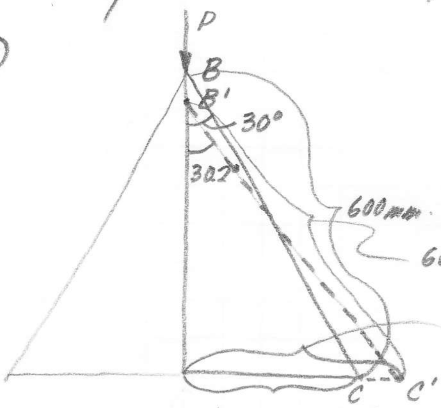
(2-7)



symmetric, focus on one half & multiply the change in length (the numerator) by 2

600 mm

600 mm (rod BC is rigid)

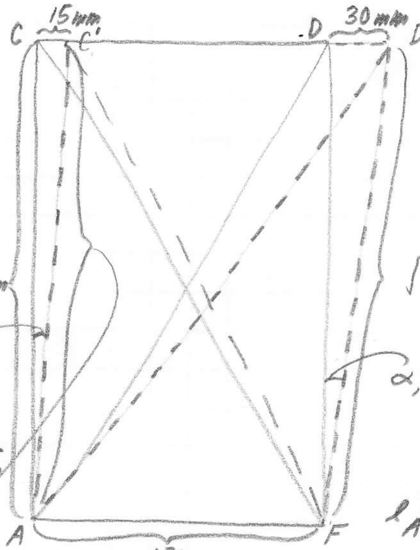
$600\,mm \sin 30.2° = 301.812\,mm$

$600\,mm \sin 30° = 300\,mm$

$$\epsilon_{AC} = \frac{2(301.812\,mm - 300\,mm)}{600\,mm} = \boxed{0.00604\,\frac{mm}{mm}}$$

(or since the strain is assumed constant over the entire length $\epsilon_{AC} = \frac{301.812\,mm - 300\,mm}{300\,mm}$)

(2-13)



$$l_{AD} = l_{CF} = \sqrt{(250\,mm)^2 + (150\,mm)^2} = 291.548\,mm$$

$$\sqrt{(250\,mm)^2 + (30\,mm)^2} = 251.794\,mm$$

α, $\tan\alpha = \frac{30\,mm}{250\,mm}$
$\alpha = 6.843°$

β
$\tan\beta = \frac{15\,mm}{250\,mm}$
$\beta = 3.4336°$

$$l_{AD'}^2 = (150\,mm)^2 + (251.794\,mm)^2 - 2(150\,mm)(251.794\,mm)\cos(90° + 6.843°)$$

$$l_{AD'} = 308.059\,mm$$

$$\sqrt{(250\,mm)^2 + (15\,mm)^2} = 250.450\,mm$$

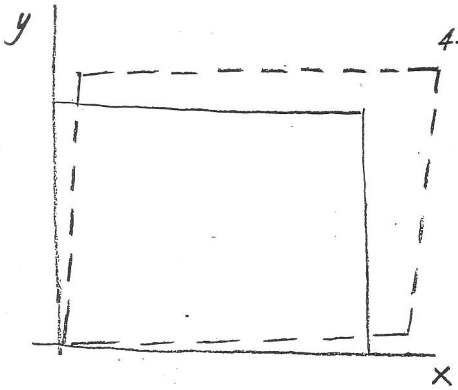
$$\epsilon_{AD} = \frac{308.059\,mm - 291.548\,mm}{291.548\,mm} = \boxed{0.0566\,\frac{mm}{mm}}$$

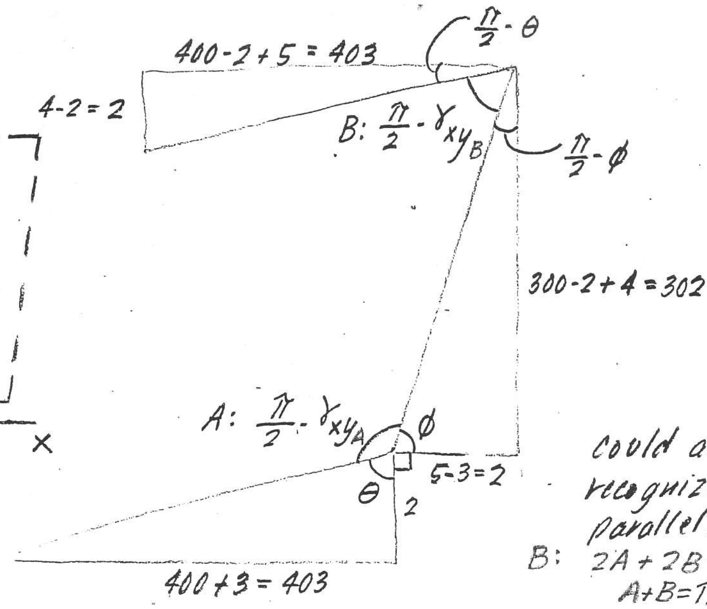
$$l_{C'F}^2 = (150\,mm)^2 + (250.450\,mm)^2 - 2(150\,mm)(250.450\,mm)\cos(90° - 3.4336°)$$

$$l_{C'F} = 284.122\,mm$$

$$\epsilon_{CF} = \frac{284.122\,mm - 291.548\,mm}{291.548\,mm} = \boxed{-0.0255\,\frac{mm}{mm}}$$

2-18





A:
(in rad)

$\tan\phi = \frac{302}{2}$ $\quad \phi = 1.5642$

$\tan\theta = \frac{403}{2}$ $\quad \theta = 1.5658$

$$\left(\frac{\pi}{2}-\gamma_{xy_A}\right)+\phi+\theta+\frac{\pi}{2} = 2\pi$$

$$\gamma_{xy_A} = \frac{\pi}{2}+\phi+\theta+\frac{\pi}{2}-2\pi = \phi+\theta-\pi$$

$$\boxed{\gamma_{xy_A} = -0.0116 \text{ rad}}$$

B:
$$\left(\frac{\pi}{2}-\gamma_{xy_B}\right)+\left(\frac{\pi}{2}-\phi\right)+\left(\frac{\pi}{2}-\theta\right) = \frac{\pi}{2}$$

$$\gamma_{xy_B} = \frac{\pi}{2}+\frac{\pi}{2}-\phi+\frac{\pi}{2}-\theta-\frac{\pi}{2} = \pi-\phi-\theta$$

$$\boxed{\gamma_{xy_B} = 0.0116 \text{ rad}}$$

could also recognize parallelogram

B: $2A+2B = 2\pi$

$A+B = \pi$

$B = \pi - A$

$\frac{\pi}{2}-\gamma_{xy_B} = \pi-\left(\frac{\pi}{2}-\gamma_{xy_A}\right)$

$\frac{\pi}{2}-\gamma_{xy_B} = \pi-\frac{\pi}{2}+\gamma_{xy_A}$

$\gamma_{xy_B} = -\gamma_{xy_A}$