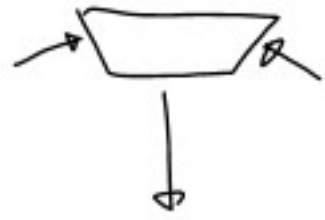
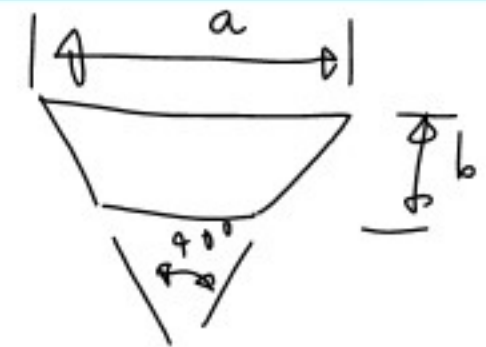


V belt



Tab 17-9

| Belt Section | Width a , in | Thickness b , in | Minimum Sheave Diameter, in | hp Range, One or More Belts |
|--------------|-------------------|-----------------------|--------------------------------|--------------------------------|
| A | $\frac{1}{2}$ | $\frac{11}{32}$ | 3.0 | $\frac{1}{4}$ –10 |
| B | $\frac{21}{32}$ | $\frac{7}{16}$ | 5.4 | 1–25 |
| C | $\frac{7}{8}$ | $\frac{17}{32}$ | 9.0 | 15–100 |
| D | $1\frac{1}{4}$ | $\frac{3}{4}$ | 13.0 | 50–250 |
| E | $1\frac{1}{2}$ | 1 | 21.6 | 100 and up |



Tab 17-10

| Section | Circumference, in |
|---------|---|
| A | 26, 31, 33, 35, 38, 42, 46, 48, 51, 53, 55, 57, 60, 62, 64, 66, 68, 71, 75, 78, 80, 85, 90, 96, 105, 112, 120, 128 |
| B | 35, 38, 42, 46, 48, 51, 53, 55, 57, 60, 62, 64, 65, 66, 68, 71, 75, 78, 79, 81, 83, 85, 90, 93, 97, 100, 103, 105, 112, 120, 128, 131, 136, 144, 158, 173, 180, 195, 210, 240, 270, 300 |
| C | 51, 60, 68, 75, 81, 85, 90, 96, 105, 112, 120, 128, 136, 144, 158, 162, 173, 180, 195, 210, 240, 270, 300, 330, 360, 390, 420 |
| D | 120, 128, 144, 158, 162, 173, 180, 195, 210, 240, 270, 300, 330, 360, 390, 420, 480, 540, 600, 660 |
| E | 180, 195, 210, 240, 270, 300, 330, 360, 390, 420, 480, 540, 600, 660 |

Tab 17-11

| Belt section | A | B | C | D | E |
|----------------------|-----|-----|-----|-----|-----|
| Quantity to be added | 1.3 | 1.8 | 2.9 | 3.3 | 4.5 |

Pitch Length = L_p = circumference +

$$L_p = 2C + \pi \frac{D+d}{2} + \frac{(D-d)^2}{4C}$$

$$C = \frac{1}{4} \left((L_p - \frac{\pi}{2}(D+d)) + \sqrt{(L_p - \frac{\pi}{2}(D+d))^2 - 2(D-d)^2} \right)$$

Tab 17-12

Horsepower Ratings

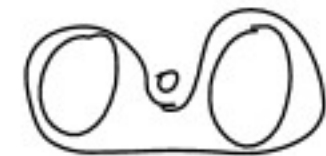
| Belt Section | Sheave Pitch Diameter, in | Belt Speed, ft/min | | | | |
|--------------|---------------------------|--------------------|------|------|------|------|
| | | 1000 | 2000 | 3000 | 4000 | 5000 |
| A | 2.6 | 0.47 | 0.62 | 0.53 | 0.15 | |
| | 3.0 | 0.66 | 1.01 | 1.12 | 0.93 | 0.38 |
| | 3.4 | 0.81 | 1.31 | 1.57 | 1.53 | 1.12 |
| | 3.8 | 0.93 | 1.55 | 1.92 | 2.00 | 1.71 |
| | 4.2 | 1.03 | 1.74 | 2.20 | 2.38 | 2.19 |
| | 4.6 | 1.11 | 1.89 | 2.44 | 2.69 | 2.58 |
| | 5.0 and up | 1.17 | 2.03 | 2.64 | 2.96 | 2.89 |
| B | 4.2 | 1.07 | 1.58 | 1.68 | 1.26 | 0.22 |
| | 4.6 | 1.27 | 1.99 | 2.29 | 2.08 | 1.24 |
| | 5.0 | 1.44 | 2.33 | 2.80 | 2.76 | 2.10 |
| | 5.4 | 1.59 | 2.62 | 3.24 | 3.34 | 2.82 |
| | 5.8 | 1.72 | 2.87 | 3.61 | 3.85 | 3.45 |
| | 6.2 | 1.82 | 3.09 | 3.94 | 4.28 | 4.00 |
| | 6.6 | 1.92 | 3.29 | 4.23 | 4.67 | 4.48 |
| | 7.0 and up | 2.01 | 3.46 | 4.49 | 5.01 | 4.90 |
| C | 6.0 | 1.84 | 2.66 | 2.72 | 1.87 | |
| | 7.0 | 2.48 | 3.94 | 4.64 | 4.44 | 3.12 |
| | 8.0 | 2.96 | 4.90 | 6.09 | 6.36 | 5.52 |
| | 9.0 | 3.34 | 5.65 | 7.21 | 7.86 | 7.39 |
| | 10.0 | 3.64 | 6.25 | 8.11 | 9.06 | 8.89 |
| | 11.0 | 3.88 | 6.74 | 8.84 | 10.0 | 10.1 |
| | 12.0 and up | 4.09 | 7.15 | 9.46 | 10.9 | 11.1 |
| D | 10.0 | 4.14 | 6.13 | 6.55 | 5.09 | 1.35 |
| | 11.0 | 5.00 | 7.83 | 9.11 | 8.50 | 5.62 |
| | 12.0 | 5.71 | 9.26 | 11.2 | 11.4 | 9.18 |
| | 13.0 | 6.31 | 10.5 | 13.0 | 13.8 | 12.2 |
| | 14.0 | 6.82 | 11.5 | 14.6 | 15.8 | 14.8 |
| | 15.0 | 7.27 | 12.4 | 15.9 | 17.6 | 17.0 |
| | 16.0 | 7.66 | 13.2 | 17.1 | 19.2 | 19.0 |
| | 17.0 and up | 8.01 | 13.9 | 18.1 | 20.6 | 20.7 |
| E | 16.0 | 8.68 | 14.0 | 17.5 | 18.1 | 15.3 |
| | 18.0 | 9.92 | 16.7 | 21.2 | 23.0 | 21.5 |
| | 20.0 | 10.9 | 18.7 | 24.2 | 26.9 | 26.4 |
| | 22.0 | 11.7 | 20.3 | 26.6 | 30.2 | 30.5 |
| | 24.0 | 12.4 | 21.6 | 28.6 | 32.9 | 33.8 |
| | 26.0 | 13.0 | 22.8 | 30.3 | 35.1 | 36.7 |
| | 28.0 and up | 13.4 | 23.7 | 31.8 | 37.1 | 39.1 |

allowable hp

$$H_a = K_1 K_2 H_{tab}$$

Tab 17-13

| $\frac{D-d}{C}$ | ϕ , deg | K_1 | |
|-----------------|--------------|-------|--------|
| | | VV* | V-Flat |
| 0.00 | 180 | 1.00 | 0.75 |
| 0.10 | 174.3 | 0.99 | 0.76 |
| 0.20 | 166.5 | 0.97 | 0.78 |
| 0.30 | 162.7 | 0.96 | 0.79 |
| 0.40 | 156.9 | 0.94 | 0.80 |
| 0.50 | 151.0 | 0.93 | 0.81 |
| 0.60 | 145.1 | 0.91 | 0.83 |
| 0.70 | 139.0 | 0.89 | 0.84 |
| 0.80 | 132.8 | 0.87 | 0.85 |
| 0.90 | 126.5 | 0.85 | 0.85 |
| 1.00 | 120.0 | 0.82 | 0.82 |
| 1.10 | 113.3 | 0.80 | 0.80 |
| 1.20 | 106.3 | 0.77 | 0.77 |
| 1.30 | 98.9 | 0.73 | 0.73 |
| 1.40 | 91.1 | 0.70 | 0.70 |
| 1.50 | 82.8 | 0.65 | 0.65 |



Tab 17-14

| K_2 Length Factor | Nominal Belt Length, in | | | | |
|------------------------|-------------------------|------------|------------|------------|-----------|
| | A Belts | B Belts | C Belts | D Belts | E Belts |
| 0.85 | Up to 35 | Up to 46 | Up to 75 | Up to 128 | |
| 0.90 | 38–46 | 48–60 | 81–96 | 144–162 | Up to 195 |
| 0.95 | 48–55 | 62–75 | 105–120 | 173–210 | 210–240 |
| 1.00 | 60–75 | 78–97 | 128–158 | 240 | 270–300 |
| 1.05 | 78–90 | 105–120 | 162–195 | 270–330 | 330–390 |
| 1.10 | 96–112 | 128–144 | 210–240 | 360–420 | 420–480 |
| 1.15 | 120 and up | 158–180 | 270–300 | 480 | 540–600 |
| 1.20 | | 195 and up | 330 and up | 540 and up | 660 |

Tob 17-15

| Driven Machinery | Source of Power | |
|------------------|------------------------------|---------------------------|
| | Normal Torque Characteristic | High or Nonuniform Torque |
| Uniform | 1.0 to 1.2 | 1.1 to 1.3 |
| Light shock | 1.1 to 1.3 | 1.2 to 1.4 |
| Medium shock | 1.2 to 1.4 | 1.4 to 1.6 |
| Heavy shock | 1.3 to 1.5 | 1.5 to 1.8 |

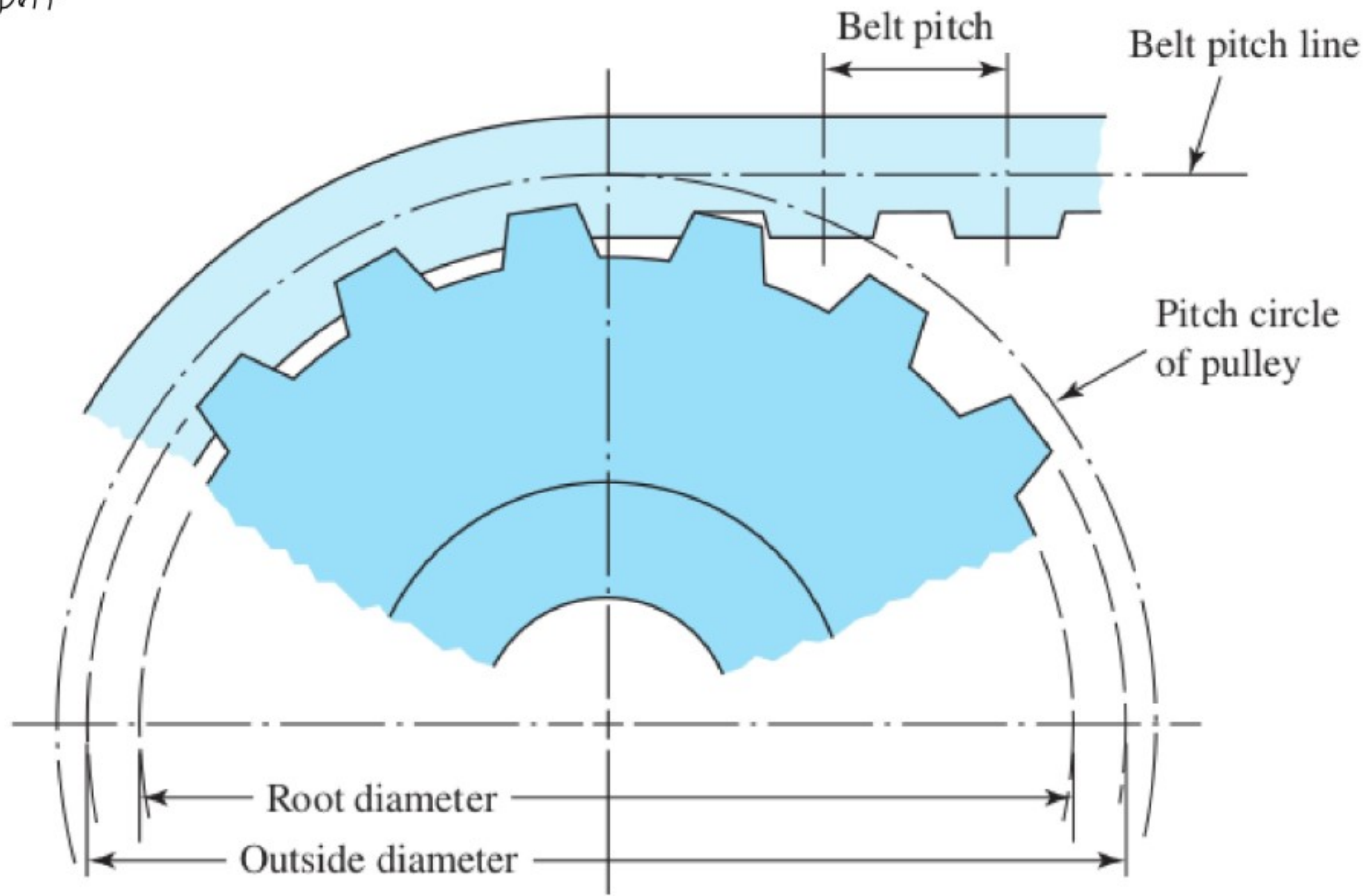
$$H_d = H_{nom} k_s n_d$$

↖ design hp

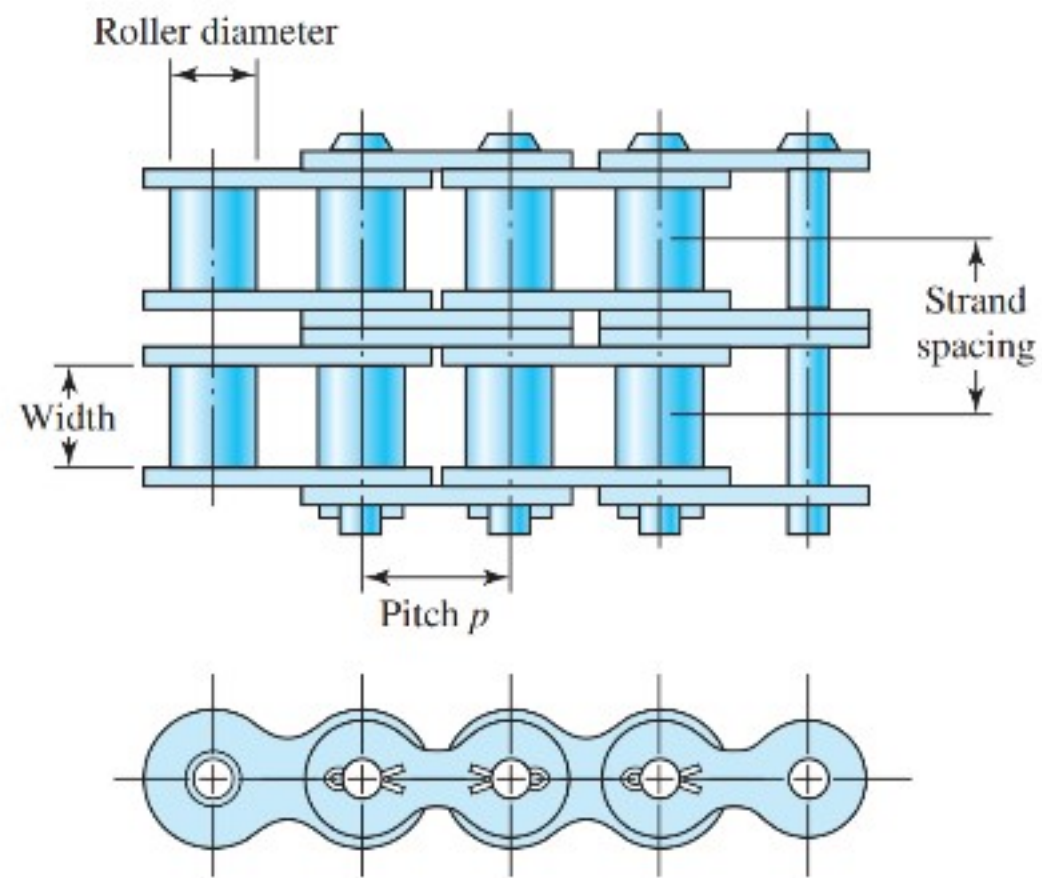
$$N_b \cong \frac{H_d}{H_a}$$

↖ number of belts

Timing Belt



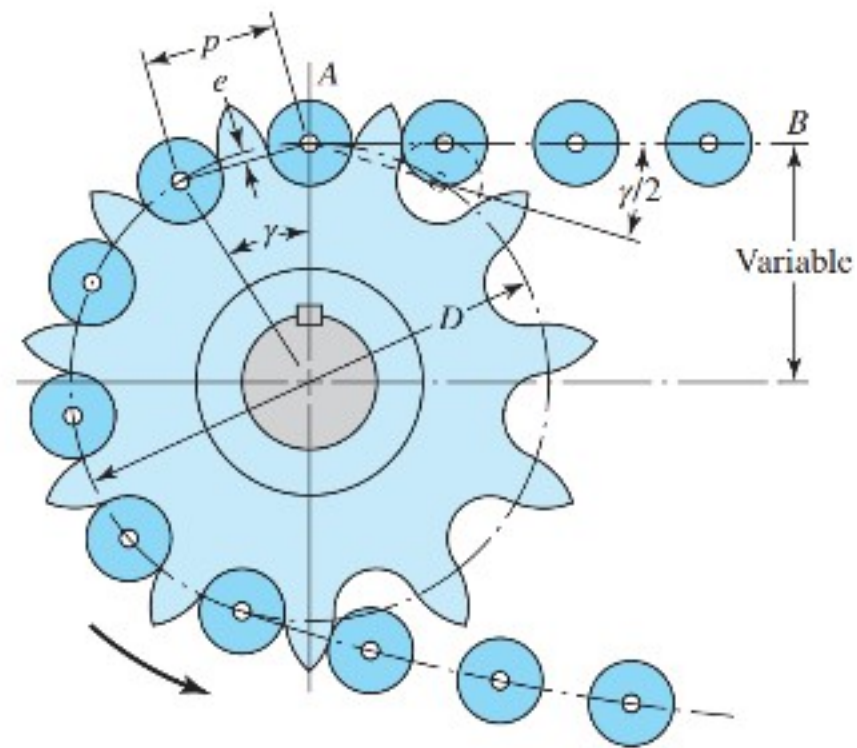
Roller chain



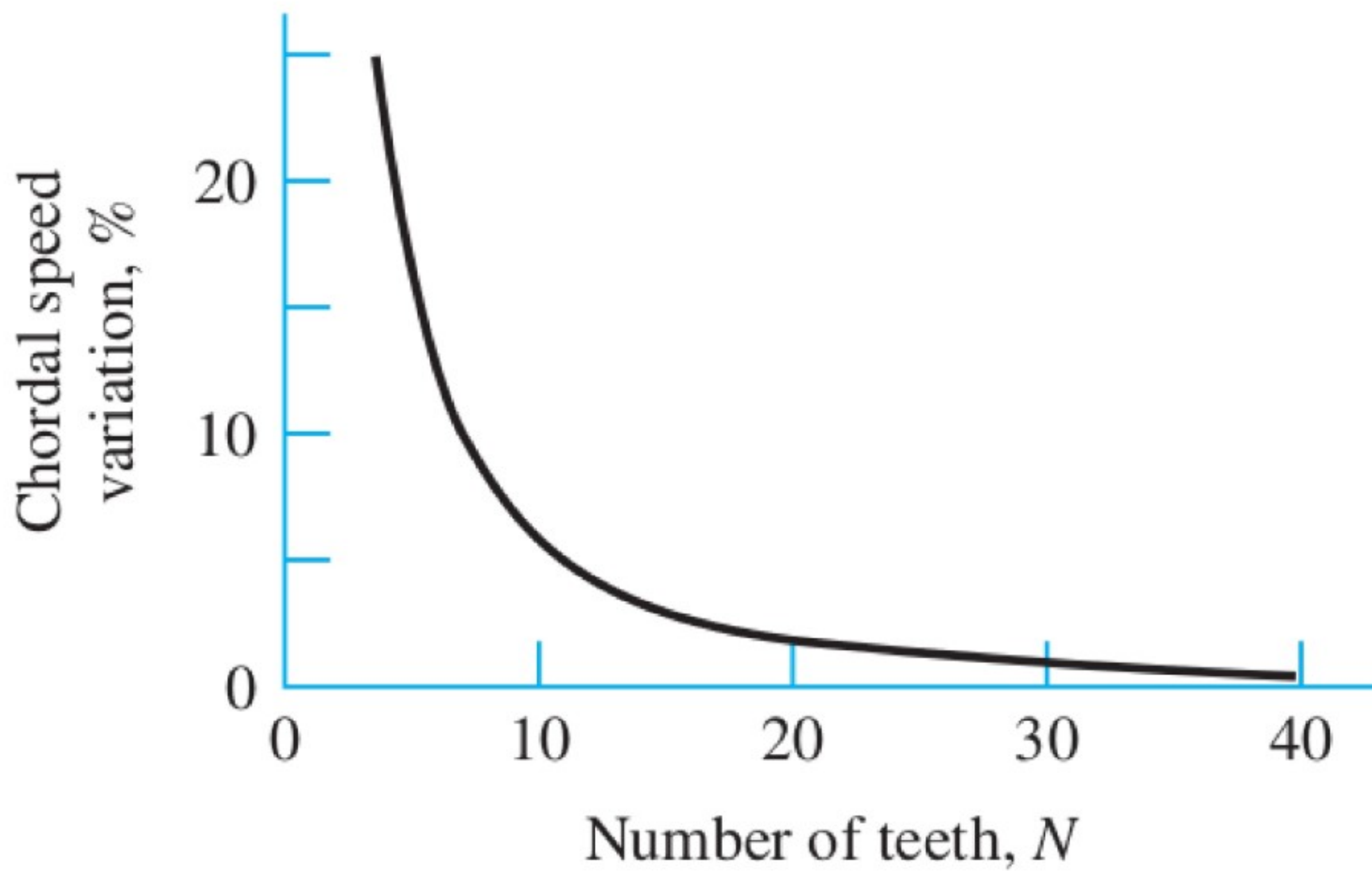
$$\sin \frac{\gamma}{2} = \frac{p/2}{D/2}$$

$$D = \frac{p}{\sin \frac{\gamma}{2}}$$

$$= \frac{p}{\sin(180^\circ/N)}$$



$$\frac{\Delta v}{v} = \frac{11}{N} \left(\frac{1}{\sin(180^\circ/N)} - \frac{1}{\tan(180^\circ/N)} \right)$$



Standard Capacity

15 000 h life
at full load

loop length

Recommended Lube

3% max elongation

Horizontal Shafts

17 tooth sprockets

$$H_1 = 0.009 N_1^{1.03} n_1^{0.9} p^{(3-0.87p)} \quad \text{hp}$$

$$H_2 = \frac{1000 K_r N_1^{1.5} p^{0.8}}{n_1^{1.5}} \quad \text{hp}$$

} use min

N_1 teeth on smaller sprocket

n_1 smaller sprocket RPM

p pitch

K_r chain #

25, 35 29

41 34

90-290 17

$$\frac{L}{p} \approx \frac{2c}{p} + \frac{N_1 + N_2}{p} + \frac{(N_2 - N_1)^2}{4\pi^2 c/p}$$

$$H_a = k_1 k_2 H_{+ab}$$

$$c = \frac{p}{4} \left(-A + \sqrt{A^2 - 3 \left(\frac{N_2 - N_1}{2\pi} \right)^2} \right)$$

$$A = \frac{N_1 + N_2}{2} - \frac{L}{p}$$

Tab 17-20

H_{tab}

| Sprocket Speed, rev/min | ANSI Chain Number | | | | | |
|-------------------------|-------------------|---------------|-------|-------|---------------|------|
| | 25 | 35 | 40 | 41 | 50 | 60 |
| 50 | 0.05 | 0.16 | 0.37 | 0.20 | 0.72 | 1.24 |
| 100 | 0.09 | 0.29 | 0.69 | 0.38 | 1.34 | 2.31 |
| 150 | 0.13* | 0.41* | 0.99* | 0.55* | 1.92* | 3.32 |
| 200 | 0.16* | 0.54* | 1.29 | 0.71 | 2.50 | 4.30 |
| 300 | 0.23 | 0.78 | 1.85 | 1.02 | 3.61 | 6.20 |
| 400 | 0.30* | 1.01* | 2.40 | 1.32 | 4.67 | 8.03 |
| 500 | 0.37 | 1.24 | 2.93 | 1.61 | 5.71 | 9.81 |
| 600 | 0.44* | 1.46* | 3.45* | 1.90* | 6.72* | 11.6 |
| 700 | 0.50 | 1.68 | 3.97 | 2.18 | 7.73 | 13.3 |
| 800 | 0.56* | 1.89* | 4.48* | 2.46* | 8.71* | 15.0 |
| 900 | 0.62 | 2.10 | 4.98 | 2.74 | 9.69 | 16.7 |
| 1000 | 0.68* | 2.31* | 5.48 | 3.01 | 10.7 | 18.3 |
| 1200 | 0.81 | 2.73 | 6.45 | 3.29 | 12.6 | 21.6 |
| 1400 | 0.93* | 3.13* | 7.41 | 2.61 | 14.4 | 18.1 |
| 1600 | 1.05* | 3.53* | 8.36 | 2.14 | 12.8 | 14.8 |
| 1800 | 1.16 | 3.93 | 8.96 | 1.79 | 10.7 | 12.4 |
| 2000 | 1.27* | 4.32* | 7.72* | 1.52* | 9.23* | 10.6 |
| 2500 | 1.56 | 5.28 | 5.51* | 1.10* | 6.58* | 7.57 |
| 3000 | 1.84 | 5.64 | 4.17 | 0.83 | 4.98 | 5.76 |
| Type A | | Type B | | | Type C | |

Tab 17-22

| Number of Teeth on Driving Sprocket | K_1 Pre-extreme Horsepower | K_1 Post-extreme Horsepower |
|---|------------------------------------|-------------------------------------|
| 11 | 0.62 | 0.52 |
| 12 | 0.69 | 0.59 |
| 13 | 0.75 | 0.67 |
| 14 | 0.81 | 0.75 |
| 15 | 0.87 | 0.83 |
| 16 | 0.94 | 0.91 |
| 17 | 1.00 | 1.00 |
| 18 | 1.06 | 1.09 |
| 19 | 1.13 | 1.18 |
| 20 | 1.19 | 1.28 |
| N | $(N_1/17)^{1.08}$ | $(N_1/17)^{1.5}$ |

Tab 17-23

| Number of Strands | K_2 |
|--------------------------|-------------------------|
| 1 | 1.0 |
| 2 | 1.7 |
| 3 | 2.5 |
| 4 | 3.3 |
| 5 | 3.9 |
| 6 | 4.6 |
| 8 | 6.0 |