the film strips would on an average last for 1,000 successive pulldowns. The duration of the pulldown stroke was 0.5 msec.

The experimental work done with the air pulldown indicates that it may find a place in the design of future motion-picture apparatus. A greater force may be applied to the film with relative ease by air pressure to effect a shorter time of pulldown or to increase the length of pulldown stroke. Air pressure maintained in the upper or lower loop can conveniently be used to keep the film under tension in the gate and held against a registering pin so that the pressure plate friction can be reduced or eliminated altogether, and a high degree of vertical steadiness results. The experimental operation of the cabinet projector described above gives evidence that the air pulldown would be desirable in automatic or pushbutton-operated projector systems because it is easier on the film, and loss of loop, if it occurs, is only momentary and rarely results in damage to the film. Although other possible applications have not as yet been worked out in detail, there would seem to be many places in which the air pulldown might be a satisfactory element of design.

American Standards

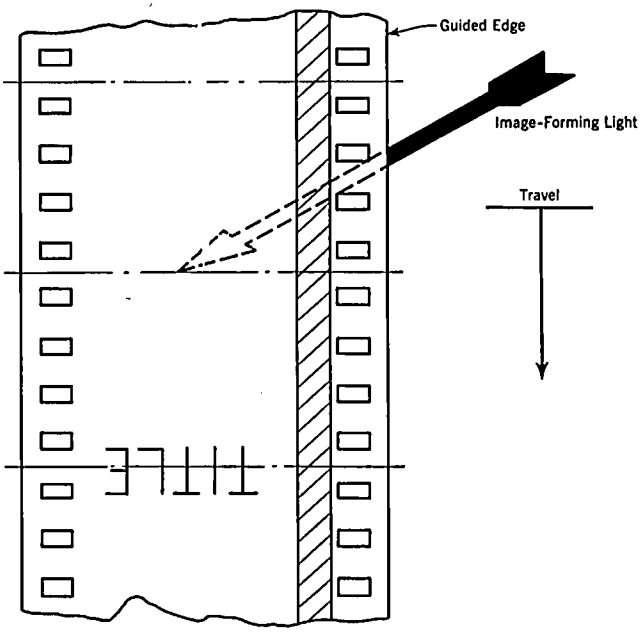
PH22.2, -.3, -.17, -.36, -.94 — 1954

Five American Standards approved by the American Standards Association on April 5 1954, are published on the following pages. The first four are revisions of previous standards, while the last one is new. These five standards were published previously for trial and comment and the background information on their development and processing will be found in the May 1953 *Journal* for PH22.2 and -.3 in the June 1953 *Journal* for -.17 and -.36, and September 1953 *Journal* for -.94 — *Henry Kogel*

American Standard

35mm Sound Motion-Picture Film Usage in Camera

ASA
Reg. U.S. Pat. Office
PH22.2-1954
Revision of Z22.2-1946
*UDC 778.5



Drawing shows film as seen from inside the camera looking toward the camera lens.

1. Position of the Emulsion

1.1 Except for special processes, the emulsion shall be toward the camera lens.

2. Rate of Exposure

2.1 The rate of exposure shall be 24 frames per second.

3. Relationship Between Sound and Picture

3.1 The apparatus and film shall be so arranged that the sound is placed on the film 20 frames, ± ½ frame, ahead of the horizontal centerline through the corresponding picture. Thus, a given point on the film shall pass the soundhead after it has passed the picture aperture.

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Sponsor: Society of Motion Picture and Television Engineers

*Universal Decimal Classification

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ASA½M554

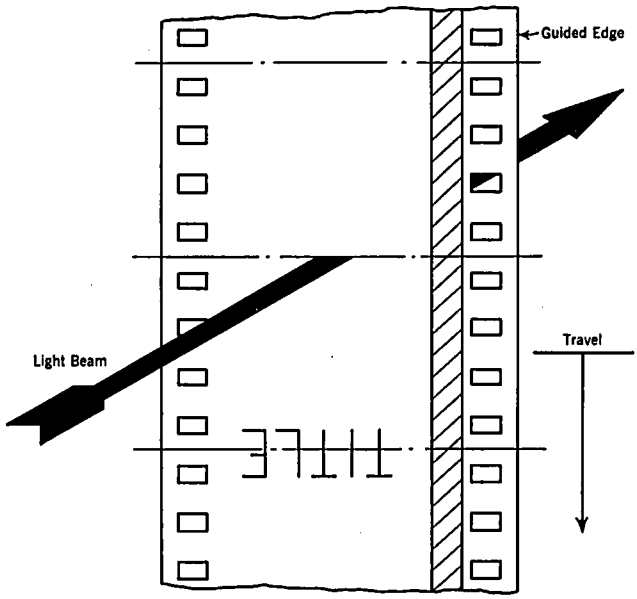
Price, 25 Cents

American Standard

35mm Sound Motion-Picture Film Usage in Projector

ASA
Reg. U.S. Pat. Office
PH22.3-1954
Revision of Z22.3-1946

*UDC 778.5



Drawing shows film as seen from the light source in the projector.

1. Position of the Emulsion

1.1 Except for special processes, the emulsion shall be toward the light source of the projector.

2. Rate of Projection

2.1 The rate of projection shall be 24 frames per second.

3. Relationship Between Sound and Picture

3.1 The apparatus and the film shall be so arranged that when the film is threaded normally, the soundtrack is scanned for reproduction at a point 20 frames, ± ½ frame, ahead of the centerline through the picture being projected. Thus, a given point on the film shall pass the soundhead after it has passed the picture aperture.

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*Universal Decimal Classification

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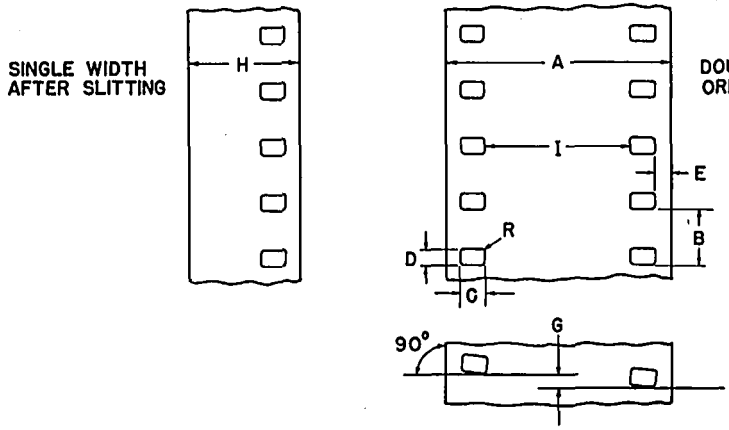
Price, 25 Cents

American Standard

Dimensions for 8mm Motion-Picture Film

ASA
Reg. U.S. Pat. Office
PH22.17-1954
Revision of 222.17-1947

*UDC 778.5:771.5



Dimensions	Inches	Millimeters
*A	0.629 ± 0.001	15.98 ± 0.03
†B	0.150 ± 0.0005	3.810 ± 0.013
C	0.072 ± 0.0004	1.83 ± 0.01
D	0.050 ± 0.0004	1.27 ± 0.01
*E	0.036 ± 0.002	0.91 ± 0.05
G	Not > 0.001	Not > 0.025
H	0.314 ± 0.002	7.98 ± 0.04
I	0.413 ± 0.001	10.490 ± 0.025
‡L	15.000 ± 0.015	381.00 ± 0.38
R	0.010	0.25

These dimensions apply to negative and positive raw stock immediately after cutting and perforating.

* For low-shrink film as defined in Appendix 2, A shall be 0.628 ± 0.001 and E shall be 0.0355 ± 0.0020.

† In any group of four consecutive perforations, the maximum difference of pitch shall not exceed 0.001 inch and should be as much smaller as possible.

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

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Sponsor: Society of Motion Picture and Television Engineers

*Universal Decimal Classification

Printed in U.S.A.
ASA1/2M55 1

Price, 25 Cents

(These Appendixes are not a part of the foregoing Standard.)

Appendix 1. Uniformity of Perforations

The dimensions given in this standard represent the practice of film manufacturers in that the dimensions 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. This is one of the reasons for the method of specifying uniformity in dimension B.

Appendix 2. Shrinkage Characteristics

In the early days of 16mm film the safety base used for this film had the characteristic of shrinking very rapidly to a certain fairly definite amount and then not shrinking much more. Although this film tended to swell at high humidities, nevertheless the shrinkage that occurred in the package before the user received the film was always at least as great as any swell that might occur due to high humidities at the time of use. This meant that the user never encountered film, even at high humidities, that had greater width than that specified in the standards. This meant that camera and projector manufacturers seldom ran into trouble so long as their film gates would readily pass film at the upper limit of the slitting tolerances, namely 0.630 inch.

Within the past few years, however, a safety base with lower shrinkage characteristics began to be used. Although this film was less susceptible than the previous film to swelling at high humidities, nevertheless the shrinkage characteristics were low enough so that this shrinkage did not always compensate for the swell at high humidities. For this reason film slit at the mid point of the tolerance for width, namely 0.629 inch, would occasionally swell at high humidities to such an extent that it would bind in film gates designed to pass film with the width of 0.630 inch. The manufacturers, therefore, were compelled to slit at the lower edge of the tolerance permitted by the American Standard. Variations in their slitting width, however, sometimes produced film slit below the limits of the standard.

For this reason an alternate standard has been adopted for this low-shrink film in order that the manufacturers may slit within the standard and still produce film which does not exceed 0.630 inch even at high humidities.

For the purpose of this specification, low-shrink film base is film base which, when coated with emulsion and any other normal coating treatment, perforated, kept in the manufacturer's sealed container for 6 months, exposed, processed, and stored exposed to air not to exceed 30 days at 65 F to 75 F and 50 to 60% relative humidity and measured under like conditions of temperature and humidity, shall have shrunk not more than 0.2% from its original dimension at the time of perforating.

This definition of low-shrink film is to be used as a guide to film manufacturers, and departure therefrom shall not be cause for rejection of the film.

PH22.17-1954

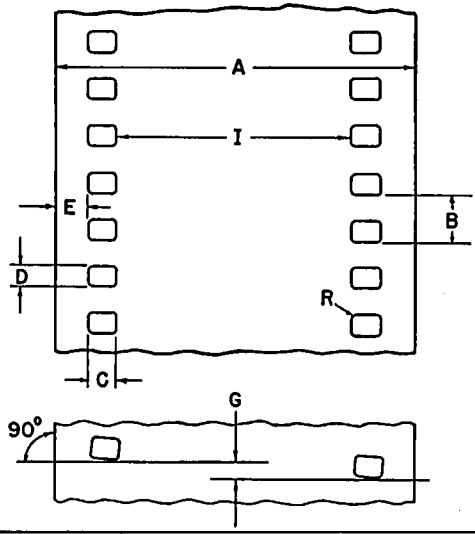
American Standard

Dimensions for 35mm Motion-Picture Positive Raw Stock

ASA
Reg. U.S. Pat. Office

PH22.36-1954
Revision of Z22.36-1947

*UDC 778.5:771.5



Dimensions	Inches	Millimeters
A	1.377 ± 0.001	34.98 ± 0.03
B	0.1870 ± 0.0005	4.750 ± 0.013
C	0.1100 ± 0.0004	2.794 ± 0.01
D	0.0780 ± 0.0004	1.98 ± 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	18.70 ± 0.015	474.98 ± 0.38
R	0.020	0.51

These dimensions apply to the film immediately after cutting and perforating. This film is used for motion-picture prints and sound recording.

* Method of indicating G is the main change from Z22.36–1947.

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

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ASA½M551

Price, 25 Cents

Appendix

(This Appendix is not a part of the foregoing Standard.)

The dimensions given in this standard represent the practice of film manufacturers in that the dimensions 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 film.

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.

American Standard

Slides and Opaques for Television Film Camera Chains

ASA
Reg. U.S. Pat. Office
PH22.94-1954
Supplement to Z38.7.19-1950
*UDC 778.5

1. Scope

1.1 This standard is intended to supplement American Standard Dimensions for Lantern Slides, Z38.7.19–1950, not replace it. The television system imposes special requirements that did not enter into the preparation of Z38.7.19–1950.

1.2 The standard applies only to slides and opaques intended for transmission in the standard fashion via a film camera chain. For other applications, such as background projection, the usual television requirements may not apply.

2. Standard Dimensions

2.1 Nominal Size. Only the four nominal sizes listed in column 1 of the table shall be considered standard for use in television film camera chains.

2.2 Overall Dimensions. The overall dimensions for any nominal size shall comply with the dimensions tabulated in column 2. (See Note 1.)

2.3 Dimensions of Transmitted Picture. The portion of the slide or opaque intended for transmission shall lie within a centrally located rectangle having the dimensions shown in column 3. (See Note 2.)

2.4 Dimensions of Picture Background. The background (or the pictorial material) of the slide or opaque shall extend without interruption over a centrally located rectangle having the dimensions shown in column 4. (See Note 3.)

2.5 Centering Tolerance. The center of the transmitted picture rectangle and the center of the background rectangle shall both lie within a circle having as its center the center of the slide and as its radius the dimension tabulated in column 5.

Note 1. The overall dimensions are in accord with American Standard Dimensions for Lantern Slides, Z38.7.19–1950, insofar as it is relevant. The thickness of opaques is not covered by Z38.7.19–1950. This quantity is here specified as 1/32 inch on the assumption that opaques will consist of double-weight photographic paper without additional support or backing.

Note 2. The dimensions shown for the transmitted picture are those which will be scanned by a perfectly adjusted film camera chain. To allow for some misadjustment of the film camera chain and an additional misadjustment in the home receiver, it is recommended that all essential information be contained in a centrally located area appreciably smaller than that specified in column 3.

Note 3. In the case of slides, the background rectangle should be defined by an opaque mask to limit the stray light entering the film camera chain. The dimensions specified in column 4 permit the use of masks which comply with Z38.7.19–1950. For opaques, masking is generally provided by the projection equipment.

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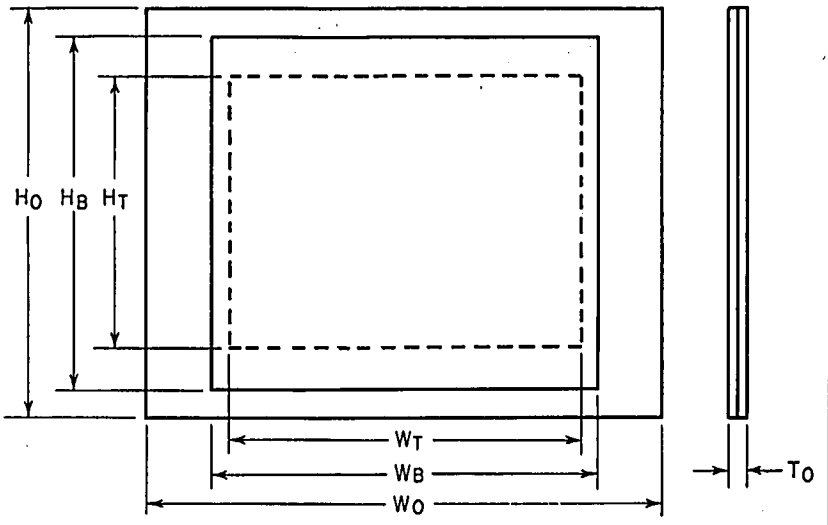

(1) Nominal	(2) Overall			(3) Transmitted Picture		(4) Picture Background		(5) Centering Tolerance
	H_O	W_O	T_O max.	H_T max.	W_T max.	H_B min.	W_B min.	
2 × 2 slide (double 35)	$2\ ^{+0}_{-1/32}$	$2\ ^{+0}_{-1/32}$	1/8	27/32	1 1/8	29/32	1 11/32	1/64
3¼ × 4 slide	$3\frac{1}{4}\ ^{+1/64}_{-1/32}$	$4\ ^{+1/64}_{-1/32}$	5/32	2 1/16	2¾	2¾	3	3/64
3¼ × 4 opaque	$3\frac{1}{4}\ ^{+1/64}_{-1/32}$	$4\ ^{+1/64}_{-1/32}$	1/32	2 1/16	2¾	2¾	3	3/64
4 × 5 opaque	$4 \pm 1/32$	$5 \pm 1/32$	1/32	3	4	3 3/16	4¼	1/16

All dimensions are in inches

PH22.94-1954