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# SMPTE RECOMMENDED PRACTICE

**RP 74-1992**
Revision of RP 74-1977

# 16-mm Sprocket Design



## 1 Scope

This practice provides dimensions and specifications for the design of sprockets used with 16-mm motion-picture raw stock or processed film.

## 2 Dimensions and specifications

**2.1** The teeth shall be equally spaced at an index angle of 360/N° where N is the number of teeth. A suitable tolerance for the index angle is ± 1 minute of arc for sprockets having 8 to 17 teeth, ± 30 seconds of arc for sprockets having 18 to 34 teeth, and ± 20 seconds of arc for sprockets having 35 to 64 teeth.

**2.2** The root diameter is computed from the equation:

$$D = N \times \frac{P}{\pi} - T$$

where N is the number of teeth, P is the sprocket pitch, and T is the film thickness. The different root diameters in tables 1a and 1b were derived using a value for T of 0.15 mm (0.006 in). If optimum working conditions are desired with film materials of different thickness, the root diameter values in tables 1a and 1b should be recomputed.

**2.3** Figure 1 shows that either the entering or leaving film path may fall within the limits specified by radii $R_1$ and $R_2$. If the film path is convex with respect to the sprocket surface (curvature away from the sprocket surface), a minimum value of 4.762 mm (0.1875 in) for $R_1$ is recommended. This is an arbitrary choice, but seems appropriate for 16-mm equipment.

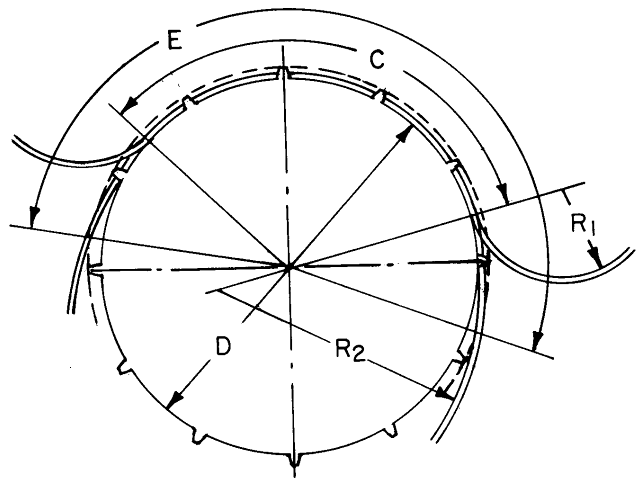


**Figure 1 – Sprocket**

The shape of the film path as the film leaves the root of the sprocket is determined by film stiffness, curl, set, and tension as well as by the shape and location of rollers or guides.

For the specified tooth shape, the film will be allowed to back-slip over the root circle a maximum distance of 0.066 mm (0.0026 in) for each tooth, measured at the pitch line (film thickness assumed to be 0.15 mm [0.006 in]), by the time the contact point between film and tooth has reached the assumed maximum working height of 0.66 mm (0.026 in), measured radially from the root circle.

**2.4** The drive sprocket is most sensitive to tooth shape because the tooth action may take place over the entire working height and is, therefore, used to derive the desired shape. For the usual drive sprocket, the pitch is greater than the film pitch which causes the film to slip backward in


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relation to the sprocket travel. The direction of the friction force between the film and the root surface is such as to assist the feed or driving action.

**2.4.1** Of the total 0.066-mm (0.0026-in) accommodation provided at each tooth for film slippage, approximately 0.013 mm (0.0005 in) is allocated to the combined tolerance of perforation pitch and sprocket tooth pitch (shorter-than-average perforation pitch combined with longer-than-average tooth pitch). An additional 0.010 mm (0.0004 in) is allocated for distortion of the perforation edge under light load (less than 0.56 N [2 oz-force] between the perforation edge and the tooth for acetate film of 0.15 mm [0.006 in] thickness). The remaining 0.043 mm (0.0017 mm) approximates 0.6% film shrinkage. It should be noted that another combination of greater load and lower shrinkage could fall within the same allowable maximum of 0.053 (0.0021 in). The user is cautioned against high loading because of possible destructive film fatigue and wear, film distortion away from the base circle, and malfunction. The selected values of $R_1$, working height and maximum pitch difference, in turn, determine the values of $X_T$ which have been computed and tabulated.

**2.4.2** For a concave film path with respect to the sprocket surface (curvature toward the sprocket radius center), the limiting radius, $R_2$, has been computed for the same $X_T$ and the same accommodation of 0.066 mm (0.0026 in), assuming a parabolic schedule (displacement function proportionate to the square of time) of reduction versus time (see reference 1). These values of $R_2$ are set forth in tables 1a and 1b. For those exiting film paths from drive sprockets corresponding to larger values of $R_1$ and $R_2$, including a straight tangent path, the accommodation of 0.066 mm (0.0026 in) for film slippage takes place in less than 0.66 mm (0.026 in) of the working height (or more accommodation results at the same height). Conversely, the slowest accommodation corresponds to the exiting path defined by the minimum values of $R_2$. Therefore, the $R_2$ value is recommended where maximum uniformity of motion is desired.

**2.5** The pitch of the usual holdback sprocket should be equal to or less than the pitch of the film. The shortest film pitch is assumed to be 7.536 mm (0.2967 in) corresponding to 0.8% shrinkage of long-pitch film (7.620 mm [0.300 in]). (This value is chosen rather than the 0.6% used for the tooth shape to avoid inadvertent interference at entering teeth.) The user may again exercise control by correct choice of the root diameter if a change is warranted. The friction between the film and the root surface, as well as against guides, assists in film holdback.

The tooth shape for a holdback sprocket has little control over the pitch differential accommodation, as the load shifts rather abruptly from the disengaging restraining tooth to the root of the following tooth. The tooth shape specified will ensure clearance at the entering position. If a holdback sprocket is to provide the best possible uniformity of motion, the design must be developed with care (see reference 1).

**2.6** The pitch of combination sprockets, 7.600 mm (0.2992 in), should correspond to the pitch of film with 0.3% shrinkage. This value is closer to the feed sprocket pitch than to the holdback sprocket pitch to prevent the film from riding high on the teeth or being damaged by guides at the entering path when used for driving action with the sprocket pitch shorter than the film pitch. Entering guides may be needed for good holdback action when the sprocket pitch is longer than the film pitch.

**2.7** The desired tooth shape can be generated by a hob corresponding to the basic rack specified by $K_H$ and $B_H$ in table 2 and figure 4. If the first hob covers the range of N from 8 to 17 inclusively and the second hob 18 to 64 inclusively, no deviations from the ideal tooth shape greater than 0.005 mm (0.0002 in) will occur.

**2.8** The tooth width at the base, dimension W, allows ample material for rounding off the tip while preserving the 0.66 mm (0.026 in) or more of working height. The value chosen does not limit the angle of wrap on the sprocket as a wider tooth would. If the wrap length is defined as one-half the sum of the number of pitch lengths in the arc of engagement, E, and the number of pitch lengths in the arc of contact, C (figure 1), then the wrap length may be as high as 6¾ pitch lengths without producing interference at the entering teeth of a drive sprocket if the film shrinkage does not exceed 0.8%.

## Table 1a – Sprocket dimensions in millimeters

| N | RDD | RDC | RDH | K | B | $R_2$ | $X_T$ |
|---|---|---|---|---|---|---|---|
| 8 | 19.252 | 19.201 | 19.097 | 1.709 | 0.111 | 14.726 | 0.2478 |
| 9 | 21.678 | 21.620 | 21.503 | 1.750 | 0.121 | 15.933 | 0.2410 |
| 10 | 24.103 | 24.040 | 23.909 | 1.809 | 0.134 | 17.137 | 0.2355 |
| 11 | 26.529 | 26.459 | 26.315 | 1.875 | 0.149 | 18.387 | 0.2309 |
| 12 | 28.954 | 28.878 | 28.721 | 1.939 | 0.164 | 19.697 | 0.2270 |
| 13 | 31.380 | 31.297 | 31.127 | 2.001 | 0.178 | 21.037 | 0.2237 |
| 14 | 33.805 | 33.716 | 33.533 | 2.061 | 0.192 | 22.392 | 0.2209 |
| 15 | 36.231 | 36.135 | 35.940 | 2.120 | 0.206 | 23.769 | 0.2184 |
| 16 | 38.656 | 38.554 | 38.346 | 2.177 | 0.219 | 25.157 | 0.2162 |
| 17 | 41.082 | 40.974 | 40.752 | 2.233 | 0.233 | 26.559 | 0.2142 |
| 18 | 43.507 | 43.393 | 43.158 | 2.288 | 0.245 | 27.970 | 0.2124 |
| 19 | 45.933 | 45.812 | 45.564 | 2.342 | 0.258 | 29.374 | 0.2109 |
| 20 | 48.358 | 48.231 | 47.970 | 2.395 | 0.271 | 30.801 | 0.2094 |
| 21 | 50.784 | 50.650 | 50.376 | 2.446 | 0.283 | 32.214 | 0.2082 |
| 22 | 53.209 | 53.069 | 52.782 | 2.497 | 0.296 | 33.646 | 0.2070 |
| 23 | 55.635 | 55.489 | 55.188 | 2.547 | 0.308 | 35.082 | 0.2059 |
| 24 | 58.061 | 57.908 | 57.595 | 2.597 | 0.320 | 36.522 | 0.2049 |
| 26 | 62.912 | 62.746 | 62.407 | 2.695 | 0.343 | 39.420 | 0.2031 |
| 28 | 67.763 | 67.584 | 67.219 | 2.790 | 0.367 | 42.328 | 0.2016 |
| 30 | 72.614 | 72.423 | 72.031 | 2.883 | 0.390 | 45.254 | 0.2003 |
| 32 | 77.465 | 77.261 | 76.843 | 2.974 | 0.412 | 48.206 | 0.1991 |
| 34 | 82.316 | 82.099 | 81.656 | 3.064 | 0.434 | 51.166 | 0.1981 |
| 36 | 87.167 | 86.938 | 86.468 | 3.153 | 0.456 | 54.162 | 0.1971 |
| 38 | 92.018 | 91.776 | 91.280 | 3.241 | 0.478 | 57.158 | 0.1963 |
| 40 | 96.869 | 96.614 | 96.092 | 3.326 | 0.499 | 60.167 | 0.1956 |
| 42 | 101.720 | 101.453 | 100.904 | 3.412 | 0.520 | 63.207 | 0.1949 |
| 44 | 106.571 | 106.291 | 105.717 | 3.496 | 0.541 | 66.258 | 0.1943 |
| 46 | 111.422 | 111.129 | 110.529 | 3.579 | 0.562 | 69.337 | 0.1937 |
| 48 | 116.273 | 115.967 | 115.341 | 3.661 | 0.582 | 72.423 | 0.1932 |
| 50 | 121.124 | 120.806 | 120.153 | 3.743 | 0.603 | 75.537 | 0.1927 |
| 52 | 125.975 | 125.644 | 124.965 | 3.825 | 0.623 | 78.679 | 0.1922 |
| 54 | 130.826 | 130.482 | 129.778 | 3.904 | 0.642 | 81.822 | 0.1918 |
| 56 | 135.677 | 135.321 | 134.590 | 3.982 | 0.662 | 84.964 | 0.1915 |
| 60 | 145.379 | 144.997 | 144.214 | 4.139 | 0.702 | 91.351 | 0.1908 |
| 64 | 155.081 | 154.674 | 153.839 | 4.292 | 0.740 | 97.811 | 0.1902 |

N – Number of teeth
RDD – Root diameter +0.03 –0.00 of drive sprocket of 7.620 pitch
RDC – Root diameter +0.03 –0.00 of combination sprocket of 7.600 pitch
RDH – Root diameter +0.00 –0.03 of holdback sprocket of 7.559 pitch
K – Circular arc radius for tooth shape, +0.00 –0.05
B – Radial distance of arc center inside root circle, +0.013 –0.000
$R_2$ – Minimum radius of film path concave to sprocket
$X_T$ – Offset of tooth at working height
$R_1$ – Minimum film path radius convex to sprocket, 4.762

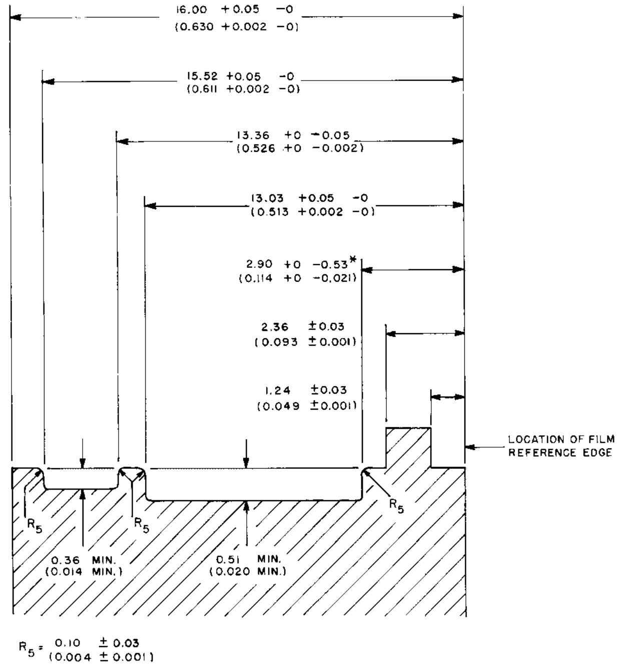
Tooth working height – 0.660
Maximum pitch difference – 0.066
Film thickness – 0.152
Other thickness – Root diameter = N•pitch/π – thickness

## Table 1b – Sprocket dimensions in inches

| N | RDD | RDC | RDH | K | B | $R_2$ | $X_T$ |
|---|---|---|---|---|---|---|---|
| 8 | 0.7580 | 0.7559 | 0.7519 | 0.0673 | 0.0044 | 0.5798 | 0.00976 |
| 9 | 0.8535 | 0.8512 | 0.8466 | 0.0689 | 0.0048 | 0.6273 | 0.00949 |
| 10 | 0.9489 | 0.9465 | 0.9413 | 0.0712 | 0.0053 | 0.6747 | 0.00927 |
| 11 | 1.0444 | 1.0417 | 1.0360 | 0.0738 | 0.0059 | 0.7239 | 0.00909 |
| 12 | 1.1399 | 1.1369 | 1.1307 | 0.0763 | 0.0065 | 0.7755 | 0.00894 |
| 13 | 1.2354 | 1.2322 | 1.2255 | 0.0788 | 0.0070 | 0.8282 | 0.00881 |
| 14 | 1.3309 | 1.3274 | 1.3202 | 0.0811 | 0.0076 | 0.8816 | 0.00870 |
| 15 | 1.4264 | 1.4226 | 1.4150 | 0.0835 | 0.0081 | 0.9358 | 0.00860 |
| 16 | 1.5219 | 1.5179 | 1.5097 | 0.0857 | 0.0086 | 0.9904 | 0.00851 |
| 17 | 1.6174 | 1.6131 | 1.6044 | 0.0879 | 0.0092 | 1.0456 | 0.00843 |
| 18 | 1.7129 | 1.7084 | 1.6991 | 0.0901 | 0.0096 | 1.1012 | 0.00836 |
| 19 | 1.8084 | 1.8036 | 1.7939 | 0.0922 | 0.0102 | 1.1565 | 0.00830 |
| 20 | 1.9039 | 1.8989 | 1.8886 | 0.0943 | 0.0107 | 1.2126 | 0.00824 |
| 21 | 1.9994 | 1.9941 | 1.9833 | 0.0963 | 0.0111 | 1.2683 | 0.00820 |
| 22 | 2.0948 | 2.0893 | 2.0780 | 0.0983 | 0.0117 | 1.3246 | 0.00815 |
| 23 | 2.1904 | 2.1846 | 2.1728 | 0.1003 | 0.0121 | 1.3812 | 0.00811 |
| 24 | 2.2859 | 2.2798 | 2.2675 | 0.1022 | 0.0126 | 1.4379 | 0.00807 |
| 26 | 2.4769 | 2.4703 | 2.4570 | 0.1061 | 0.0135 | 1.5520 | 0.00800 |
| 28 | 2.6678 | 2.6608 | 2.6464 | 0.1098 | 0.0144 | 1.6665 | 0.00794 |
| 30 | 2.8588 | 2.8513 | 2.8359 | 0.1135 | 0.0154 | 1.7817 | 0.00789 |
| 32 | 3.0498 | 3.0418 | 3.0253 | 0.1171 | 0.0162 | 1.8979 | 0.00784 |
| 34 | 3.2408 | 3.2322 | 3.2148 | 0.1206 | 0.0171 | 2.0144 | 0.00780 |
| 36 | 3.4318 | 3.4228 | 3.4043 | 0.1241 | 0.0180 | 2.1324 | 0.00776 |
| 38 | 3.6228 | 3.6132 | 3.5937 | 0.1276 | 0.0188 | 2.2503 | 0.00773 |
| 40 | 3.8137 | 3.8037 | 3.7831 | 0.1309 | 0.0196 | 2.3688 | 0.00770 |
| 42 | 4.0047 | 3.9942 | 3.9726 | 0.1343 | 0.0205 | 2.4885 | 0.00767 |
| 44 | 4.1957 | 4.1847 | 4.1621 | 0.1376 | 0.0213 | 2.6086 | 0.00765 |
| 46 | 4.3867 | 4.3752 | 4.3515 | 0.1409 | 0.0221 | 2.7298 | 0.00763 |
| 48 | 4.5777 | 4.5656 | 4.5410 | 0.1441 | 0.0229 | 2.8513 | 0.00761 |
| 50 | 4.7687 | 4.7561 | 4.7304 | 0.1474 | 0.0237 | 2.9739 | 0.00759 |
| 52 | 4.9596 | 4.9466 | 4.9199 | 0.1506 | 0.0245 | 3.0976 | 0.00757 |
| 54 | 5.1506 | 5.1371 | 5.1094 | 0.1537 | 0.0253 | 3.2213 | 0.00755 |
| 56 | 5.3416 | 5.3276 | 5.2988 | 0.1568 | 0.0261 | 3.3450 | 0.00754 |
| 60 | 5.7236 | 5.7085 | 5.6777 | 0.1630 | 0.0276 | 3.5965 | 0.00751 |
| 64 | 6.1056 | 6.0895 | 6.0567 | 0.1690 | 0.0291 | 3.8508 | 0.00749 |

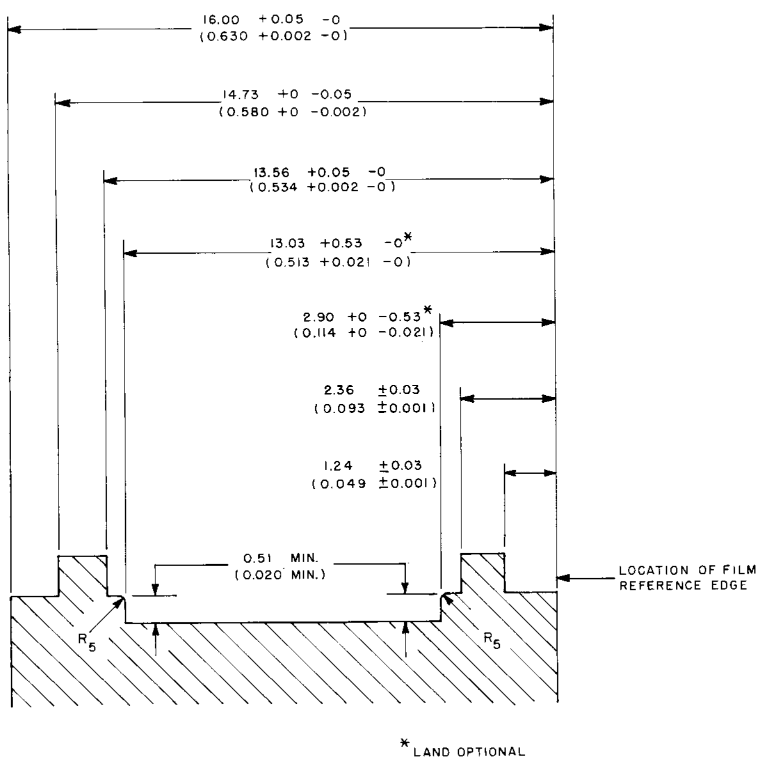
N – Number of teeth
RDD – Root diameter +0.001 –0.000 of drive sprocket of 0.3000 pitch
RDC – Root diameter +0.001 –0.000 of combination sprocket of 0.2992 pitch
RDH – Root diameter +0.000 –0.001 of holdback sprocket of 0.2976 pitch
K – Circular arc radius for tooth shape, +0.000 –0.002
B – Radial distance of arc center inside root circle, +0.0005 –0.0000
$R_2$ – Minimum radius of film path concave to sprocket
$X_T$ – Offset of tooth at working height
$R_1$ – Minimum film path radius convex to sprocket, 0.1875

Tooth working height – 0.0260
Maximum pitch difference – 0.0026
Film thickness – 0.0060
Other thickness – Root diameter = N•pitch/π – thickness




NOTE – Dimensions in millimeters, inches in parentheses.

**Figure 2a – Recommended lateral profile for all equipment**




NOTE – Dimensions in millimeters, inches in parentheses.

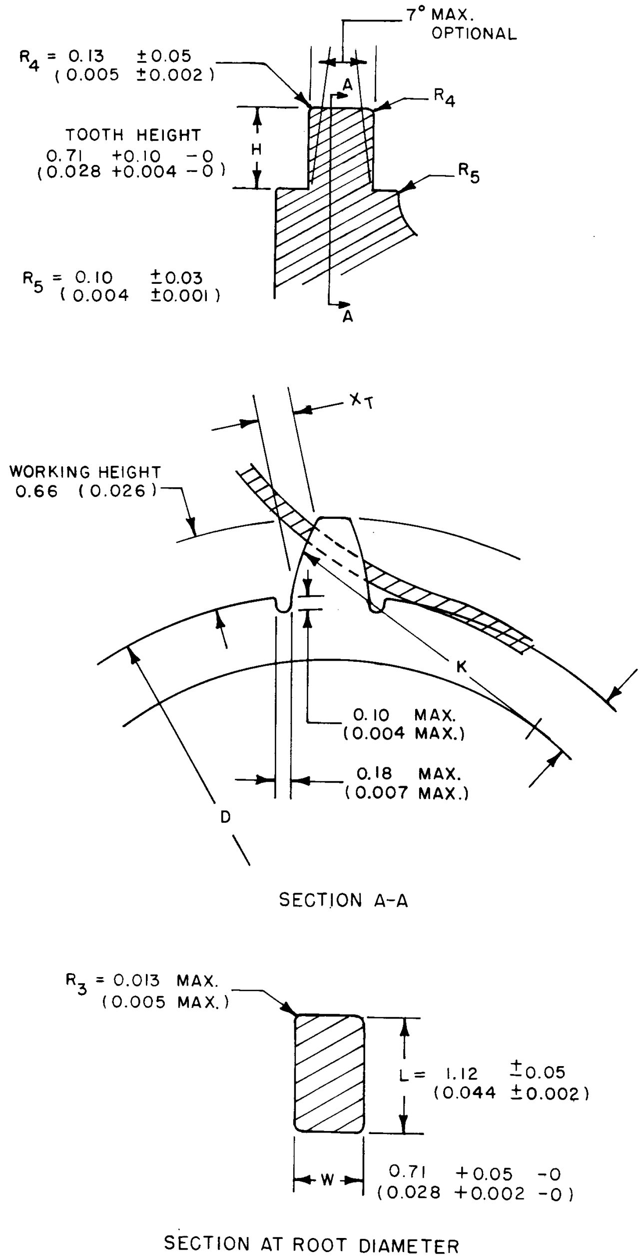
**Figure 2b – Alternate lateral profile for silent equipment only**

**2.9** The lateral profile has been derived on the assumption that the film is channel-guided at or near the sprocket. This guiding may be provided by fixed guides, by the flanges of an adjacent roller at the entering position or, preferably, by flanges on the sprocket itself. When a fixed guide is needed at the perforated edge and the film urged against the guide by a spring or other means, the lateral dimension, L, of the tooth can be increased somewhat. If the sprocket teeth are to perform the function of side guiding, then their lateral dimension, L, may be increased to 1.803 mm +0 mm –0.013 mm (0.0710 in +0 in –0.0005 in) with special consideration given to tooth alignment, smoothness of the sides, and rounding or tapering at the tips (see figures 2a and 2b).

When the sprocket teeth have been increased in width to perform the function of lateral guiding, the $R_3$ value for the radius of the corners of the sprocket tooth should be increased to comply with the radius of the perforation fillet, 0.25 mm +0.05 mm –0 mm (0.010 in +0.002 in –0 in).

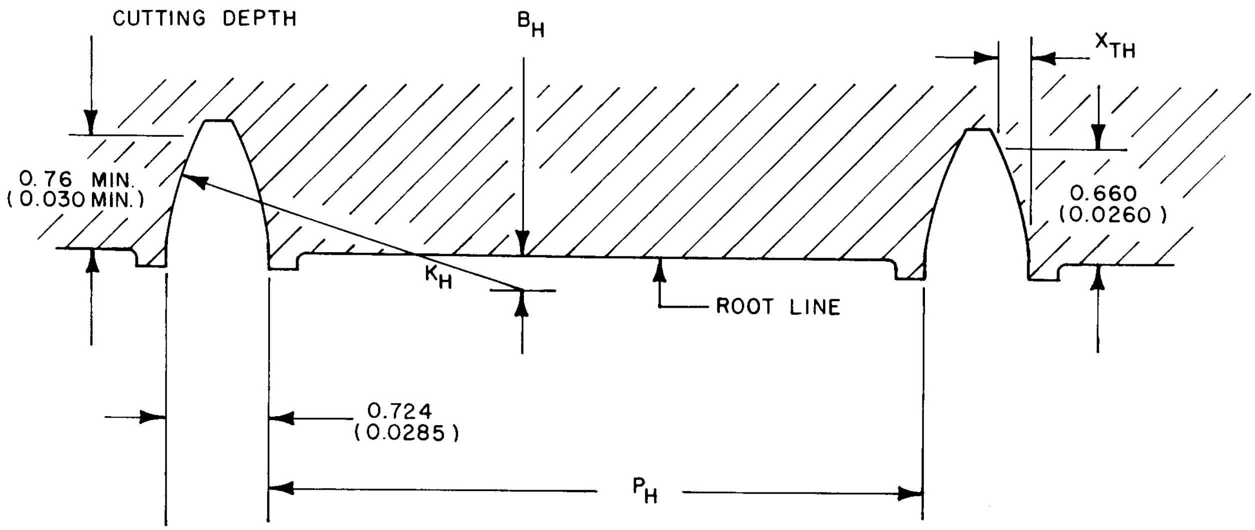
**2.10** In order for the film guide to function properly, the sprocket eccentricity as mounted in operation shall not exceed 0.025 mm (0.0010 in), and the lateral weave or wobble measured at the root circle shall not exceed ± 0.025 mm (0.0010 in). Less eccentricity may be required for a special application such as a sound printer sprocket.

**2.11** In some cases of large-scale layouts or critical comparisons, it may be more convenient to work with values of $X_T$ than with values of B. As shown in figure 3, $X_T$ is the distance measured perpendicular to the radial line intersecting the root of the tooth from a point on the tooth which is 0.66 mm (0.026 in) above the root circle. Further information on sprocket design is contained in reference 2.




NOTE – Dimensions in millimeters, inches in parentheses.

**Figure 3 – Sprocket tooth**




NOTE – Dimensions in millimeters, inches in parentheses.

**Figure 4 – Basic rack**

**Table 2 – Rack dimensions**

| Tooth range | Rack pitch, $P_H$ ± 0.003 mm (± 0.0001 in) | Shape radius, $K_H$ +0 –0.03 mm (+0 –0.001 in) | Distance of center below root, $B_H$ +0.005 –0 mm (+0.002 –0 in) | Offset at 0.66-mm (0.026-in) height, $X_{TH}$ |
|---|---|---|---|---|
| 8–17 | 7.559 mm (0.2976 in) | 2.248 mm (0.0885 in) | 0.264 mm (0.0104 in) | 0.1831 mm (0.00721 in) |
| 18–64 | 7.602 mm (0.2993 in) | 3.594 mm (0.1415 in) | 0.617 mm (0.0243 in) | 0.1816 mm (0.00715 in) |

## **Annex A** (informative)
## Additional data

**A.1** It is intended that the pitch of feed sprockets shall always be equal to or greater than the pitch of the film. The longest film pitch was assumed to be 7.620 mm (0.3000 in), corresponding to zero shrinkage with no allowance for plus tolerance during perforating. The pitch of unprocessed film under some conditions of high humidity may be longer. On the other hand, processed film perforated with the maximum plus tolerance at low-humidity conditions may be shorter by 0.2% or 0.3%.

Another condition which gives rise to an effectively long film pitch is film distortion at the perforation resulting from higher-than-normal force at the contact point of the driving tooth. A classical example is the prolongment of film life if the root diameter of the 16-tooth intermittent sprocket for 35-mm projectors is increased from 24.039 mm (0.9464 in), corresponding to unshrunk film, to 24.130 mm (0.9500 in). Presumably, the improvement can be explained in part by a better tooth action if the sprocket pitch is equal to or greater than the effective pitch between the loaded perforation and the following perforation, which must engage freely. The designer may exercise control of the pitch by proper selection of the root diameter. The same hobs are usable for the new diameter.

The friction between the film and the root surface of the normal feed sprocket assists in the driving action; however, friction between the film and guide members which control edge position and film path should be minimized.

**A.2** No unique formula has been used to compute the sprocket data. However, there was a logical sequence of computer operations performed in deriving the sprocket data, taking practical as well as theoretical considerations into account. The computations were limited to the applications of the sprockets as feed sprockets where the tooth must meet shape requirements. Holdback sprockets contact film only near the root diameter and any sprocket tooth design for feeding will serve as well for holdback.

The value of $R_1$, 4.762 mm (0.1875 in), was chosen for 16-mm as the smallest radius one would expect to use as the path along which the film is guided while leaving the sprocket. This value also results in adequate tooth width at the working height, about 0.305 mm (0.0120 in). A larger value of $R_1$ would result in a smaller $X_T$, thus producing a larger $R_2$ value. This would result in more flutter and unsteadiness (see 2.4.2). The driven edges of the film perforations in stripping off the sprocket in the path designated by $R_1$ must not interfere as they pass the tips of the sprocket teeth. As can be readily appreciated, if the offset of the teeth at the maximum working height is too small, the edges of the perforations would be under load at the tips of the sprocket teeth, and the film would suddenly snap to the position where the next tooth takes up the load with resultant shock loading and film gouging. The last tooth fully engaged with the film essentially carries the film load. When the film strips off this last tooth, the film slips back relative to the sprocket base until the next perforation (which is now the last perforation) carries the film load. The maximum back-slip of the film (see 2.3), as well as the relative paths taken by the base and the tip of the sprocket tooth and by the film, were used in computations of $X_T$. With $X_T$ established for each N, the position of one point along the shape of each sprocket tooth relative to the root position has been determined.

It is necessary that the face of each sprocket tooth be as erect as possible to give good load-carrying capacity and a minimum tendency for the film to ride up on the tooth. And, of course, the tooth must not force the film to slip along the base of the sprocket in the forward direction at any point as this would increase the load because of friction, and would require more total back-slip and tooth slant. Yet, the tooth shape must provide smooth transfer of the film load from one tooth to the next, at disengagement, for long film life. This leads to another requirement that cannot be overlooked in sprocket specifications, i.e., the condition of maximum steadiness of film motion or minimum flutter within the design range of pitch differentials. If the film on exiting from the sprocket is made to ride up the sprocket teeth smoothly, a condition of minimum flutter can be achieved where a smooth transfer of film load from one tooth to the next can be obtained (several teeth are usually engaged simultaneously). The minimum value of the radius (concave toward the sprocket) defining the exiting film path for minimum flutter or maximum smoothness has been designated as $R_2$ and is listed in tables 1a and 1b for each value of N (see reference 1). Computing the values of $R_2$ would hardly be possible without an electronic computer because a method of successive approximations must be used. The limiting radius, $R_2$, of the film leaving the drive sprocket defines the shape of the tooth face. A carefully modified epicycloid best fits this ideal curve. It is far simpler to specify and use the specifications if the curve of the tooth face is a circular arc with radius and center given. On investigation, it was found that errors would be sufficiently small to make the circular-arc specification practical. From the data for the tooth face as derived in computing $R_2$, a point on the face was selected at one third the working tooth height. Using the position of this point with the established root and tip positions, the radius and its center were computed for each sprocket. Comparing the positions of points along the sprocket face as defined by the circular arc to those as defined by the ideal curve derived in computing $R_2$, the maximum deviations at other than the three fixed points were in the order of 0.005 mm (0.0002 in).

The arc specification is convenient and lends itself to small-quantity production of sprockets with a single formed cutter and indexing means. For large-quantity production, the use of hobs is more economical. Many sprockets have been produced using involute shapes of some specified pressure angle. The slope of the resultant tooth at the root is undesirably reduced, and the tooth shape is poorer for steadiness and flutter. The use of the circular arc, as specified by K and B in tables 1a and 1b, denotes an important improvement over the use of the involute. Therefore, further computer studies investigated the use of hobs with circular arc cutting faces (see $K_H$ and $B_H$ in table 2 and figure 3) to generate the sprocket teeth. The computer program was made to minimize fit errors for offset values at maximum working heights and at one-third heights. As a result, two hobs are specified; the first covers the range of 8–17 teeth and the second 18–64 teeth. It was found that the maximum errors along the entire tooth height compared to a theoretically correct shape are even less (about two-thirds) than those for the circular arc specifications.

It is anticipated that sprockets not specified by the tables will be specified by interpolation.

**A.3** An exception to these pitch considerations is the radial tooth design (see reference 3).

## Annex B (informative)
## Bibliography

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3 Streiffert, J.G. The radial-tooth, variable-pitch sprocket. *Journal of the SMPTE* 57(6):529-550; December 1951.