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1. Scope

1.1 This standard is applicable to sprockets used in conjunction with 35mm motion-picture film perforated in accordance with either American Standard Dimensions for 35mm Motion-Picture Film, Alternate Standards for Either Positive or Negative Raw Stock, PH22.1-1953, or Dimensions for 35mm Motion-Picture Positive Raw Stock, PH22.36-1954, or the latest revisions thereof approved by the American Standards Association, Incorporated.

1.2 This standard is limited to sprockets employed in the picture projection mechanism.

2. Definitions

2.1 **Feed Sprocket.**—A feed sprocket is a sprocket which pulls the film against tension. It originally applied to the upper sprocket in the projector.

2.2 **Hold-Back Sprocket.**—A hold-back sprocket is a sprocket which holds back the film against tension. It originally applied to the lower sprocket in the projector.

3. Dimensions

3.1 The sprocket dimensions shall be as given in the diagram and table provided.

	Feed Sprocket		Intermittent Sprocket		Hold-Back Sprocket	
	Inches	Millimeters	Inches	Millimeters	Inches	Millimeters
A	1.097±0.001	27.86±0.03	1.097±0.001	27.86±0.03	1.097±0.001	27.86±0.03
B	+0.003 -0.002	1.40±0.05	+0.003 -0.002	1.40±0.05	+0.003 -0.002	1.40±0.05
C	+0.000 -0.002	1.40±0.05	+0.000 -0.002	1.40±0.05	+0.000 -0.002	1.40±0.05
D	+0.000 -0.002	1.40±0.05	+0.000 -0.002	1.40±0.05	+0.000 -0.002	1.40±0.05
E	22 degrees 30 min ± 1.5 min (22 degrees 30 min ± 0.75 min; 22 degrees 30 min ± 1.5 min)					
Suggested Dimensions						
r	0.077	1.96	0.077	1.96	0.077	1.96
s	0.064	0.10	0.064	0.10	0.064	0.10
t	0.925	23.75	0.925	23.75	0.922	23.42
u	0.139	3.53	0.139	3.53	0.139	3.53
v	0.040	1.02	0.040	1.02	0.040	1.02
w	1.045	26.54	1.045	26.54	1.032	26.21

† This dimension varies in commercial practice from 0.935 in. to 0.950 in. for the feed and intermittent sprockets. Manufacturers have discovered that this dimension may appreciably affect the projector noise level. The choice of an optimum value is somewhat empirical in nature and appears to be influenced by tooth design, the degree of film wrap and the amount of film tension. When film life is of the greatest importance, dimension 0.950 in. should be chosen. For hold-back sprockets, this dimension varies in commercial practice from 0.932 in. to 0.940 in. Good practice requires that the pitch of a hold-back sprocket be less than the pitch of the film.

‡ The accumulated error between any 2 teeth shall not exceed 4 min.

Page 1 of 2 Pages

1. Scope

1.1 This standard specifies for 8mm motion-picture projectors the image to be projected and the relative positions of the aperture producing this image, the edge guide and the film registration device.

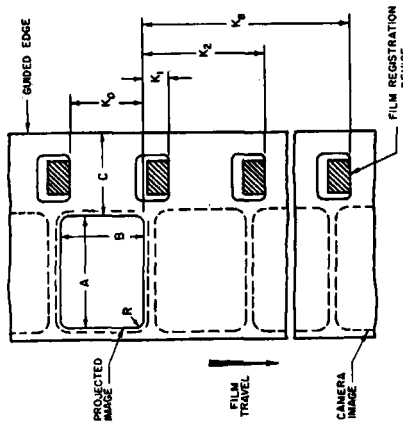
1.2 The notes are a part of this standard.

2. Dimensions

2.1 The dimensions shall be as specified in the diagram and table.

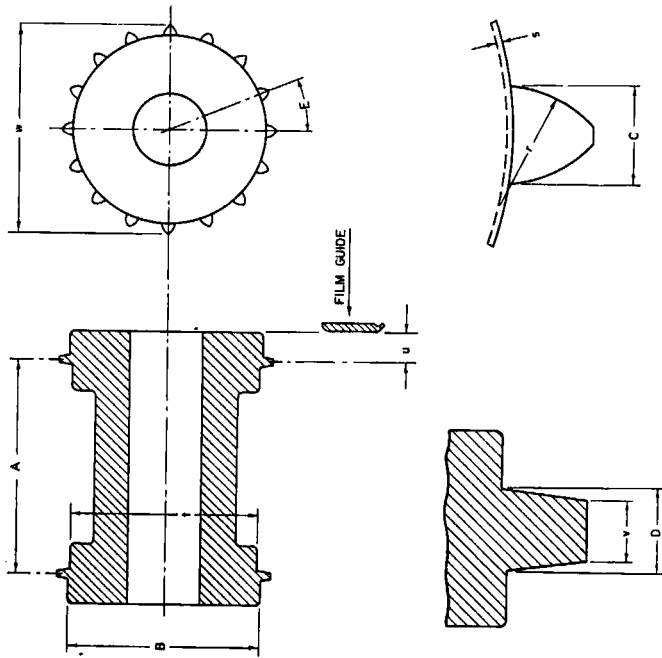
2.2 The angle between the vertical edges of the image and the edges of normally positioned film shall be $0^\circ \pm 1/2^\circ$.

2.3 The angle between the horizontal edges of the image and the edges of normally positioned film shall be $90^\circ \pm 1/2^\circ$.



DRAWING SHOWS ARRANGEMENT AS SEEN FROM INSIDE PROJECTOR LAMP-HOUSE LOOKING TOWARD THE LENS

Dimensions	Inches	Millimeters
A	0.172 ± 0.001	4.37 ± 0.03
B	0.129 ± 0.001	3.28 ± 0.03
C	0.119 ± 0.002	3.02 ± 0.05
K ₀	0.114 ± 0.005	2.90 ± 0.13
K ₁	0.035 ± 0.005	0.89 ± 0.13
K ₂	0.184 ± 0.005	4.67 ± 0.13
K ₃	0.333 ± 0.005	8.46 ± 0.13
K ₄	0.482 ± 0.005	12.24 ± 0.13
K ₅	0.631 ± 0.005	16.03 ± 0.13
K ₆	0.780 ± 0.005	19.81 ± 0.13
K ₇	0.929 ± 0.005	23.59 ± 0.13
K ₈	1.078 ± 0.005	27.38 ± 0.13
R	0.010 max	0.25 max



NOTE: When a sprocket is acting as an idler the value of dimension B depends on the particular design of the projector. The range for this dimension in commercial practice is 0.937 in. to 0.950 in.

NOTES

1. Dimensions A, B and R apply to the portion of the image on the film that is to be projected; the actual opening in the aperture plate has to be slightly smaller. The exact amount of this difference depends on the lens used and on the separation of the emulsion and the physical aperture. To minimize the difference in size and make the image of the aperture as sharp as practicable on the screen, this separation should be no larger than is necessary to preclude scratching of the film. When the reduction in size from the image to the actual aperture is being computed, it is suggested a 1-in. $f/1.6$ lens be assumed unless there is reason for doing otherwise.
2. The limiting aperture is usually between the film and the light source so that it will give the maximum protection from heat. If other factors are more important, it may be on the other side of the film.
3. In 8mm projectors the edge guide should bear on the edge of the film adjacent to the perforations. The other edge of the film usually is slit after processing and so is more likely to weave laterally with respect to the pictures. The value of dimension C has been chosen so that film having a slight shrinkage when it is projected will be properly centered. This is the normal condition.
4. The K dimensions are measured along the path of the film from the bottom of the image area formed on the film by the aperture to the stopping position of the registration device. It is customary to provide a framing movement of approximately 0.025 in. above and below this nominal position. For any given projector, use the value of K corresponding to the location of the registration device. If the film does not stop exactly where the film registration device leaves it, because of coating or some other cause, a slight adjustment of the value of K will be necessary.

Four American Standards

Published here are American Standards PH22.8-, PH22.20-, PH22.35- and PH22.41-1957 which were approved by the American Standards Association on June 26, 1957.

PH22.8, Projected Image Area of 16-mm Motion-Picture Film, and PH22.20, Projected Image Area of 8mm Motion-Picture Film, are revisions of the 1950 standards Z22.8 and Z22.20. Subsequent to their trial publication in the May 1956 *Journal*, a modification of both standards was proposed and approved and is incorporated in these final versions. This change involved the deletion of the side view in the diagram indicating the D value as a relationship of the film to the aperture plate. Inasmuch as D is a dimensionless value, a note is included in the standard which states that "This separation should be no larger than is necessary to preclude scratching of the film."

PH22.41, a revision of Z22.41-1946, also had its trial publication in the May 1956 *Journal*. The final version remains the same as that published for trial and comment.

PH22.35, a revision of Z22.35-1947, had its trial publication in the September 1955 *Journal*, and has been adopted as an American Standard without change since the trial publication.—*J. Howard Schumacher*, Staff Engineer.

American Standard

Photographic Sound Record on 16mm Prints

ASA
Ref. U.S. Pat. Off.
PH22.41-1957
Revision of Z22.41.1946
*UDC 778.554.4

Approved June 26, 1957 by the American Standards Association, Incorporated
Sponsor: Society of Motion Picture and Television Engineers

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70 East Ferryville Street, New York 17, N. Y.

Printed in U.S.A.
ASA 1957

* Universal Decimal Classification

Price, 25 Cents

1. Scope

1.1 This standard specifies the location and dimensions of variable-area and variable-density sound records for the photographic printing of sound on 16mm motion-picture film perforated along one edge. Also specified is the area scanned in the sound reproducer.

1.2 The notes are a part of this standard.

2. Dimensions

2.1 The dimensions and location of the sound record shall be as specified in the diagram and table.

2.2 The sound record as printed on the film shall be displaced from the center of the corresponding picture by a distance of 26 frames $\pm 1/2$ frame in the direction of film travel during normal projection.

Dimensions	Inches	Millimeters
A	0.018 max	0.46 max
B	0.110 max	2.79 max
	0.098 min	2.49 min
C	0.060 \pm 0.006	1.52 \pm 0.15
	— 0.001	— 0.03
D	0.058 \pm 0.002	1.47 \pm 0.05
E	0.080 \pm 0.001	2.03 \pm 0.03
F	0.058 \pm 0.001	1.47 \pm 0.03
	0.072 max	1.83 max
G	0.070 min	1.78 min

NOTES

1. Where the original sound record has been reduced, up to the picture on one side and up to the film edge on the other, it may be impossible to obtain the black septum on either side of the record area. The presence of a clear septum between the sound and picture areas which does not encroach on the minimum tolerances of the printed area shall not be a basis for the rejection of prints. Shaded septum areas are intended to include all unused areas on both sides of the sound record, up to the picture on one side and up to the film edge on the other.

2. Dimension C is based on present-day equipment design. It is recommended that all future equipment be designed for a record width of 0.060 ± 0.001 in. and that existing equipment be modified to produce prints having dimension C as close as practicable to 0.060 ± 0.001 in.

American Standard

Projected Image Area of 16mm Motion-Picture Film

ASA
Ref. U.S. Pat. Off.
PH22.8-1957
Revision of Z22.8.1950
*UDC 778.55

Approved June 26, 1957 by the American Standards Association, Incorporated
Sponsor: Society of Motion Picture and Television Engineers

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Printed in U.S.A.
ASA 1957

* Universal Decimal Classification

Price, 25 Cents

1. Scope

1.1 This standard specifies for 16mm motion-picture projectors, employing 16mm film perforated along either one or both edges, the image to be projected and the relative positions of the aperture producing this image, the edge guide and the film registration device.

1.2 The diagram illustrates film with perforations along both edges. When single-perforated film is used, the perforations appear only on that edge of the film that bears against the fixed guides.

1.3 The notes are a part of this standard

2. Dimensions

2.1 The dimensions shall be as specified in the diagram and table.

2.2 The angle between the vertical edges of the image and the edges of normally positioned film shall be $0^\circ \pm 1/2^\circ$.

2.3 The angle between the horizontal edges of the image and the edges of normally positioned film shall be $90^\circ \pm 1/2^\circ$.

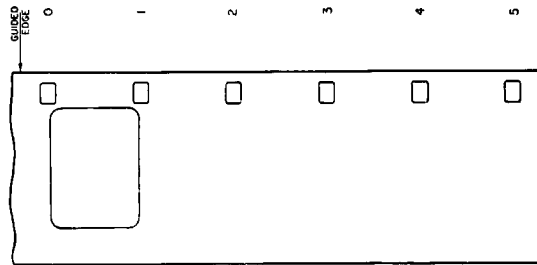
Dimensions	Inches	Millimeters
A	0.380 \pm 0.002	9.65 \pm 0.05
B	0.284 \pm 0.002	7.21 \pm 0.05
C	0.124 \pm 0.002	3.15 \pm 0.05
K ₀	0.266 \pm 0.005	6.76 \pm 0.13
K ₁	0.032 \pm 0.005	0.81 \pm 0.13
K ₂	0.330 \pm 0.005	8.38 \pm 0.13
K ₃	0.628 \pm 0.005	15.95 \pm 0.13
K ₄	0.926 \pm 0.005	23.52 \pm 0.13
K ₅	1.224 \pm 0.005	31.09 \pm 0.13
R	0.020 max	0.51 max

NOTES

1. Dimensions A, B and R apply to the portion of the image on the film that is to be projected; the actual opening in the aperture plate has to be slightly smaller. The exact amount of this difference depends on the lens used and on the separation of the emulsion and the physical aperture. To minimize the difference in size and make the image of the aperture as sharp as practicable on the screen, this separation should be no larger than is necessary to preclude scratching of the film. When the reduction in size from the image to the actual aperture is being computed, it is suggested a 2-in $f/1.6$ lens be assumed unless there is reason for doing otherwise.
 2. The limiting aperture is usually between the film and the light source so that it will give the maximum protection from heat. If other factors are more important, it may be on the other side of the film.
 3. The K dimensions are measured along the path of the film from the bottom of the image area formed on the film by the aperture to the stopping position of the registration device. It is customary to provide a framing movement of 0.025 in. above and below this nominal position. For any given projector, use the value of K corresponding to the location of the registration device.
- If the film does not stop exactly where the film registration device leaves it, because of coasting or some other cause, a slight adjustment of the value of K will be necessary.

APPENDIX

(This Appendix is not a part of the American Standard Projected Image Area of 16mm Motion-Picture Film. PH22.8-1957, but is included to facilitate its use.)



Perforation 3 in the diagram is suggested as the preferred location for vertical registration, since it is the perforation used in the numerically largest group of 16mm cameras. This location is desirable unless another position is necessary because of the requirements of special-purpose equipment or a sprocket type of pull-down mechanism.

If perforation 3 is used for vertical registration, good kinematic design points to the location of the edge guiding means at points opposite perforations 0 and

3

SMPTE Recommended Practice Approved

The proposed SMPTE Recommended Practice, Lens Mount Surface, High-Speed Motion-Picture Cameras, published in the March 1957 *Journal* for trial and comment, was approved without change by the Society's Board of Governors on July 12, 1957 at its quarterly meeting.

A copy of this Recommended Practice may be obtained without charge upon request directed to *J. Howard Schumacher*, Staff Engineer, at Society Headquarters.

SMPTE RECOMMENDED PRACTICE

Lens Mount Surface

High-Speed Motion-Picture Cameras

INTRODUCTION

This Recommended Practice originated in the Lens Mount Subcommittee of the High-Speed Photography Committee. It was approved by the High-Speed Photography and Standards Committees and was published in the March 1957 *Journal*. The recommendation received final approval by the SMPTE Board of Governors on July 12, 1957.

RECOMMENDATION

1. *Scope*
 - 1.1 This recommendation specifies for high-speed motion-picture cameras the surface for mounting lens adapters.
2. *Lens Mount Surface*
 - 2.1 High-speed motion-picture cameras shall have a machined plane surface for mounting lens adapters.
 - 2.2 Data shall be supplied with each camera locating the mechanical and optical distance from this machined surface to the plane of the film.
 - 2.3 Data shall also be supplied for locating the lens mount radially and for attaching the lens adapter.