

Standards

Splices for 16-Mm and 8-Mm Film

THESE PROPOSED American Standards, developed by the 16-Mm and 8-Mm Motion Pictures Committee, appear on the following pages. They are published here for trial and criticism for a period of ninety days. Please forward any comments to Henry Kogel, Staff Engineer at Society Headquarters, by July 1, 1951.

For many years the standards for splices have shown both a diagonal splice with a 0.070-in. overlap and a straight splice with a 0.100-in. overlap. It is presumed that the diagonal splice was narrower so that it would not encroach on the perforations. These dimensions were specified in Chart 12 of Z22-1930 and repeated in 1941 in Z22.24 and Z22.25. Actually, however, the dimensions of the straight splice were first established in 1924 when 16-mm equipment was introduced. Many thousands of splicers making splices with these dimensions have been manufactured and used. When splicers for 8-mm film were introduced in 1932, the same 0.070-in. and 0.100-in. overlaps for diagonal and straight splices were specified.

For twenty years these dimensions have been retained as new splicers came on the market, even though a great deal of experimental work was being conducted in an effort to improve splices and lengthen their life during projection.

In January, 1944, Subcommittee C of the American Standards Association's

Z52 War Committee on Photography and Cinematography was appointed to handle standards relating to 16-mm laboratory practice. One of the first projects of this subcommittee was to specify the type of splice that should be used for 16-mm release prints. The discussion showed that there was little agreement among the laboratories. Some preferred narrower splices because they are less conspicuous on the screen. It was stated that, contrary to former beliefs, wide splices were more susceptible to failure than narrow ones. Several members said that they were using splices that were less than 70-mils wide and had found them quite satisfactory. It was then agreed to make the 0.070-in. overlap a maximum inasmuch as it was desired to secure splices with as small an overlap as possible. It was then decided to write a new standard covering diagonal and straight splices.

Later the title of the proposed standard was changed to limit the splices to processed film because the suitability of the splices for raw stock had not been considered by the committee. The final War Standard, Z52.20-1944, was approved May 29, 1944, by the American Standards Association.

This action resulted in the existence of two standards for straight splices: the original 0.100-in. splice from Z22.24-1941 and Z22.25-1941, and the new 0.070-in. splice in Z52.20-1944. It was realized at the time that careful comparative

tests would eventually be required in order to determine which splice was superior. If it were decided to carry over into peacetime the 0.070-in. splice, it would be necessary to rebuild all the existing tools for amateur splicers, which would involve considerable expense to the industry because of the many splicers for 0.100-in. splices on the market.

Consideration of Dual Standards

The desirability of continuing the two standards for splices was considered when Committee Z22 of the American Standards Association reviewed the War Standards in October, 1945. At this meeting, and at subsequent meetings, the need for having standards for splices was questioned, but the committee decided that such standards were of value to the industry. Eventually, the question was referred by Z22 to the Standards Committee of the Society, and a subcommittee was appointed, under the chairmanship of W. H. Offenhauser, Jr., to review the situation.

Meanwhile, the suggestion had been made that the 0.100-in. splice be designated the amateur splice and that the 0.070-in. be the professional or laboratory standard. This suggestion was discussed by the subcommittee, and it was agreed that the standard should prescribe good commercial practice, as well as a splice that would be practicable for the amateur.

The relative merits of symmetrical versus unsymmetrical splices were also discussed, but it was decided that both diagonal and straight splices would be shown symmetrical with respect to the included perforation. Finally, although it was brought out that the 0.070-in. splice would be difficult for the amateur to perform because of the more precise control of hand scraping required, it was voted that the 0.070-in. straight splice be standardized for a trial of one year. During that period, data would be col-

lected so that a review could be made and a final decision reached.

This decision of the subcommittee was reported to the Standards Committee at a meeting on February 20, 1946. Although one member reported at that time that the narrower splice did not last as long in projection as the 0.100-in. splice, it was decided to publish the standard calling for the narrower splice and to collect more information during the trial period of one year.

When the report on splices was presented to the Society on May 8, 1946, the following test results was submitted to Mr. Offenhauser: Of 45 loops of film, each containing one 0.100-in. and one 0.070-in. splice and run in a projector until one of the splices broke, 40 loops broke first at the 0.070-in. splice and only 5 broke first at the 0.100-in. splice. These tests were run by two different departments of the same company, and included three projectors and splices made by several different operators. A third group ran 6 loops containing two splices of each width. The average life of the 0.070-in. splice was half that of the 0.100-in. splice.

Conclusions of Tests

These conclusions were confirmed later with splices made on an expensive precision splicer of the 0.070-in. type. Seven loops were made with one 0.070-in. precision splice and one 0.100-in. splice. All broke at the 0.070-in. splice first. In most cases, nevertheless, the life of the weaker 0.070-in. splice was probably adequate for either amateur or professional use. Such might not have been the case, however, if an ordinary hand splicer had been employed since most operators have considerable difficulty scraping the narrow splice. Because the strip of film between the perforations and the cut end of the film is only 0.010-in. wide, it is difficult to remove all the emulsion without damaging the film. In addition, shrinkage of

the film reduces this width still further and makes the scraping operation even more difficult.

From the foregoing tests, it is quite apparent that the wide splice was stronger despite its greater resistance to smooth bending of film around loops, rollers and sprockets.

Comments After Publication

The proposal of the subcommittee was published in the July, 1946, *JOURNAL*. It was simpler than previous standards because nonessential dimensions were omitted. Although only sound film was shown, it was stated that splices for silent film would be the same. A curved splice, included in the War Standard, was dropped because no one expressed interest in it. Comments were invited, particularly on the relative desirability of the 0.070-in. splice compared with the 0.100-in. splice, and on symmetrical versus unsymmetrical splices.

Although the response was rather small, a number of interesting suggestions were offered. The suggestions fell into two distinct groups: first, those concerned with splices made in processing laboratories by professionals, usually in negative or other preprint material; and second, those concerned with splices made in reversal originals or release prints.

Of the first group, a proposal by Joseph V. Noble of DeFrenes & Company Studios called for an invisible 0.016-in. frameline splice in the width of the film devoted to the picture area, with an overlap of 0.079 in. along both edges of the films. In addition, John S. Carroll listed the advantages of the unsymmetrical Griswold "negative" splice, and advocated increasing its width from 0.0625 in. to 0.070 in. for greater strength. He did not recommend it for release prints, however, because of its poorer mechanical properties. G. A. Chambers recalled the successful use of

0.070-in. splices at the Anacostia laboratory and recommended them for laboratories but not for the amateur.

The group favoring the retention of the 0.100-in. overlap was interested primarily in amateur splicing. Their arguments were based on the longer projection life, the greater success that the amateur has in making the 0.100-in. splice, and the large investments in tools for 0.100-in. splicers.

Since the industry did not appear to be ready for the adoption of the standards outlined in the July, 1946, *JOURNAL*, the Committee on Standards agreed that the original Z22.24 and Z22.25 should be reaffirmed until the situation is clarified. At this point, the problem of standards for splices was referred to the 16-Mm and 8-Mm Motion Pictures Committee.

Work of 16-Mm and 8-Mm Committee

In preparing the drafts submitted herewith, the Committee noted that the old standards did not conform to modern methods of dimensioning. It was suggested, also, that sound and silent films be combined into one standard. As these changes were made, it was discovered that other alterations and additions would be desirable. For example, the splices were redrawn so that they would appear as they do on splicing blocks. Tolerances were added to cover the proper transverse alignment of the perforations and the edges of the films, and the parallelism of the edges of the two films after the splice has been made. Again the question of whether straight splices should be 0.070-in. or 0.100-in. wide was raised. For 8-mm film the 0.100-in. splice was of course preferable. When the title and wording of the 16-mm splice proposal were changed to limit it to release prints, all objections to the 0.100-in. splice were withdrawn.

Drafts of the proposals approved by the 16-Mm and 8-Mm Motion Pictures Committee were submitted to the Stand-

ards Committee in May, 1949, for balloting on the question of publication in the JOURNAL for a ninety-day period of trial and comment. In due course, this ballot was completed favoring publication at an early date. During the course of this balloting, however, various members of the 16- and 8-mm Committee raised the question of whether or not manufacturers of splicers still promoted the sale of equipment to make diagonal splices. Upon investigation, it was found that no manufacturer expects to produce equipment of this type in the

future. In the light of this information, it was recommended that the diagonal splice be dropped from the proposal.

Since this was considered to be a major change from the version upon which the Standards Committee originally balloted, the ballot was withdrawn at a meeting of the Standards Committee on February 1, 1950. In subsequent balloting, completed in December, 1950, and January, 1951, the Committee approved publication of these two proposals in their present form for trial and comment.

Erratum:

W. F. Kelley and W. V. Wolfe, "Recent studies on standardizing the Dubray-Howell Perforation for universal application," *Jour. SMPTE* vol. 56, pp. 30-38, Jan. 1951.

Page 32, line 5 *et seq.*, and Fig. 1: *For Cooke read Cook.* This refers to Allen W. Cook who made the Ansco proposal a number of years ago.

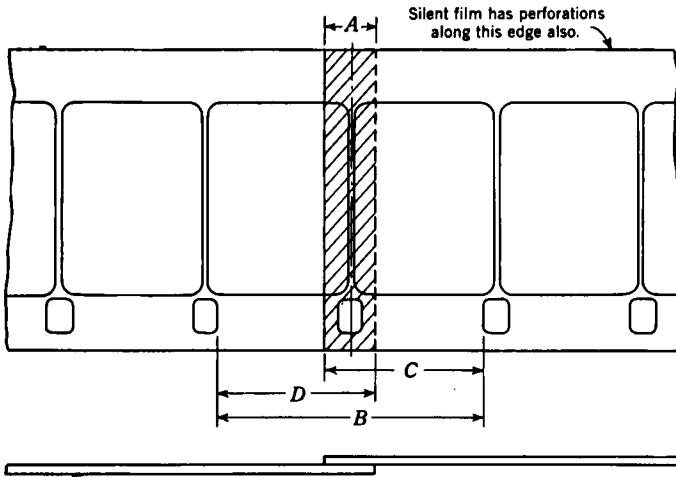
Proposed American Standard
Splices for
16-Mm Motion Picture Films
for Projection

PH22.24
(Z22.24)
Revision of
Z22.24 - 1941
and
Z22.25 - 1941

P. 1 of 2 pp.

Scope. Splices made in accordance with this standard are primarily for use with films intended for actual projection, such as release prints and reversal films. It is not intended that this standard be prejudicial to the use of

diagonal type splicers, nor to the use of narrower splices for professional purposes. For negatives and other laboratory films, narrower splices, sometimes with one edge on the frameline, frequently are used.



	Inches	Millimeters
A	0.100 $\begin{matrix} + 0.000 \\ - 0.005 \end{matrix}$	2.54 $\begin{matrix} + 0.00 \\ - 0.13 \end{matrix}$
B	0.548 $\begin{matrix} + 0.001 \\ - 0.001 \end{matrix}$	13.920 $\begin{matrix} + 0.025 \\ - 0.025 \end{matrix}$
C	0.324 $\begin{matrix} + 0.000 \\ - 0.003 \end{matrix}$	8.23 $\begin{matrix} + 0.00 \\ - 0.08 \end{matrix}$
D	0.324 $\begin{matrix} + 0.000 \\ - 0.003 \end{matrix}$	8.23 $\begin{matrix} + 0.00 \\ - 0.08 \end{matrix}$

NOT APPROVED

Proposed American Standard
Splices for
16-Mm Motion Picture Films
for Projection

PH22.24

(Z22.24)

Revision of
Z22.24 - 1941
and
Z22.25 - 1941

P. 2 of 2 pp.

Note 1. In the plan view, the splice is arranged with the perforations at the bottom in order to show them as they appear on most splicers. The splice may be made with the films turned through an angle of 180 degrees, or any other angle, but of course the emulsion surface should always be up. It is customary to scrape the top (emulsion) surface of the left-hand film and to cement this scraped area to the bottom (base) surface of the right-hand film.

Note 2. Dimension A is given a negative but no positive tolerance because narrower splices are less conspicuous on the screen and are less likely to affect the normal curvature of the film as it follows the bends in its path through cine-machinery.

Note 3. Dimension B controls the longitudinal registration of the two films being spliced. It is measured to the perforations that are most commonly used for registration on splicing blocks, and to the nearer edges of these perforations because they are edges that are generally used for the registration. This dimension is made the same as in Z22.77, Splices for 8-Mm Motion Picture Film, because many splicers are designed to accept either 16- or 8-mm film.

The nominal value of the B dimension was made 0.548 inch instead of the usual 0.550 (for unshrunk film) because the films being spliced are always shrunk to some extent. The 0.548 figure corresponds to a shrinkage of 0.36 percent, while the 0.549 and 0.547 values, permitted by the tolerances, correspond to 0.18 percent and 0.55 percent, respectively. Thus, the tolerances include the range of shrinkage ordinarily encountered when film is being spliced.

Note 4. Dimensions C and D were chosen to give a straight 0.100-inch splice that is symmetrical about the included perforation (and, therefore, the frame-line) when the film is shrunk 0.36 percent. See Note 3 above.

Note 5. The width of the film at the splice shall not exceed 0.630 inch. If the film has been widened during scraping, the extra width shall be removed.

Note 6. The overlapping perforations of the two films shall not be offset laterally more than 0.002 inch.

Note 7. At the splice, the edges of the two spliced films shall not be offset laterally more than 0.002 inch, unless a difference in the lateral shrinkages of the two strips makes it impossible to maintain that tolerance. Shoulders formed by such misalignment shall be beveled after the cement has dried.

Note 8. In the plan view, the angle between the respective edges of the spliced films shall be 180 degrees, plus or minus 40 minutes. Thus, the spliced film shall be aligned to the extent that when one portion of the film is placed against a straight edge, the other portion will not deviate more than 0.006 inch (approximately the thickness of the film) in 6 inches.

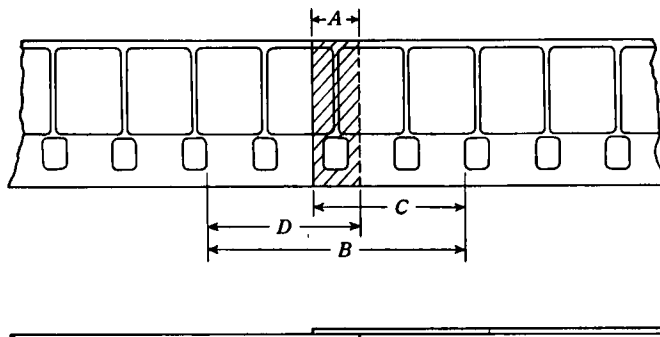
Note 9. In order to prevent the appearance of a white line on the screen, the scraped area shall be 0.001 to 0.003 inch narrower than the area covered by the overlapping film. The presence of this narrow uncemented area will not shorten the life of the splice.

NOT APPROVED

Proposed American Standard
Splices for
8-Mm Motion Picture Films

PH22.77
(Z22.77)

P. 1 to 2 pp.



	Inches	Millimeters
A	0.100 $\begin{matrix} + 0.000 \\ - 0.005 \end{matrix}$	2.54 $\begin{matrix} + 0.00 \\ - 0.13 \end{matrix}$
B	0.548 $\begin{matrix} + 0.001 \\ - 0.001 \end{matrix}$	13.920 $\begin{matrix} + 0.025 \\ - 0.025 \end{matrix}$
C	0.324 $\begin{matrix} + 0.000 \\ - 0.003 \end{matrix}$	8.23 $\begin{matrix} + 0.00 \\ - 0.08 \end{matrix}$
D	0.324 $\begin{matrix} + 0.000 \\ - 0.003 \end{matrix}$	8.23 $\begin{matrix} + 0.00 \\ - 0.08 \end{matrix}$

Note 1. In the plan view, the splice is arranged with the perforations at the bottom in order to show them as they appear on most splicers. The splice may be made with the film turned through an angle of 180 degrees or any other angle, but, of course, the emulsion surfaces should always be up. It is customary to scrape the top (emulsion) surface of the left-hand

film, and to cement this scraped area to the bottom (base) surface of the right-hand film.

Note 2. Dimension A is given a negative, but no positive, tolerance because narrower splices are less conspicuous on the screen and are less likely to affect the normal curvature of the film as it follows the bends in its path through cine-machinery.

NOT APPROVED

Proposed American Standard
Splices for
8-Mm Motion Picture Films

PH22.77
(Z22.77)

P. 2 of 2 pp.

Note 3. Dimension B controls the longitudinal registration of the two films being spliced. It is measured to the perforations that are most commonly used for registration on splicing blocks, and to the nearer edges of these perforations because they are the edges that are generally used for the registration. This dimension was made the same as in Z22.24, Splices for 16-Mm Motion Picture Film, because many splicers are designed to accept either 8-mm or 16-mm film.

The nominal value of the B dimension was made 0.548 inch instead of the usual 0.550 (for unshrunk film) because the films being spliced are always shrunk to some extent. The 0.548 figure corresponds to a shrinkage of 0.36 percent, while the 0.549 and 0.547 values, permitted by the tolerances, correspond to 0.18 percent and 0.55 percent, respectively. Thus the tolerances include the range of shrinkage ordinarily encountered when film is being spliced.

Note 4. Dimensions C and D were chosen to give a 0.100-inch splice that is symmetrical about the included perforation (and therefore the frameline) when the film is shrunk 0.36 per cent. See Note 3.

Note 5. The width of the film at the splice shall not

exceed 0.317 inch. If the film has been widened during scraping, the extra width shall be removed.

Note 6. The overlapping perforations of the two films shall not be offset laterally more than 0.002 inch.

Note 7. At the splice, the edges of the two spliced films shall not be offset laterally more than 0.002 inch unless a difference in the lateral shrinkages of the two strips makes it impossible to maintain that tolerance. Shoulders formed by misalignment shall be removed after the cement has dried.

Note 8. In the plan view, the angle between the respective edges of the spliced films shall be 180 degrees, plus or minus 40 minutes. Thus, the spliced film shall be aligned to the extent that when one portion of the film is placed against a straight edge, the other portion will not deviate more than 0.006 inch (approximately the thickness of the film) in six inches.

Note 9. In order to prevent the appearance of a white line on the screen, the scraped area shall be 0.001 to 0.003 inch narrower than the area covered by the overlapping film. The presence of this narrow uncemented area will not shorten the life of the splice.

NOT APPROVED