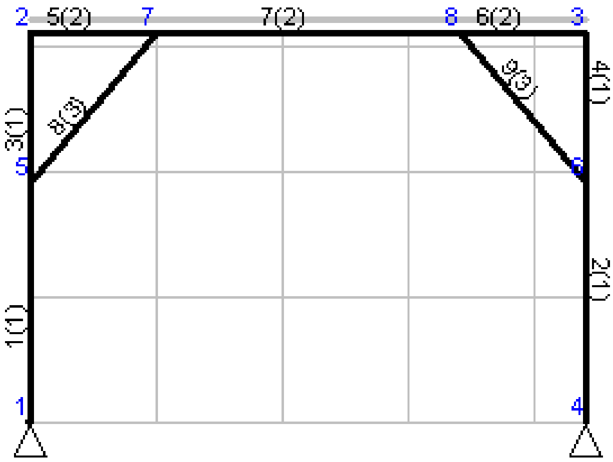
1-Finite element model (FEM)



Nodal points

Node	x [m]	y[m]
1	0.000	0.000
2	0.000	3.100
3	4.400	3.100
4	4.400	0.000
5	0.000	1.900
6	4.400	1.900
7	1.000	3.100
8	3.400	3.100

Supports

Node	kind	ux[mm]	uy[mm]	ur[rad]
1	pin ux=uy=0			
4	pin ux=uy=0			

Materials

Material : Timber, E= 10.000 [GPa]
Weight density : ρ= 9.000 [kN/m³]
The element self weight is included in loads and masses

Element cross sections

Cr.sec.	b[cm]	h[cm]	Ac[cm²]	Ic[cm4]
1	12.000	12.000	1.44000E+002	1.72800E+003
2	12.000	15.000	1.80000E+002	3.37500E+003
3	6.000	10.000	6.00000E+001	5.00000E+002

Elements

Element	node 1	node 2	material	length(m)	angle(°)
1	1	5	1	1.900	90.000
2	6	4	1	1.900	270.000
3	5	2	1	1.200	90.000
4	3	6	1	1.200	270.000
5	2	7	2	1.000	0.000
6	8	3	2	1.000	0.000
7	7	8	2	2.400	0.000
8	5	7	3	1.562	50.194
9	8	6	3	1.562	309.806

Element distributed loads (γg=1.35, γq=1.50)

element	G[kN/m]	Q[kN/m]	γgG+γqQ[kN/m]	load kind	load direction
5	0.800	1.600	3.480	uniform	vertical
6	0.800	1.600	3.480	uniform	vertical
7	0.800	1.600	3.480	uniform	vertical

Element distributed loads due to self weight (γg=1.35, γq=1.50)

element	G[kN/m]	Q[kN/m]	γgG+γqQ[kN/m]	load kind	load direction
1	0.130	0.000	0.175	uniform	vertical
2	0.130	0.000	0.175	uniform	vertical
3	0.130	0.000	0.175	uniform	vertical
4	0.130	0.000	0.175	uniform	vertical
5	0.162	0.000	0.219	uniform	vertical
6	0.162	0.000	0.219	uniform	vertical
7	0.162	0.000	0.219	uniform	vertical
8	0.054	0.000	0.073	uniform	vertical
9	0.054	0.000	0.073	uniform	vertical

2-Results of static-linear-elastic analysis

Diagrams of internal forces M, V, N, and displacements d, of element 1

n	x/l	x[m]	M[kNm]	V[kN]	N[kN]	dx[mm]	dy[mm]	d[mm]
0	0.000	0.00	0.00	1.74	-8.80	0.000	0.000	0.000
1	0.100	0.19	-0.33	1.74	-8.76	-2.417	-0.011	2.417
2	0.200	0.38	-0.66	1.74	-8.73	-4.764	-0.023	4.764
3	0.300	0.57	-0.99	1.74	-8.70	-6.973	-0.034	6.973
4	0.400	0.76	-1.32	1.74	-8.66	-8.975	-0.046	8.975
5	0.500	0.95	-1.66	1.74	-8.63	-10.700	-0.057	10.700
6	0.600	1.14	-1.99	1.74	-8.59	-12.079	-0.068	12.079
7	0.700	1.33	-2.32	1.74	-8.56	-13.043	-0.080	13.044
8	0.800	1.52	-2.65	1.74	-8.53	-13.523	-0.091	13.523
9	0.900	1.71	-2.98	1.74	-8.49	-13.450	-0.102	13.450
10	1.000	1.90	-3.31	1.74	-8.46	-12.754	-0.114	12.754

Maximum values for element 1

maxM= 0.00 kNm, minM= -3.31 kNm
maxV= 1.74 kN, minV= 1.74 kN
maxN= -8.46 kN, minN= -8.80 kN
maxd= 13.523 mm

Diagrams of internal forces M, V, N, and displacements d, of element 2

n	x/l	x[m]	M[kNm]	V[kN]	N[kN]	dx[mm]	dy[mm]	d[mm]
0	0.000	0.00	-3.31	-1.74	-8.46	12.754	-0.114	12.754
1	0.100	0.19	-2.98	-1.74	-8.49	13.450	-0.102	13.451
2	0.200	0.38	-2.65	-1.74	-8.53	13.524	-0.091	13.524
3	0.300	0.57	-2.32	-1.74	-8.56	13.043	-0.080	13.044
4	0.400	0.76	-1.99	-1.74	-8.60	12.080	-0.068	12.080
5	0.500	0.95	-1.66	-1.74	-8.63	10.700	-0.057	10.700
6	0.600	1.14	-1.32	-1.74	-8.66	8.976	-0.046	8.976
7	0.700	1.33	-0.99	-1.74	-8.70	6.974	-0.034	6.974
8	0.800	1.52	-0.66	-1.74	-8.73	4.765	-0.023	4.765
9	0.900	1.71	-0.33	-1.74	-8.76	2.417	-0.011	2.417
10	1.000	1.90	0.00	-1.74	-8.80	0.000	0.000	0.000

Maximum values for element 2

maxM= 0.00 kNm, minM= -3.31 kNm
maxV= -1.74 kN, minV= -1.74 kN
maxN= -8.46 kN, minN= -8.80 kN
maxd= 13.524 mm

Diagrams of internal forces M, V, N, and displacements d, of element 3

n	x/l	x[m]	M[kNm]	V[kN]	N[kN]	dx[mm]	dy[mm]	d[mm]
0	0.000	0.00	-2.55	-2.63	-1.93	-12.754	-0.114	12.754
1	0.100	0.12	-2.24	-2.63	-1.91	-12.001	-0.115	12.002
2	0.200	0.24	-1.92	-2.63	-1.88	-11.062	-0.117	11.063
3	0.300	0.36	-1.60	-2.63	-1.86	-9.963	-0.118	9.964
4	0.400	0.48	-1.29	-2.63	-1.84	-8.731	-0.120	8.732
5	0.500	0.60	-0.97	-2.63	-1.82	-7.391	-0.122	7.392
6	0.600	0.72	-0.66	-2.63	-1.80	-5.970	-0.123	5.971
7	0.700	0.84	-0.34	-2.63	-1.78	-4.495	-0.124	4.496
8	0.800	0.96	-0.03	-2.63	-1.76	-2.991	-0.126	2.993
9	0.900	1.08	0.29	-2.63	-1.74	-1.485	-0.127	1.490
10	1.000	1.20	0.61	-2.63	-1.72	-0.003	-0.129	0.129

Maximum values for element 3

maxM= 0.61 kNm, minM= -2.55 kNm
maxV= -2.63 kN, minV= -2.63 kN
maxN= -1.72 kN, minN= -1.93 kN
maxd= 12.754 mm

Diagrams of internal forces M, V, N, and displacements d, of element 4

n	x/l	x[m]	M[kNm]	V[kN]	N[kN]	dx[mm]	dy[mm]	d[mm]
0	0.000	0.00	0.61	2.63	-1.72	0.003	-0.129	0.129
1	0.100	0.12	0.29	2.63	-1.74	1.485	-0.127	1.490
2	0.200	0.24	-0.03	2.63	-1.76	2.991	-0.126	2.994
3	0.300	0.36	-0.34	2.63	-1.78	4.495	-0.124	4.497
4	0.400	0.48	-0.66	2.63	-1.80	5.970	-0.123	5.972
5	0.500	0.60	-0.97	2.63	-1.82	7.391	-0.122	7.392
6	0.600	0.72	-1.29	2.63	-1.84	8.731	-0.120	8.732
7	0.700	0.84	-1.60	2.63	-1.86	9.964	-0.118	9.965
8	0.800	0.96	-1.92	2.63	-1.88	11.063	-0.117	11.063
9	0.900	1.08	-2.24	2.63	-1.91	12.002	-0.115	12.002
10	1.000	1.20	-2.55	2.63	-1.93	12.754	-0.114	12.754

Maximum values for element 4

maxM= 0.61 kNm, minM= -2.55 kNm
maxV= 2.63 kN, minV= 2.63 kN
maxN= -1.72 kN, minN= -1.93 kN
maxd= 12.754 mm

Diagrams of internal forces M, V, N, and displacements d, of element 5

n	x/l	x[m]	M[kNm]	V[kN]	N[kN]	dx[mm]	dy[mm]	d[mm]
0	0.000	0.00	0.61	-1.72	2.63	-0.003	-0.129	0.129
1	0.100	0.10	0.76	-1.35	2.63	-0.001	-1.337	1.337
2	0.200	0.20	0.88	-0.98	2.63	0.000	-2.522	2.522
3	0.300	0.30	0.95	-0.61	2.63	0.002	-3.681	3.681
4	0.400	0.40	1.00	-0.24	2.63	0.003	-4.813	4.813
5	0.500	0.50	1.00	0.13	2.63	0.005	-5.915	5.915
6	0.600	0.60	0.97	0.50	2.63	0.006	-6.987	6.987
7	0.700	0.70	0.90	0.87	2.63	0.007	-8.030	8.030
8	0.800	0.80	0.80	1.24	2.63	0.009	-9.048	9.048
9	0.900	0.90	0.65	1.61	2.63	0.010	-10.041	10.041
10	1.000	1.00	0.47	1.98	2.63	0.012	-11.015	11.015

Maximum values for element 5

maxM= 1.00 kNm, minM= 0.47 kNm
maxV= 1.98 kN, minV= -1.72 kN
maxN= 2.63 kN, minN= 2.63 kN
maxd= 11.015 mm

Diagrams of internal forces M, V, N, and displacements d, of element 6

n	x/l	x[m]	M[kNm]	V[kN]	N[kN]	dx[mm]	dy[mm]	d[mm]
0	0.000	0.00	0.47	-1.98	2.63	-0.011	-11.015	11.015
1	0.100	0.10	0.65	-1.61	2.63	-0.010	-10.041	10.041
2	0.200	0.20	0.80	-1.24	2.63	-0.009	-9.048	9.048
3	0.300	0.30	0.90	-0.87	2.63	-0.007	-8.030	8.030
4	0.400	0.40	0.97	-0.50	2.63	-0.006	-6.987	6.987
5	0.500	0.50	1.00	-0.13	2.63	-0.004	-5.915	5.915
6	0.600	0.60	1.00	0.24	2.63	-0.003	-4.813	4.813
7	0.700	0.70	0.95	0.61	2.63	-0.001	-3.681	3.681
8	0.800	0.80	0.88	0.98	2.63	0.000	-2.522	2.522
9	0.900	0.90	0.76	1.35	2.63	0.002	-1.337	1.337
10	1.000	1.00	0.61	1.72	2.63	0.003	-0.129	0.129

Maximum values for element 6

maxM= 1.00 kNm, minM= 0.47 kNm
maxV= 1.72 kN, minV= -1.98 kN
maxN= 2.63 kN, minN= 2.63 kN
maxd= 11.015 mm

Diagrams of internal forces M, V, N, and displacements d, of element 7

n	x/l	x[m]	M[kNm]	V[kN]	N[kN]	dx[mm]	dy[mm]	d[mm]
0	0.000	0.00	0.94	-4.44	-1.74	0.012	-11.015	11.015
1	0.100	0.24	1.90	-3.55	-1.74	0.010	-13.225	13.225
2	0.200	0.48	2.65	-2.66	-1.74	0.007	-15.114	15.114
3	0.300	0.72	3.18	-1.78	-1.74	0.005	-16.554	16.554
4	0.400	0.96	3.50	-0.89	-1.74	0.002	-17.454	17.454
5	0.500	1.20	3.61	0.00	-1.74	0.000	-17.760	17.760
6	0.600	1.44	3.50	0.89	-1.74	-0.002	-17.454	17.454
7	0.700	1.68	3.18	1.78	-1.74	-0.005	-16.554	16.554
8	0.800	1.92	2.65	2.66	-1.74	-0.007	-15.114	15.114
9	0.900	2.16	1.90	3.55	-1.74	-0.009	-13.225	13.225
10	1.000	2.40	0.94	4.44	-1.74	-0.011	-11.015	11.015

Maximum values for element 7

maxM= 3.61 kNm, minM= 0.94 kNm
maxV= 4.44 kN, minV= -4.44 kN
maxN= -1.74 kN, minN= -1.74 kN
maxd= 17.760 mm

Diagrams of internal forces M, V, N, and displacements d, of element 8

n	x/l	x[m]	M[kNm]	V[kN]	N[kN]	dx[mm]	dy[mm]	d[mm]
0	0.000	0.00	-0.76	-0.82	-7.82	-12.754	-0.114	12.754
1	0.100	0.16	-0.63	-0.82	-7.81	-11.981	-0.784	12.007
2	0.200	0.31	-0.51	-0.81	-7.80	-10.972	-1.651	11.096
3	0.300	0.47	-0.38	-0.80	-7.79	-9.773	-2.676	10.133
4	0.400	0.62	-0.25	-0.79	-7.79	-8.432	-3.820	9.257
5	0.500	0.78	-0.13	-0.79	-7.78	-6.996	-5.044	8.624
6	0.600	0.94	-0.01	-0.78	-7.77	-5.510	-6.308	8.376
7	0.700	1.09	0.11	-0.77	-7.76	-4.021	-7.575	8.576
8	0.800	1.25	0.23	-0.77	-7.75	-2.575	-8.807	9.176
9	0.900	1.41	0.35	-0.76	-7.74	-1.216	-9.966	10.040
10	1.000	1.56	0.47	-0.75	-7.73	0.012	-11.015	11.015

Maximum values for element 8

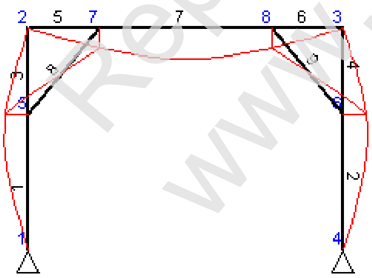
maxM= 0.47 kNm, minM= -0.76 kNm
maxV= -0.75 kN, minV= -0.82 kN
maxN= -7.73 kN, minN= -7.82 kN
maxd= 12.754 mm

Diagrams of internal forces M, V, N, and displacements d, of element 9

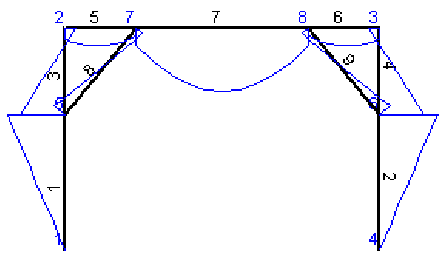
n	x/l	x[m]	M[kNm]	V[kN]	N[kN]	dx[mm]	dy[mm]	d[mm]
0	0.000	0.00	0.47	0.75	-7.73	-0.011	-11.015	11.015
1	0.100	0.16	0.35	0.76	-7.74	1.216	-9.966	10.040
2	0.200	0.31	0.23	0.77	-7.75	2.575	-8.807	9.176
3	0.300	0.47	0.11	0.77	-7.76	4.022	-7.575	8.577
4	0.400	0.62	-0.01	0.78	-7.77	5.511	-6.308	8.376
5	0.500	0.78	-0.13	0.79	-7.78	6.996	-5.044	8.625
6	0.600	0.94	-0.25	0.79	-7.79	8.433	-3.820	9.258
7	0.700	1.09	-0.38	0.80	-7.79	9.774	-2.676	10.133
8	0.800	1.25	-0.51	0.81	-7.80	10.973	-1.651	11.096
9	0.900	1.41	-0.63	0.82	-7.81	11.982	-0.784	12.007
10	1.000	1.56	-0.76	0.82	-7.82	12.754	-0.114	12.754

Maximum values for element 9

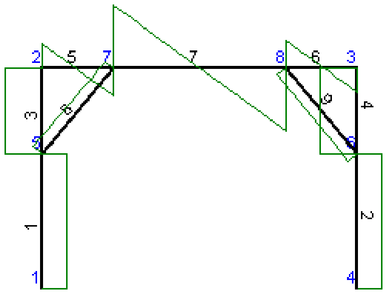
maxM= 0.47 kNm, minM= -0.76 kNm
maxV= 0.82 kN, minV= 0.75 kN
maxN= -7.73 kN, minN= -7.82 kN
maxd= 12.754 mm



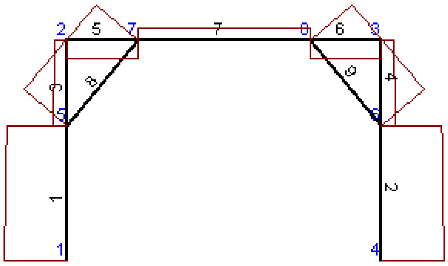
Displacement diagram
maxD=17.76 mm



Bending moment diagram
maxM=3.61 kNm, minM=-3.31 kNm



Shear force diagram
maxV=4.44 kN, minV=-4.44 kN



Axial force diagram
maxN=2.63 kN, minN=-8.80 kN

3-Dimensioning of Timber

Design codes

EN1990:2002, Eurocode 0 Basis of Structural Design
EN1991-1-1:2002, Eurocode 1-1 Actions on structures
EN1995-1-1:2009, Eurocode 5 Timber structures
EN1997-1-1:2004, Eurocode 7 Geotechnical design
EN1998-1-1:2004, Eurocode 8 Design in earthquake environment
NA - National Annex:

Material properties (EC5 EN1995-1-1:2009, §3)
Timber class : C24
Service classes : Class 2, moisture content<=20% (§2.3.1.3)
Material factor γM=1.30 (EC5 Table 2.3)
Load duration classes : Long-term (Table 2.1)

Timber design, element 1, [Span], L= 1.900m, B= 120mm, H= 120mm

Med = -2.32 kNm, Ved = 1.74 kN, Ned = -8.56 kN (x=1.33m)

Compression parallel to the grain, Fc0d=-8.562 kN (EC5 §6.1.4)
Rectangular cross section, b=120 mm, h=120 mm, A= 14 400 mm^2
Modification factor Kmod=0.70 (Table 3.1), material factor γM=1.30 (Table 2.3)
fc0k=21.00 N/mm^2, fc0d=Kmod·fc0k/γM=0.70x21.00/1.30=11.31N/mm^2 (EC5 Eq.2.14)
Fc0d=-8.562 kN, σc0d=Fc0d/Anetto=1000x8.562/14400=0.59N/mm^2 < 11.31N/mm^2=fc0d (Eq.6.2)
The check is satisfied

Bending, Myd=2.318 kNm, Mzd=0.000 kNm (EC5 §6.1.6)
Rectangular cross section, b=120mm, h=120mm, A=1.440E+004mm^2, Wy=2.880E+005mm^3, Wz=2.880E+005mm^3
Modification factor Kmod=0.70 (Table 3.1), material factor γM=1.30 (Table 2.3)

fmyk=24.00 N/mm^2, fmyd=Kmod·fmyk/γM=0.70x24.00/1.30=12.92N/mm^2
fmzk=24.00 N/mm^2, fmzd=Kmod·fmzk/γM=0.70x24.00/1.30=12.92N/mm^2

Rectangular cross section Km=0.70 (EC5 §6.1.6.(2))
σmyd=Myd/Wmy,netto=1E+06x2.318/2.880E+005= 8.05 N/mm^2
σmzd=Mzd/Wmz,netto=1E+06x0.000/2.880E+005= 0.00 N/mm^2

σmyd/fmyd+Km.σmzd/fmzd=0.623+0.000= 0.62 < 1 (EC5 Eq.6.11)
Km.σmyd/fmyd+σmzd/fmzd=0.436+0.000= 0.44 < 1 (EC5 Eq.6.12)
The check is satisfied

Shear, Fv=1.743 kN (EC5 §6.1.7)
Rectangular cross section, bef=0.67x120=80 mm, h=120 mm, A= 9 600 mm^2
Modification factor Kmod=0.70 (Table 3.1), material factor γM=1.30 (Table 2.3)
fvk=4.00 N/mm^2, fvd=Kmod·fvk/γM=0.70x4.00/1.30=2.15N/mm^2 (EC5 Eq.2.14)
Fv=1.743 kN, τv0d=1.50Fv0d/Anetto=1000x1.50x1.743/9600=0.27N/mm^2 < 2.15N/mm^2=fv0d (Eq.6.13)
The check is satisfied

Combined bending and axial compression, Fc0d=-8.562kN, Myd=2.318kNm, Mzd=0.000kNm (EC5 §6.2.4)
Rectangular cross section, b=120mm, h=120mm, A=1.440E+004mm^2, Wy=2.880E+005mm^3, Wz=2.880E+005mm^3
Modification factor Kmod=0.70 (Table 3.1), material factor γM=1.30 (Table 2.3)
fc0k=21.00 N/mm^2, fc0d=Kmod·fc0k/γM=0.70x21.00/1.30=11.31N/mm^2
fmyk=24.00 N/mm^2, fmyd=Kmod·fmyk/γM=0.70x24.00/1.30=12.92N/mm^2
fmzk=24.00 N/mm^2, fmzd=Kmod·fmzk/γM=0.70x24.00/1.30=12.92N/mm^2

Rectangular cross section Km=0.70 (EC5 §6.1.6.(2))
σc0d=Fc0d/Anetto=1000x8.562/14400= 0.59 N/mm^2
σmyd=Myd/Wmy,netto=1E+06x2.318/2.880E+005= 8.05 N/mm^2
σmzd=Mzd/Wmz,netto=1E+06x0.000/2.880E+005= 0.00 N/mm^2

(σc0d/fc0d)^2+σmyd/fmyd+Km.σmzd/fmzd=0.003+0.623+0.000= 0.63 < 1 (EC5 Eq.6.19)
(σc0d/fc0d)^2+Km.σmyd/fmyd+σmzd/fmzd=0.003+0.436+0.000= 0.44 < 1 (EC5 Eq.6.20)
The check is satisfied

Timber design, element 1, [Left end], L= 1.900m, B= 120mm, H= 120mm

MedA=0.00kNm (x=t/2=0.00m), VedA=1.74kN (x=t/2=0.00m), VedAmax=1.74kN, NedA=-8.80kN

Compression parallel to the grain, Fc0d=-8.795 kN (EC5 §6.1.4)
Rectangular cross section, b=120 mm, h=120 mm, A= 14 400 mm^2
Modification factor Kmod=0.70 (Table 3.1), material factor γM=1.30 (Table 2.3)
fc0k=21.00 N/mm^2, fc0d=Kmod·fc0k/γM=0.70x21.00/1.30=11.31N/mm^2 (EC5 Eq.2.14)
Fc0d=-8.795 kN, σc0d=Fc0d/Anetto=1000x8.795/14400=0.61N/mm^2 < 11.31N/mm^2=fc0d (Eq.6.2)
The check is satisfied

Shear, Fv=1.743 kN (EC5 §6.1.7)
Rectangular cross section, bef=0.67x120=80 mm, h=120 mm, A= 9 600 mm^2
Modification factor Kmod=0.70 (Table 3.1), material factor γM=1.30 (Table 2.3)
fvk=4.00 N/mm^2, fvd=Kmod·fvk/γM=0.70x4.00/1.30=2.15N/mm^2 (EC5 Eq.2.14)
Fv=1.743 kN, τv0d=1.50Fv0d/Anetto=1000x1.50x1.743/9600=0.27N/mm^2 < 2.15N/mm^2=fv0d (Eq.6.13)
The check is satisfied

Timber design, element 1, [Right end], L= 1.900m, B= 120mm, H= 120mm

MedB=-3.17kNm (x=t/2=0.08m), VedB=1.74kN (x=t/2=0.08m), VedBmax=1.74kN, NedB=-8.46kN

Compression parallel to the grain, Fc0d=-8.462 kN (EC5 §6.1.4)
Rectangular cross section, b=120 mm, h=120 mm, A= 14 400 mm^2
Modification factor Kmod=0.70 (Table 3.1), material factor γM=1.30 (Table 2.3)
fc0k=21.00 N/mm^2, fc0d=Kmod·fc0k/γM=0.70x21.00/1.30=11.31N/mm^2 (EC5 Eq.2.14)
Fc0d=-8.462 kN, σc0d=Fc0d/Anetto=1000x8.462/14400=0.59N/mm^2 < 11.31N/mm^2=fc0d (Eq.6.2)
The check is satisfied

Bending, Myd=3.175 kNm, Mzd=0.000 kNm (EC5 §6.1.6)
Rectangular cross section, b=120mm, h=120mm, A=1.440E+004mm^2, Wy=2.880E+005mm^3, Wz=2.880E+005mm^3
Modification factor Kmod=0.70 (Table 3.1), material factor γM=1.30 (Table 2.3)

fmyk=24.00 N/mm^2, fmyd=Kmod·fmyk/γM=0.70x24.00/1.30=12.92N/mm^2
fmzk=24.00 N/mm^2, fmzd=Kmod·fmzk/γM=0.70x24.00/1.30=12.92N/mm^2

Rectangular cross section Km=0.70 (EC5 §6.1.6.(2))
σmyd=Myd/Wmy,netto=1E+06x3.175/2.880E+005=11.02 N/mm^2
σmzd=Mzd/Wmz,netto=1E+06x0.000/2.880E+005= 0.00 N/mm^2

σmyd/fmyd+Km.σmzd/fmzd=0.853+0.000= 0.85 < 1 (EC5 Eq.6.11)
Km.σmyd/fmyd+σmzd/fmzd=0.597+0.000= 0.60 < 1 (EC5 Eq.6.12)
The check is satisfied

Shear, Fv=1.743 kN (EC5 §6.1.7)
Rectangular cross section, bef=0.67x120=80 mm, h=120 mm, A= 9 600 mm^2
Modification factor Kmod=0.70 (Table 3.1), material factor γM=1.30 (Table 2.3)
fvk=4.00 N/mm^2, fvd=Kmod·fvk/γM=0.70x4.00/1.30=2.15N/mm^2 (EC5 Eq.2.14)
Fv=1.743 kN, τv0d=1.50Fv0d/Anetto=1000x1.50x1.743/9600=0.27N/mm^2 < 2.15N/mm^2=fv0d (Eq.6.13)
The check is satisfied

Combined bending and axial compression, Fc0d=-8.462kN, Myd=3.175kNm, Mzd=0.000kNm (EC5 §6.2.4)
Rectangular cross section, b=120mm, h=120mm, A=1.440E+004mm^2, Wy=2.880E+005mm^3, Wz=2.880E+005mm^3
Modification factor Kmod=0.70 (Table 3.1), material factor γM=1.30 (Table 2.3)
fc0k=21.00 N/mm^2, fc0d=Kmod·fc0k/γM=0.70x21.00/1.30=11.31N/mm^2
fmyk=24.00 N/mm^2, fmyd=Kmod·fmyk/γM=0.70x24.00/1.30=12.92N/mm^2
fmzk=24.00 N/mm^2, fmzd=Kmod·fmzk/γM=0.70x24.00/1.30=12.92N/mm^2

Rectangular cross section Km=0.70 (EC5 §6.1.6.(2))
σc0d=Fc0d/Anetto=1000x8.462/14400= 0.59 N/mm^2
σmyd=Myd/Wmy,netto=1E+06x3.175/2.880E+005=11.02 N/mm^2
σmzd=Mzd/Wmz,netto=1E+06x0.000/2.880E+005= 0.00 N/mm^2

(σc0d/fc0d)^2+σmyd/fmyd+Km.σmzd/fmzd=0.003+0.853+0.000= 0.86 < 1 (EC5 Eq.6.19)
(σc0d/fc0d)^2+Km.σmyd/fmyd+σmzd/fmzd=0.003+0.597+0.000= 0.60 < 1 (EC5 Eq.6.20)
The check is satisfied

Timber design, element 1 , L= 1.900m, B= 120mm, H= 120mm, Buckling resistance

Column stability with bending, Fc0d=-8.795kN, Myd=3.175kNm, Mzd=0.000kNm (EC5 §6.3.2)
Rectangular cross section, b=120mm, h=120mm, A=1.440E+004mm^2, Wy=2.880E+005mm^3, Wz=2.880E+005mm^3
Modification factor Kmod=0.70 (Table 3.1), material factor γM=1.30 (Table 2.3, E005=7400N/mm^2)
fc0k=21.00 N/mm^2, fc0d=Kmod·fc0k/γM=0.70x21.00/1.30=11.31N/mm^2
fmyk=24.00 N/mm^2, fmyd=Kmod·fmyk/γM=0.70x24.00/1.30=12.92N/mm^2
fmzk=24.00 N/mm^2, fmzd=Kmod·fmzk/γM=0.70x24.00/1.30=12.92N/mm^2

Rectangular cross section Km=0.70 (EC5 §6.1.6.(2))
σc0d=Fc0d/Anetto=1000x8.795/14400= 0.61 N/mm^2
σmyd=Myd/Wmy,netto=1E+06x3.175/2.880E+005=11.02 N/mm^2
σmzd=Mzd/Wmz,netto=1E+06x0.000/2.880E+005= 0.00 N/mm^2

Buckling length Sk
Sky= 1.00x1.900=1.900 m= 1900 mm
Skz= 1.00x1.900=1.900 m= 1900 mm

Slenderness
iy=$\sqrt{(Iy/A)}$=0.289x 120= 35 mm, λy= 1900/ 35= 54.29
iz=$\sqrt{(Iz/A)}$=0.289x 120= 35 mm, λz= 1900/ 35= 54.29

Critical stresses
σc,crity=π^2E005/λy^2= 24.78 N/mm^2, λrel,y=$\sqrt{(fc0k/\sigma c,crity)}$= 0.92 (EC5 Eq.6.21)
σc,critz=π^2E005/λz^2= 24.78 N/mm^2, λrel,z=$\sqrt{(fc0k/\sigma c,critz)}$= 0.92 (EC5 Eq.6.22)

βc=0.20 (solid timber)
ky=0.5[1+βc(λrely-0.3)+$\lambda rely^2$]= 0.99, Kcy=1/(ky+$\sqrt{(ky^2-\lambda rely^2)}$)=0.747 (Eq.6.27 6.25)
kz=0.5[1+βc(λrelz-0.3)+$\lambda relz^2$]= 0.99, Kcz=1/(kz+$\sqrt{(kz^2-\lambda relz^2)}$)=0.747 (Eq.6.28 6.26)

σc0d/(Kcy·fc0d)+σmyd/fmyd+Km.σmzd/fmzd=0.072+0.853+0.000= 0.93 < 1 (EC5 Eq.6.23)
σc0d/(Kcz·fc0d)+Km.σmyd/fmyd+σmzd/fmzd=0.072+0.597+0.000= 0.67 < 1 (EC5 Eq.6.24)
The check is satisfied

Timber design, element 3, [Span], L= 1.200m, B= 120mm, H= 120mm

Med = -1.60 kNm, Ved = 2.63 kN, Ned = -1.86 kN (x=0.36m)

Bending, Myd=1.604 kNm, Mzd=0.000 kNm (EC5 §6.1.6)
Rectangular cross section, b=120mm, h=120mm, A=1.440E+004mm^2, Wy=2.880E+005mm^3, Wz=2.880E+005mm^3
Modification factor Kmod=0.70 (Table 3.1), material factor γM=1.30 (Table 2.3)

fmyk=24.00 N/mm^2, fmyd=Kmod·fmyk/γM=0.70x24.00/1.30=12.92N/mm^2
fmzk=24.00 N/mm^2, fmzd=Kmod·fmzk/γM=0.70x24.00/1.30=12.92N/mm^2

Rectangular cross section Km=0.70 (EC5 §6.1.6.(2))
σmyd=Myd/Wmy,netto=1E+06x1.604/2.880E+005= 5.57 N/mm^2
σmzd=Mzd/Wmz,netto=1E+06x0.000/2.880E+005= 0.00 N/mm^2

σmyd/fmyd+Km.σmzd/fmzd=0.431+0.000= 0.43 < 1 (EC5 Eq.6.11)
Km.σmyd/fmyd+σmzd/fmzd=0.302+0.000= 0.30 < 1 (EC5 Eq.6.12)
The check is satisfied

Shear, Fv=2.631 kN (EC5 §6.1.7)
Rectangular cross section, bef=0.67x120=80 mm, h=120 mm, A= 9 600 mm^2
Modification factor Kmod=0.70 (Table 3.1), material factor γM=1.30 (Table 2.3)
fvk=4.00 N/mm^2, fvd=Kmod·fvk/γM=0.70x4.00/1.30=2.15N/mm^2 (EC5 Eq.2.14)
Fv=2.631 kN, τv0d=1.50Fv0d/Anetto=1000x1.50x2.631/9600=0.41N/mm^2 < 2.15N/mm^2=fv0d (Eq.6.13)
The check is satisfied

Combined bending and axial compression, Fc0d=-1.863kN, Myd=1.604kNm, Mzd=0.000kNm (EC5 §6.2.4)
Rectangular cross section, b=120mm, h=120mm, A=1.440E+004mm^2, Wy=2.880E+005mm^3, Wz=2.880E+005mm^3
Modification factor Kmod=0.70 (Table 3.1), material factor γM=1.30 (Table 2.3)
fc0k=21.00 N/mm^2, fc0d=Kmod·fc0k/γM=0.70x21.00/1.30=11.31N/mm^2
fmyk=24.00 N/mm^2, fmyd=Kmod·fmyk/γM=0.70x24.00/1.30=12.92N/mm^2
fmzk=24.00 N/mm^2, fmzd=Kmod·fmzk/γM=0.70x24.00/1.30=12.92N/mm^2

Rectangular cross section Km=0.70 (EC5 §6.1.6.(2))
σc0d=Fc0d/Anetto=1000x1.863/14400= 0.13 N/mm^2
σmyd=Myd/Wmy,netto=1E+06x1.604/2.880E+005= 5.57 N/mm^2
σmzd=Mzd/Wmz,netto=1E+06x0.000/2.880E+005= 0.00 N/mm^2

(σc0d/fc0d)^2+σmyd/fmyd+Km.σmzd/fmzd=0.000+0.431+0.000= 0.43 < 1 (EC5 Eq.6.19)
(σc0d/fc0d)^2+Km.σmyd/fmyd+σmzd/fmzd=0.000+0.302+0.000= 0.30 < 1 (EC5 Eq.6.20)
The check is satisfied

Timber design, element 3, [Left end], L= 1.200m, B= 120mm, H= 120mm

MedA=-2.35kNm (x=t/2=0.08m), VedA=2.63kN (x=t/2=0.08m), VedAmax=2.63kN, NedA=-1.93kN

Bending, Myd=2.345 kNm, Mzd=0.000 kNm (EC5 §6.1.6)
Rectangular cross section, b=120mm, h=120mm, A=1.440E+004mm^2, Wy=2.880E+005mm^3, Wz=2.880E+005mm^3
Modification factor Kmod=0.70 (Table 3.1), material factor γM=1.30 (Table 2.3)

fmyk=24.00 N/mm^2, fmyd=Kmod·fmyk/γM=0.70x24.00/1.30=12.92N/mm^2
fmzk=24.00 N/mm^2, fmzd=Kmod·fmzk/γM=0.70x24.00/1.30=12.92N/mm^2

Rectangular cross section Km=0.70 (EC5 §6.1.6.(2))
σmyd=Myd/Wmy,netto=1E+06x2.345/2.880E+005= 8.14 N/mm^2
σmzd=Mzd/Wmz,netto=1E+06x0.000/2.880E+005= 0.00 N/mm^2

σmyd/fmyd+Km.σmzd/fmzd=0.630+0.000= 0.63 < 1 (EC5 Eq.6.11)
Km.σmyd/fmyd+σmzd/fmzd=0.441+0.000= 0.44 < 1 (EC5 Eq.6.12)
The check is satisfied

Shear, Fv=2.631 kN (EC5 §6.1.7)
Rectangular cross section, bef=0.67x120=80 mm, h=120 mm, A= 9 600 mm^2
Modification factor Kmod=0.70 (Table 3.1), material factor γM=1.30 (Table 2.3)
fvk=4.00 N/mm^2, fvd=Kmod·fvk/γM=0.70x4.00/1.30=2.15N/mm^2 (EC5 Eq.2.14)
Fv=2.631 kN, τv0d=1.50Fv0d/Anetto=1000x1.50x2.631/9600=0.41N/mm^2 < 2.15N/mm^2=fv0d (Eq.6.13)
The check is satisfied

Combined bending and axial compression, Fc0d=-1.926kN, Myd=2.345kNm, Mzd=0.000kNm (EC5 §6.2.4)
Rectangular cross section, b=120mm, h=120mm, A=1.440E+004mm^2, Wy=2.880E+005mm^3, Wz=2.880E+005mm^3
Modification factor Kmod=0.70 (Table 3.1), material factor γM=1.30 (Table 2.3)
fc0k=21.00 N/mm^2, fc0d=Kmod·fc0k/γM=0.70x21.00/1.30=11.31N/mm^2
fmyk=24.00 N/mm^2, fmyd=Kmod·fmyk/γM=0.70x24.00/1.30=12.92N/mm^2
fmzk=24.00 N/mm^2, fmzd=Kmod·fmzk/γM=0.70x24.00/1.30=12.92N/mm^2

Rectangular cross section Km=0.70 (EC5 §6.1.6.(2))
σc0d=Fc0d/Anetto=1000x1.926/14400= 0.13 N/mm^2
σmyd=Myd/Wmy,netto=1E+06x2.345/2.880E+005= 8.14 N/mm^2
σmzd=Mzd/Wmz,netto=1E+06x0.000/2.880E+005= 0.00 N/mm^2

(σc0d/fc0d)^2+σmyd/fmyd+Km.σmzd/fmzd=0.000+0.630+0.000= 0.63 < 1 (EC5 Eq.6.19)
(σc0d/fc0d)^2+Km.σmyd/fmyd+σmzd/fmzd=0.000+0.441+0.000= 0.44 < 1 (EC5 Eq.6.20)
The check is satisfied

Timber design, element 3, [Right end], L= 1.200m, B= 120mm, H= 120mm

MedB=0.41kNm (x=t/2=0.07m), VedB=2.63kN (x=t/2=0.07m), VedBmax=2.63kN, NedB=-1.72kN

Bending, Myd=0.409 kNm, Mzd=0.000 kNm (EC5 §6.1.6)
Rectangular cross section, b=120mm, h=120mm, A=1.440E+004mm^2, Wy=2.880E+005mm^3, Wz=2.880E+005mm^3
Modification factor Kmod=0.70 (Table 3.1), material factor γM=1.30 (Table 2.3)

fmyk=24.00 N/mm^2, fmyd=Kmod·fmyk/γM=0.70x24.00/1.30=12.92N/mm^2
fmzk=24.00 N/mm^2, fmzd=Kmod·fmzk/γM=0.70x24.00/1.30=12.92N/mm^2

Rectangular cross section Km=0.70 (EC5 §6.1.6.(2))
σmyd=Myd/Wmy,netto=1E+06x0.409/2.880E+005= 1.42 N/mm^2
σmzd=Mzd/Wmz,netto=1E+06x0.000/2.880E+005= 0.00 N/mm^2

σmyd/fmyd+Km.σmzd/fmzd=0.110+0.000= 0.11 < 1 (EC5 Eq.6.11)
Km.σmyd/fmyd+σmzd/fmzd=0.077+0.000= 0.08 < 1 (EC5 Eq.6.12)
The check is satisfied

Shear, Fv=2.631 kN (EC5 §6.1.7)
Rectangular cross section, bef=0.67x120=80 mm, h=120 mm, A= 9 600 mm^2
Modification factor Kmod=0.70 (Table 3.1), material factor γM=1.30 (Table 2.3)
fvk=4.00 N/mm^2, fvd=Kmod·fvk/γM=0.70x4.00/1.30=2.15N/mm^2 (EC5 Eq.2.14)
Fv=2.631 kN, τv0d=1.50Fv0d/Anetto=1000x1.50x2.631/9600=0.41N/mm^2 < 2.15N/mm^2=fv0d (Eq.6.13)
The check is satisfied

Combined bending and axial compression, Fc0d=-1.716kN, Myd=0.409kNm, Mzd=0.000kNm (EC5 §6.2.4)
Rectangular cross section, b=120mm, h=120mm, A=1.440E+004mm^2, Wy=2.880E+005mm^3, Wz=2.880E+005mm^3
Modification factor Kmod=0.70 (Table 3.1), material factor γM=1.30 (Table 2.3)
fc0k=21.00 N/mm^2, fc0d=Kmod·fc0k/γM=0.70x21.00/1.30=11.31N/mm^2
fmyk=24.00 N/mm^2, fmyd=Kmod·fmyk/γM=0.70x24.00/1.30=12.92N/mm^2
fmzk=24.00 N/mm^2, fmzd=Kmod·fmzk/γM=0.70x24.00/1.30=12.92N/mm^2

Rectangular cross section Km=0.70 (EC5 §6.1.6.(2))
σc0d=Fc0d/Anetto=1000x1.716/14400= 0.12 N/mm^2
σmyd=Myd/Wmy,netto=1E+06x0.409/2.880E+005= 1.42 N/mm^2
σmzd=Mzd/Wmz,netto=1E+06x0.000/2.880E+005= 0.00 N/mm^2

(σc0d/fc0d)^2+σmyd/fmyd+Km.σmzd/fmzd=0.000+0.110+0.000= 0.11 < 1 (EC5 Eq.6.19)
(σc0d/fc0d)^2+Km.σmyd/fmyd+σmzd/fmzd=0.000+0.077+0.000= 0.08 < 1 (EC5 Eq.6.20)
The check is satisfied

Timber design, element 3 , L= 1.200m, B= 120mm, H= 120mm, Buckling resistance

Column stability with bending, Fc0d=-1.926kN, Myd=2.345kNm, Mzd=0.000kNm (EC5 §6.3.2)

```
Rectangular cross section, b=120mm, h=120mm, A=1.440E+004mm², Wy=2.880E+005mm³, Wz=2.880E+005mm³
Modification factor Kmod=0.70 (Table 3.1), material factor γM=1.30 (Table 2.3, E005=7400N/mm²)
fc0k=21.00 N/mm², fc0d=Kmod·fc0k/γM=0.70x21.00/1.30=11.31N/mm²
fmyk=24.00 N/mm², fmyd=Kmod·fmyk/γM=0.70x24.00/1.30=12.92N/mm²
fmzk=24.00 N/mm², fmzd=Kmod·fmzk/γM=0.70x24.00/1.30=12.92N/mm²

Rectangular cross section Km=0.70 (EC5  §6.1.6.(2))
σc0d=Fc0d/Anetto=1000x1.926/14400= 0.13 N/mm²
σmyd=Myd/Wmy,netto=1E+06x2.345/2.880E+005= 8.14 N/mm²
σmzd=Mzd/Wmz,netto=1E+06x0.000/2.880E+005= 0.00 N/mm²

Buckling length Sk
Sky= 1.00x1.200=1.200 m= 1200 mm
Skz= 1.00x1.200=1.200 m= 1200 mm

Slenderness
iy=√(Iy/A)=0.289x 120= 35 mm, λy= 1200/ 35= 34.29
iz=√(Iz/A)=0.289x 120= 35 mm, λz= 1200/ 35= 34.29

Critical stresses
σc,crity=π²E005/λy²=   62.11 N/mm², λrel,y=√(fc0k/σc,crity)=  0.58 (EC5 Eq.6.21)
σc,critz=π²E005/λz²=   62.11 N/mm², λrel,z=√(fc0k/σc,critz)=  0.58 (EC5 Eq.6.22)

βc=0.20 (solid timber)
ky=0.5[1+βc(λrely-0.3)+λrely²]= 0.70, Kcy=1/(ky+√(ky²-λrely²))=0.924 (Eq.6.27 6.25)
kz=0.5[1+βc(λrelz-0.3)+λrelz²]= 0.70, Kcz=1/(kz+√(kz²-λrelz²))=0.924 (Eq.6.28 6.26)

σc0d/(Kcy·fc0d)+σmyd/fmyd+Km.σmzd/fmzd=0.013+0.630+0.000= 0.64 < 1 (EC5 Eq.6.23)
σc0d/(Kcz·fc0d)+Km.σmyd/fmyd+σmzd/fmzd=0.013+0.441+0.000= 0.45 < 1 (EC5 Eq.6.24)
The check is satisfied
```

Timber design, element 5, [Span   ], L= 1.000m, B= 120mm, H= 150mm

Med = 1.00 kNm, Ved = 0.13 kN, Ned = 2.63 kN (x=0.50m)

Bending, Myd=1.002 kNm, Mzd=0.000 kNm (EC5 §6.1.6)

```
Rectangular cross section, b=120mm, h=150mm, A=1.800E+004mm², Wy=4.500E+005mm³, Wz=3.600E+005mm³
Modification factor Kmod=0.70 (Table 3.1), material factor γM=1.30 (Table 2.3)

fmyk=24.00 N/mm², fmyd=Kmod·fmyk/γM=0.70x24.00/1.30=12.92N/mm²
fmzk=24.00 N/mm², fmzd=Kmod·fmzk/γM=0.70x24.00/1.30=12.92N/mm²

Rectangular cross section Km=0.70 (EC5  §6.1.6.(2))
σmyd=Myd/Wmy,netto=1E+06x1.002/4.500E+005= 2.23 N/mm²
σmzd=Mzd/Wmz,netto=1E+06x0.000/3.600E+005= 0.00 N/mm²

σmyd/fmyd+Km.σmzd/fmzd=0.172+0.000= 0.17 < 1 (EC5 Eq.6.11)
Km.σmyd/fmyd+σmzd/fmzd=0.121+0.000= 0.12 < 1 (EC5 Eq.6.12)
The check is satisfied
```

Combined bending and axial tension, Ft0d=2.631kN, Myd=1.002kNm, Mzd=0.000kNm (EC5 §6.2.3)

```
Rectangular cross section, b=120mm, h=150mm, A=1.800E+004mm², Wy=4.500E+005mm³, Wz=3.600E+005mm³
Modification factor Kmod=0.70 (Table 3.1), material factor γM=1.30 (Table 2.3)
ft0k=14.00 N/mm², ft0d=Kmod·ft0k/γM=0.70x14.00/1.30=7.54N/mm²
fmyk=24.00 N/mm², fmyd=Kmod·fmyk/γM=0.70x24.00/1.30=12.92N/mm²
fmzk=24.00 N/mm², fmzd=Kmod·fmzk/γM=0.70x24.00/1.30=12.92N/mm²
```

Rectangular cross section Km=0.70 (EC5 §6.1.6.(2))
σt0d=Ft0d/Anetto=1000x2.631/18000= 0.15 N/mm^2
σmyd=Myd/Wmy,netto=1E+06x1.002/4.500E+005= 2.23 N/mm^2
σmzd=Mzd/Wmz,netto=1E+06x0.000/3.600E+005= 0.00 N/mm^2

σt0d/ft0d+σmyd/fmyd+Km.σmzd/fmzd=0.019+0.172+0.000= 0.19 < 1 (EC5 Eq.6.17)
σt0d/ft0d+Km.σmyd/fmyd+σmzd/fmzd=0.019+0.121+0.000= 0.14 < 1 (EC5 Eq.6.18)
The check is satisfied

Timber design, element 5, [Left end], L= 1.000m, B= 120mm, H= 150mm

MedA=0.70kNm (x=t/2=0.06m), VedA=1.49kN (x=t/2=0.06m), VedAmax=1.72kN, NedA=2.63kN

Bending, Myd=0.702 kNm, Mzd=0.000 kNm (EC5 §6.1.6)
Rectangular cross section, b=120mm, h=150mm, A=1.800E+004mm^2, Wy=4.500E+005mm^3, Wz=3.600E+005mm^3
Modification factor Kmod=0.70 (Table 3.1), material factor γM=1.30 (Table 2.3)

fmyk=24.00 N/mm^2, fmyd=Kmod·fmyk/γM=0.70x24.00/1.30=12.92N/mm^2
fmzk=24.00 N/mm^2, fmzd=Kmod·fmzk/γM=0.70x24.00/1.30=12.92N/mm^2

Rectangular cross section Km=0.70 (EC5 §6.1.6.(2))
σmyd=Myd/Wmy,netto=1E+06x0.702/4.500E+005= 1.56 N/mm^2
σmzd=Mzd/Wmz,netto=1E+06x0.000/3.600E+005= 0.00 N/mm^2

σmyd/fmyd+Km.σmzd/fmzd=0.121+0.000= 0.12 < 1 (EC5 Eq.6.11)
Km.σmyd/fmyd+σmzd/fmzd=0.085+0.000= 0.08 < 1 (EC5 Eq.6.12)
The check is satisfied

Shear, Fv=1.494 kN (EC5 §6.1.7)
Rectangular cross section, bef=0.67x120=80 mm, h=150 mm, A= 12 000 mm^2
Modification factor Kmod=0.70 (Table 3.1), material factor γM=1.30 (Table 2.3)
fvk=4.00 N/mm^2, fvd=Kmod·fvk/γM=0.70x4.00/1.30=2.15N/mm^2 (EC5 Eq.2.14)
Fv=1.494 kN, τv0d=1.50Fv0d/Anetto=1000x1.50x1.494/12000=0.19N/mm^2 < 2.15N/mm^2=fv0d (Eq.6.13)
The check is satisfied

Combined bending and axial tension, Ft0d=2.631kN, Myd=0.702kNm, Mzd=0.000kNm (EC5 §6.2.3)
Rectangular cross section, b=120mm, h=150mm, A=1.800E+004mm^2, Wy=4.500E+005mm^3, Wz=3.600E+005mm^3
Modification factor Kmod=0.70 (Table 3.1), material factor γM=1.30 (Table 2.3)
ft0k=14.00 N/mm^2, ft0d=Kmod·ft0k/γM=0.70x14.00/1.30=7.54N/mm^2
fmyk=24.00 N/mm^2, fmyd=Kmod·fmyk/γM=0.70x24.00/1.30=12.92N/mm^2
fmzk=24.00 N/mm^2, fmzd=Kmod·fmzk/γM=0.70x24.00/1.30=12.92N/mm^2

Rectangular cross section Km=0.70 (EC5 §6.1.6.(2))
σt0d=Ft0d/Anetto=1000x2.631/18000= 0.15 N/mm^2
σmyd=Myd/Wmy,netto=1E+06x0.702/4.500E+005= 1.56 N/mm^2
σmzd=Mzd/Wmz,netto=1E+06x0.000/3.600E+005= 0.00 N/mm^2

σt0d/ft0d+σmyd/fmyd+Km.σmzd/fmzd=0.019+0.121+0.000= 0.14 < 1 (EC5 Eq.6.17)
σt0d/ft0d+Km.σmyd/fmyd+σmzd/fmzd=0.019+0.085+0.000= 0.10 < 1 (EC5 Eq.6.18)
The check is satisfied

Timber design, element 5, [Right end], L= 1.000m, B= 120mm, H= 150mm

MedB=0.59kNm (x=t/2=0.07m), VedB=1.74kN (x=t/2=0.07m), VedBmax=1.72kN, NedB=2.63kN

Bending, Myd=0.594 kNm, Mzd=0.000 kNm (EC5 §6.1.6)
Rectangular cross section, b=120mm, h=150mm, A=1.800E+004mm^2, Wy=4.500E+005mm^3, Wz=3.600E+005mm^3
Modification factor Kmod=0.70 (Table 3.1), material factor γM=1.30 (Table 2.3)

fmyk=24.00 N/mm^2, fmyd=Kmod·fmyk/γM=0.70x24.00/1.30=12.92N/mm^2
fmzk=24.00 N/mm^2, fmzd=Kmod·fmzk/γM=0.70x24.00/1.30=12.92N/mm^2

```
Rectangular cross section Km=0.70 (EC5  §6.1.6.(2))
σmyd=Myd/Wmy,netto=1E+06x0.594/4.500E+005= 1.32 N/mm²
σmzd=Mzd/Wmz,netto=1E+06x0.000/3.600E+005= 0.00 N/mm²

σmyd/fmyd+Km.σmzd/fmzd=0.102+0.000= 0.10 < 1 (EC5 Eq.6.11)
Km.σmyd/fmyd+σmzd/fmzd=0.071+0.000= 0.07 < 1 (EC5 Eq.6.12)
The check is satisfied
```

Shear, Fv=1.742 kN (EC5 §6.1.7)

```
Rectangular cross section, bef=0.67x120=80 mm, h=150 mm, A= 12 000 mm²
Modification factor Kmod=0.70 (Table 3.1), material factor γM=1.30 (Table 2.3)
fvk=4.00 N/mm², fvd=Kmod·fvk/γM=0.70x4.00/1.30=2.15N/mm² (EC5 Eq.2.14)
Fv=1.742 kN, τv0d=1.50Fv0d/Anetto=1000x1.50x1.742/12000=0.22N/mm² < 2.15N/mm²=fv0d (Eq.6.13)
The check is satisfied
```

Combined bending and axial tension, Ft0d=2.631kN, Myd=0.594kNm, Mzd=0.000kNm (EC5 §6.2.3)

```
Rectangular cross section, b=120mm, h=150mm, A=1.800E+004mm², Wy=4.500E+005mm³, Wz=3.600E+005mm³
Modification factor Kmod=0.70 (Table 3.1), material factor γM=1.30 (Table 2.3)
ft0k=14.00 N/mm², ft0d=Kmod·ft0k/γM=0.70x14.00/1.30=7.54N/mm²
fmyk=24.00 N/mm², fmyd=Kmod·fmyk/γM=0.70x24.00/1.30=12.92N/mm²
fmzk=24.00 N/mm², fmzd=Kmod·fmzk/γM=0.70x24.00/1.30=12.92N/mm²

Rectangular cross section Km=0.70 (EC5  §6.1.6.(2))
σt0d=Ft0d/Anetto=1000x2.631/18000= 0.15 N/mm²
σmyd=Myd/Wmy,netto=1E+06x0.594/4.500E+005= 1.32 N/mm²
σmzd=Mzd/Wmz,netto=1E+06x0.000/3.600E+005= 0.00 N/mm²

σt0d/ft0d+σmyd/fmyd+Km.σmzd/fmzd=0.019+0.102+0.000= 0.12 < 1 (EC5 Eq.6.17)
σt0d/ft0d+Km.σmyd/fmyd+σmzd/fmzd=0.019+0.071+0.000= 0.09 < 1 (EC5 Eq.6.18)
The check is satisfied
```

Timber design, element 5 , L= 1.000m, B= 120mm, H= 150mm, Buckling resistance

Lateral torsional stability of beams, Myd=1.002 kNm, Mzd=0.000 kNm (EC5 §6.3.3)

```
Rectangular cross section, b=120mm, h=150mm, A=1.800E+004mm², Wy=4.500E+005mm³, Wz=3.600E+005mm³
Modification factor Kmod=0.70 (Table 3.1), material factor γM=1.30 (Table 2.3)
fc0k=21.00 N/mm², fc0d=Kmod·fc0k/γM=0.70x21.00/1.30=11.31N/mm²
fmyk=24.00 N/mm², fmyd=Kmod·fmyk/γM=0.70x24.00/1.30=12.92N/mm²
fmzk=24.00 N/mm², fmzd=Kmod·fmzk/γM=0.70x24.00/1.30=12.92N/mm²

Rectangular cross section Km=0.70 (EC5  §6.1.6.(2))
σmyd=Myd/Wmy,netto=1E+06x1.002/4.500E+005= 2.23 N/mm²
σmzd=Mzd/Wmz,netto=1E+06x0.000/3.600E+005= 0.00 N/mm²

Buckling length Sk
Sky= 1.00x1.000=1.000 m= 1000 mm
Skz= 1.00x1.000=1.000 m= 1000 mm

Slenderness
iy=√(Iy/A)=0.289x 150= 43 mm, λy= 1000/ 43= 23.26
iz=√(Iz/A)=0.289x 120= 35 mm, λz= 1000/ 35= 28.57

σm,crit=0.78.b²·E005/(h·Lef)=0.78x120²x 7400/(150x1000)= 554.11N/mm² (EC5 Eq.6.32)
σm,crit=0.78.b²·E005/(h·Lef)=0.78x150²x 7400/(120x1000)=1082.25N/mm² (EC5 Eq.6.32)
Critical stresses
σm,crity=  554.11 N/mm², λrel,my=√(fmyk/σm,crity)=  0.21 (EC5 Eq.6.30)
σm,critz= 1082.25 N/mm², λrel,mz=√(fmzk/σm,critz)=  0.15 (EC5 Eq.6.30)

λrel,my=0.21, (λrel<=0.75), Kcrity=1.00 (EC5 Eq.6.34)
λrel,mz=0.15, (λrel<=0.75), Kcritz=1.00 (EC5 Eq.6.34)
```

σmyd/(Kcrity·fmyd)+Km.σmzd/(Kcritz·fmzd)=0.172+0.000= 0.17 < 1 (EC5 Eq.6.33)
Km.σmyd/(Kcrity·fmyd)+σmzd/(Kcritz·fmzd)=0.121+0.000= 0.12 < 1 (EC5 Eq.6.33)
The check is satisfied

Timber design, element 7, [Span], L= 2.400m, B= 120mm, H= 150mm

Med = 3.61 kNm, Ved = 0.00 kN, Ned = -1.74 kN (x=1.20m)

Bending, Myd=3.606 kNm, Mzd=0.000 kNm (EC5 §6.1.6)
Rectangular cross section, b=120mm, h=150mm, A=1.800E+004mm^2, Wy=4.500E+005mm^3, Wz=3.600E+005mm^3
Modification factor Kmod=0.70 (Table 3.1), material factor γM=1.30 (Table 2.3)

fmyk=24.00 N/mm^2, fmyd=Kmod·fmyk/γM=0.70x24.00/1.30=12.92N/mm^2
fmzk=24.00 N/mm^2, fmzd=Kmod·fmzk/γM=0.70x24.00/1.30=12.92N/mm^2

Rectangular cross section Km=0.70 (EC5 §6.1.6.(2))
σmyd=Myd/Wmy,netto=1E+06x3.606/4.500E+005= 8.01 N/mm^2
σmzd=Mzd/Wmz,netto=1E+06x0.000/3.600E+005= 0.00 N/mm^2

σmyd/fmyd+Km.σmzd/fmzd=0.620+0.000= 0.62 < 1 (EC5 Eq.6.11)
Km.σmyd/fmyd+σmzd/fmzd=0.434+0.000= 0.43 < 1 (EC5 Eq.6.12)
The check is satisfied

Combined bending and axial compression, Fc0d=-1.743kN, Myd=3.606kNm, Mzd=0.000kNm (EC5 §6.2.4)
Rectangular cross section, b=120mm, h=150mm, A=1.800E+004mm^2, Wy=4.500E+005mm^3, Wz=3.600E+005mm^3
Modification factor Kmod=0.70 (Table 3.1), material factor γM=1.30 (Table 2.3)
fc0k=21.00 N/mm^2, fc0d=Kmod·fc0k/γM=0.70x21.00/1.30=11.31N/mm^2
fmyk=24.00 N/mm^2, fmyd=Kmod·fmyk/γM=0.70x24.00/1.30=12.92N/mm^2
fmzk=24.00 N/mm^2, fmzd=Kmod·fmzk/γM=0.70x24.00/1.30=12.92N/mm^2

Rectangular cross section Km=0.70 (EC5 §6.1.6.(2))
σc0d=Fc0d/Anetto=1000x1.743/18000= 0.10 N/mm^2
σmyd=Myd/Wmy,netto=1E+06x3.606/4.500E+005= 8.01 N/mm^2
σmzd=Mzd/Wmz,netto=1E+06x0.000/3.600E+005= 0.00 N/mm^2

(σc0d/fc0d)^2+σmyd/fmyd+Km.σmzd/fmzd=0.000+0.620+0.000= 0.62 < 1 (EC5 Eq.6.19)
(σc0d/fc0d)^2+Km.σmyd/fmyd+σmzd/fmzd=0.000+0.434+0.000= 0.43 < 1 (EC5 Eq.6.20)
The check is satisfied

Timber design, element 7, [Left end], L= 2.400m, B= 120mm, H= 150mm

MedA=1.22kNm (x=t/2=0.07m), VedA=4.20kN (x=t/2=0.07m), VedAmax=4.44kN, NedA=-1.74kN

Bending, Myd=1.224 kNm, Mzd=0.000 kNm (EC5 §6.1.6)
Rectangular cross section, b=120mm, h=150mm, A=1.800E+004mm^2, Wy=4.500E+005mm^3, Wz=3.600E+005mm^3
Modification factor Kmod=0.70 (Table 3.1), material factor γM=1.30 (Table 2.3)

fmyk=24.00 N/mm^2, fmyd=Kmod·fmyk/γM=0.70x24.00/1.30=12.92N/mm^2
fmzk=24.00 N/mm^2, fmzd=Kmod·fmzk/γM=0.70x24.00/1.30=12.92N/mm^2

Rectangular cross section Km=0.70 (EC5 §6.1.6.(2))
σmyd=Myd/Wmy,netto=1E+06x1.224/4.500E+005= 2.72 N/mm^2
σmzd=Mzd/Wmz,netto=1E+06x0.000/3.600E+005= 0.00 N/mm^2

σmyd/fmyd+Km.σmzd/fmzd=0.210+0.000= 0.21 < 1 (EC5 Eq.6.11)
Km.σmyd/fmyd+σmzd/fmzd=0.147+0.000= 0.15 < 1 (EC5 Eq.6.12)
The check is satisfied

Shear, Fv=4.198 kN (EC5 §6.1.7)
Rectangular cross section, bef=0.67x120=80 mm, h=150 mm, A= 12 000 mm^2
Modification factor Kmod=0.70 (Table 3.1), material factor γM=1.30 (Table 2.3)
fvk=4.00 N/mm^2, fvd=Kmod·fvk/γM=0.70x4.00/1.30=2.15N/mm^2 (EC5 Eq.2.14)
Fv=4.198 kN, τv0d=1.50Fv0d/Anetto=1000x1.50x4.198/12000=0.52N/mm^2 < 2.15N/mm^2=fv0d (Eq.6.13)
The check is satisfied

Combined bending and axial compression, Fc0d=-1.743kN, Myd=1.224kNm, Mzd=0.000kNm (EC5 §6.2.4)
Rectangular cross section, b=120mm, h=150mm, A=1.800E+004mm^2, Wy=4.500E+005mm^3, Wz=3.600E+005mm^3
Modification factor Kmod=0.70 (Table 3.1), material factor γM=1.30 (Table 2.3)
fc0k=21.00 N/mm^2, fc0d=Kmod·fc0k/γM=0.70x21.00/1.30=11.31N/mm^2
fmyk=24.00 N/mm^2, fmyd=Kmod·fmyk/γM=0.70x24.00/1.30=12.92N/mm^2
fmzk=24.00 N/mm^2, fmzd=Kmod·fmzk/γM=0.70x24.00/1.30=12.92N/mm^2

Rectangular cross section Km=0.70 (EC5 §6.1.6.(2))
σc0d=Fc0d/Anetto=1000x1.743/18000= 0.10 N/mm^2
σmyd=Myd/Wmy,netto=1E+06x1.224/4.500E+005= 2.72 N/mm^2
σmzd=Mzd/Wmz,netto=1E+06x0.000/3.600E+005= 0.00 N/mm^2

(σc0d/fc0d)^2+σmyd/fmyd+Km.σmzd/fmzd=0.000+0.210+0.000= 0.21 < 1 (EC5 Eq.6.19)
(σc0d/fc0d)^2+Km.σmyd/fmyd+σmzd/fmzd=0.000+0.147+0.000= 0.15 < 1 (EC5 Eq.6.20)
The check is satisfied

Timber design, element 7, [Right end], L= 2.400m, B= 120mm, H= 150mm

MedB=1.22kNm (x=t/2=0.07m), VedB=4.20kN (x=t/2=0.07m), VedBmax=4.44kN, NedB=-1.74kN

Bending, Myd=1.224 kNm, Mzd=0.000 kNm (EC5 §6.1.6)
Rectangular cross section, b=120mm, h=150mm, A=1.800E+004mm^2, Wy=4.500E+005mm^3, Wz=3.600E+005mm^3
Modification factor Kmod=0.70 (Table 3.1), material factor γM=1.30 (Table 2.3)

fmyk=24.00 N/mm^2, fmyd=Kmod·fmyk/γM=0.70x24.00/1.30=12.92N/mm^2
fmzk=24.00 N/mm^2, fmzd=Kmod·fmzk/γM=0.70x24.00/1.30=12.92N/mm^2

Rectangular cross section Km=0.70 (EC5 §6.1.6.(2))
σmyd=Myd/Wmy,netto=1E+06x1.224/4.500E+005= 2.72 N/mm^2
σmzd=Mzd/Wmz,netto=1E+06x0.000/3.600E+005= 0.00 N/mm^2

σmyd/fmyd+Km.σmzd/fmzd=0.210+0.000= 0.21 < 1 (EC5 Eq.6.11)
Km.σmyd/fmyd+σmzd/fmzd=0.147+0.000= 0.15 < 1 (EC5 Eq.6.12)
The check is satisfied

Shear, Fv=4.198 kN (EC5 §6.1.7)
Rectangular cross section, bef=0.67x120=80 mm, h=150 mm, A= 12 000 mm^2
Modification factor Kmod=0.70 (Table 3.1), material factor γM=1.30 (Table 2.3)
fvk=4.00 N/mm^2, fvd=Kmod·fvk/γM=0.70x4.00/1.30=2.15N/mm^2 (EC5 Eq.2.14)
Fv=4.198 kN, τv0d=1.50Fv0d/Anetto=1000x1.50x4.198/12000=0.52N/mm^2 < 2.15N/mm^2=fv0d (Eq.6.13)
The check is satisfied

Combined bending and axial compression, Fc0d=-1.743kN, Myd=1.224kNm, Mzd=0.000kNm (EC5 §6.2.4)
Rectangular cross section, b=120mm, h=150mm, A=1.800E+004mm^2, Wy=4.500E+005mm^3, Wz=3.600E+005mm^3
Modification factor Kmod=0.70 (Table 3.1), material factor γM=1.30 (Table 2.3)
fc0k=21.00 N/mm^2, fc0d=Kmod·fc0k/γM=0.70x21.00/1.30=11.31N/mm^2
fmyk=24.00 N/mm^2, fmyd=Kmod·fmyk/γM=0.70x24.00/1.30=12.92N/mm^2
fmzk=24.00 N/mm^2, fmzd=Kmod·fmzk/γM=0.70x24.00/1.30=12.92N/mm^2

Rectangular cross section Km=0.70 (EC5 §6.1.6.(2))
σc0d=Fc0d/Anetto=1000x1.743/18000= 0.10 N/mm^2
σmyd=Myd/Wmy,netto=1E+06x1.224/4.500E+005= 2.72 N/mm^2
σmzd=Mzd/Wmz,netto=1E+06x0.000/3.600E+005= 0.00 N/mm^2

```
(σc0d/fc0d)²+σmyd/fmyd+Km.σmzd/fmzd=0.000+0.210+0.000= 0.21 < 1 (EC5 Eq.6.19)
(σc0d/fc0d)²+Km.σmyd/fmyd+σmzd/fmzd=0.000+0.147+0.000= 0.15 < 1 (EC5 Eq.6.20)
The check is satisfied
```

Timber design, element 7 , L= 2.400m, B= 120mm, H= 150mm, Buckling resistance

Lateral torsional stability of beams, Myd=3.606 kNm, Mzd=0.000 kNm (EC5 §6.3.3)

```
Rectangular cross section, b=120mm, h=150mm, A=1.800E+004mm², Wy=4.500E+005mm³, Wz=3.600E+005mm³
Modification factor Kmod=0.70 (Table 3.1), material factor γM=1.30 (Table 2.3)
fc0k=21.00 N/mm², fc0d=Kmod·fc0k/γM=0.70x21.00/1.30=11.31N/mm²
fmyk=24.00 N/mm², fmyd=Kmod·fmyk/γM=0.70x24.00/1.30=12.92N/mm²
fmzk=24.00 N/mm², fmzd=Kmod·fmzk/γM=0.70x24.00/1.30=12.92N/mm²

Rectangular cross section Km=0.70 (EC5  §6.1.6.(2))
σmyd=Myd/Wmy,netto=1E+06x3.606/4.500E+005= 8.01 N/mm²
σmzd=Mzd/Wmz,netto=1E+06x0.000/3.600E+005= 0.00 N/mm²
```

Buckling length Sk

```
Sky= 1.00x2.400=2.400 m= 2400 mm
Skz= 0.50x2.400=1.200 m= 1200 mm
```

Slenderness

```
iy=√(Iy/A)=0.289x 150= 43 mm, λy= 2400/ 43= 55.81
iz=√(Iz/A)=0.289x 120= 35 mm, λz= 1200/ 35= 34.29

σm,crit=0.78.b²·E005/(h·Lef)=0.78x120²x 7400/(150x2160)= 256.53N/mm² (EC5 Eq.6.32)
σm,crit=0.78.b²·E005/(h·Lef)=0.78x150²x 7400/(120x1080)=1002.08N/mm² (EC5 Eq.6.32)
```

Critical stresses

```
σm,crity=  256.53 N/mm², λrel,my=√(fmyk/σm,crity)=  0.31 (EC5 Eq.6.30)
σm,critz= 1002.08 N/mm², λrel,mz=√(fmzk/σm,critz)=  0.15 (EC5 Eq.6.30)

λrel,my=0.31, (λrel<=0.75), Kcrity=1.00 (EC5 Eq.6.34)
λrel,mz=0.15, (λrel<=0.75), Kcritz=1.00 (EC5 Eq.6.34)

σmyd/(Kcrity·fmyd)+Km.σmzd/(Kcritz·fmzd)=0.620+0.000= 0.62 < 1 (EC5 Eq.6.33)
Km.σmyd/(Kcrity·fmyd)+σmzd/(Kcritz·fmzd)=0.434+0.000= 0.43 < 1 (EC5 Eq.6.33)
The check is satisfied
```

Timber design, element 8, [Span], L= 1.562m, B= 60mm, H= 100mm

Med = -0.38 kNm, Ved = 0.80 kN, Ned = -7.79 kN (x=0.47m)

Compression parallel to the grain, Fc0d=-7.794 kN (EC5 §6.1.4)

```
Rectangular cross section, b=60 mm, h=100 mm, A= 6 000 mm²
Modification factor Kmod=0.70 (Table 3.1), material factor γM=1.30 (Table 2.3)
fc0k=21.00 N/mm², fc0d=Kmod·fc0k/γM=0.70x21.00/1.30=11.31N/mm² (EC5 Eq.2.14)
Fc0d=-7.794 kN, σc0d=Fc0d/Anetto=1000x7.794/6000=1.30N/mm² < 11.31N/mm²=fc0d (Eq.6.2)
The check is satisfied
```

Bending, Myd=0.379 kNm, Mzd=0.000 kNm (EC5 §6.1.6)

```
Rectangular cross section, b=60mm, h=100mm, A=6.000E+003mm², Wy=1.000E+005mm³, Wz=6.000E+004mm³
Modification factor Kmod=0.70 (Table 3.1), material factor γM=1.30 (Table 2.3)

fmyk=24.00 N/mm², fmyd=Kmod·fmyk/γM=0.70x24.00/1.30=12.92N/mm²
fmzk=24.00 N/mm², fmzd=Kmod·fmzk/γM=0.70x24.00/1.30=12.92N/mm²

Rectangular cross section Km=0.70 (EC5  §6.1.6.(2))
σmyd=Myd/Wmy,netto=1E+06x0.379/1.000E+005= 3.79 N/mm²
σmzd=Mzd/Wmz,netto=1E+06x0.000/6.000E+004= 0.00 N/mm²
```

σmyd/fmyd+Km.σmzd/fmzd=0.294+0.000= 0.29 < 1 (EC5 Eq.6.11)
Km.σmyd/fmyd+σmzd/fmzd=0.205+0.000= 0.21 < 1 (EC5 Eq.6.12)
The check is satisfied

Shear, Fv=0.802 kN (EC5 §6.1.7)
Rectangular cross section, bef=0.67x60=40 mm, h=100 mm, A= 4 000 mm^2
Modification factor Kmod=0.70 (Table 3.1), material factor γM=1.30 (Table 2.3)
fvk=4.00 N/mm^2, fvd=Kmod·fvk/γM=0.70x4.00/1.30=2.15N/mm^2 (EC5 Eq.2.14)
Fv=0.802 kN, τv0d=1.50Fv0d/Anetto=1000x1.50x0.802/4000=0.30N/mm^2 < 2.15N/mm^2=fv0d (Eq.6.13)
The check is satisfied

Combined bending and axial compression, Fc0d=-7.794kN, Myd=0.379kNm, Mzd=0.000kNm (EC5 §6.2.4)
Rectangular cross section, b=60mm, h=100mm, A=6.000E+003mm^2, Wy=1.000E+005mm^3, Wz=6.000E+004mm^3
Modification factor Kmod=0.70 (Table 3.1), material factor γM=1.30 (Table 2.3)
fc0k=21.00 N/mm^2, fc0d=Kmod·fc0k/γM=0.70x21.00/1.30=11.31N/mm^2
fmyk=24.00 N/mm^2, fmyd=Kmod·fmyk/γM=0.70x24.00/1.30=12.92N/mm^2
fmzk=24.00 N/mm^2, fmzd=Kmod·fmzk/γM=0.70x24.00/1.30=12.92N/mm^2

Rectangular cross section Km=0.70 (EC5 §6.1.6.(2))
σc0d=Fc0d/Anetto=1000x7.794/6000= 1.30 N/mm^2
σmyd=Myd/Wmy,netto=1E+06x0.379/1.000E+005= 3.79 N/mm^2
σmzd=Mzd/Wmz,netto=1E+06x0.000/6.000E+004= 0.00 N/mm^2

(σc0d/fc0d)^2+σmyd/fmyd+Km.σmzd/fmzd=0.013+0.294+0.000= 0.31 < 1 (EC5 Eq.6.19)
(σc0d/fc0d)^2+Km.σmyd/fmyd+σmzd/fmzd=0.013+0.205+0.000= 0.22 < 1 (EC5 Eq.6.20)
The check is satisfied

Timber design, element 8, [Left end], L= 1.562m, B= 60mm, H= 100mm

MedA=-0.68kNm (x=t/2=0.09m), VedA=0.82kN (x=t/2=0.09m), VedAmax=0.82kN, NedA=-7.82kN

Compression parallel to the grain, Fc0d=-7.820 kN (EC5 §6.1.4)
Rectangular cross section, b=60 mm, h=100 mm, A= 6 000 mm^2
Modification factor Kmod=0.70 (Table 3.1), material factor γM=1.30 (Table 2.3)
fc0k=21.00 N/mm^2, fc0d=Kmod·fc0k/γM=0.70x21.00/1.30=11.31N/mm^2 (EC5 Eq.2.14)
Fc0d=-7.820 kN, σc0d=Fc0d/Anetto=1000x7.820/6000=1.30N/mm^2 < 11.31N/mm^2=fc0d (Eq.6.2)
The check is satisfied

Bending, Myd=0.683 kNm, Mzd=0.000 kNm (EC5 §6.1.6)
Rectangular cross section, b=60mm, h=100mm, A=6.000E+003mm^2, Wy=1.000E+005mm^3, Wz=6.000E+004mm^3
Modification factor Kmod=0.70 (Table 3.1), material factor γM=1.30 (Table 2.3)

fmyk=24.00 N/mm^2, fmyd=Kmod·fmyk/γM=0.70x24.00/1.30=12.92N/mm^2
fmzk=24.00 N/mm^2, fmzd=Kmod·fmzk/γM=0.70x24.00/1.30=12.92N/mm^2

Rectangular cross section Km=0.70 (EC5 §6.1.6.(2))
σmyd=Myd/Wmy,netto=1E+06x0.683/1.000E+005= 6.83 N/mm^2
σmzd=Mzd/Wmz,netto=1E+06x0.000/6.000E+004= 0.00 N/mm^2

σmyd/fmyd+Km.σmzd/fmzd=0.529+0.000= 0.53 < 1 (EC5 Eq.6.11)
Km.σmyd/fmyd+σmzd/fmzd=0.370+0.000= 0.37 < 1 (EC5 Eq.6.12)
The check is satisfied

Shear, Fv=0.820 kN (EC5 §6.1.7)
Rectangular cross section, bef=0.67x60=40 mm, h=100 mm, A= 4 000 mm^2
Modification factor Kmod=0.70 (Table 3.1), material factor γM=1.30 (Table 2.3)
fvk=4.00 N/mm^2, fvd=Kmod·fvk/γM=0.70x4.00/1.30=2.15N/mm^2 (EC5 Eq.2.14)
Fv=0.820 kN, τv0d=1.50Fv0d/Anetto=1000x1.50x0.820/4000=0.31N/mm^2 < 2.15N/mm^2=fv0d (Eq.6.13)
The check is satisfied

Combined bending and axial compression, Fc0d=-7.820kN, Myd=0.683kNm, Mzd=0.000kNm (EC5 §6.2.4)
Rectangular cross section, b=60mm, h=100mm, A=6.000E+003mm^2, Wy=1.000E+005mm^3, Wz=6.000E+004mm^3
Modification factor Kmod=0.70 (Table 3.1), material factor γM=1.30 (Table 2.3)
fc0k=21.00 N/mm^2, fc0d=Kmod·fc0k/γM=0.70x21.00/1.30=11.31N/mm^2
fmyk=24.00 N/mm^2, fmyd=Kmod·fmyk/γM=0.70x24.00/1.30=12.92N/mm^2
fmzk=24.00 N/mm^2, fmzd=Kmod·fmzk/γM=0.70x24.00/1.30=12.92N/mm^2

Rectangular cross section Km=0.70 (EC5 §6.1.6.(2))
σc0d=Fc0d/Anetto=1000x7.820/6000= 1.30 N/mm^2
σmyd=Myd/Wmy,netto=1E+06x0.683/1.000E+005= 6.83 N/mm^2
σmzd=Mzd/Wmz,netto=1E+06x0.000/6.000E+004= 0.00 N/mm^2

(σc0d/fc0d)^2+σmyd/fmyd+Km.σmzd/fmzd=0.013+0.529+0.000= 0.54 < 1 (EC5 Eq.6.19)
(σc0d/fc0d)^2+Km.σmyd/fmyd+σmzd/fmzd=0.013+0.370+0.000= 0.38 < 1 (EC5 Eq.6.20)
The check is satisfied

Timber design, element 8, [Right end], L= 1.562m, B= 60mm, H= 100mm

MedB=0.40kNm (x=t/2=0.10m), VedB=0.76kN (x=t/2=0.10m), VedBmax=0.82kN, NedB=-7.73kN

Compression parallel to the grain, Fc0d=-7.733 kN (EC5 §6.1.4)
Rectangular cross section, b=60 mm, h=100 mm, A= 6 000 mm^2
Modification factor Kmod=0.70 (Table 3.1), material factor γM=1.30 (Table 2.3)
fc0k=21.00 N/mm^2, fc0d=Kmod·fc0k/γM=0.70x21.00/1.30=11.31N/mm^2 (EC5 Eq.2.14)
Fc0d=-7.733 kN, σc0d=Fc0d/Anetto=1000x7.733/6000=1.29N/mm^2 < 11.31N/mm^2=fc0d (Eq.6.2)
The check is satisfied

Bending, Myd=0.396 kNm, Mzd=0.000 kNm (EC5 §6.1.6)
Rectangular cross section, b=60mm, h=100mm, A=6.000E+003mm^2, Wy=1.000E+005mm^3, Wz=6.000E+004mm^3
Modification factor Kmod=0.70 (Table 3.1), material factor γM=1.30 (Table 2.3)

fmyk=24.00 N/mm^2, fmyd=Kmod·fmyk/γM=0.70x24.00/1.30=12.92N/mm^2
fmzk=24.00 N/mm^2, fmzd=Kmod·fmzk/γM=0.70x24.00/1.30=12.92N/mm^2

Rectangular cross section Km=0.70 (EC5 §6.1.6.(2))
σmyd=Myd/Wmy,netto=1E+06x0.396/1.000E+005= 3.96 N/mm^2
σmzd=Mzd/Wmz,netto=1E+06x0.000/6.000E+004= 0.00 N/mm^2

σmyd/fmyd+Km.σmzd/fmzd=0.307+0.000= 0.31 < 1 (EC5 Eq.6.11)
Km.σmyd/fmyd+σmzd/fmzd=0.215+0.000= 0.21 < 1 (EC5 Eq.6.12)
The check is satisfied

Shear, Fv=0.756 kN (EC5 §6.1.7)
Rectangular cross section, bef=0.67x60=40 mm, h=100 mm, A= 4 000 mm^2
Modification factor Kmod=0.70 (Table 3.1), material factor γM=1.30 (Table 2.3)
fvk=4.00 N/mm^2, fvd=Kmod·fvk/γM=0.70x4.00/1.30=2.15N/mm^2 (EC5 Eq.2.14)
Fv=0.756 kN, τv0d=1.50Fv0d/Anetto=1000x1.50x0.756/4000=0.28N/mm^2 < 2.15N/mm^2=fv0d (Eq.6.13)
The check is satisfied

Combined bending and axial compression, Fc0d=-7.733kN, Myd=0.396kNm, Mzd=0.000kNm (EC5 §6.2.4)
Rectangular cross section, b=60mm, h=100mm, A=6.000E+003mm^2, Wy=1.000E+005mm^3, Wz=6.000E+004mm^3
Modification factor Kmod=0.70 (Table 3.1), material factor γM=1.30 (Table 2.3)
fc0k=21.00 N/mm^2, fc0d=Kmod·fc0k/γM=0.70x21.00/1.30=11.31N/mm^2
fmyk=24.00 N/mm^2, fmyd=Kmod·fmyk/γM=0.70x24.00/1.30=12.92N/mm^2
fmzk=24.00 N/mm^2, fmzd=Kmod·fmzk/γM=0.70x24.00/1.30=12.92N/mm^2

Rectangular cross section Km=0.70 (EC5 §6.1.6.(2))
σc0d=Fc0d/Anetto=1000x7.733/6000= 1.29 N/mm^2
σmyd=Myd/Wmy,netto=1E+06x0.396/1.000E+005= 3.96 N/mm^2
σmzd=Mzd/Wmz,netto=1E+06x0.000/6.000E+004= 0.00 N/mm^2

(σc0d/fc0d)^2+σmyd/fmyd+Km.σmzd/fmzd=0.013+0.307+0.000= 0.32 < 1 (EC5 Eq.6.19)
(σc0d/fc0d)^2+Km.σmyd/fmyd+σmzd/fmzd=0.013+0.215+0.000= 0.23 < 1 (EC5 Eq.6.20)
The check is satisfied

Timber design, element 8 , L= 1.562m, B= 60mm, H= 100mm, Buckling resistance

Column stability with bending, Fc0d=-7.820kN, Myd=0.683kNm, Mzd=0.000kNm (EC5 §6.3.2)
Rectangular cross section, b=60mm, h=100mm, A=6.000E+003mm^2, Wy=1.000E+005mm^3, Wz=6.000E+004mm^3
Modification factor Kmod=0.70 (Table 3.1), material factor γM=1.30 (Table 2.3, E005=7400N/mm^2)
fc0k=21.00 N/mm^2, fc0d=Kmod·fc0k/γM=0.70x21.00/1.30=11.31N/mm^2
fmyk=24.00 N/mm^2, fmyd=Kmod·fmyk/γM=0.70x24.00/1.30=12.92N/mm^2
fmzk=24.00 N/mm^2, fmzd=Kmod·fmzk/γM=0.70x24.00/1.30=12.92N/mm^2

Rectangular cross section Km=0.70 (EC5 §6.1.6.(2))
σc0d=Fc0d/Anetto=1000x7.820/6000= 1.30 N/mm^2
σmyd=Myd/Wmy,netto=1E+06x0.683/1.000E+005= 6.83 N/mm^2
σmzd=Mzd/Wmz,netto=1E+06x0.000/6.000E+004= 0.00 N/mm^2

Buckling length Sk
Sky= 1.00x1.562=1.562 m= 1562 mm
Skz= 1.00x1.562=1.562 m= 1562 mm

Slenderness
iy=√(Iy/A)=0.289x 100= 29 mm, λy= 1562/ 29= 53.86
iz=√(Iz/A)=0.289x 60= 17 mm, λz= 1562/ 17= 91.88

Critical stresses
σc,crity=π^{2}E005/λy^2= 25.18 N/mm^2, λrel,y=√(fc0k/σc,crity)= 0.91 (EC5 Eq.6.21)
σc,critz=π^{2}E005/λz^2= 8.65 N/mm^2, λrel,z=√(fc0k/σc,critz)= 1.56 (EC5 Eq.6.22)

βc=0.20 (solid timber)
ky=0.5[1+βc(λrely-0.3)+λrely^2]= 0.98, Kcy=1/(ky+√(ky^2-λrely^2))=0.752 (Eq.6.27 6.25)
kz=0.5[1+βc(λrelz-0.3)+λrelz^2]= 1.84, Kcz=1/(kz+√(kz^2-λrelz^2))=0.355 (Eq.6.28 6.26)

σc0d/(Kcy·fc0d)+σmyd/fmyd+Km.σmzd/fmzd=0.153+0.529+0.000= 0.68 < 1 (EC5 Eq.6.23)
σc0d/(Kcz·fc0d)+Km.σmyd/fmyd+σmzd/fmzd=0.325+0.370+0.000= 0.69 < 1 (EC5 Eq.6.24)
The check is satisfied