

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

*Use of 2-in Tape on Cartridge/Cassette Spools  
for Quadruplex Video Tape Recorders*

**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-mm, 35-mm, 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 Appendix A.2.)

**2. 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 Proposed SMPTE Recommended Practice on Method for Determining the Degree of Jump and Wobble in 70-mm, 35-mm and 16-mm Motion-Picture Projected Images, RP 105; and that the screen luminance has been adjusted to be in accord with American National Standard Screen

Luminance and Viewing Conditions for Indoor Theater Projection of Motion-Picture Prints, ANSI PH22.196-1978.

**3. Definitions**

3.1 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. (In television terminology, resolution is described by counting both the black lines and white spaces as single units.)

3.2 The apparent screen image size is a ratio of screen height to viewing distance from the rear seating area:

Large appearing screen image assumes a viewing distance of 2.5 to 3.5 screen heights.

Medium-large appearing screen image assumes a viewing distance of 3.5 to 5.5 screen heights.

Medium appearing screen image assumes a viewing distance of 5.5 to 8 screen heights.

Small appearing screen image assumes a viewing distance over 8 screen heights.

**1. Classification**

Classification of projected image quality in terms of clearly recognizable lines per millimeter shall be as follows:

Center	Lines per Millimeter	
	Sides*	Corners
80	56	48
68	56	40
56	48	40
40 or less	less than 40	less than 34

\* Assumes left and right sides equivalent at same focus setting.

**Appendix**

The Appendix is not a part of this SMPTE Engineering Guideline but is included for information purposes only.

A1. Judgment of screen image resolution must be made from areas lower to the screen than those generally considered the best for viewing and definitely not from the rear of the theater or projection room.

A2. The recommended method of measurement is to run a test film, made by a registration-pin camera, such as the

2.3 Start and End of Tape Markers. Tapes distributed on spools shall contain start and end of tape markers in accordance with Fig. 1. Holes shall be used to mark tapes for cassette machines and foil for cartridge machines. Although recording a cue track is optional, its inclusion saves time for the user whose machine is compatible with the type of cue track recorded on the tape. The tape shall be loaded on the spool as shown in Fig. 1.

2.4 Recorder Tape Format. The final recording of program material to be shipped on spools for cartridge or cassette machines shall meet the cartridge/cassette recorder tape format shown in Fig. 1, except that the cue data may be omitted. The design of the recording equipment is at the option of the user and the only requirement is that the final recording meet all applicable 2-in quadruplex standards and the format shown in Fig. 1.

2.4.1 If a cartridge or cassette machine is available, the spool removed from the cartridge or cassette subsequent to recording for shipment to the user.

2.5 Cue Track Information. When a user receives a spool, it should be inserted into a cartridge or cassette to determine whether the proper cue track information is on the tape. If so, it needs only an overall quality check. If no cue track information is on the tape or the information is not compatible with the machine, the machine should be used to record a new cue track, and the usual quality checks made.

1. Scope  
This guideline specifies the use of 2-in tape on cartridge/cassette spools for quadruplex video tape recorders.

**2. Specifications**

2.1 Procedure. The procedure consists of the following steps:

- (1) Modification of the cassette format
  - (2) Standardization of the location of the start of tape (SOT) and end of tape (EOT) markers for cartridge and cassette formats
  - (3) Inclusion of both types (hole and foil) of SOT and EOT markers on a tape to be interchanged between cartridge and cassette formats
  - (4) Recording the cue track on the same type machine as the tape to be played if the pre-recorded cue track is a different format
- 2.2 Cassette Machine Modification. Cassette machines require a simple field modification to achieve spool interchange. The modification (two resistors and a capacitor) ensures accurate parking of the tape close to the SOT hole when shuttling in reverse, and shortens the cue sequence lurch-back time from approximately 8 to 5 seconds.