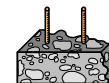


# Concrete

## CONCRETE STRENGTH

Concrete is classified according to its compressive strength which is based on the classification per strength measured on cylinders as indicated in the NF EN 206-1 standard. For information, the table below gives an equivalence between the characteristic values and average strength on cylindrical and cubic specimens in Mpa.



Classes	Characteristic strength $f_{ck}$		Average strength		
	Cylinder 16 x 32 cm	Cube 15 x 15 x 15 cm	Cylinder ( $f_{cm}$ ) 16 x 32 cm	Cube 15 x 15 x 15 cm	Cube 20 x 20 x 20 cm
C 16/20	16	20	20	25	24
◆ C 20/25	<b>20</b>	<b>25</b>	<b>25</b>	<b>31</b>	<b>29</b>
C 25/30	25	30	30	37	36
◆ C 30/37	<b>30</b>	<b>37</b>	<b>37</b>	<b>46</b>	<b>43</b>
C 35/45	35	45	45	56	53
◆ C 40/50	<b>40</b>	<b>50</b>	<b>50</b>	<b>62</b>	<b>59</b>
C 45/55	45	55	55	69	65
◆ C 50/60	<b>50</b>	<b>60</b>	<b>60</b>	<b>72</b>	<b>68</b>

◆ The most usual classes

## FIELD OF USAGE: CRACKED OR NON CRACKED CONCRETE

Concrete can be considered as cracked for many reasons. According to the ETA Guideline, we must verify if the concrete is cracked or non cracked by calculation of stresses in the works or part of the works serving as the base material (ETA Guideline - Annex C - §4.1):

$$\sigma_L + \sigma_R \leq 0$$

$\sigma_L$ : Stresses in the concrete induced by external loads, including anchors loads

$\sigma_R$ : Stresses in the concrete due to restraint of intrinsic imposed deformations

(e.g; shrinkage of concrete) or extrinsic imposed deformations (e.g. due to displacement of support or temperature variations).

If no detailed analysis is conducted, then  $\sigma_R = 3N/mm^2$  should be assumed, according to Eurocode 2.

If there are no details available to make the above calculation, use the table below.

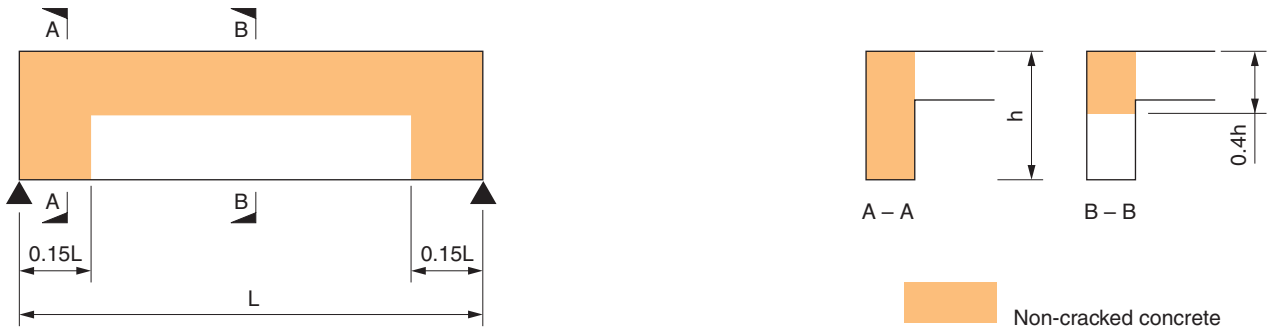
Nevertheless, it is the responsibility of the designer to check the status of the base material (cracked or non cracked).

Works or parts of works used as anchoring base	Concrete condition	
	Non cracked	Cracked
Deflected elements (slabs, longitudinal beam, firder, purlin) in reinforced concrete		X
Deflected elements (slabs, longitudinal beam, firder, purlin) in prestressed concrete	X	
Outside wall of a building in not reinforced (according to BAEL) or with reinforced skin		X
Outside wall of a building in reinforced concrete	X	
Inside wall of a building	X	
Angle or edge post		X
Inside post	X	
Base plate paving		X
Keying areas of a building made from prefabricated elements		X
Ends of deflected elements (ex: projected balcony noses)	X	
Tanking	X	

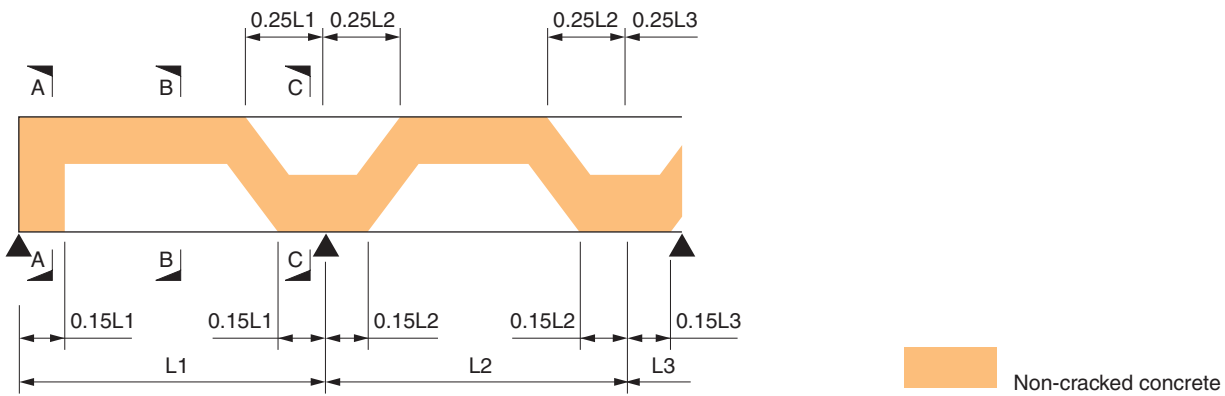
# Concrete

The following are examples of non-cracked locations in simple structures (issue from the technical report n° CEN/TC250/SC2/WG2 "effect of cracking" published by CEN).

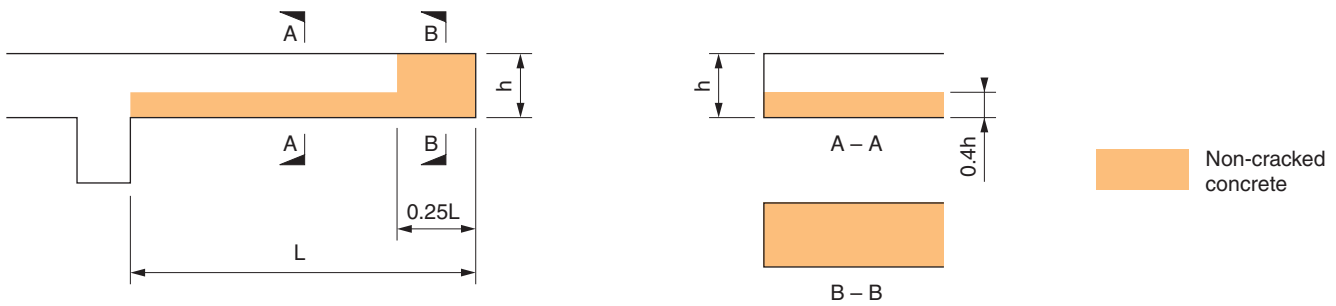
## Solid slabs, beams - simply supported



## Solid slabs, beams, ribbed floors - Continuous



## Cantilever slabs



## Cantilever beams

