p6D-1

Equations

Problem 6.D1

A large tower is to be supported by a series of steel wires; it is estimated that the load on each wire will be 13,300 N.

$$F = 13300 \ [\mathrm{N}] \tag{1}$$

Determine the minimum required wire diameter, assuming a factor of safety of 2 and a yield strength of 860 MPa for the steel.

$$FS = 2 \tag{2}$$

$$\sigma_y = 860 \ \left[\mathrm{N/mm^2}\right] \tag{3}$$

Solution

Calculate the working stress

$$\sigma_y / \sigma_{work} = FS \tag{4}$$

Calculate the cross sectional area

$$F/A = \sigma_{work} \tag{5}$$

Calculate the diameter

$$A = \pi/4 \cdot d^2 \tag{6}$$

Solution

$A = 30.93 \, [\mathrm{mm^2}]$	$\boxed{d = 6.275 \, [\mathrm{mm}]}$
$F = 13300 \, [\mathrm{N}]$	$FS = 2$
$\sigma_{work} = 430 \, [\mathrm{MPa}]$	$\sigma_y = 860 \, [\mathrm{MPa}]$