

# Proposed American Standard

ALMOST FROM THE OUTSET of the motion picture industry, the size and shape of the 35-mm film perforation presented a continuous and continuing problem. The Proposed American Standard appearing on the following pages is another attempt to standardize a single perforation (Dubray-Howell) for both negative and positive film. However, this is not offered now as a universal perforation to replace the two separate standards but rather as a third and *alternate* cutting and perforating standard. It is again published here for 90-day trial and criticism. All comments should be sent to Henry Kogel, SMPTE Staff Engineer, prior to January 1952 along with a carbon for Dr. E. K. Carver, Chairman of the Film Dimensions Committee.

This proposal and a detailed history of the subject were previously published in April 1949; however, objections were raised and the proposal was rejected by the Standards Committee on the grounds that a 90-day trial period was insufficient for a proposal of this nature. It has since been thrashed out in meetings of the Film Dimensions Committee, changes of a non-dimensional character made, and all objections overcome. Since a period of well over two years has elapsed, it is believed that a 90-day period, subsequent to this publication, should be adequate for comment.

A brief review of the sprocket-hole story is provided for background information.

The first attempt at standardization was initiated with a paper by D. J. Bell, published in the *JOURNAL* for October 1916. He proposed a perforation hav-

ing a width of 0.110 in., a height of 0.073 in. and rounded sides. Within a few years, this "Bell & Howell" perforation was accepted almost universally and was formally standardized in 1922. This development led in turn to a re-design of sprocket teeth to provide a greater picture steadiness with the accepted perforation.

However, after some time, it was noted that this perforation gave evidence of fracturing at the corners when run frequently through projection equipment. In 1923, (on the basis of experimental tests) J. G. Jones proposed a rectangular perforation having filleted corners, the same 0.110-in. width and an increased height, 0.078 in., to eliminate sprocket-tooth interference encountered previously with the 0.073-in. dimension. Since this new perforation might have given trouble in some cameras then in use, its use was not recommended for negative films. With its adoption in October 1925, separate standards for positive and negative film came into existence.

The present proposal was first put forth by Messrs. Dubray and Howell in April 1932. They claimed that it combined the advantages of both perforations and that film so perforated could still be used on all existing equipment without alteration. This, however, found few supporters at the time and instead the existing rectangular perforation for positive film was adopted in 1933 as the universal standard for both negative and positive film. Although this standard was used for positive and sound film, it was not used for camera negative film.

In 1937 the Subcommittee on Film Perforating Standards proposed withdrawal of the 1933 standard and adoption of the Dubray-Howell proposal in its place—but without success.

It then became apparent that establishing a universal perforation would be very difficult. This left negative film without an official standard and consequently the old Bell & Howell perforation, still in common use, was re-established as a standard for negative film.

The issue lay dormant until some time in 1945 when the American Standards Association asked the Society of Motion Picture Engineers to reaffirm or revise the standards, in accordance with its policy of periodic review of all standards. In the reviewing process the Motion Picture Research Council refused to approve the negative perforating standard and instead proposed that the whole question be reinvestigated and the Dubray-Howell perforation be reconsidered. The Film Dimensions Committee, therefore, initiated and carried through a rather thorough study of the whole question during 1947-48. The study revealed that this perforation had a projection life superior to the negative perforation and only slightly less than the positive perforation. In addition, it operated satisfactorily in most equipment designed for either of the old perforations and also produced films of satisfactory steadiness. (For additional information on the studies of the Dubray-Howell perforations made by the Motion Picture Research Council, see the January 1951 *Journal*, p. 30.)

At about this time, the registration problem that exists in the printing of certain types of color release prints enters the picture. It is possible to solve the problem by the use of cine negative perforations in the release prints, but then shortened projection life becomes a fac-

tor. Meanwhile, two producers used film having the Dubray-Howell perforation for a number of color release prints and obtained very satisfactory results when printing from standard negative Bell & Howell perforations. This lent added weight and significance to the attempts to standardize the Dubray-Howell perforation and, indeed, was the stated reason for the publication of this standard initially in April 1949.

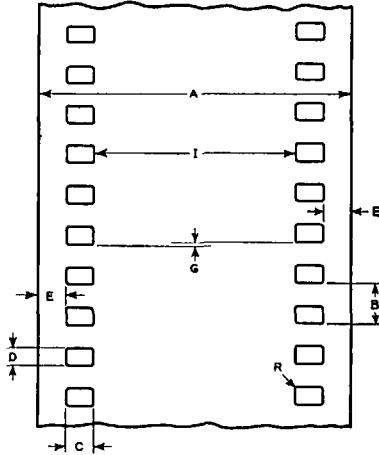
In December 1949 Ansco proposed another type of perforation which they believed might be superior to the Dubray-Howell. This is essentially the negative perforation but with fillets in the previously sharp corners to provide additional strength. The Film Dimensions Committee agreed to wait six to eight months while Ansco conducted their tests and to then review all the experimental evidence. This was done at a subsequent meeting in October 1950. The comparison of the Dubray-Howell and "modified negative" showed little difference as to camera steadiness but definite superiority with the latter in printing. The tests on projection life were not complete but in all cases the modified negative was never worse than the Dubray-Howell. (For a more complete history on the Ansco proposal see the W. G. Hill paper in the August 1951 *Journal*, p. 108.)

The Film Dimensions Committee recommends preliminary publication of the Dubray-Howell proposal at this time, under the belief that: (1) it is not advisable to delay action until final proof is at hand as to the best type of perforation, and (2) the present wide use of the Dubray-Howell perforation means that it is probably here to stay for some time. The proposal is labelled "an alternate standard" in view of the continued usefulness of the present standards and the possibility of a fourth standard becoming the ultimate universal single standard.

Proposed American Standard  
Cutting and Perforating Dimensions for  
35-Mm Motion Picture Film - Alternate Standards  
for Either Positive or Negative Raw Stock

PH 22.1

P. 1 of 2 pp.



Dimensions	Inches	Millimeters
A	1.377 ± 0.001	34.980 ± 0.025
B	0.1870 ± 0.0005	4.750 ± 0.013
C	0.1100 ± 0.0004	2.794 ± 0.01
D	0.0730 ± 0.0004	1.85 ± 0.01
E	0.079 ± 0.002	2.01 ± 0.05
G	Not > 0.001	Not > 0.025
I	0.999 ± 0.002	25.37 ± 0.05
L*	18.700 ± 0.015	474.98 ± 0.38
R	0.013 ± 0.001	0.330 ± 0.025

These dimensions and tolerances apply to the material immediately after cutting and perforating.

\* This dimension represents the length of any 100 consecutive perforation intervals.

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PH 22.1

P. 2 of 2 pp.

### Appendix

The dimensions given in this standard represent the practice of film manufacturers in that the dimensions and tolerances are for film immediately after perforation. The punches and dies themselves are made to tolerances considerably smaller than those given, but owing to the fact that film is a plastic material, the dimensions of the slit and perforated film never agree exactly with the dimensions of the punches and dies. Shrinkage of the film, due to change in moisture content or loss of residual solvents, invariably results in a change in these dimensions during the life of the film. This change is generally uniform throughout the roll.

The uniformity of perforation is one of the most important of the variables affecting steadiness of projection.

Variations in pitch from roll to roll are of little significance compared to variations from one sprocket hole to the next. Actually, it is the maximum variation

from one sprocket hole to the next within any small group that is important.

Perforations of this size and shape were first described in the *Journal of the SMPE* in 1932 by Dubray and Howell. In 1937, a subcommittee report reviewed the work to date. The main interest in the perforation at that time was in its use as a universal perforation for both positive and negative film. The perforation has been adopted as a standard at this time largely because it has a projection life comparable to that of the perforation used for ordinary cine positive film (Z22.36-1947), and the same over-all dimensions as the perforations used in the negative film (Z22.34-1949). It should be particularly noted that although the present standard has the same over-all dimensions as the older cine negative perforation, positioning pins or sprocket teeth made to fit this perforation exactly will injure the corners of the cine negative perforation.

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