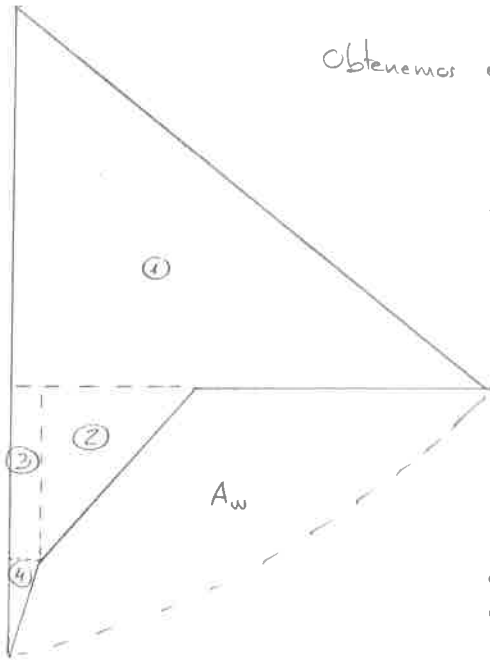


RESOLUCIÓN EJERCICIO

a)

1º Debemos determinar el área del material deslizante  $A_w$

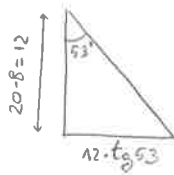
Obtenemos el área total y le restamos ①, ②, ③ y ④



$A_{TOTAL}$

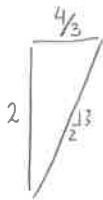
$$\begin{aligned} 360^\circ - \pi r^2 &\Rightarrow x = 185 \text{ m}^2 = A_{TOTAL} \\ 53^\circ - x & \end{aligned}$$

$A_1$



$$A_1 = \frac{1}{2} \cdot 12 \cdot 12 \cdot \text{tg } 53 = 95,54 \text{ m}^2$$

$A_{21}$



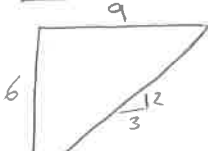
$$A_4 = \frac{1}{2} \cdot 2 \cdot \frac{4}{3} = \frac{4}{3} \text{ m}^2$$

$A_3$



$$A_3 = 6 \cdot \frac{4}{3} = 8 \text{ m}^2$$

$A_2$



$$A_2 = \frac{1}{2} \cdot 6 \cdot 9 = 27 \text{ m}^2$$

$A_{TOTAL}$

$$A_w = A_T - A_1 - A_2 - A_3 - A_4 = 53,13 \text{ m}^2$$

$w$

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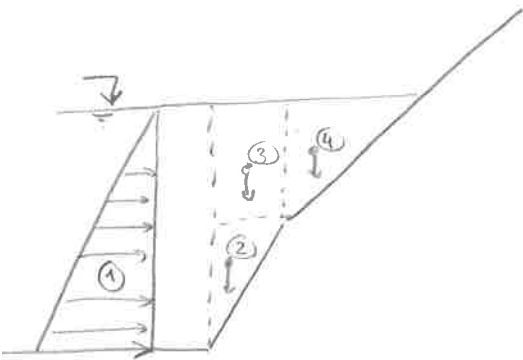
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$$Q = 80 \times 5,59 = 447,3 \text{ KN/m} \quad @ \quad \frac{5,59}{9} + 9 + \frac{4}{3} = 13,13 \text{ m}$$

3° Hallamos los empujes del agua. Los dividimos para simplificar



$$E_{w1} = \frac{1}{2} \cdot 4^2 \cdot 10 = 80 \text{ kNm} @ 20 - \frac{2}{3} \cdot 4 = 17,3 \text{ m}$$

$$E_{w2} = \frac{1}{2} \cdot 2 \cdot \frac{4}{3} \cdot 10 = 13,3 \text{ kNm} @ \frac{1}{3} \cdot \frac{4}{3} = \frac{4}{9} \text{ m}$$

$$E_{w3} = 2 \cdot \frac{4}{3} \cdot 10 = 26,6 \text{ kNm} @ \frac{1}{2} \cdot \frac{4}{3} = \frac{2}{3} \text{ m}$$

$$E_{w4} = \frac{1}{2} \cdot 3 \cdot 2 \cdot 10 = 30 \text{ kNm} @ \frac{1}{3} \cdot 3 + \frac{4}{3} = \frac{7}{3} \text{ m}$$

14° Planteamos el F.S. y resolvemos:

$$FS = \frac{\sum M_{est}}{\sum M_{mov}}$$

$$\begin{aligned} L &\rightarrow 360^\circ - 211^\circ \\ &53 - x \\ &\downarrow \\ L = x &= 18,5 \text{ m} \end{aligned}$$

$$\sum M_{est} = C_u \cdot L \cdot R = 18,5 \cdot 45 \cdot 20 = 16.650,44 \text{ kNm}$$

$$\sum M_{mov} = M_{w_0} + M_q + M_{w_{hid}}$$

$$M_{w_0} = 1062,53 \cdot 8 = 8500,24 \text{ kNm}$$

$$M_q = 447,3 \cdot 13,13 = 5873 \text{ kNm}$$

$$M_{w_{hid}} = -M_{w_1} + M_{w_2} + M_{w_3} + M_{w_4} = -80 \cdot 17,3 + 13,3 \cdot \frac{4}{9} + 26,6 \cdot \frac{2}{3} + 30 \cdot \frac{7}{3} = -1290,36 \text{ kNm}$$

(¡¡¡o signo!!)

$$\sum M_{mov} = 13082,9 \text{ kNm}$$

$$FS = 1,27$$

b) Para obtener la F debemos añadir el momento que nos introduce

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