6 Following Juvinall's recommendations:

basic factor (load accurately known) 2.5

shock factor (e.g. impact on chain hoist) 3

risk factor (potential danger to life due to motor suspended overhead) 2

$\therefore$ overall factor $= 2.5 \times 3 \times 2 = \underline{15}$.

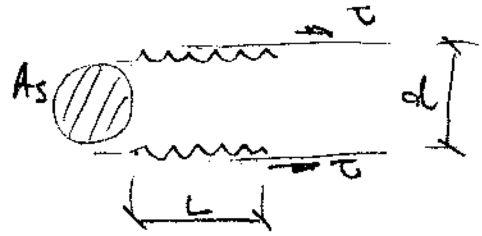
Design load $20 \times 15 = 300$ kN.

Base on ultimate (e.g. won't fail if yielding occurs) 800 MPa.

$\therefore A_s \geq 300 \times 10^3 / 800 = 375\ mm^2$

Probably get away with M24×3 ($A_s = 353\ mm^2$) but to be on safe side select M30×3.5 ($561\ mm^2$) since extra cost is negligible.

Consider shear stress τ tending to strip nut threads at major dia. d. Let L be length of engagement, and neglect non-uniform load distribution between threads.



For any load F_b.

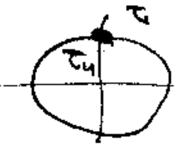
$\sigma_s = F_b / A_s$ in screw

$\tau_n = F_b / \pi d L$ in nut.

Screw safety factor $n_s = S_s/\sigma_s = S_s A_s / F_b$.

For the nut, assume max. shear stress failure theory, so

$\sigma_e = 2\tau_n = 2 F_b / \pi d L$



$\therefore$ nut safety factor

$n_n = S_n/\sigma_e = S_n \pi d L / 2 F_b$.

If $n_n = n_s$ (failure equally likely) then

$S_n \pi d L / 2 F_b = S_s A_s / F_b$.

and if further $S_n = \frac{1}{2} S_s$ (given)

$L = \underline{4 A_s / \pi d}$.

$= 4 \times 561 / 30\pi = 23.8$ mm.

($p = 3.5$ mm) $\equiv$ 7 $\underline{\text{threads}}$.