21 Sept 60

Strength of Poles:

These are vertical cantilevers

Moment = Wl where W = load at end in pounds
l = length of beam in inches

Outside Fibre Stress = $s = \frac{Mc}{I}$ where M = moment
c = radius in inches (distance to outside fibre)
I = moment of inertia

Moment of Inertia = $\frac{\pi r^4}{4}$ where r = radius in inches.

$$s = \frac{Mc}{I} = \frac{Wlr}{\frac{\pi}{4}r^4} = \frac{4Wl}{\pi r^3} \text{ lbs/sq inch}$$

let l = 70 feet = 840 inches
W = 900 lbs.
r = 9 inches

$$s = \frac{4 \cdot 900 \cdot 840}{\pi \cdot 9^3} = 1320 \text{ lbs/sq inch}$$

This is very safe, as $s = 9000^{\#}$/sq in for hard woods in compression.

(over)

at half way up pole $l' = 420$ inches

Assume $S = 1320$ same as at base

$$r^3 = \frac{4Wl'}{\pi S} = \frac{4 \cdot 900 \cdot 420}{\pi \cdot 1320} = 365$$

$$r = (365)^{\frac{1}{3}} = 7{,}2 \text{ inches.}$$

at $\frac{3}{4}$ way up pole $l'' = 210$ inches,

Assume $S = 1320$, again

$$r^3 = \frac{4Wl''}{\pi S} = \frac{4 \cdot 900 \cdot 210}{\pi \cdot 1320} = 183$$

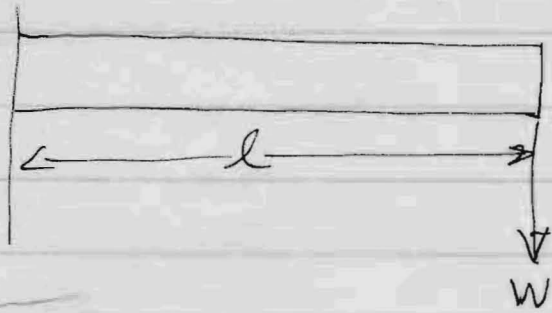
$$r = (183)^{\frac{1}{3}} = 5{,}7 \text{ inches.}$$

Wind = 10# / sq foot

Pole average 1 ft cross section, 70 feet long.

This equals 700# at center or 350# at end.

Again, very safe as wind load only $\frac{1}{3}$ of max wire load.



moment = Wl

deflection = $f = \frac{Wl^3}{3EI}$

Max unit stress in outside fibre = $S = \frac{Mc}{I}$

Here $M = Wl$

$I = \frac{\pi r^4}{4}$

$c = r$

$1.6 \times 10^6 = E$ for yellow pine

$I = \frac{\pi r^4}{4}$ = moment of inertia for cylinder about plane through axis

~~$Wl = SI$~~ $S = 9000$ lbs/sq" for maple, oak ash, Compression

~~$S = \frac{Wl}{I}$~~ $S = 17{,}000$ in tension.

14 March 61

Wind pressure stacks taken as 25 lbs/sq ft.
from Handbook at University

Wind pressure on chimneys 30 lbs/sq ft. x 0.66 for a circular chimney
from Building construction by Bateford page 362

Wind pressure $P = V^2/300$ where P is in lbs/sq ft and V is in miles per hour.
from BHP handbook page 78

when V = 100, P = 33.3 lbs/sq ft.
x 0.66 for a circular structure = 22.2 lbs/sq ft