

Eurocode 2 - Pile Structural Capacity Check

Previously, it was generally understood that the verification of the Eurocode structural capacity of piles was in accordance with Section 3 of Eurocode 2. However, this is only applicable to reinforced concrete and different rules apply to plain or lightly reinforced concrete structures / piles as follows.

Clause 3.1.6

$$f_{c;d} = \frac{\alpha_{cc} \times f_{c;k}}{\gamma_c \times k_f}$$

Where; $\gamma_c = 1.5$

$k_f = 1.1$ for cast in-situ piles without permanent casing.

α_{cc} is the coefficient taking into account long term effects on the compressive strength and of unfavourable effects resulting from the way the load is applied.

National Annex states a value of 0.85 should be used.

However, the above is only applicable for piles which provide at least minimum reinforcement.

Otherwise, the piles will need to be designed to clause 12.3.1 (Plain & Lightly Reinforced Concrete Structures), where $\alpha_{cc,pl} = 0.6$ in the National Annex.

Note - α_{ct} values in tension also differ.

Recommended action includes a review of FPS position paper on the design of piles to Eurocodes to clarify, specifically Section 3. Note – Section 5 relating to Ground Anchor design may also be updated at the same time.

Independent advice from The Concrete Centre.

In EC2 Part 1-1 cl 9.2.1.1 a minimum amount of longitudinal reinforcement, $A_{s,min}$, should be provided to control cracking, equation 9.1N. Sections containing less reinforcement than $A_{s,min}$, should be considered as unreinforced, i.e design as plain concrete using Section 12 in EC2. $A_{s,min}$ is needed so that the steel will not exceed its yield strength when the first crack forms. The values for $A_{s,min}$ are:

Table 6
Minimum percentage of reinforcement required

f_{ck}	f_{ctm}	Minimum % ($0.26 f_{ctm} / f_{yk}^2$)
25	2.6	0.13%
28	2.8	0.14%
30	2.9	0.15%
32	3.0	0.16%
35	3.2	0.17%
40	3.5	0.18%
45	3.8	0.20%
50	4.1	0.21%

Key
a Where $f_{yk} = 500$ MPa.

For reinforced concrete the design strengths are given in EC2 Part 1-1 Section 3.0. The recommended value of α_{cc} is 1.0 in cl 3.1.6(1) but the UK NA says use 0.85 for compression in flexure and axial loading.

For plain concrete the design strengths are given in EC2 Part 1-1 Section 12.0. The recommended value of $\alpha_{cc,pl}$ is 0.8 in cl 12.3.1(1) but the UK NA says use 0.6.

Regards

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