9. Compute the actual CD

$$CD = \frac{1}{4}[L_C - \frac{N_2 + N_1}{2} + \sqrt{(L_C - \frac{N_2 + N_1}{2})^2 - \frac{8(N_2 - N_1)^2}{4\pi^2}}]$$

10. Compute the angle of wrap for each sprocket. The minimum angle of wrap should be 120°

$$\theta_1 = 180^\circ - 2\sin^{-1}[\frac{PD_2 - PD_1}{2CD}]$$
$$\theta_2 = 180^\circ + 2\sin^{-1}[\frac{PD_2 - PD_1}{2CD}]$$

11. Compute factor of safety

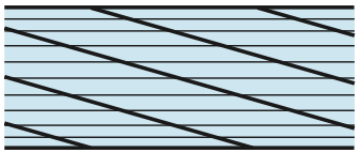
$$FS = P_{allowed}/P_{des}$$

$P_{allowed}$ is the number you got from the table in step 3 times the strand factor

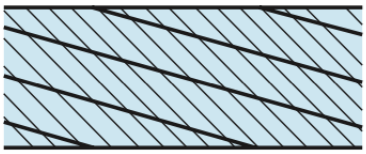
1.7 Wire Rope

1.7.1 Anatomy

There's two types of rope winding:



(*a*) Regular lay



(*b*) Lang lay

- Regular-lay ropes have the wires in the strand twisted in one direction and the strands in the rope twisted in the opposite direction
- Lang-lay ropes have the wires in the strand and the strands in the rope twisted in the same direction. Lang lay is more flexible than regular lay.

1.7.2 Nomenclature

F = tensile force on rope (lbf)
W = weight at the end of the rope (load) (lbf)
m = number of ropes supporting load
w = weight/foot supporting load (lbf/ft)

l = maximum suspended length of rope (ft)
a = maximum acceleration/deceleration (ft/s^2)
g = acceleration of gravity (32.17 ft/s^2)
p/S_u = specified life
S_u = ultimate tensile strength (psi)
D = sheave or which drum diameter (in)
d = nominal wire rope size (in)
E_r = Young's modulus (psi)
d_w = diameter of the wire (in)
A_m = metal cross-sectional area (in^2)

1.7.3 Formulae

$$\text{rope tension: } F_t = \left(\frac{W}{m} + wl\right)\left(1 + \frac{a}{g}\right)$$

$$\text{ultimate strength of wire: } S_u = \frac{2000F}{Dd}$$

$$\text{fatigue tension: } F_f = \frac{(p/S_u)S_u Dd}{2}$$

$$\text{equivalent bending load: } F_b = \frac{E_r d_w A_m}{D}$$

$$\text{fatigue factor of safety: } n_f = \frac{F_f - F_b}{F_t}$$

$$\text{factor of safety for static loading: } n_s = \frac{F_u - F_b}{F_t}$$

$$\text{bearing pressure: } P = \frac{2F}{dD}$$

1.7.4 Useful Tables

Table 17–24 Wire-Rope Data

Rope	Weight per Foot, lbf	Minimum Sheave Diameter, in	Standard Sizes d, in	Material	Size of Outer Wires	Modulus of Elasticity,* Mpsi	Strength,† kpsi
6 × 7 haulage	$1.50d^2$	$42d$	$\frac{1}{4}$–$1\frac{1}{2}$	Monitor steel Plow steel Mild plow steel	$d/9$ $d/9$ $d/9$	14 14 14	100 88 76
6 × 19 standard hoisting	$1.60d^2$	$26d$–$34d$	$\frac{1}{4}$–$2\frac{3}{4}$	Monitor steel Plow steel Mild plow steel	$d/13$–$d/16$ $d/13$–$d/16$ $d/13$–$d/16$	12 12 12	106 93 80
6 × 37 special flexible	$1.55d^2$	$18d$	$\frac{1}{4}$–$3\frac{1}{2}$	Monitor steel Plow steel	$d/22$ $d/22$	11 11	100 88
8 × 19 extra flexible	$1.45d^2$	$21d$–$26d$	$\frac{1}{4}$–$1\frac{1}{2}$	Monitor steel Plow steel	$d/15$–$d/19$ $d/15$–$d/19$	10 10	92 80
7 × 7 aircraft	$1.70d^2$	—	$\frac{1}{16}$–$\frac{3}{8}$	Corrosion-resistant steel Carbon steel	— —	— —	124 124
7 × 9 aircraft	$1.75d^2$	—	$\frac{1}{8}$–$1\frac{3}{8}$	Corrosion-resistant steel Carbon steel	— —	— —	135 143
19-wire aircraft	$2.15d^2$	—	$\frac{1}{32}$–$\frac{5}{16}$	Corrosion-resistant steel Carbon steel	— —	— —	165 165

Table 17–27 Some Useful Properties of 6 × 7, 6 × 19, and 6 × 37 Wire Ropes

Wire Rope	Weight per Foot w, lbf/ft	Weight per Foot Including Core w, lbf/ft	Minimum Sheave Diameter D, in	Better Sheave Diameter D, in	Diameter of Wires d_w, in	Area of Metal A_m, in^2	Rope Young's Modulus E_r, psi
6 × 7	$1.50d^2$		$42d$	$72d$	$0.111d$	$0.38d^2$	13×10^6
6 × 19	$1.60d^2$	$1.76d^2$	$30d$	$45d$	$0.067d$	$0.40d^2$	12×10^6
6 × 37	$1.55d^2$	$1.71d^2$	$18d$	$27d$	$0.048d$	$0.40d^2$	12×10^6

Table 17–26 Maximum Allowable Bearing Pressures of Ropes on Sheaves (in psi)

Rope	Sheave Material				
	Wood[a]	Cast Iron[b]	Cast Steel[c]	Chilled Cast Irons[d]	Manganese Steel[e]
Regular lay:					
6 × 7	150	300	550	650	1470
6 × 19	250	480	900	1100	2400
6 × 37	300	585	1075	1325	3000
8 × 19	350	680	1260	1550	3500
Lang lay:					
6 × 7	165	350	600	715	1650
6 × 19	275	550	1000	1210	2750
6 × 37	330	660	1180	1450	3300

S_u ranges:

Improved plow steel (monitor)	$240 < S_u < 280$ kpsi
Plow steel	$210 < S_u < 240$ kpsi
Mild plow steel	$180 < S_u < 210$ kpsi

No idea how to use this but here it is in case it's relevant: