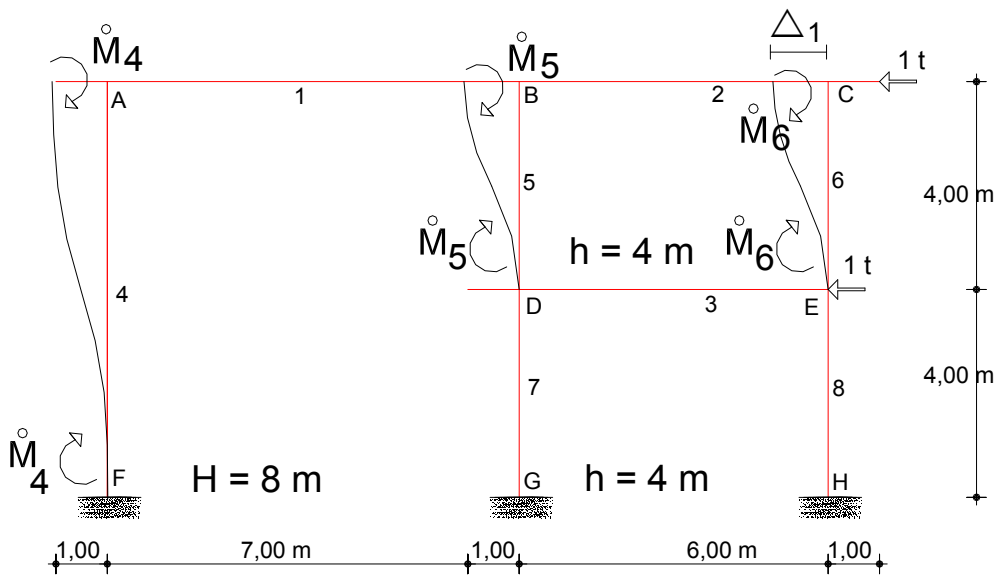
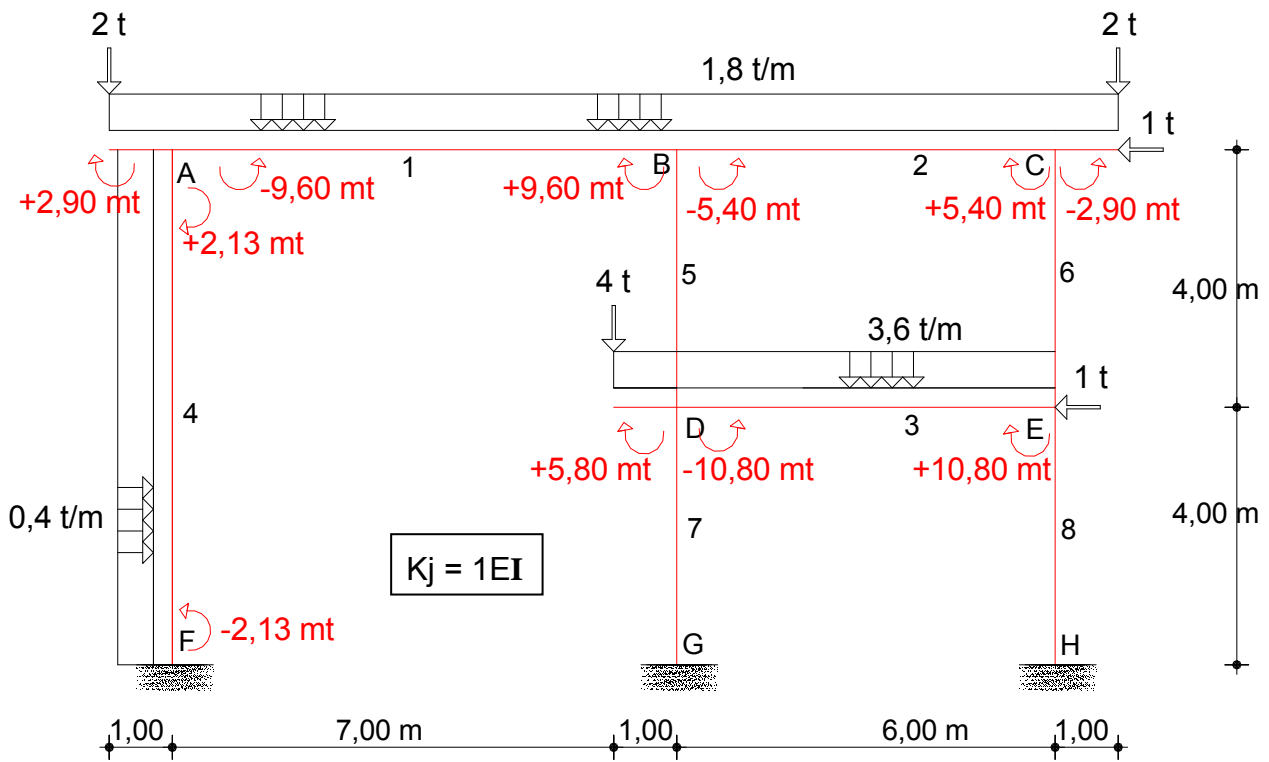
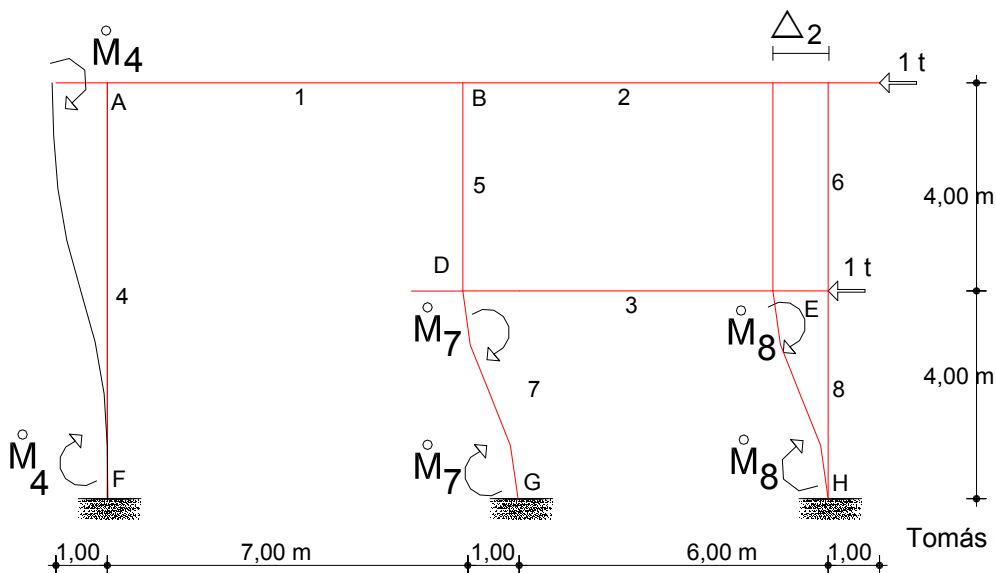


# Ejercicio nº 9: Pórtico con pilar de doble altura (malla incompleta)

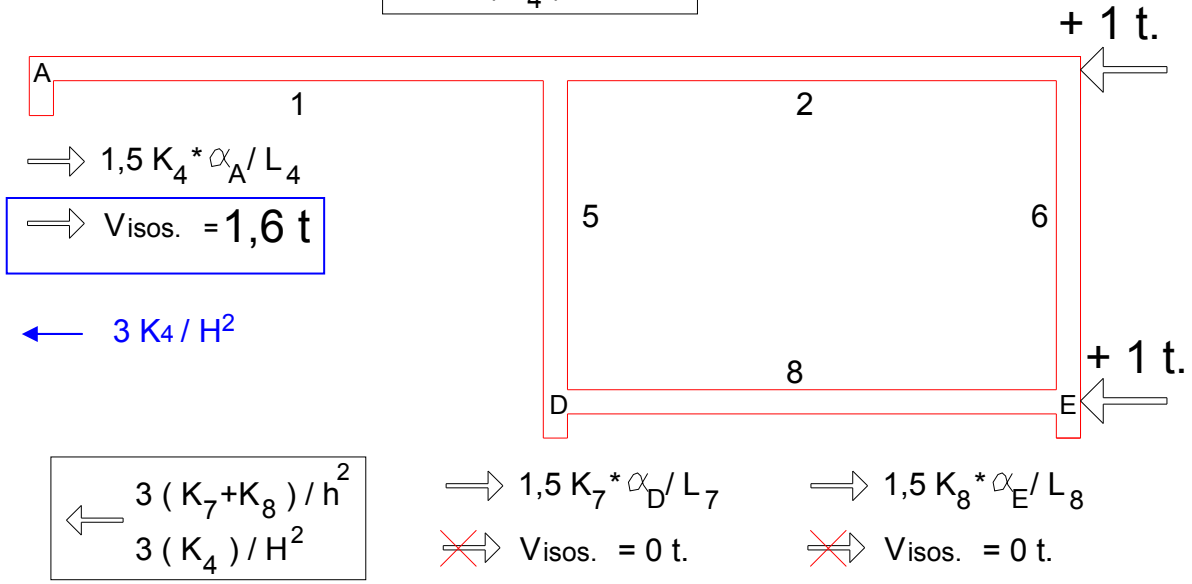
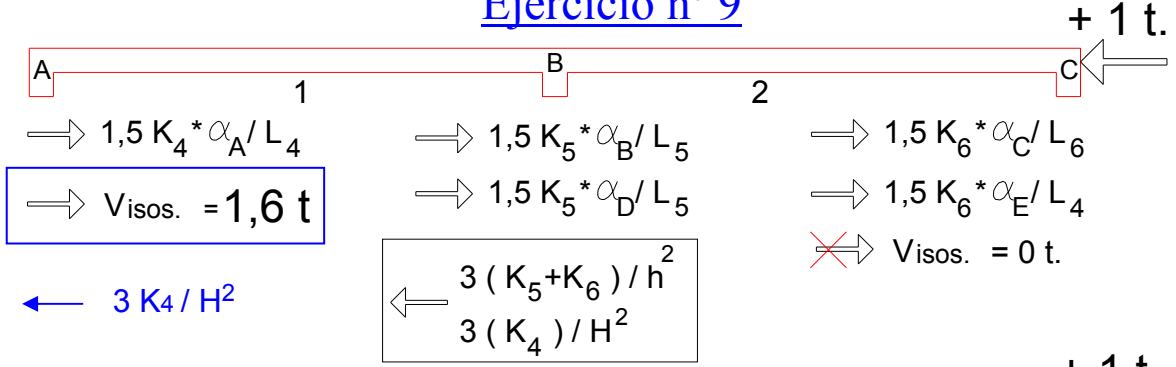


GT: 2

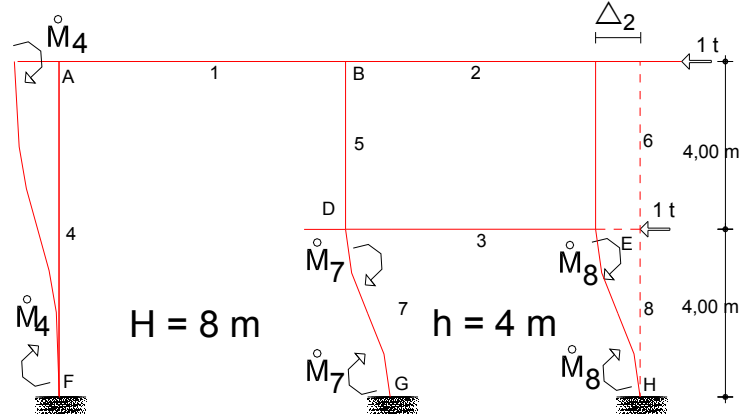
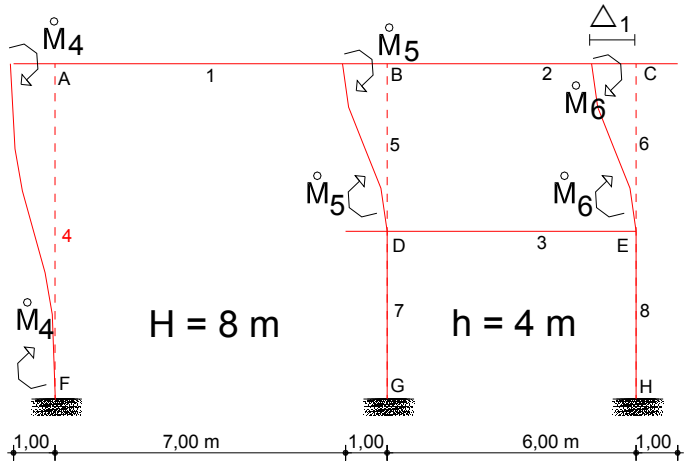


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# Ejercicio nº 9

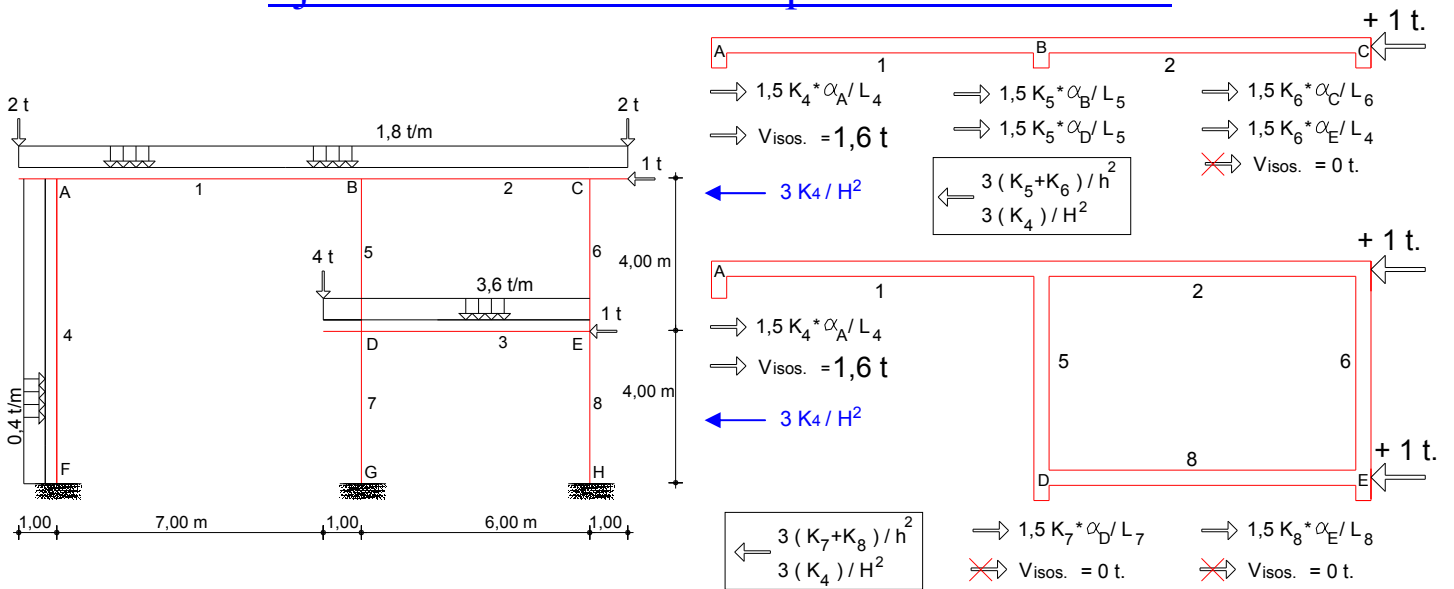


| $\alpha_A$        | $\alpha_B$        | $\alpha_C$        | $\alpha_D$        | $\alpha_E$        | $\Delta_1$                  | $\Delta_2$                  |            |        |
|-------------------|-------------------|-------------------|-------------------|-------------------|-----------------------------|-----------------------------|------------|--------|
| $K_1+K_4$         | $1/2 * K_1$       |                   |                   |                   | $1,5 * K_4 / L_4$           | $1,5 * K_4 / L_4$           | $\alpha_A$ | +4,57  |
| $1/2 * K_1$       | $K_1+K_2+K_5$     | $1/2 * K_2$       | $1/2 * K_5$       |                   | $1,5 * K_5 / L_5$           |                             | $\alpha_B$ | -4,20  |
|                   | $1/2 * K_2$       | $K_2+K_6$         |                   | $1/2 * K_6$       | $1,5 * K_6 / L_6$           |                             | $\alpha_C$ | -2,50  |
|                   |                   |                   | $K_5+K_3+K_7$     | $1/2 * K_3$       | $1,5 * K_5 / L_5$           | $1,5 * K_7 / L_7$           | $\alpha_D$ | +5,00  |
|                   |                   | $1/2 * K_8$       | $1/2 * K_4$       | $K_4+K_5+K_8$     | $1,5 * K_6 / L_6$           | $1,5 * K_8 / L_8$           | $\alpha_E$ | -10,80 |
| $1,5 * K_4 / L_4$ | $1,5 * K_2 / L_2$ | $1,5 * K_6 / L_6$ | $1,5 * K_5 / L_5$ | $1,5 * K_6 / L_6$ | $3K_4/H^2 + 3(K_5+K_6)/h^2$ | $3K_4/H^2$                  | $\Delta_1$ | -0,60  |
| $1,5 * K_4 / L_4$ |                   |                   | $1,5 * K_7 / L_7$ | $1,5 * K_8 / L_8$ | $3K_4/H^2$                  | $3K_4/H^2 + 3(K_7+K_8)/h^2$ | $\Delta_2$ | 0,40   |



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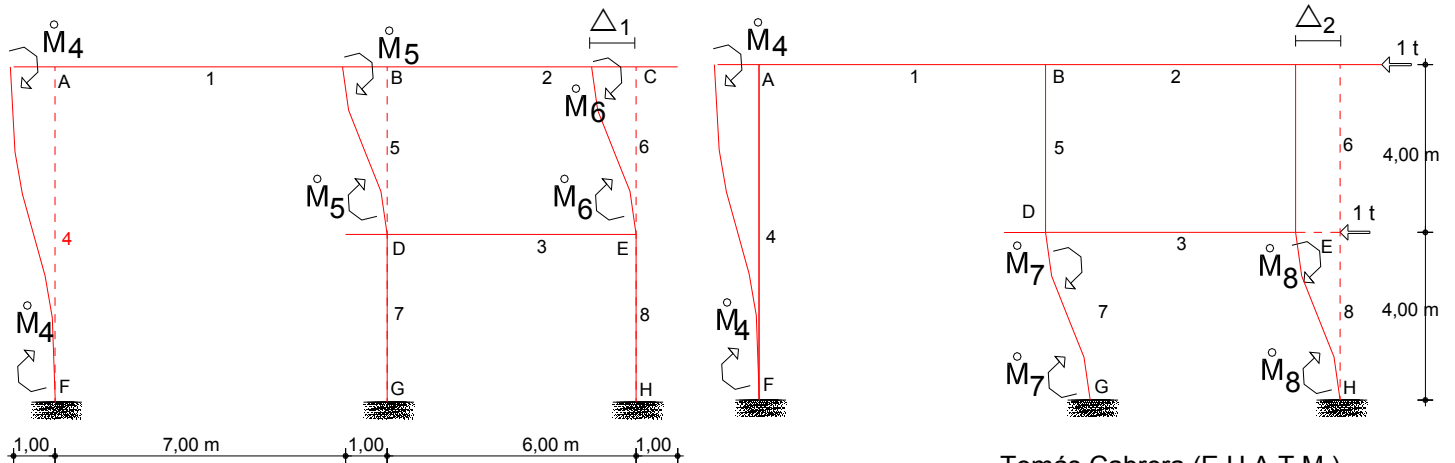
## Ejercicio nº 9: Pórtico con pilar de doble altura



|            | $\alpha_A$ | $\alpha_B$ | $\alpha_C$ | $\alpha_D$ | $\alpha_E$ | $\Delta_1$ | $\Delta_2$ |            |            |        |
|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|--------|
| $\alpha_A$ | 2          | 0,5        |            |            |            | 0,1875     | 0,1875     | *          | $\alpha_A$ | +4,57  |
| $\alpha_B$ | 0,5        | 3          | 0,5        | 0,5        |            | 0,3750     |            |            | $\alpha_B$ | -4,20  |
| $\alpha_C$ |            | 0,5        | 2          |            | 0,5        | 0,3750     |            |            | $\alpha_C$ | -2,50  |
| $\alpha_D$ |            | 0,5        |            | 3          | 0,5        | 0,3750     | 0,3750     |            | $\alpha_D$ | +5,00  |
| $\alpha_E$ |            |            | 0,5        | 0,5        | 3          | 0,3750     | 0,3750     |            | $\alpha_E$ | -10,80 |
| $\Delta_1$ | 0,1875     | 0,3750     | 0,3750     | 0,3750     | 0,3750     | 0,4219     | 0,0469     | $\Delta_1$ | -0,60      |        |
| $\Delta_2$ | 0,1875     |            |            | 0,3750     | 0,3750     | 0,0469     | 0,4219     | $\Delta_2$ | 0,40       |        |

$\alpha_A = + 2,7058 / EI$    
  $\alpha_B = - 2,4115 / EI$    
  $\alpha_C = + 0,3038 / EI$    
  $\alpha_D = + 2,5473 / EI$

$\alpha_E = - 4,3157 / EI$    
  $\Delta_1 = +0,6826 / EI$    
  $\Delta_2 = +1,2416 / EI$



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### Ejemplo nº 9: Pórtico con pilar de doble altura (malla incompleta)

$$M_{1A} = -9,60 + 1 * \left( +2,7058 + \frac{1}{2} * -2,4115 + 1,5 * 0 / 8 \right) = -8,10mt$$

$$M_{1B} = +9,60 + 1 * \left( -2,4115 + \frac{1}{2} * +2,7058 + 1,5 * 0 / 8 \right) = +8,54mt$$

$$M_{2B} = -5,40 + 1 * \left( -2,4115 + \frac{1}{2} * +0,3038 + 1,5 * 0 / 6 \right) = -7,66mt$$

$$M_{2C} = +5,40 + 1 * \left( +0,3037 + \frac{1}{2} * -2,4091 + 1,5 * 0 / 6 \right) = +4,50mt$$

$$M_{3D} = -10,80 + 1 * \left( +2,5473 + \frac{1}{2} * -4,3157 + 1,5 * 0 / 6 \right) = -10,41mt$$

$$M_{3E} = +10,80 + 1 * \left( -4,3157 + \frac{1}{2} * +2,5473 + 1,5 * 0 / 6 \right) = +7,76mt$$

$$M_{4F} = -2,13 + 1 * \left( 0 + \frac{1}{2} * 2,7058 + 1,5 * (+0,6826 + 1,2416 / 8) \right) = -0,42mt$$

$$M_{4A} = +2,13 + 1 * \left( +2,7058 + \frac{1}{2} * 0 + 1,5 * (+0,6826 + 1,2416 / 8) \right) = +5,20mt$$

$$M_{5D} = 0,00 + 1 * \left( +2,5473 + \frac{1}{2} * -2,4115 + 1,5 * +0,6826 / 4 \right) = +1,60mt$$

$$M_{5B} = 0,00 + 1 * \left( -2,4115 + \frac{1}{2} * +2,5473 + 1,5 * +0,6826 / 4 \right) = -0,88mt$$

$$M_{6E} = 0,00 + 1 * \left( -4,3157 + \frac{1}{2} * +0,3038 + 1,5 * +0,6826 / 4 \right) = -3,91mt$$

$$M_{6C} = 0,00 + 1 * \left( +0,3038 + \frac{1}{2} * -4,3157 + 1,5 * +0,6826 / 4 \right) = -1,60mt$$

$$M_{7G} = 0,00 + 1 * \left( 0 + \frac{1}{2} * +2,5473 + 1,5 * +1,2416 / 4 \right) = +1,74mt$$

$$M_{7D} = 0,00 + 1 * \left( +2,5473 + \frac{1}{2} * 0 + 1,5 * +1,2416 / 4 \right) = +3,01mt$$

$$M_{8H} = 0,00 + 1 * \left( 0 + \frac{1}{2} * -4,3283 + 1,5 * +1,2416 / 4 \right) = -1,69mt$$

$$M_{8E} = 0,00 + 1 * \left( -4,3157 + \frac{1}{2} * 0 + 1,5 * +1,2416 / 4 \right) = -3,85mt$$

Tomás Cabrera (E.U.A.T.M.)