RP 17-1964

SMPTE RECOMMENDED PRACTICE

Photographic Recording Technique for Measuring High-Speed Camera Image Unsteadiness

1 Scope

1.1 Specification

This practice specifies a photographic method of recording and measuring high-speed motion-picture image unsteadiness.

1.2 Image-steadiness methods

Existing image-steadiness methods are applicable to professional motion-picture cameras showing vertical image-steadiness accuracy within 0.0004 in (see annex A).

1.3 Application

The procedure for measuring image unsteadiness, described in this practice, is far more practical for high-speed, rotating-prism motion-picture cameras usually showing unsteadiness characteristics greater than 0.0004 in.

2 Measurements procedure

2.1 Film exposure

2.1.1 Double exposure

Film shall be double exposed to produce overlapped images of the plus-sign target.

2.1.2 Target

The target shall be opaque, except for a plus sign transmitting sufficient light for exposure through lines no wider than 1-mm on an 8 in x 10 in field.

2.1.3 Backlighting

The target shall be backlighted.

2.1.4 First exposure

The first exposure shall be made in a professional camera known to afford image steadiness within 0.004 in.

2.1.5 Second exposure

The second exposure shall be made in a high-speed motion-picture camera, as shown in figure 1.

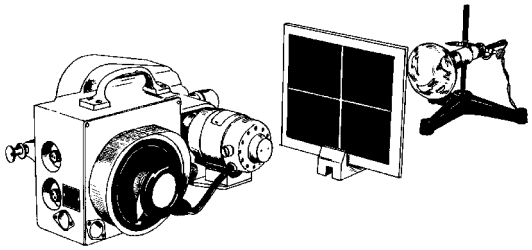

Figure 1 – Typical set-up for second exposure

2.1.6 Exposure adjustments

Exposure shall be adjusted for each camera to produce equal density for both plus-sign images.

3 Recording unsteadiness data

3.1 Projection

Processed film shall be projected onto a rotating drum wrapped with recording-type paper (cut 1.5 in x 24 in), as shown in figure 2.

3.1.1 The projector shall be positioned approximately 24 in from the drum, with both horizontal

Approved April 12, 1964

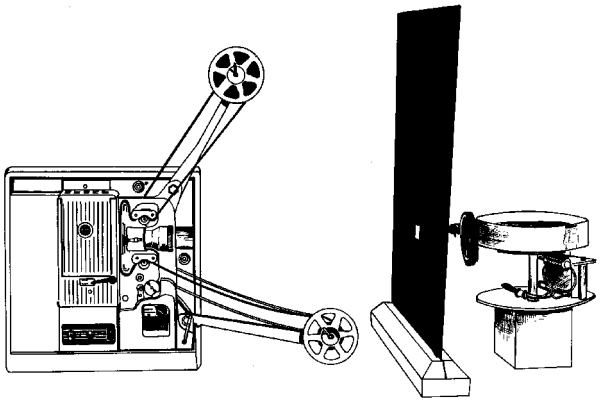

Figure 2 – Projection of test film onto drum wrapped with recording paper

lines focused on the recording paper and through a 1/32-in vertical slit positioned directly in front of the recording drum.

3.1.2 The vertical slit shall transmit very small, dotlike sections of both horizontal lines representing the image characteristics of the reference camera and the high-speed camera.

3.1.3 The recorder shall rotate horizontally one revolution per 100 ft of projection (or 6 in per minute), as shown in figure 3.

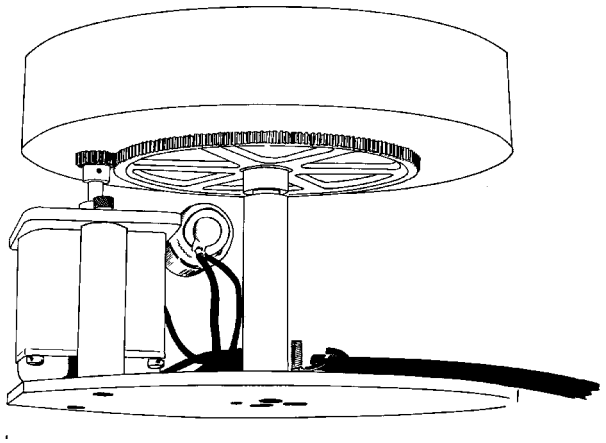

Figure 3 – Driving mechanism of recording drum

3.2 Vertical unsteadiness

The photographic record shall be processed conventionally and the camera evaluated for vertical unsteadiness.

3.3 Horizontal unsteadiness

Horizontal unsteadiness shall be recorded in a similar manner by rotating the normally vertical lines 90 optically with a mirror or dove prism, as shown in figure 4.

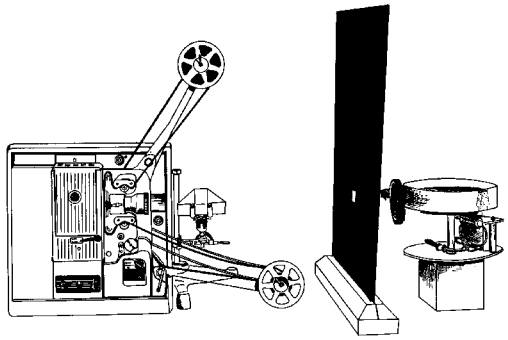

Figure 4 – Position of dove prism for recording horizontal unsteadiness

4 Characteristics of recording

4.1 Differential

Differential in amplitude between the traces indicates relative image unsteadiness of the high-speed camera, since projector unsteadiness is cancelled.

4.2 Comparisons

The permanent recording should be compared with previous recordings to determine the degree of degradation.

5 Calculation of image displacement

Actual image displacement on the high-speed camera film shall be calculated by determining the magnification factor between the focal plane of the projector and the recording paper. When using a 2-in projection lens 2 ft from the recording drum, the magnification is approximately 10X. A typical trace is shown in figure 5.

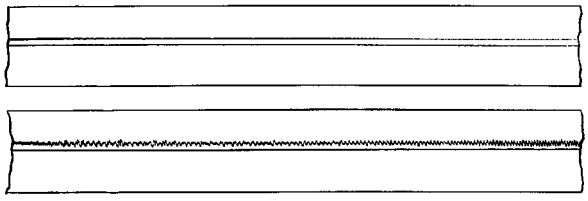

Figure 5 – Typical trace shown on recording paper

Annex A (informative)
Bibliography

Robertson, A. C., A method of measuring the steadiness of motion picture cameras. Journal of the SMPTE, 68: 21-25; January 1959

Townsley, M. G., A method for measuring the steadiness of motion picture cameras. Journal of the SMPTE, 43: 45-50, July 1944.