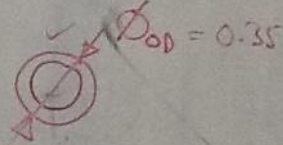


Reality - Complex  $\rightarrow$  Simplified

1. Type of Material — Steel  $E_{st} = 200 \text{ GPa}$

2. Base structure, depth of penetration, location

3. Design of the pole, shape



4. Original dimension  $\Rightarrow 8 \times 100 \text{ kg}$

5. Weight of the lamp  $\downarrow$

6. Cost

① What is the displacement of the lamp pole before & after installation?

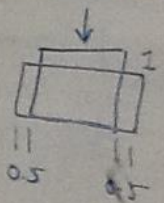
Poisson Ratio  $\nu = 0.35$  <sup>0.2 Concrete</sup>

Stress  $\sigma = \frac{P}{A}$

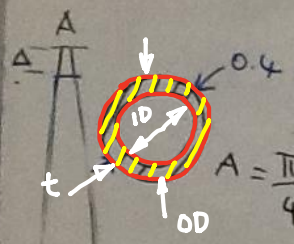
Hooke's  $\sigma = E\varepsilon$

Strain  $\varepsilon = \frac{\Delta}{L}$  displacement

Steel ② What is the strain?  
 0.5 rubber ③ What is the strain at lateral?



$\varepsilon_{lat} = 1.113 \times 10^{-7}$   
 $\Delta_{lat} = 1.115 \times 10^{-2}$   
 $\times 0.4 \text{ m}$   
 $= 4.45 \times 10^{-8} \text{ m}$   
 $= 4.45 \times 10^{-6}$   
 $= 4.45 \mu$

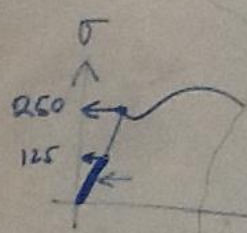


$A = \frac{\pi}{4} (OD^2 - ID^2)$

tebal,  $t = 5 \text{ mm}$

$\Delta = \frac{PL}{EA} = \frac{(8 \times 100 \times 9.81)(50)}{200 \times 10^9 \times \frac{\pi}{4} \left( \frac{0.35 + 0.65}{2} \right)^2}$   
 $= 1.59 \times 10^{-5} \text{ m}$   
 $= 0.0159 \text{ mm}$

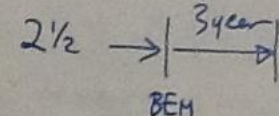
X



Mechanical Engineer



Ir Mazlan



ε - Analyzing Existing Structure/Component/System

- Design of a Structure/Component/System

→ What type of <sup>Suitable</sup> Material

> What is the size needed?

$$SF = \frac{1.0}{2.0}$$

$$\frac{\sigma_{all}}{\sigma_Y} = \frac{1}{SF}$$

$$\sigma_{all} = 125 MPa$$

$$A = \frac{P}{\sigma_{allow}} \quad ?$$

$$\sigma_Y = 250 MPa$$

Existing

