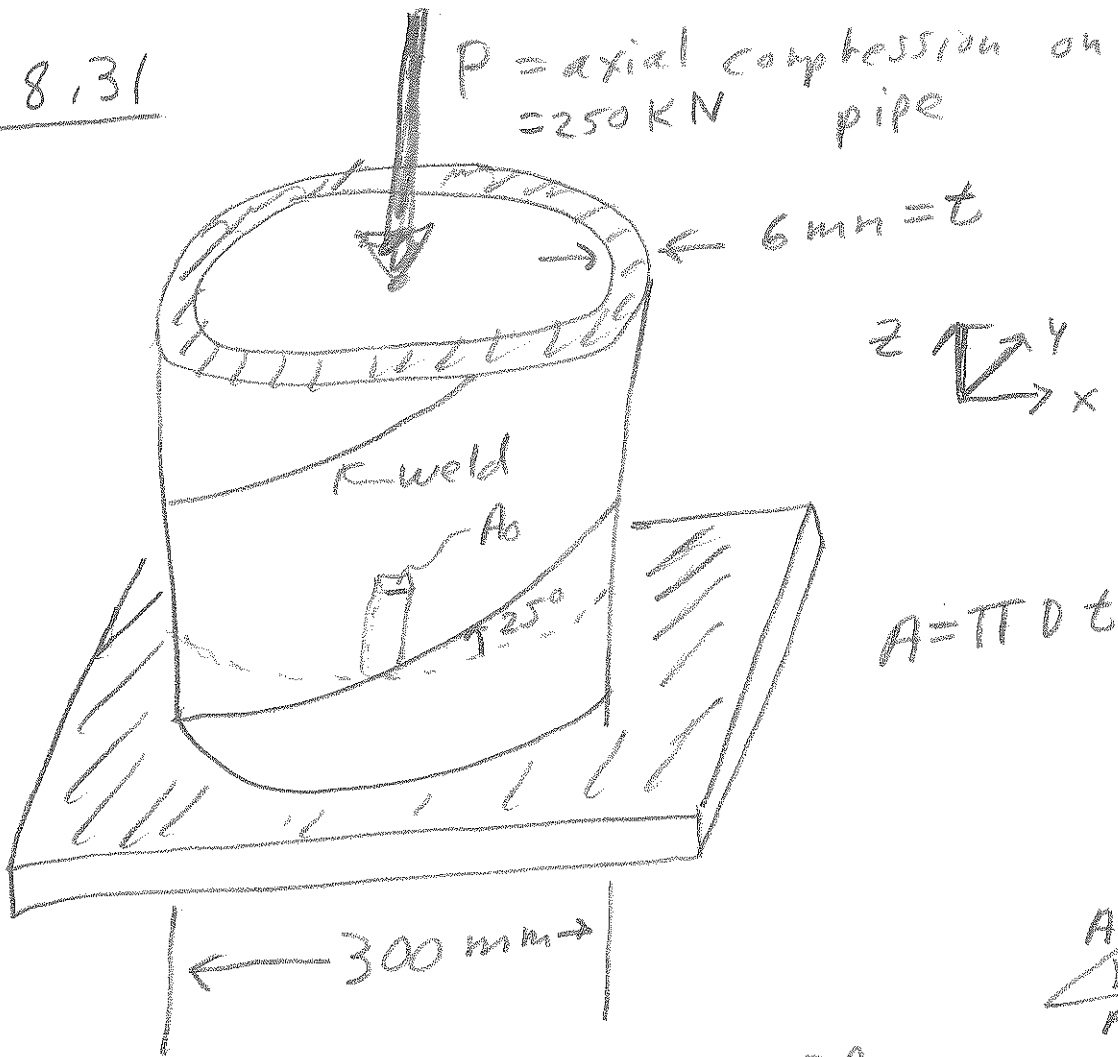


BJ 8.31

$P = \text{axial compression on pipe} = 250 \text{ kN}$



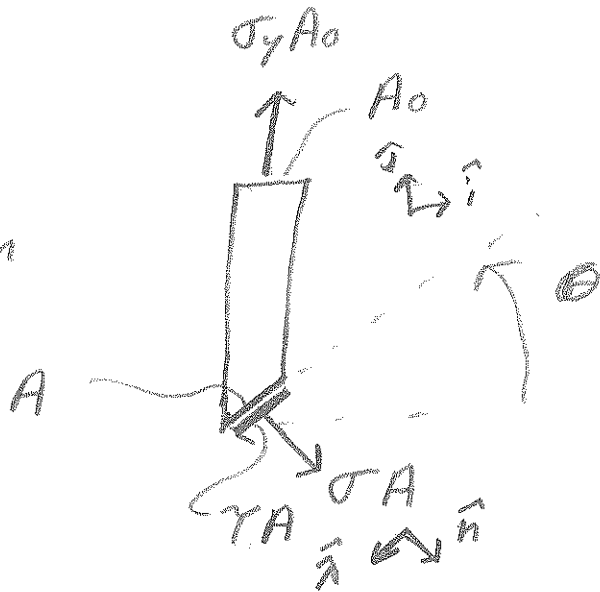
$$\sigma_y = \frac{-P}{A} = \frac{-P}{\pi D t}$$

FBD of small prism

$$\sum \vec{F} = \vec{0}$$

$$\left\{ \sigma_y A_0 \hat{j} + \sigma A \hat{n} + \gamma A \hat{n} = \vec{0} \right\}$$

$$\left\{ \right\} \cdot \hat{n} \Rightarrow -\sigma_y A_0 \cos \theta + \sigma A = 0$$



$\cos(25 \text{ deg})$

$\cos(\theta)$

$\cos(\theta)$

$\cos(\theta)$

$$\sigma = \sigma_y \cos \theta \sin \theta$$

$$\sigma = \frac{-P}{\pi D t} \cos \theta \sin \theta = \frac{-250 \cdot 10^3 \text{ N} \cos 25^\circ \sin 25^\circ}{\pi \cdot (0.3 \text{ m}) \cdot (0.006 \text{ m})}$$

36 Mpa

$$\sigma = 17 \cdot 10^6 \text{ N/m}^2$$

# 8.31 (cont'd)

$$\left\{ \right\} \cdot \hat{n} \Rightarrow -\sigma_y A_0 \sin\theta + \gamma A = 0$$

$\cancel{2 A_0 / \sin\theta} \leftarrow \cos(\theta)$

$$\Rightarrow \gamma = \sigma_y \cancel{\sin\theta}$$

$$= \frac{-P}{\pi D t} \cancel{\sin\theta}$$

$$= \frac{-250 \cdot 10^3 \text{ N} \cancel{\sin^2 25^\circ}}{\pi (.3 \text{ m}) \cdot (.006 \text{ m})}$$

$$= -7.9 \cdot 10^6 \text{ N/m}^2$$

sin<sup>2</sup> should be  
sin\*cos in all three  
equations

-3.7 \* 10<sup>6</sup> N/m<sup>2</sup>