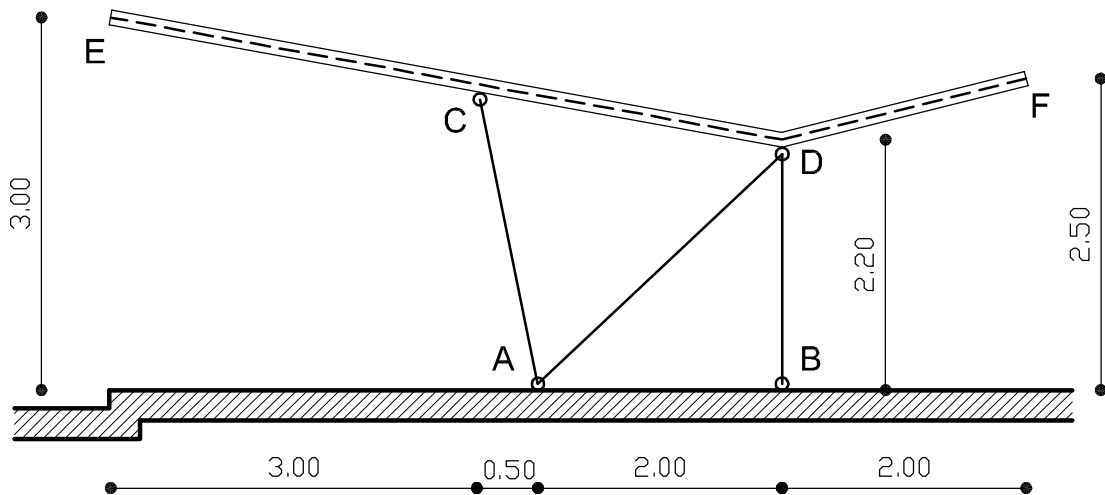
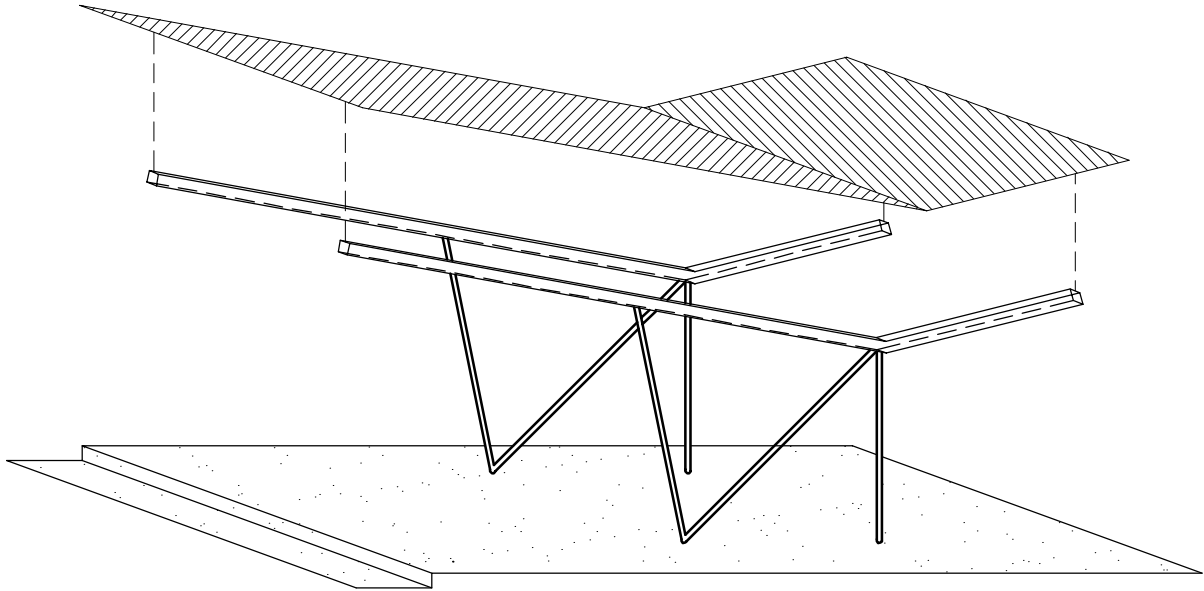


ESTABILIDAD DE LAS CONSTRUCCIONES II  
Solicitaciones en estructuras isostáticas



Estudiar las reacciones en los apoyos de la estructura que se indica por el Método tramo por tramo y confirmar los valores calculando dichas reacciones también por el Método Analítico.

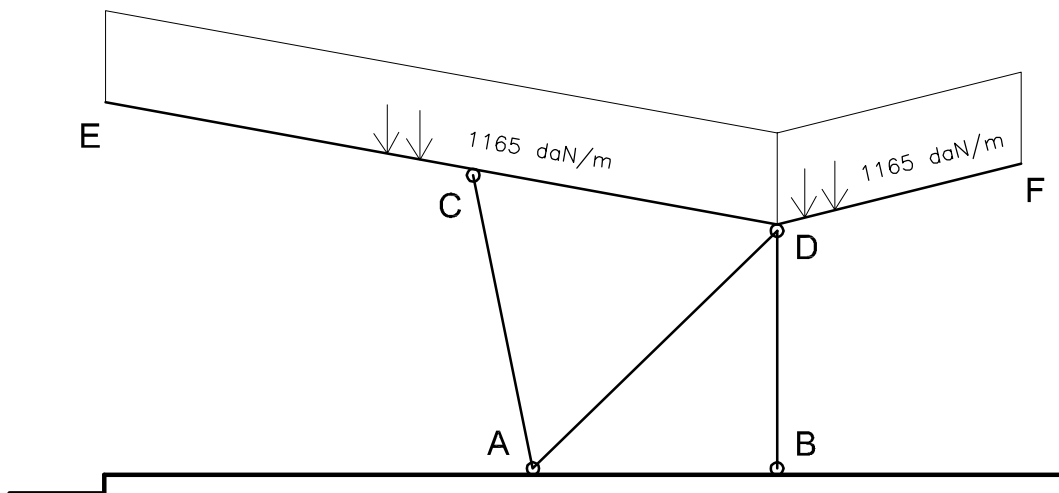
Expresar las fuerzas reactivas con su componente horizontal y vertical.

Se pide además trazar los diagramas de solicitaciones de las barras EC, CD y DF, hallando valores de Momentos máximos.

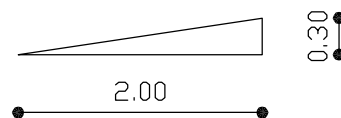
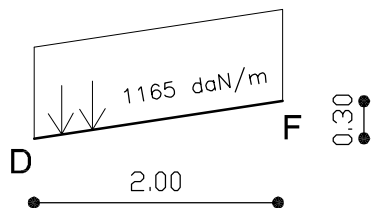
Los tramos EC, CD y DF reciben una descarga de 1050 daN por metro de tramo, y tienen un peso propio de 115 daN por metro de tramo.

El peso propio de los tramos AC, AD y DB se desprecia.

En los tramos EC, CD y DF actúa el peso propio  
 y una descarga que se suman:  
 $115 \text{ daN/m} + 1050 \text{ daN/m} = 1165 \text{ daN/m}$

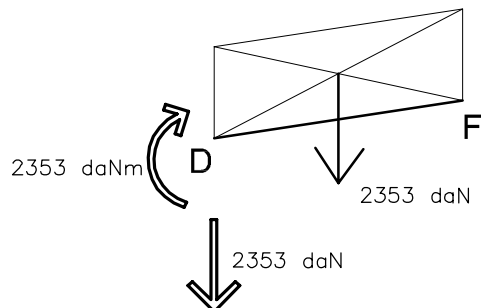


TRAMO DF

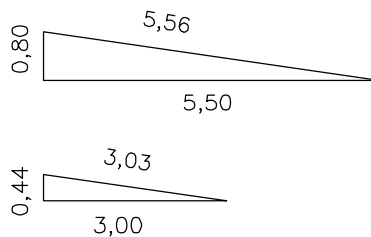
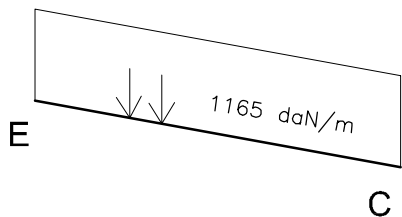


Calculamos la luz real del tramo aplicando Pitágoras

$$L = \sqrt{2,0^2 + 0,3^2} = 2,02 \text{ m}$$



TRAMO EC

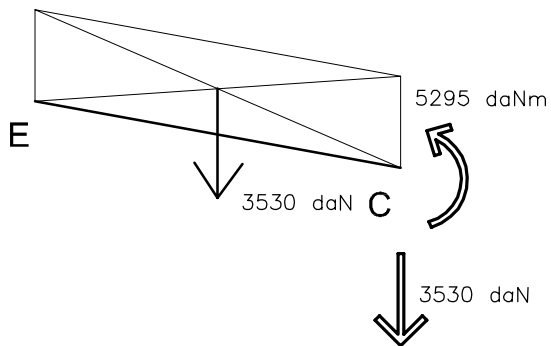


Por Pitágoras:

$$L = \sqrt{5,5^2 + 0,8^2} = 5,56 \text{ m}$$

Por semejanza de triángulos:

$$\frac{3,00}{5,50} = \frac{a}{0,80} = \frac{b}{5,56}$$



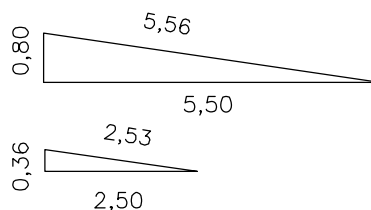
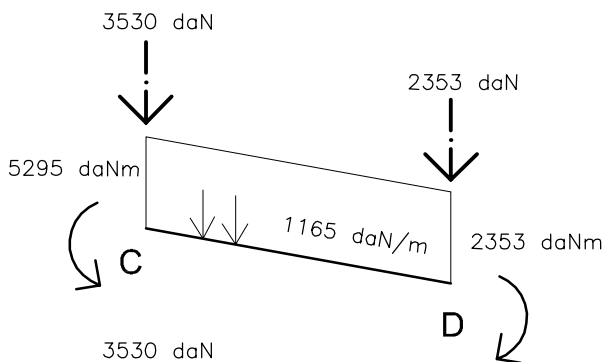
$$1165 \text{ daN/m} \times 3,03 \text{ m} = 3530 \text{ daN}$$

Descarga en C = 3530 daN

$$3530 \text{ daN/m} \times 1,50 \text{ m} = 5295 \text{ daNm}$$

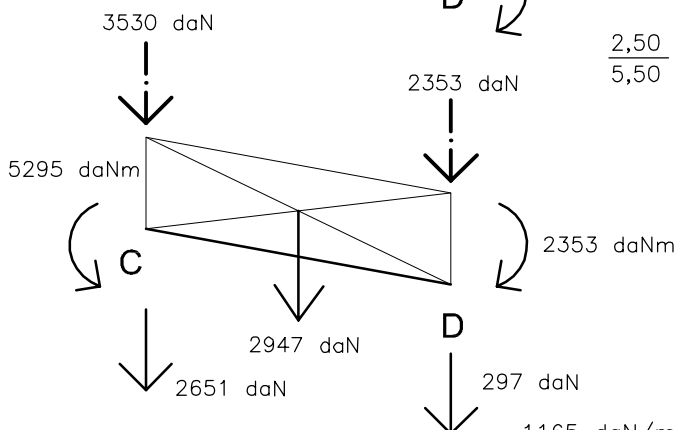
Momento en C = 5295 daNm

TRAMO CD



Por semejanza de triángulos:

$$\frac{2,50}{5,50} = \frac{a}{0,80} = \frac{b}{5,56}$$



$$1165 \text{ daN/m} \times 2,53 \text{ m} = 2947 \text{ daN}$$

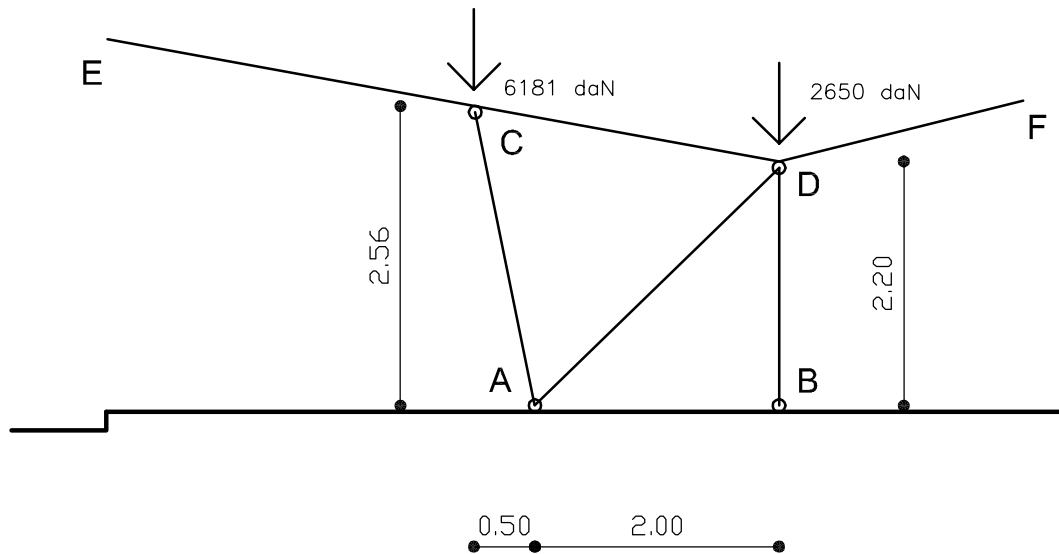
Descarga en apoyos =  $2947/2 = 1474 \text{ daN}$

$$\text{Descarga de Momentos} = \frac{5295 - 2353}{2,5} = \frac{2942}{2,5} = 1177$$

Descarga en C =  $1474 + 1177 = 2651 \text{ daN}$

Descarga en D =  $1474 - 1177 = 297 \text{ daN}$

Descomponemos las descargas halladas según los caminos materiales hasta llegar a los apoyos:



$$L_{AC} = \sqrt{2,56^2 + 0,5^2} = 2,61 \text{ m}$$

$$\alpha = \text{Arctg} \frac{0,5}{2,56} = 11,05^\circ$$

$$\beta = \text{Arccos} \frac{0,5}{2,61} = 78,96^\circ$$

$$\delta = \text{Arctg} \frac{0,36}{2,5} = 8,19^\circ$$

$$\varphi = 90 - 11,05 - 8,19 = 70,76^\circ$$

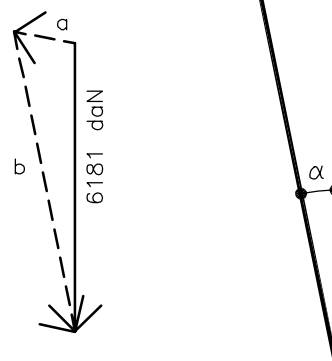
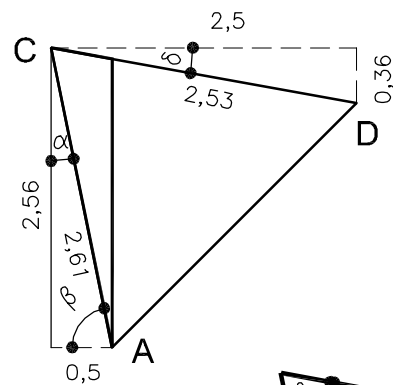
$$\lambda = 180 - 11,05 - 70,76 = 98,19^\circ$$

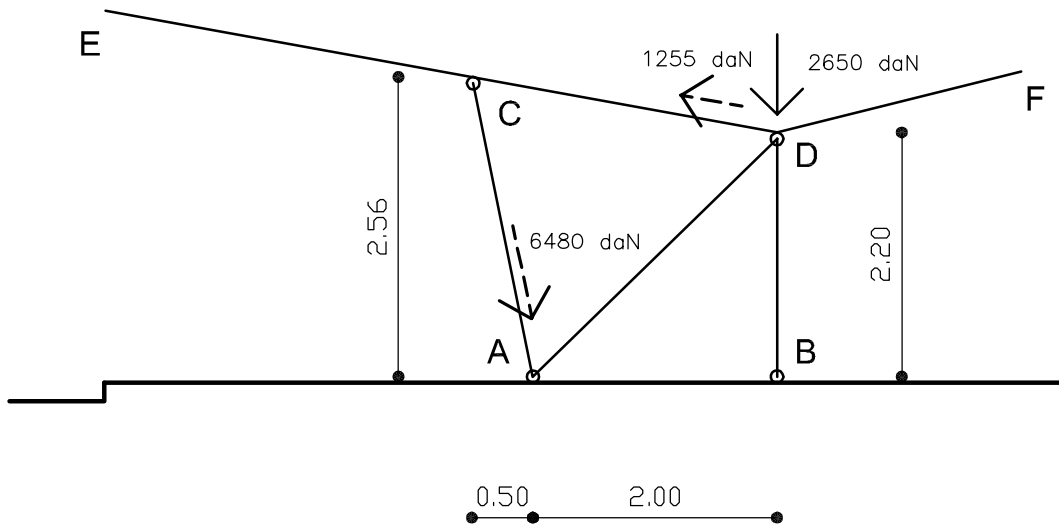
Aplicando Teorema del Seno:

$$\frac{6181}{\text{sen } \varphi} = \frac{a}{\text{sen } \alpha} = \frac{b}{\text{sen } \lambda}$$

$$a = 1255 \text{ daN}$$

$$b = 6480 \text{ daN}$$





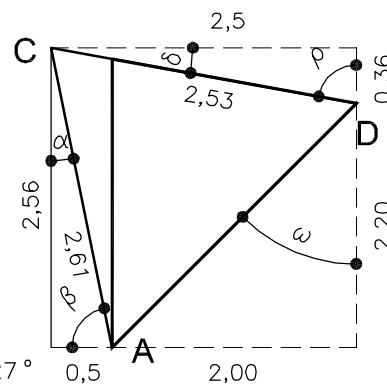
$$\sigma = \alpha + \varphi = 11,05 + 70,76 = 81,81^\circ$$

$$\omega = \text{Arctg} \frac{2,0}{2,20} = 42,27^\circ$$

$$\rho = \sigma = 90 - \delta = 90 - 8,19 = 81,81^\circ$$

$$\tau = 180 - \rho - \omega = 180 - 81,81 - 42,27 = 55,92^\circ$$

$$\nu = \omega = 180 - \sigma - \tau = 180 - 81,81 - 55,92 = 42,27^\circ$$

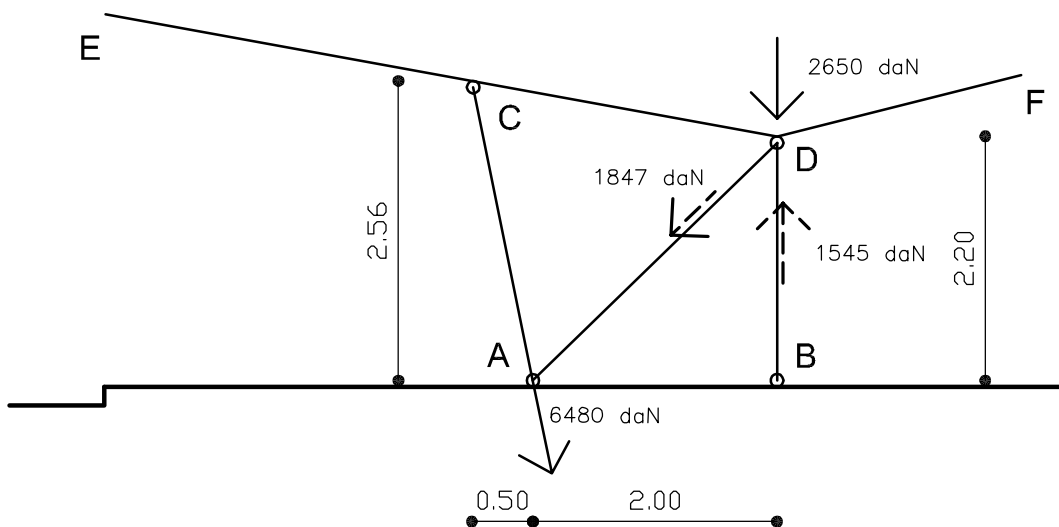
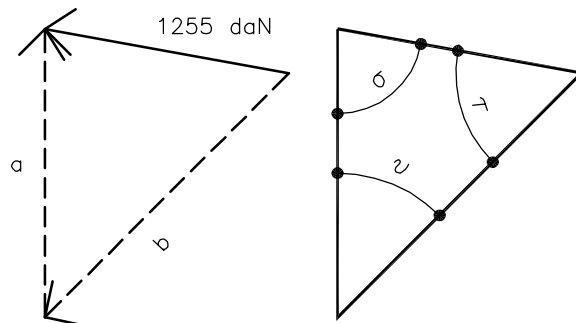


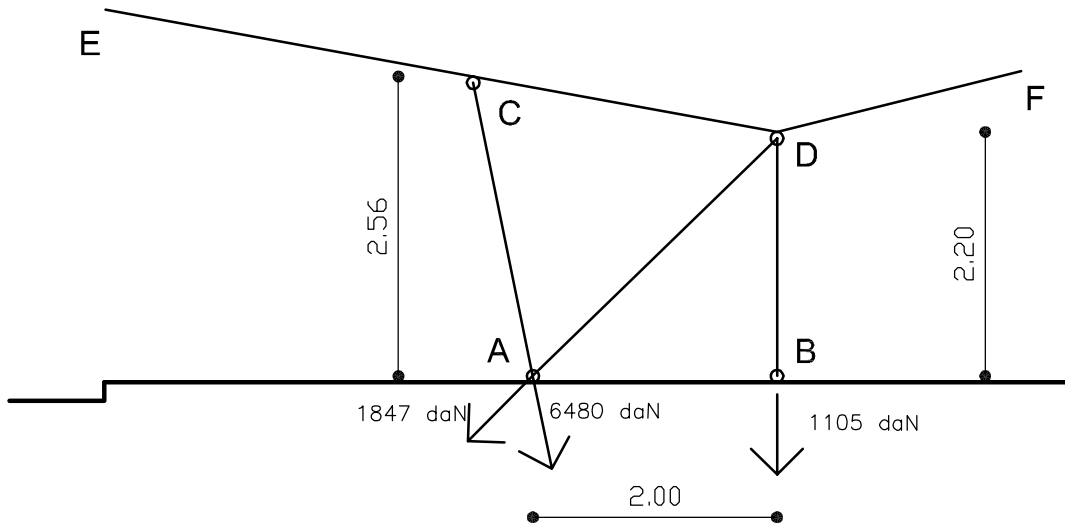
Aplicando Teorema del Seno:

$$\frac{1255}{\text{sen} \nu} = \frac{a}{\text{sen} \tau} = \frac{b}{\text{sen} \sigma}$$

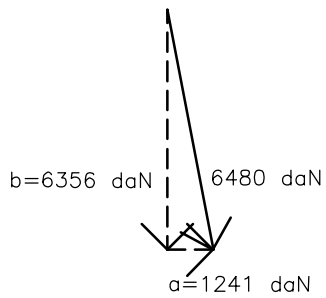
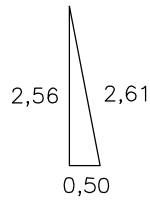
$$a = 1545 \text{ daN}$$

$$b = 1847 \text{ daN}$$

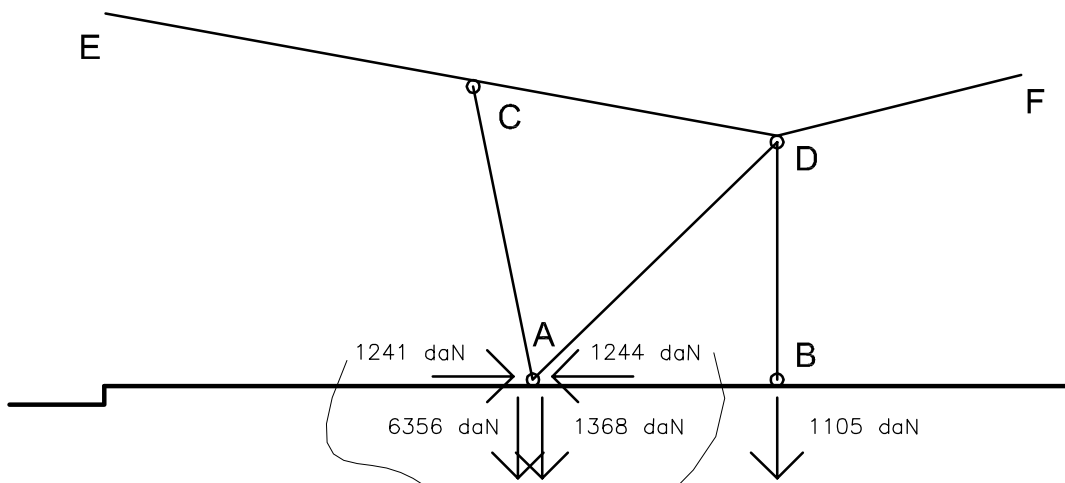
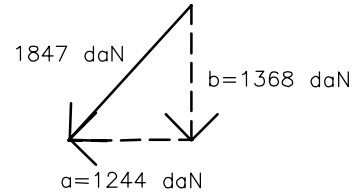
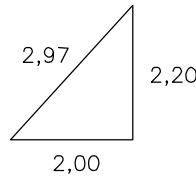




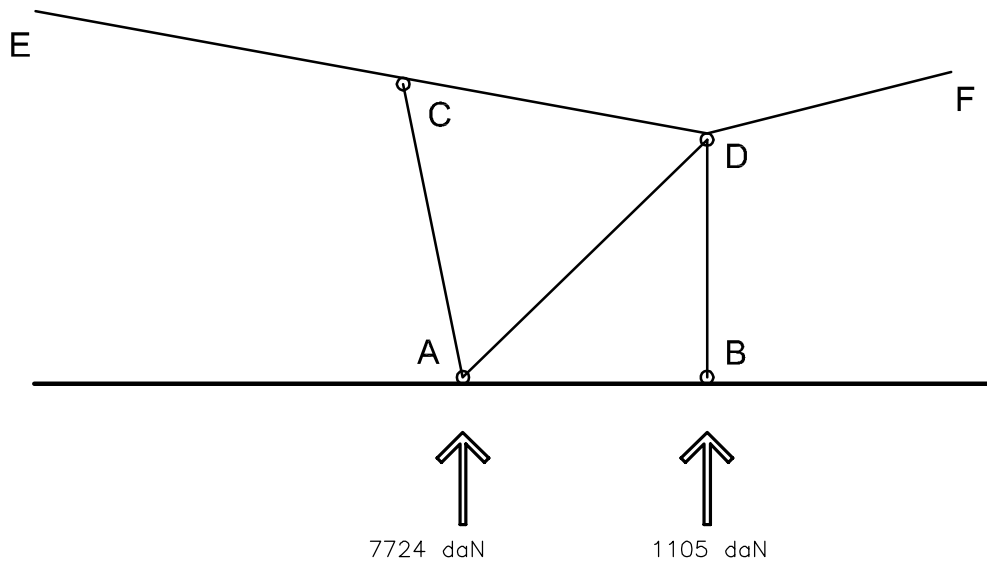
$$\frac{6480}{2,61} = \frac{a}{0,5} = \frac{b}{2,56}$$



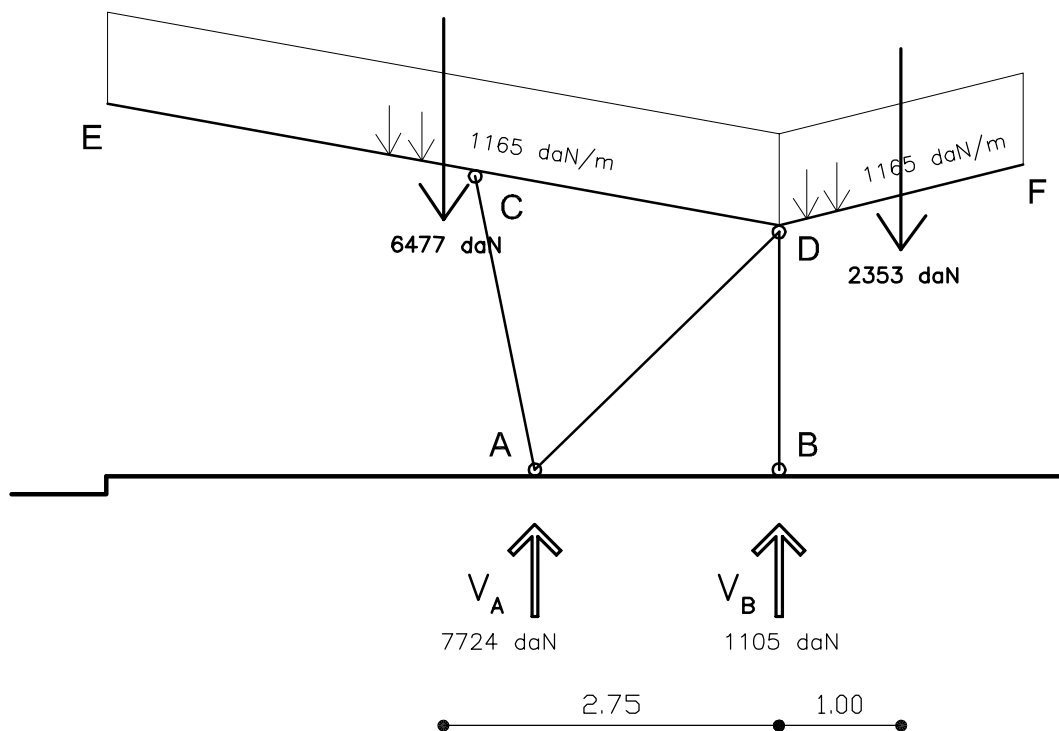
$$\frac{1847}{2,97} = \frac{a}{2,0} = \frac{b}{2,2}$$



Se anulan. La diferencia proviene de las descomposiciones.



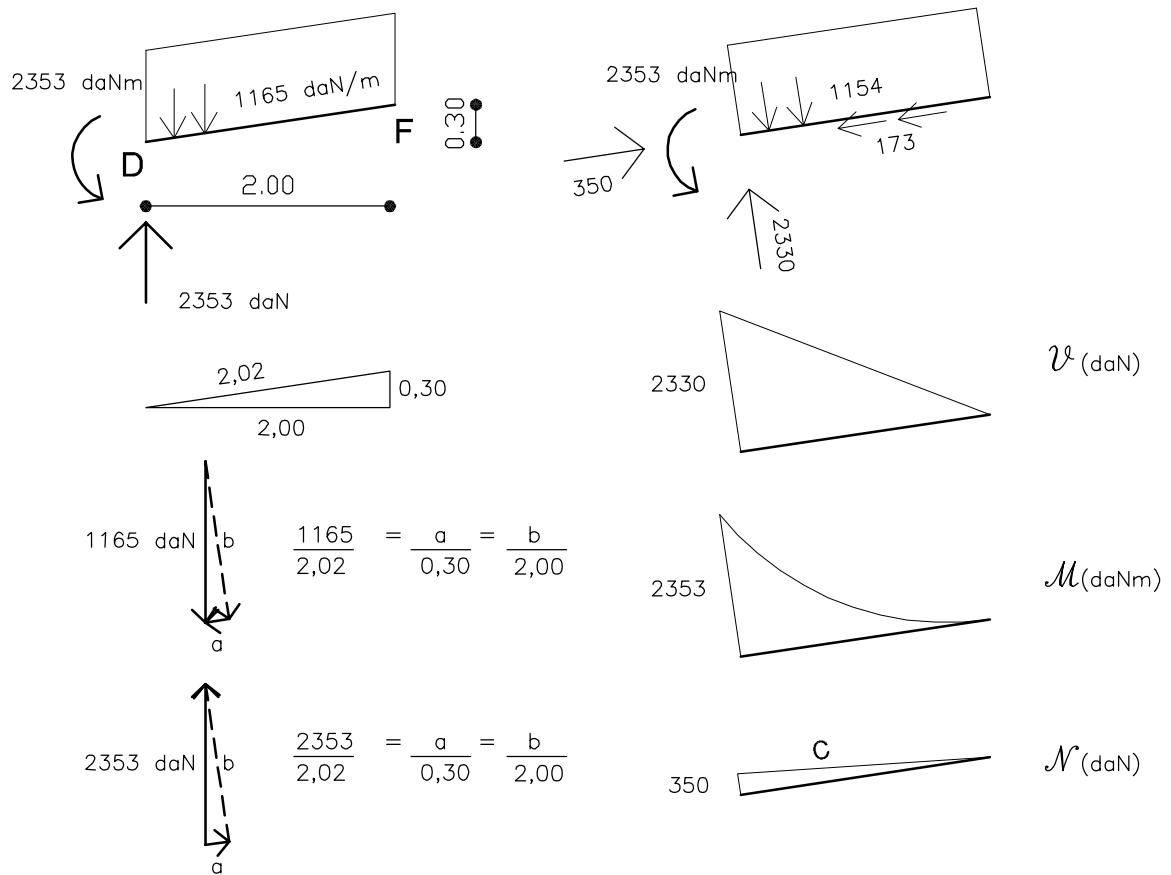
Confirmaremos ahora estos valores determinando las reacciones por el método analítico general:



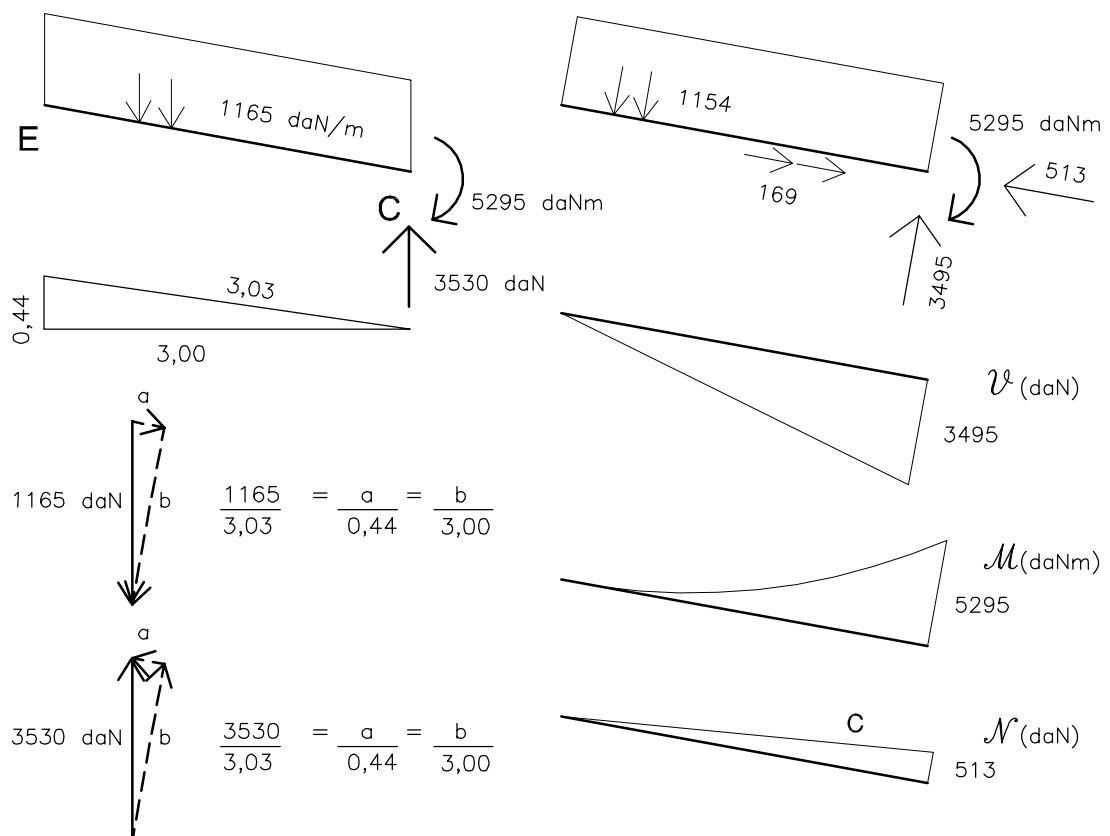
$$\begin{aligned} \sum F_H &= 0 \\ \sum F_V &= 6477 + 2353 - [V_A + V_B] = 8829 - [V_A + V_B] = 0 \\ \sum M_B &= -6477 \times 2,75 + 2353 \times 1 + V_A \times 2 = 0 \\ &= -15459 + V_A \times 2 = 0 \\ V_A &= 15459 / 2 = 7730 \text{ daN} \approx 7724 \text{ daN} \\ V_A + V_B &= 8829 \text{ daN} \\ V_B &= 8829 - 7724 = 1105 \text{ daN} \end{aligned}$$

## DIAGRAMAS DE SOLICITACIONES

TRAMO DF:

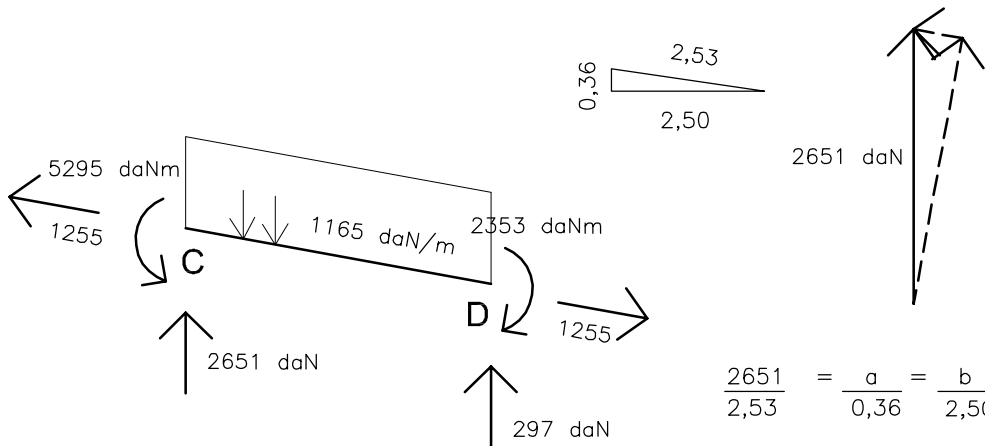


TRAMO EC:



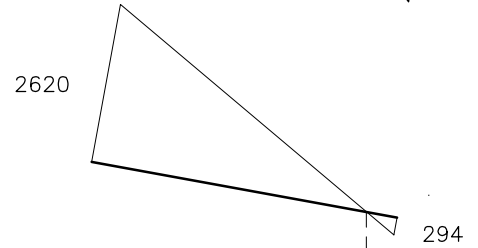
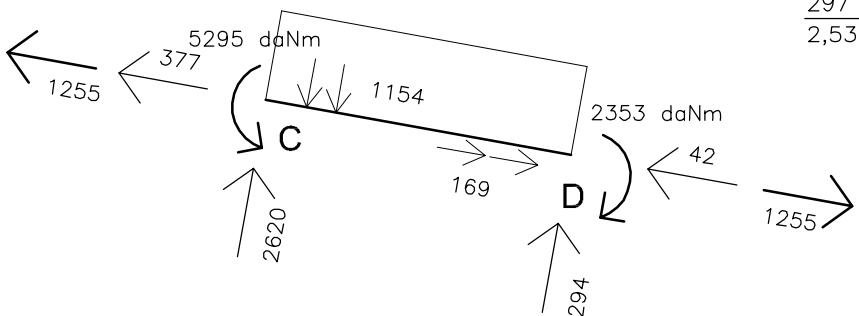


TRAMO CD



$$\frac{2651}{2,53} = \frac{a}{0,36} = \frac{b}{2,50}$$

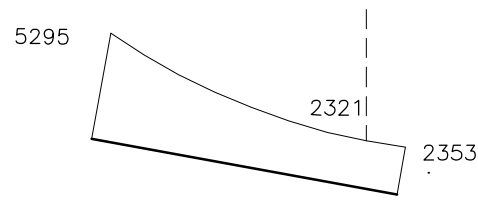
$$\frac{297}{2,53} = \frac{a}{0,36} = \frac{b}{2,50}$$



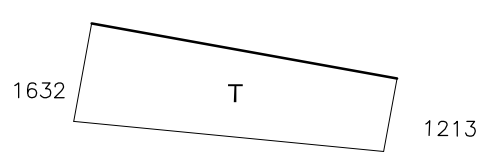
$V$  (daN)

$$X_0 = \frac{2620}{1154} = 2,27$$

$$M_0 = 5295 - \frac{2620 \times 2,27}{2} = 2321$$



$M$  (daNm)



$N$  (daN)