Stresses

Tension & compression $\sigma = \frac{F}{A}$ $\tau_{all} = \frac{0.5Sy}{F.S}$

bending $\sigma = \frac{My}{I}$ $\sigma_{all} = \frac{Sy}{F.S}$

Shear $\tau = \frac{F}{A}$ $\tau_{\max} = \sqrt{\left(\frac{\sigma}{2}\right)^2 + \tau^2}$

Torsion $\tau = \frac{T * r}{J}$ $\sigma_{\max} = \frac{\sigma}{2} + \sqrt{\left(\frac{\sigma}{2}\right)^2 + \tau^2}$

Bolts :

Shear force $F' = \frac{F}{n}$ shear stress $= \frac{F'}{n}$

Tension stress $\sigma_t = \frac{F}{A}$

$$\sigma_{\max} = \frac{\sigma_t}{2} + \sqrt{\left(\frac{\sigma_t}{2}\right)^2 + \tau^2} = \frac{S.y}{F.S}$$

$$\tau_{\max} = \sqrt{\left(\frac{\sigma_t}{2}\right)^2 + \tau^2} = \frac{0.5S.y}{F.S}$$

Welding

Primary shear $\tau' = \frac{F}{A}$

Secondary shear $\tau_s = \frac{Tr}{J}$ As $J = J_u * 0.707h$

$$\tau_{\max} = \sqrt{\tau'^2 + \tau_s^2 + 2\tau'\tau_s \cos\theta} \le \tau_{all}$$

$$\tau_{\max} \le \frac{0.5Sy}{F.S}$$

$$\sigma_b = \frac{My_{\max}}{I}$$

$$\sigma_{\max} = \frac{\sigma_b}{2} + \sqrt{\left(\frac{\sigma_b}{2}\right)^2 + \tau^2} \le \frac{Su}{F.S} = \sigma_{all}$$

$$\tau_{\max} = \sqrt{\left(\frac{\sigma_b}{2}\right)^2 + \tau^2} \le \frac{Sush}{F.S} = \tau_{all}$$

Power screw :

L = np & p = d_0 – di & dm = $= \frac{d_i + d_0}{2}$

$$T = w * \frac{dm}{2}\left[\frac{\pi\mu dm.\sec\alpha + L}{\pi dm - \mu L\sec\alpha}\right] + T_C$$

$$T_C = \frac{\mu W d_{mc}}{2} \& T = F_{handle} * L_{handle}$$

$$T_0 = \frac{WL}{2\pi} \qquad \eta = \frac{T_0}{T}$$

Stresses : torsion $\tau = \frac{Tr}{J}$ bending $\sigma_b = \frac{My}{I}$

1 – **Screw** $\tau_{\max} = \sqrt{\left(\frac{\sigma_b}{2}\right)^2 + \tau^2} = \frac{0.5Sy}{F.S}$

Compression $\sigma_C = \frac{W}{A}$ torsion $\tau = \frac{T_C * r}{J}$

2 – **Thread** $\tau_{sefew} = \frac{W/N}{\pi d_i * \frac{p}{2}} = \frac{2W}{\pi d_i H}$

$$\tau_{nat} = \frac{2W}{\pi d_0 H}$$

3- **Bearing** $\sigma_{br} = \frac{W/N}{\frac{\pi}{4}\left(d_0^2 - d_i^2\right)} = \frac{2w}{\pi d_m H}$

Springs :

Shear stress $\tau_1 = \frac{4F}{\pi d^2}$ torsion stress $\tau_2 = \frac{4F}{\pi d^3}$

$$K = \frac{4C-1}{4C-4} + \frac{0.615}{C}$$

$$\tau = K\frac{8FD}{\pi d^3}$$

$$u = \frac{4F^2D^3N}{Gd^4}\left(\frac{1}{2C^2} + 1\right)$$

$$\sigma = \frac{8FD^3N}{Gd^4}$$