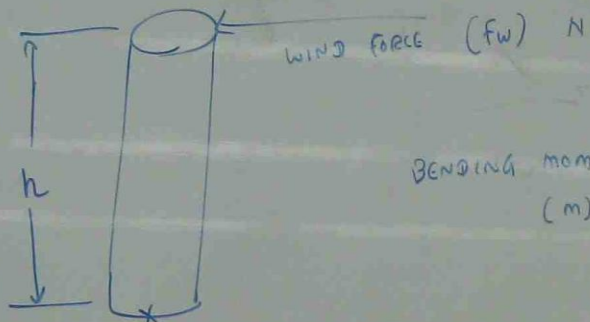


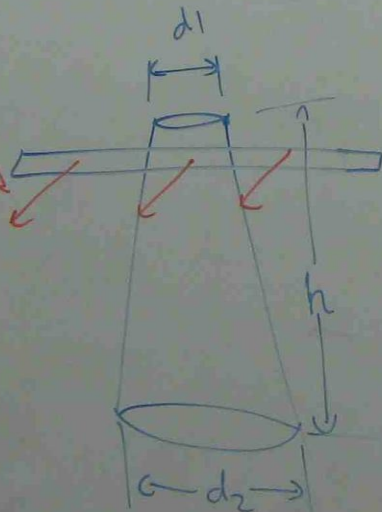
OVER HEAD LINE MECHANICAL DESIGN



$$\text{BENDING MOMENT (m)} = F_w \times h \quad (\text{N-m})$$

$h = \text{HEIGHT OF POLE}$

CONDUCTORS WEIGHT



CROSS ARM

$$\text{TOTAL BENDING MOMENT (m)} = \text{BENDING MOMENT CAUSED BY WIND ON POLE (i)} + \text{BENDING MOMENT CAUSED BY WIND ON CONDUCTORS (ii)}$$

$$\text{BENDING MOMENT CAUSED BY WIND ON POLE (i)} = \text{WIND PRESSURE PASCAL} \times h^2 \left(\frac{d_1}{6} + \frac{d_2}{3} \right)$$

$$\text{BENDING MOMENT CAUSED BY WIND ON CONDUCTORS (ii)} = \text{WIND PRESSURE} \times \text{THE AREA OF CONDUCTORS SUBJECT TO WIND FOR THE WHOLE SPAN} \times \text{NO. OF CONDUCTOR} \times h$$

MAXIMUM FIBRE STRESS ON POLE

$$f = m \times \frac{c}{I}$$

f = MAXIMUM FIBRE
STRESS N/m^2

m = TOTAL BENDING
MOMENT (N-m)



$$c = \frac{d}{2}$$

d = DIAMETER OF
② POLE

I = MOMENT OF INERTIA OF

② POLE

$$I = \frac{\pi d^4}{64}$$

BASED ON ABOVE FORMULA, WE CAN CALCULATE
THE STRESS IN THE POLE. THEN USE THE
SPECIFICATION DATA TO SELECT THE
APPROPRIATE MATERIAL FOR POLE.

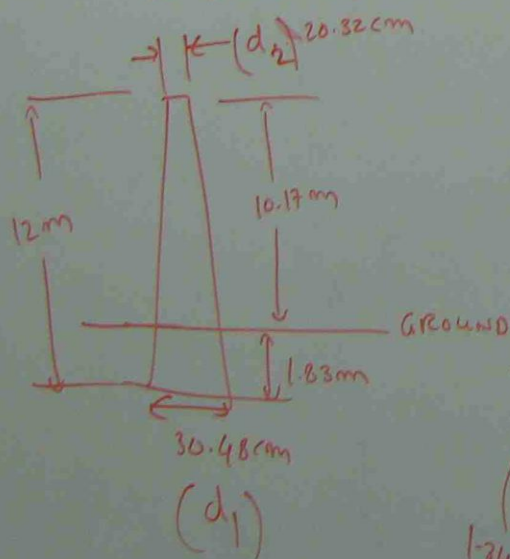
COMMENT

— EFFECT OF POWER POINT LOCATION ON
LINE VOLTAGE DROP / POWER AT LOAD

ph 12 m pole set 1.83 m in ground with three no 4/0 stranded copper conductors on a cross arm with conductor level at the top of pole and 45.7 m balance of span in a heavy loading area. pole has 20.32 cm at top and 30.48 cm at bottom. the moment due to wind on conductors when ice coated is as follows. no 4/0 stranded copper wire of 1.34 cm allow 2.54 cm of ice for a unit diameter of 3.88 cm area to wind

calculate total moment of inertia and pole circumference required to stand the moment.

(wind pressure = 196.2)

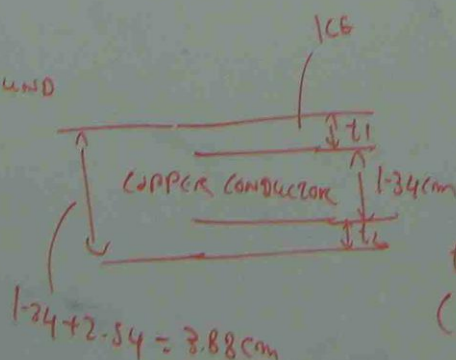


BENDING MOMENT CAUSED BY WIND FORCE ON TOWER

$$= \text{WIND PRESSURE} \times h^2 \times \left(\frac{d_1}{6} + \frac{d_2}{3} \right)$$

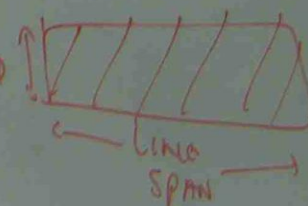
$$= 196.2 \times (10.17)^2 \times \left(\frac{30.48 \times 10^{-2}}{6} + \frac{20.32 \times 10^{-2}}{3} \right)$$

$$= 2404 \text{ N-m}$$



$$t_1 + t_2 = 2.54 \text{ cm}$$

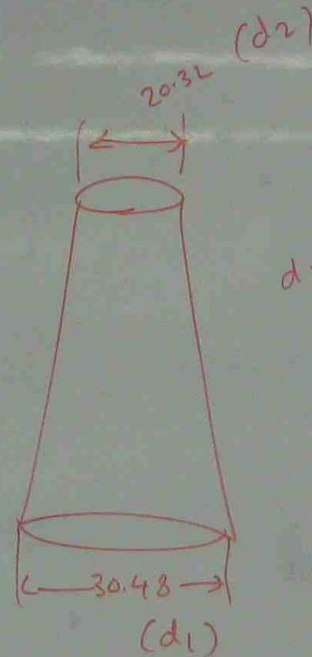
(ICE)



$$\begin{aligned} \text{WIND FORCE ON CONDUCTOR} &= \text{WIND PRESSURE} \times \text{AREA OF CONDUCTOR TO WIND} \times \text{No. OF CONDUCTORS} \times h \\ &= 196.2 \times 3.88 \times 10^{-2} \times 45.7 \times 3 \times 10.17 \\ &= 10614 \text{ N-m} \end{aligned}$$

$$\begin{aligned} \text{TOTAL BENDING MOMENT} &= 2404 + 10614 \\ &= 13018 \text{ N-m} \end{aligned}$$

$$\begin{aligned} \text{FIBRE STRESS } (f) &= m \frac{C}{I} \\ &= 13018 \times \frac{d/2}{\frac{\pi d^4}{64}} \\ &= 13018 \times \frac{d}{2} \times \frac{64}{\pi d^4} \\ &= 13018 \times \frac{32}{\pi d^3} \\ &= \frac{13018 \times 32}{\frac{3.1416 \times (25.4)^3}{100}} = 8.095 \times 10^6 \text{ N/m}^2 \end{aligned}$$



$$\begin{aligned} d &= \frac{d_1 + d_2}{2} \\ &= \frac{20.32 + 30.48}{2} \\ &= 25.4 \text{ cm} \end{aligned}$$