

Wire Rope

Windings type

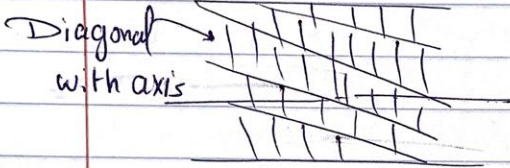
1- regular lay

Parallel to axis



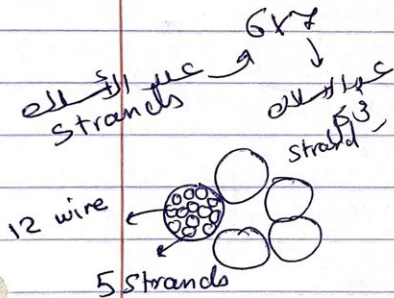
Resistance is higher (friction)

2- lang lay

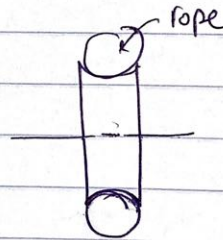


التي يكون ساكن حول
وال friction

Standard From Table 17-21



sheave:



strength = (out) rope

Factor of safety

$$n = \frac{F_u}{F_b}$$

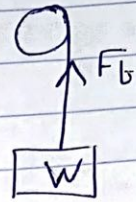
load F_{OS} \rightarrow ultimate force F_u
 tension in rope F_b

Assume $n=1 \rightarrow$ from Table 17-21

$$F_u = (S_{ut} R) A_{rope} = \frac{\pi d^2}{4}$$

To find F_b \rightarrow WF-24

$$F_t = \left[\underbrace{W}_{\text{weight}} + \underbrace{w l}_{\text{weight of rop}} \right] \left[1 + \frac{a}{g} \right]$$



Neglecting Bending

$$\sum F = 0$$

$$F_b - W = m a$$

For Bending

$$F_b - W = \frac{W}{g} a$$

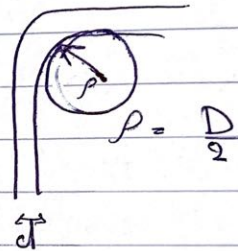
$$F_b = W + \frac{W}{g} a$$

$$\sigma = \frac{M c}{I} \quad \left[c = \frac{d_{\text{wire}}}{2} \right]$$

$$\frac{1}{\rho} = \frac{M}{EI}$$

$$\frac{2}{D} = \frac{M}{EI}$$

$$\left[M = \frac{2EI}{D} \right]$$



$$\sigma = \frac{2EI}{D} \frac{d_{\text{wire}}}{2} = \frac{E d_{\text{wire}}}{D}$$

$$\sigma = \frac{F_b}{A} = \frac{E d w}{D}$$

A_{metal} (مساحة الفولاذ)

$$F_b = \frac{A_m E d w}{D} \rightarrow (n_s) = \frac{F_u - F_b}{F_u}$$

If Diameter $>$ Diameter in Table \rightarrow bending is neglected

Factor of Safety of Applications Table WF-25

Figure 17-20

at y: $\sigma = \frac{F}{A}$
 $n_s = \frac{F_u}{F_t}$

$S_{reduced} = \frac{1}{2} S_{ut}$

$F_u = 0.86 S_{ut}$ A rope

→ here F_b is not considered in law since it is considered in 86!

Fatigue Fas

Pressure = $P = \frac{2F}{Dd}$ rope
 Shear

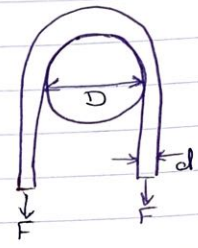
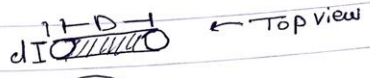
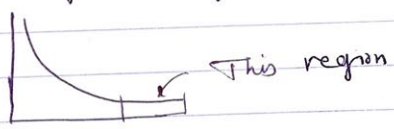


Figure 17-21 → $\frac{P}{S_{ut}} 1000$

Number of bendings is not usually known or given we assume infinite life and we take at constant



Sut table is for Rope

Now :- when obtaining this value:-

To compare $P = \frac{P}{S_u}$ (Sut/wire = $\frac{2F_{fatigue}}{Dd}$)
 rope

So $F_{fatigue} = \frac{Dd S_{ut}}{2} \left(\frac{P}{S_u} \right)_f$ ← From Figure

$n_f = \frac{F_{fatigue}}{F_t} < n_s$ (always)
 found previously

Sut is given on

	Assumed	Kps
Improved Plow	240	240 < Su < 280
Plow steel	210	210 < Su < 240
Mild Plow st	180	180 < Su < 210