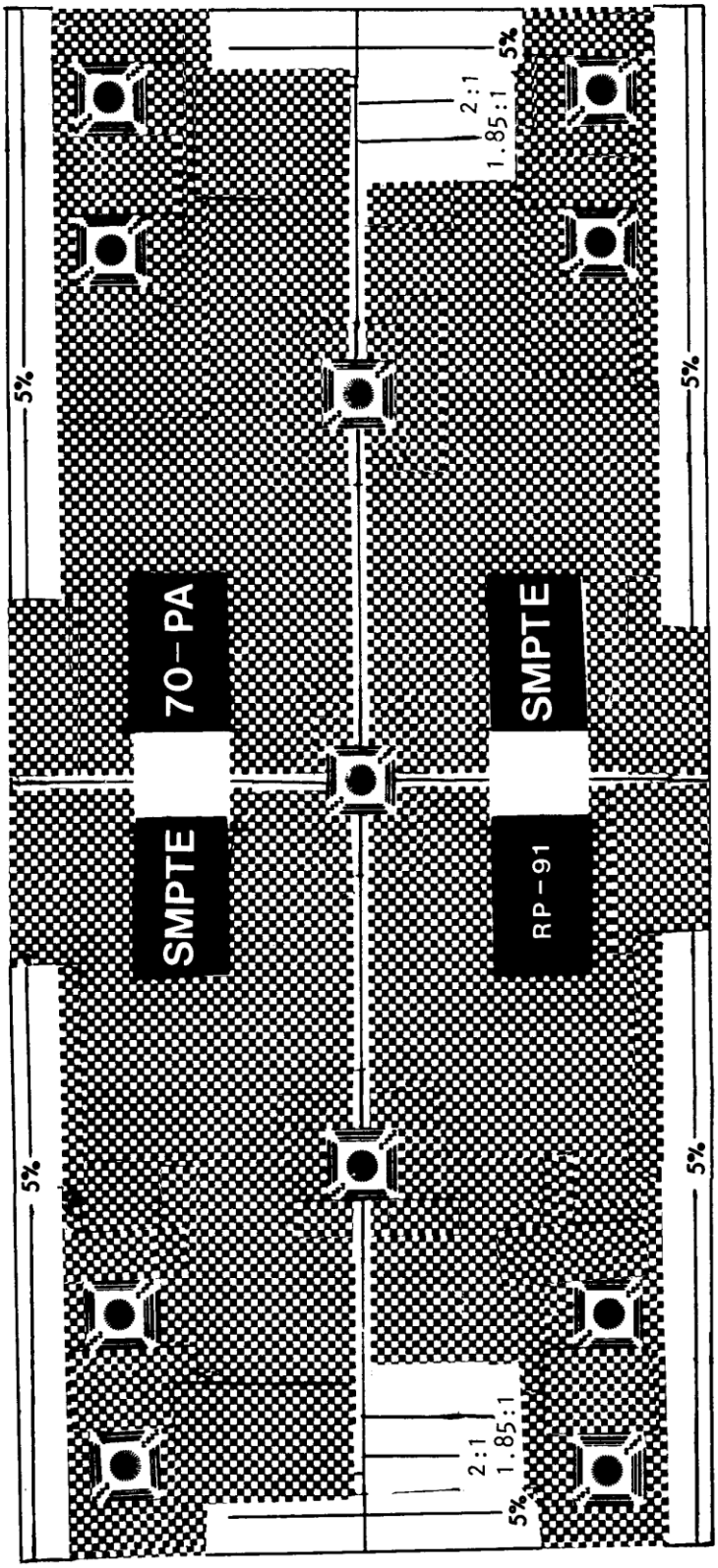

Figure 1 – Reproduction of test chart

5 Dimensions

5.1 The dimensions of the original test chart shall be 25X the dimensions given in Table 1. This precise requirement is necessary because the NBS resolution test charts are designed for a 25X reduction. For practical purposes, a smaller original chart can be prepared provided that the NBS resolution charts can be accurately reduced in size by a known ratio which shall then apply to all the other dimensions on the test chart.

5.2 The modified NBS resolution test chart shall be placed on the original test chart as specified by the dimensions in Figure 3.

5.3 The densitometric control area specified in Section 4.3 shall be not less than 0.2” x 0.2” (5.08 mm x 5.08 mm) on the 70-mm film.

5.4 The gray patches, along with the SMPTE logo, should be placed midway between the horizontal centerline and the top and bottom of the test chart.

5.5 The checkerboard background shall contain 100 squares vertically and 220 squares horizontally.

5.6 The dimensions marked with an asterisk in the table shall be within tolerances of 0.002 in (0.05 mm) on the print. All other dimensions are nominal.

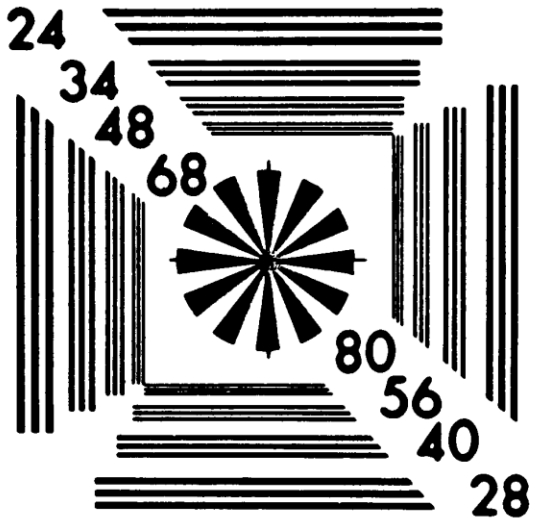

Figure 2 – Resolution chart

Table 1 – Dimensions

Dimensions	Inches	Millimeters
A*	1.912	48.56
B*	0.870	22.10
C*	0.956	24.28
D	0.946	24.03
E	0.600	15.24
F	0.478	12.14
G	0.300	7.62
H	0.125	3.18
J*	0.435	11.05
K	0.425	10.80
L	0.275	6.98
M	0.130	3.30
N	0.045	1.14
O*	0.022	0.56
P	0.096	2.44
Q*	0.048	1.22
R*	0.086	2.18
S*	0.151	3.84
T	0.215	5.46
U	0.2	5.08
V	0.560	14.22
W	0.155	3.94
*See Section 5.6 for tolerances.		

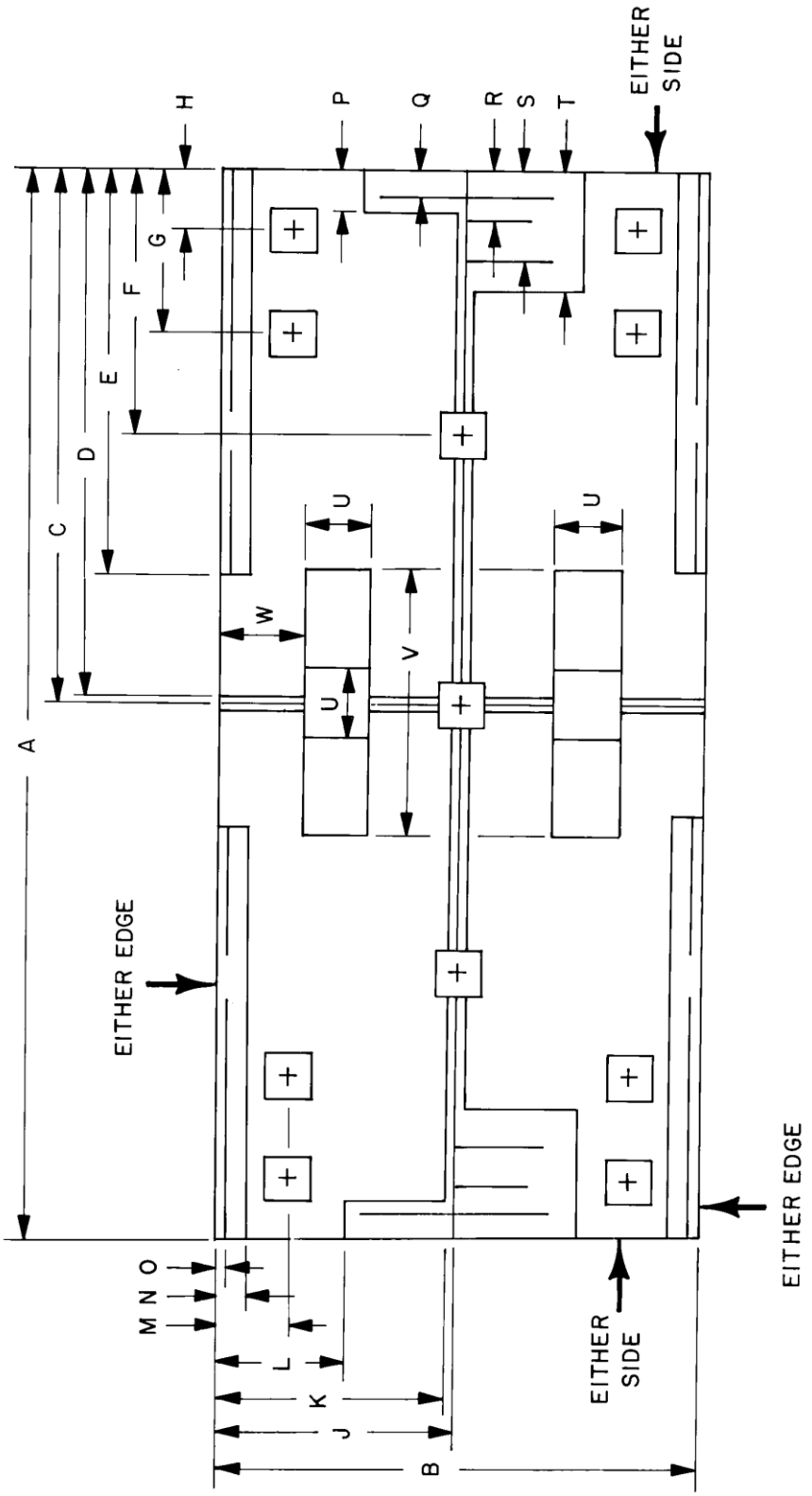

Figure 3 – Test chart dimensions

Annex A Control of Resolution and Definition in the Preparation of Test Prints
(Informative)

A.1 It has been found that producing test prints 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.

A.2 The background checkerboard pattern provides for a 50% transmission of the incident radiant energy so as to be more nearly consistent with the projection performance of an average release print.

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 ANSI/NAPM IT2.19. Selection of a film for producing the negative must take into consideration image spread characteristics such that, in conjunction with the print films at image densities that are useful, there is substantial image spread cancellation in the resolution range of interest. Accordingly, the final print will resolve 80 lines per millimeter with the lines and spaces equal in width.

A.4 Selection of a film for producing the dye-image print must take into consideration not only the requirements of Section 4.6, but also image spread characteristics compatible with the negative and projection characteristics suitable for theatrical projection.

A.5 Preparation of the test prints with a resolution and steadiness adequate for the film's purpose requires great care in the selection and operation of the printer. Satisfactory results can be obtained only with a step-contact printer employing registration pins.

Annex B Bibliography (Informative)

ANSI/NAPM IT2.19-1994, Photography — Density Measurements — Part 2: Geometric Conditions for Transmission Density