Slenderness ratio:

Effective thickness of inner leaf, \( t_{ef} = \frac{1}{\sqrt{t_1^2 + t_2^2}} \)

\[ = t_{ef} = \frac{1}{\sqrt{102.5^2 + 140^2}} = 156 \text{ mm} \]

Effective height \( h_{ef} = 0.75 \times 3000 = 2250 \text{ mm} \)

\[ h_{ef} = \frac{2250}{156} = 14.4 \]

Eccentricity of 1st floor loading, \( e_i = \frac{t}{6} \)

Hence eccentricity of design vertical load, \( e_i = \frac{M_{id}}{N_{id}} + e_{he} + e_{init} \geq 0.05t \)

Therefore \( e_i = 1.8 + 0 + 5.0 = 6.8 \text{ mm} \) (i.e. 0.049t)

\[ \text{where } M_{id}/N_{id} = \frac{10 \times 140}{130 \times 6} = 1.80 \text{ mm} \]

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

\[ e_{init} = h_{ef}/450 = \frac{3000 \times 0.75}{450} = 5.0 \text{ mm} \]

\( e_i \) 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, \( e_m = \frac{M_{md}}{N_{md}} + e_{hm} + e_{init} \geq 0.05t \)

Therefore \( e_{mk} = e_m + e_k = 0 + 0 + 5.0 = 5.0 \text{ mm} \) (i.e. 0.036t)

\[ \text{where } M_{md}/N_{md} = 0 \text{ (point of contraflexure of double curvature strut)} \]

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

\[ e_{init} = h_{ef}/450 = \frac{3000 \times 0.75}{450} = 5.0 \text{ mm} \]

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

\( e_{mk} \) is 0.05 \( t \) at mid-height of the wall which is the minimum eccentricity design value to be used.

Hence for \( E = 1000f_k \) Part 1.1 Annex G equations or Figure G1 gives:
Φₘ = 0,76

Design resistance per unit length \( N_{Rd} = \Phi_{\text{min}} t f_d \)

Where design strength, \( f_d = \frac{f_k}{Y_m} \)

\[ N_{Rd} = 0,76 \times 140 \times f_k / 2,3 = 130 \text{ kN/m run} \]

Hence \( f_k \) required = 2,81 N/mm²

\[ f_k = Kf_b f_m^b \]

Therefore \( 2,81 = 0,75 \times f_b^{0,7} \times 4^{0,3} \)

\[ f_b^{0,7} = 2,472 \quad \text{i.e. } f_{\text{bmin}} = 0,7 \sqrt[0,7]{2,472} \]

\[ f_{\text{bmin}} = 3.64 \text{ N/mm}^2 \text{ min.} \]

Normalised compressive strength, \( f_b = \text{compressive strength} \times \delta \times \text{conditioning factor} \)

Using a 215mm high by 140mm wide masonry unit, \( \delta \), the shape factor from BS EN 772-1, Table A.1 is 1,30 for the air dry condition compressive testing regime

Therefore masonry unit compressive strength required = \( 3.64 / (1,30 \times 1,0) \)

\[ = 2.8 \text{ N/mm}^2 \]

Choose for convenience a concrete block masonry unit with a compressive strength (non-normalised) of 2.9 N/mm², (represents a normalised compressive strength \( (f_b) \) of 3.77 N/mm² when masonry unit is conditioned for testing air dry).

Therefore actual \( f_k \) achieved = \( f_k = Kf_b f_m^b = 0,75 \times 3.77^{0,7} \times 4^{0,3} = 2.88 \text{ N/mm}^2 \)

\[ f_d = \frac{f_k}{Y_m} \]

And actual wall vertical load capacity:

\[ N_{Rd} = 0,76 \times 140 \times 2.88 / 2,3 = 133 \text{ kN/m run} \]

Wall will carry a design vertical load of 133 kN/m run (> 130 kN/m applied)