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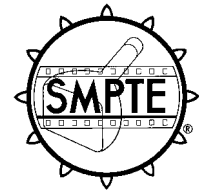
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# 8-mm Type R (Regular 8) Sprocket Design



Page 1 of 8 pages

## 1 Scope

This practice provide dimensions and specifications for the design of sprockets used with 8-mm type R (regular 8) motion-picture raw stock or processed film.

## 2 Dimensions and specifications

**2.1** The teeth shall be equally spaced at an index angle of  $360/N^\circ$  where N is the number of teeth. A suitable tolerance for the index angle is  $\pm 1$  minute of arc for sprockets having 8 to 24 teeth and  $\pm 30$  seconds of arc for sprockets having 25 to 84 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 thicknesses, 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 3.962 mm (0.1560 in) for  $R_1$  is recommended. This is an arbitrary choice, but seems appropriate for 8-mm equipment.

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 0.046 mm (0.0018 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.

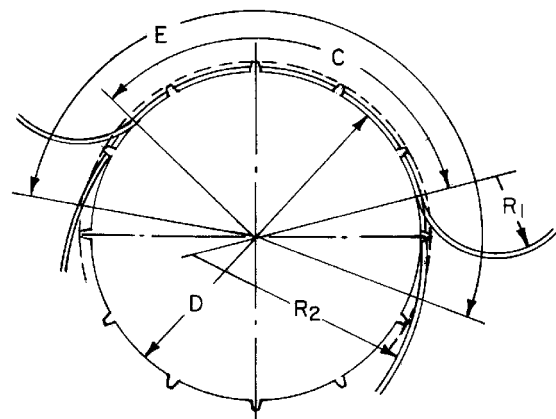


Figure 1 – Sprocket

**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 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.

Table 1a – Sprocket dimensions in millimeters

| N  | RDD     | RDC     | RDH     | K     | B     | R <sub>2</sub> | X <sub>T</sub> |
|----|---------|---------|---------|-------|-------|----------------|----------------|
| 12 | 14.401  | 14.363  | 14.287  | 1.457 | 0.034 | 11.837         | 0.2534         |
| 13 | 15.614  | 15.573  | 15.490  | 1.510 | 0.044 | 12.576         | 0.2477         |
| 14 | 16.827  | 16.782  | 16.693  | 1.560 | 0.054 | 13.317         | 0.2428         |
| 15 | 18.039  | 17.992  | 17.896  | 1.608 | 0.064 | 14.065         | 0.2385         |
| 16 | 19.252  | 19.201  | 19.099  | 1.655 | 0.073 | 14.816         | 0.2347         |
| 17 | 20.465  | 20.411  | 20.303  | 1.700 | 0.082 | 15.573         | 0.2313         |
| 18 | 21.678  | 21.620  | 21.506  | 1.744 | 0.092 | 16.328         | 0.2283         |
| 19 | 22.890  | 22.830  | 22.709  | 1.787 | 0.100 | 17.097         | 0.2255         |
| 20 | 24.103  | 24.040  | 23.912  | 1.828 | 0.109 | 17.853         | 0.2231         |
| 21 | 25.316  | 25.249  | 25.115  | 1.869 | 0.118 | 18.625         | 0.2208         |
| 22 | 26.529  | 26.459  | 26.319  | 1.909 | 0.126 | 19.387         | 0.2188         |
| 23 | 27.741  | 27.668  | 27.522  | 1.947 | 0.134 | 20.160         | 0.2169         |
| 24 | 28.954  | 28.878  | 28.725  | 1.986 | 0.142 | 20.941         | 0.2151         |
| 26 | 31.380  | 31.297  | 31.131  | 2.060 | 0.158 | 22.497         | 0.2120         |
| 28 | 33.805  | 33.716  | 33.538  | 2.132 | 0.174 | 24.065         | 0.2093         |
| 30 | 36.231  | 36.135  | 35.944  | 2.202 | 0.190 | 25.634         | 0.2070         |
| 32 | 38.656  | 38.554  | 38.351  | 2.270 | 0.204 | 27.224         | 0.2049         |
| 34 | 41.082  | 40.974  | 40.757  | 2.336 | 0.219 | 28.814         | 0.2031         |
| 36 | 43.507  | 43.393  | 43.164  | 2.401 | 0.234 | 30.413         | 0.2015         |
| 38 | 45.933  | 45.812  | 45.570  | 2.464 | 0.248 | 32.032         | 0.2000         |
| 40 | 48.358  | 48.231  | 47.976  | 2.526 | 0.262 | 33.652         | 0.1987         |
| 42 | 50.784  | 50.650  | 50.383  | 2.588 | 0.276 | 35.285         | 0.1975         |
| 44 | 53.209  | 53.069  | 52.789  | 2.648 | 0.290 | 36.929         | 0.1964         |
| 46 | 55.635  | 55.489  | 55.196  | 2.707 | 0.303 | 38.582         | 0.1954         |
| 48 | 58.061  | 57.908  | 57.602  | 2.766 | 0.316 | 40.263         | 0.1944         |
| 50 | 60.486  | 60.327  | 60.009  | 2.823 | 0.330 | 41.928         | 0.1935         |
| 52 | 62.912  | 62.746  | 62.415  | 2.880 | 0.343 | 43.617         | 0.1928         |
| 54 | 65.337  | 65.165  | 64.821  | 2.936 | 0.356 | 45.307         | 0.1921         |
| 56 | 67.763  | 67.584  | 67.228  | 2.991 | 0.368 | 47.019         | 0.1914         |
| 60 | 72.614  | 72.423  | 72.041  | 3.100 | 0.394 | 50.461         | 0.1902         |
| 64 | 77.465  | 77.261  | 76.854  | 3.206 | 0.418 | 53.962         | 0.1891         |
| 68 | 82.316  | 82.099  | 81.666  | 3.311 | 0.443 | 57.517         | 0.1881         |
| 72 | 87.167  | 86.938  | 86.479  | 3.413 | 0.467 | 61.089         | 0.1873         |
| 76 | 92.018  | 91.776  | 91.292  | 3.514 | 0.490 | 64.739         | 0.1865         |
| 80 | 96.869  | 96.614  | 96.105  | 3.612 | 0.513 | 68.430         | 0.1858         |
| 84 | 101.720 | 101.453 | 100.918 | 3.709 | 0.536 | 72.157         | 0.1852         |

## NOTES

N: Number of teeth

RDD: Root diameter +0.03 –0.00 of drive sprocket of 3.810 pitch

RDC: Root diameter +0.03 –0.00 of combination sprocket of 3.800 pitch

RDH: Root diameter +0.00 –0.03 of holdback sprocket of 3.780 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<sub>2</sub>: Minimum radius of film path concave to sprocketX<sub>T</sub>: Offset of tooth at working heightR<sub>1</sub>: Minimum film path radius convex to sprocket, 3.962

Tooth working height: 0.660

Maximum pitch difference: 0.046

Film thickness: 0.152

Other thickness: root diameter =  $N \cdot \text{pitch} / \pi$  – thickness