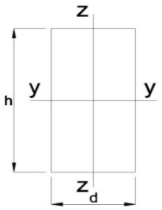
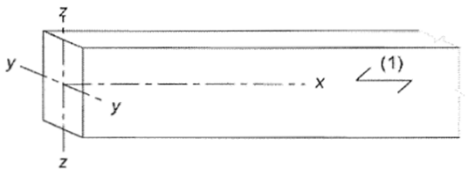
COMPANY NAME		Calc. No.	CALC. NUMBER	
CALCULATION SHEET		Project No.	PROJECT NUMBER	
Project Title:	Project Name	Calc. By	Date	Rev.
Subject:	Wood Element Bending Moment Capacity (Eurocode 5)	Author	today	0

Wood Element Bending Moment Capacity Calculation (Eurocode 5) per EN 1995-1-1:2004* & EN 338*

Maximum working loads (Ultimate Limit State)

$M_{y,Ed}$=	4	kN*m	bending moment y-y
$M_{z,Ed}$=	0.5	kN*m	bending moment z-z





Element dimensions - Rectangular cross section

h =	20	cm	height
d =	15	cm	width

Section Properties

A =	d*h =	300.00 cm^2	section area
I_Y =	$d*h^3/12$ =	10000.00 cm^4	moment of inertia about y-y axis
I_z =	$d^3*h/12$ =	5625.00 cm^4	moment of inertia about z-z axis

Material characteristics per EN 338-97 - Table 1

Wood strength class: C14

$f_{m,k}$ = 14 N/mm^2 Characteristic bending strength

γ_m = 1.3 per EN 1995-1-1 - Table 2.3

1.3 for solid timber, 1.25 for glued laminated timber

ρ_{wood} = 600 kg/m^3 timber density per EN 1995-1-1 - Section 3.2 (3), formula (3.1)

for (h<150mm) $k_h = \min((15/h)^{0.2} ; 1.3)$

for timber with density less than 700 kg/m^3 and h < 150mm the characteristic valus of $f_{m,k}$ and $f_{t,0,k}$ may be increased by the factor k_h

k_h = 1.00

k_{mod} = 0.8 per EN 1995-1-1 - Table 3.1

Load duration classes per EN 1995-1-1 Section 2.3.1.2 - Table 2.1 and 2.2

Service classes per EN 1995-1-1 - Section 2.3.1.3

$f_{m,y,d}$ = $f_{m,z,d}$ = $k_{mod} * k_h * f_{m,k} / \gamma_m$ = 8.62 N/mm^2 design bending strength about y and z axis per EN 1995-1-1 - Section 2.4.1, formula (2.14)

$\sigma_{m,y,d}$ = $M_{y,Ed} * (h/2) / I_y$ = 4.00 N/mm^2 Design bending stress about the principal y axis

$\sigma_{m,z,d}$ = $M_{z,Ed} * (d/2) / I_z$ = 0.67 N/mm^2 Design bending stress about the principal z axis

k_m = 0.7 for rectangular sections per EN 1995-1-1 - Section 6.1.6 (2)

Check on for y-y axis

$(\sigma_{m,y,d} / f_{m,y,d}) + k_m * (\sigma_{m,z,d} / f_{m,z,d})$ = 0.518 < 1 per EN 1995-1-1 - Section 6.1.6, formula (6.11)

element OK

Check on for z-z axis

$k_m * (\sigma_{m,y,d} / f_{m,y,d}) + (\sigma_{m,z,d} / f_{m,z,d})$ = 0.402 < 1 per EN 1995-1-1 - Section 6.1.6, formula (6.12)

element OK

References:
EN 1995-1-1:2004 - Eurocode 5: Design of timber structures - Part 1-1: Common rules and rules for buildings
EN 338 : 2003 - Structural Timber; Strength Classes