Solution - Design Example V2

Equation 3.3 of Eurocode 6 and Table NA.4 of UK National Annex (NA)

\[ f_k = K_f \alpha = 0,90 \times 9,50^{0.85} = 6,10 \text{ N/mm}^2 \]

Checking Capacity:

Effective height, \( h_{ef} = \rho_n h = 0,75 \times 3000 = 2250 \text{ mm as before} \)

Effective thickness, \( t_{ef} = t = 120 \text{ mm} \)

\[ \therefore \text{Slenderness ratio} = \frac{2250}{120} = 18,75 < 27 \text{ limiting} \]

(Therefore the effects of creep may be ignored, NA.2.14 of UK NA)

Hence eccentricity of design vertical load, \( e_i = (M_{id} / N_{id}) + e_{he} + e_{init} \geq 0,05t \)

Therefore \( e_i = 0 + 0 + 5,0 = 5,0 \text{ mm (i.e. 0,042t)} \)

\[ \text{where } \frac{M_{id}}{N_{id}} = 0 \]

\[ e_{he} = 0 \text{ (horizontal loads effect)} \]

\[ e_{init} = \frac{h_{ef}}{450} = \frac{3000 \times 0.75}{450} = 5,0 \text{ mm} \]

\( e_i \) is 0,05 \( t \) at top and bottom of the wall which are the minimum eccentricity design values to be used

Therefore \( \phi_i = 1 - 2(e_i / t) = 1 - 2(0,05t / t) = 0,9 \)

And eccentricity of design vertical load, \( e_m = (M_{md} / N_{md}) + e_{hm} + e_{init} \geq 0,05t \)

Therefore \( e_{mk} = e_m + e_k = 0 + 0 + 5,0 = 5,0 \text{ mm (i.e. 0,042t)} \)

\[ \text{where } \frac{M_{md}}{N_{md}} = 0 \]

\[ e_{hm} = 0 \text{ (horizontal loads effect)} \]

\[ e_{init} = \frac{h_{ef}}{450} = \frac{3000 \times 0.75}{450} = 5,0 \text{ mm} \]

\[ e_k = 0 \text{ (creep effect)} \]

\( e_{mk} \) is 0,05 \( t \) at mid-height of the wall which is the minimum eccentricity design value to be used

Hence for \( E = 1000f_k \) (5420 N/mm\(^2\)) Part 1.1 Annex G equations or Figure G1 gives:

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\[ \Phi_m = 0.66 \]

Class I execution control \( \therefore \gamma_m = 2.3 \)

Design resistance per unit length \( N_{Rd} = \Phi t f_d \) from Table NA.1 of UK NA

Where design strength, \( f_d = \frac{f_k}{\gamma_m} \) for vertical load on the units in the -
- normal direction of loading

\[ N_{Rd} = 0.66 \times 120 \times 6.10 / 2.3 = 210 \text{ kN/m run} > 180 \text{ kN/m} \]

This is greater than the design load and therefore the concrete block masonry units and thin layer mortar jointing specified are adequate.