

COMPANY NAME
CALCULATION SHEET

Calc. No.	CALC. NUMBER	
Project No.	PROJECT NUMBER	
Calc. By	Date	Rev.
Author	today	0

Project Title: Project Name
Subject: Reinforced Concrete Beam - Bending Moment Capacity (Eurocode 2)

Column dimensions

$b_x = 500$ mm
 $b_z = 500$ mm

Reinforcement

$c = 30$ mm cover
 $d = 470$ mm ($b_x - c$)

Concrete class EN 1992-1-1:2004
C12/15 Section 3 Table 3.1
 $f_{ck} = 12$ MPa

Tension side reinforcement

$\phi = 32$ mm - bars diameter
 $n = 5$ no. of bars

Area and percentage of tension reinf

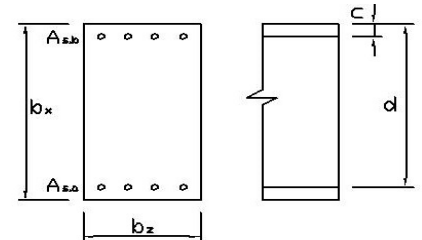
$A_{s,a} = 4021.2$ mm²
 $\rho_{reinf,a} = 1.61$ %

Compression side reinforcement

$\phi = 32$ mm - bars diameter
 $n = 5$ no. of bars

Area and percentage of comp. reinf

$A_{s,b} = 4021.2$ mm²
 $\rho_{reinf,b} = 1.61$ %



Reinforcement type

S500
 $f_{yk} = 500$ MPa - yield strength

Partial factors for materials for ULS

$\gamma_c = 1.5$ EN 1992-1-1:2004
 $\gamma_s = 1.15$ Section 2 Table 2.1N

Design compressive concrete strength

$\alpha_{cc} = 1$ Section 3.1.6
 $f_{cd} = \alpha_{cc} * f_{ck} / \gamma_c$ Formula 3.15
 $f_{cd} = 8.00$ MPa

Reinforcement ductility class

A ductility class A, B or C

Ultimate concrete comp. shortening strain

$\epsilon_{cu3} = 3.5$ / 1000

EN 1992-1-1:2004 - Section 3.1.3 Table 3.1

Design reinforcement strength

$f_{yd} = f_{yk} / \gamma_s$ Section 3.1.7 Figure 3.8
 $f_{yd} = 434.78$ MPa

Characteristic reinf. strain at max. force

Function of the reinf. ductility class
EN 1992-1-1:2004 Annex C - Table C1
 $\epsilon_{uk} = 2.5$ %

Design reinf. strain at maximum force

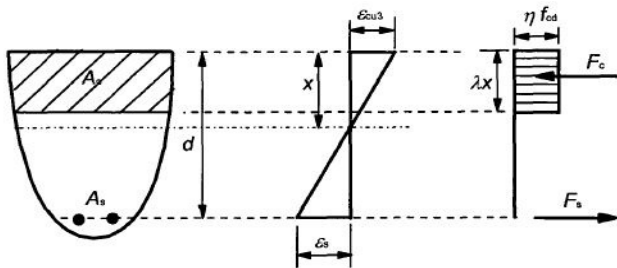
EN 1992-1-1:2004 -Section 3.2.7 Note 1
 $\epsilon_{ud} = 0.90$ * ϵ_{uk}
 $\epsilon_{ud} = 2.25$ %

Reinf. modulus of elasticity

EN 1992-1-1:2004 -Section 3.2.7 (4)
 $E_s = 200$ GPa

Rectangular stress distribution EN 1992-1-1:2004 - formulas 3.19, 3.20, 3.21 and 3.22

$\lambda = 0.8$ height of the compression zone
 $\eta = 1$ effective strength



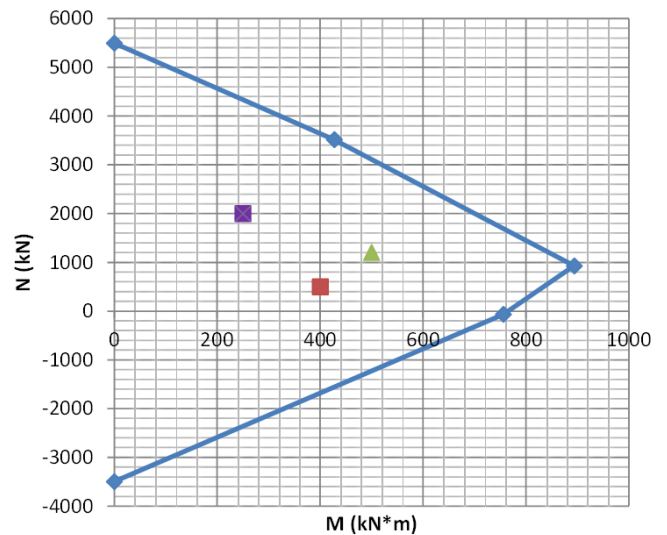
Data for the M-N interaction graph:

Capacity

	N_{cap} kN	M_{cap} kN*m
Case 0	-3496.73	0.00
Case 1	-65.75	755.77
Case 2	927.75	893.63
Case 3	3517.26	427.48
Case 4	5496.73	0.00

Loading

	N_{eff} kN	M_{eff} kN*m
CO1	500.0	400
CO2	1200.0	500
CO3	2000.0	250



References:

EN 1993-1-1:2004 - Eurocode 2: Design of concrete structures - Part 1-1: General rules and rules for buildings