SMPTE ST 241:2015
Revision of
ANSI/SMPTE 241-1995

SMPTE STANDARD

Motion-Picture Equipment — 35-mm and 70-mm Projection Reels

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Foreword

SMPTE (the Society of Motion Picture and Television Engineers) is an internationally-recognized standards developing organization. Headquartered and incorporated in the United States of America, SMPTE has members in over 80 countries on six continents. SMPTE's Engineering Documents, including Standards, Recommended Practices, and Engineering Guidelines, are prepared by SMPTE's Technology Committees. Participation in these Committees is open to all with a bona fide interest in their work. SMPTE cooperates closely with other standards-developing organizations, including ISO, IEC and ITU.

SMPTE Engineering Documents are drafted in accordance with the rules given in its Standards Operations Manual.

SMPTE ST 241 was prepared by Technology Committee 20F.

Intellectual Property

At the time of publication no notice had been received by SMPTE claiming patent rights essential to the implementation of this Engineering Document. However, attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. SMPTE shall not be held responsible for identifying any or all such patent rights.

1 Scope

1.1 This standard specifies the dimensions of 35-mm projection reels for motion-picture and television applications and 35-mm and 70-mm projection reels intended for use on combination 70/35-mm projectors and rewinds.

1.2 This standard does not apply to shipping reels as specified in SMPTE ST 192.

2 Conformance Notation

Normative text is text that describes elements of the design that are indispensable or contains the conformance language keywords: "shall", "should", or "may". Informative text is text that is potentially helpful to the user, but not indispensable, and can be removed, changed, or added editorially without affecting interoperability. Informative text does not contain any conformance keywords.

All text in this document is, by default, normative, except: the Introduction, any section explicitly labeled as "Informative" or individual paragraphs that start with "Note:"

The keywords "shall" and "shall not" indicate requirements strictly to be followed in order to conform to the document and from which no deviation is permitted.

The keywords, "should" and "should not" indicate that, among several possibilities, one is recommended as particularly suitable, without mentioning or excluding others; or that a certain course of action is preferred but not necessarily required; or that (in the negative form) a certain possibility or course of action is deprecated but not prohibited.

The keywords "may" and "need not" indicate courses of action permissible within the limits of the document.

The keyword “reserved” indicates a provision that is not defined at this time, shall not be used, and may be defined in the future. The keyword “forbidden” indicates “reserved” and in addition indicates that the provision will never be defined in the future.

A conformant implementation according to this document is one that includes all mandatory provisions ("shall") and, if implemented, all recommended provisions ("should") as described. A conformant implementation need not implement optional provisions ("may") and need not implement them as described.

Unless otherwise specified, the order of precedence of the types of normative information in this document shall be as follows: Normative prose shall be the authoritative definition; Tables shall be next; followed by formal languages; then figures; and then any other language forms.

3 Applicatiions

3.1 For conventional application, the 2000-ft (610-m) capacity reel shall be preferred, except in applications where the practice is to combine reels.

3.2 For television application, the 3000-ft (914-m) capacity reel shall be preferred.

3.3 The 1000-ft (305-m) capacity reel is in general use for laboratory and television applications. It should not be used in theatrical projection because the tension on the 2-in (50.8-mm) core may be excessive.

4 Dimensions

4.1 The dimensions of the reels shall be as given in the figures and table.

4.2 Dimension F defines the area over which the reel thickness, specified by dimension C_2, applies.

4.3 Dimension M in Figure 2 indicates a clearance for the driving pin in the reel hub.

4.4 Figure 4 illustrates an optional spindle hole for reel capacities of 3000 ft and less, but mandatory for large-capacity, 70-mm, and 35-mm combination reels. The four driving holes are intended for use on spindles whose diameter is 0.500 in + 0.000 in -- 0.005 in (12.70 mm + 0.00 mm -- 0.13 mm) and driven by a pin of 0.250-in (6.35-mm) nominal diameter, engaging in one of the driving holes.

4.5 Figure 5 illustrates the standard spindle hole for use with 5⁄16-in spindles. This hole is preferred for reel capacities of 3000 ft and less. The vertical measurement E, Figure 5, shall be measured from the apex of the top of the round hole.

4.6 The centerlines indicated for all figures are coincident.

4.7 Dimension N in Figures 1 – 3 is the flange thickness, which can vary. See Annex A.5 for guidance.

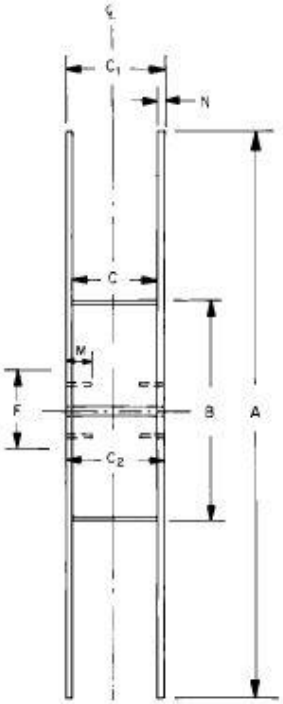

Figure 1 – 35-mm reel

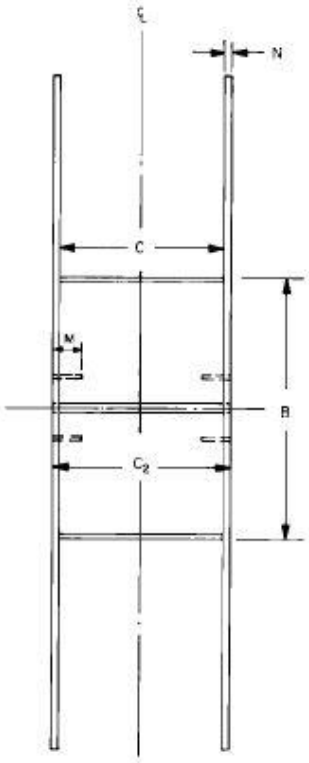

Figure 2 – 70-mm reel

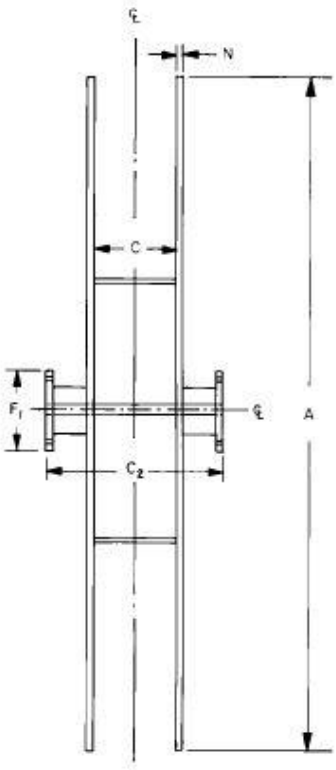

Figure 3 – 35-mm reel for combination projectors

Figure 4 – Enlargement of spindle and driving hole

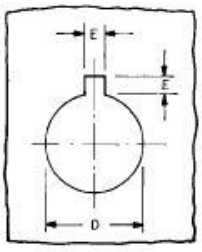

Figure 5 – Enlarged view of hole in both flanges

Optional system (see Section 4.4)

Preferred system (see Section 4.5)

Table 1 – Specifications

Dimensions		Inches		Millimeters	
A	(1000 ft, 305 m)	9.90	+ 0.00 – 0.02	251.5	+ 0.0 – 5.1
A	(2000 ft, 610 m)	15.00	+ 0.00 – 0.05	381.0	+ 0.0 – 1.3
A	(3000 ft, 914 m)	16.90	+ 0.00 – 0.05	429.3	+ 0.0 – 1.3
A	(4000 ft, 1219 m)	21.75	± 0.03	552.4	± 0.8
A	(4300 ft, 1300 m)	21.00	± 0.06	533.4	± 1.5
A	(5600 ft, 1700 m)	23.70	± 0.06	602.0	± 1.5
A	(5800 ft, 1775 m)	24.50	± 0.06	622.3	± 1.5
B	(1000 ft)	1.95	± 0.10	49.5	± 2.5
B	(2000 ft)	5.00	± 0.10	127.0	± 2.5
B	(3000 ft)	5.00	± 0.10	127.0	± 2.5
B	(4000 ft)	8.00	± 0.03	203.2	± 0.8
B	(4300 ft)	7.00	± 0.03	177.8	± 0.8
B	(5600 ft)	8.00	± 0.03	203.2	± 0.8
B	(5800 ft)	8.00	± 0.03	203.2	± 0.8
C	(35-mm)	1.530	+ 0.075 – 0.030	38.86	+ 1.90 – 0.76
C	(70-mm)	2.87	± 0.03	72.9	± 0.8
C	(35-mm combination)	1.530	+ 0.00 – 0.03	38.86	+ 0.0 – 0.8
C_1	(35-mm)	1.885	+ 0.075 – 0.030	47.88	+ 1.90 – 0.76
C_2	(35-mm up to 3000 ft)	1.625	+ 0.075 – 0.030	41.28	+ 1.90 – 0.76
C_2	(35-mm above 4000 ft)	1.625	+ 0.175 – 0.030	41.28	+ 4.44 – 0.76
C_2	(70mm and 35-mm combination)	3.41	± 0.03	86.6	± 0.8
D		0.317	+ 0.002 – 0.000	8.05	+ 0.05 – 0.00
E		0.150	± 0.010	3.81	± 0.25
F		2.25	min	57.2	min
F_1		2.50	min	63.5	min
G		0.265	± 0.002	6.73	± 0.05
H		0.782	nom	19.86	nom
J		0.375	nom	9.52	nom
K	(diameter)	0.505	+ 0.003 – 0.000	12.83	+ 0.08 – 0.00
L	(threading slot, 35-mm)	0.035	nom	0.89	nom
L	(threading slot, 70-mm and 35-mm combination)	0.060	nom	1.52	nom
M		0.75	min	19.0	min

Annex A Additional Data (Informative)

A.1 Specifications for the reels are based on good engineering design of film-winding equipment and on minimum tension variation between hub and rim. Film tension in a projector feed and take-up mechanism should be kept low to avoid perforation damage. In order to maintain low tension where a constant-torque clutch device is used, it is necessary to keep the quotient B/A (hub diameter B divided by flange diameter A) as large as possible. In this standard, the quotient is 0.333, which maintains the initial film tension to final film tension within the 3:1 ratio. Complete interchangeability may require some adjustment in the take-up and hold-back tensions of the projector, maintaining the lowest film tension possible and still wind a full reel.

A.2 In designing reels of the size and weight described in this standard, it is the practice to chamfer the spindle hole to facilitate placing the reel on the spindle. The degree of chamfer should be in accordance with good engineering practice, and should not reduce the bearing surface of the spindle hole on the spindle to the point of endangering reel stability.

A.3 Although this standard does not preclude reels of other diameters or design, the rim-to-hub ratio referred to in Annex A.1 remains a factor of consideration for any projector with an uncompensated constant-torque clutch in the feed or take-up mechanism.

A.4 To minimize perforation damage, projector operators using large-capacity reels are cautioned against allowing film slack to accumulate. Film wound too loosely may slip on itself causing scratches and cinch marks.

A.5 For 70 mm, the newer sheet aluminum reels are not as wide as the older cast aluminum reels. Therefore spacers on the projector shafts should be used when using the newer sheet aluminum reels, one inside each reel and one outside each reel. Washers are recommended, with an inner diameter of 0.5 inches, an outer diameter of 1.25 inches, and a thickness of 0.185 inches.

Annex B Bibliography (Informative)

Note: All references in this document to other SMPTE documents use the current numbering style (e.g. SMPTE ST 192:1991) although, during a transitional phase, the document as published (printed or PDF) may bear an older designation (such as ANSI/SMPTE 192-1991). Documents with the same root number (e.g. 192) and publication year (e.g. 1991) are functionally identical.

SMPTE ST 192:1991, Motion-Picture Equipment (35-mm) ---- Shipping Reels for Prints